EPIDEMIOLOGY OF BURN INJURIES

IN SULAYMANIYAH PROVINCE OF IRAQ

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To my wife, Kazhal and my children Aran, Roza and Rawand without whose understanding and support, I could not have accomplished this project.

Abstract

Background

Sulaymaniyah is one of the three provinces of the Kurdish region in northern Iraq with a population of 1,700,000. Burn injuries remain a major concern for health authorities in this region where published data on the nature and size of the problem are scarce. The objectives of this PhD project were to investigate the epidemiology of burn injuries, burn mortality, intentional self-harm burns and risk factors for burns in pre-school children.

Methods

This project involved three main studies; an incidence and outcome study, a three-year admissions study and a case-control study. In the incidence and outcome study which was undertaken prospectively from 3rd November 2007 to 2nd November 2008 at the only burns centre in Sulaymaniyah, all patients attending for a new burn injury were included whether admitted or treated as an outpatient. Patients admitted for intentional self-harm within this study were separately analysed. In the three-year admissions study, all acute burn admissions of 2006-2008 were included. The case-control study investigating risk factors for burns in children aged 0-5 years, involved incident burn cases and controls admitted for other conditions. The risk factors for death, for self-harm and for childhood burns were analysed using multiple logistic regression.

Results

The incidence and outcome study: A total of 2975 patients were recruited (male 52%, female 48%; median age 18 years). The all-age incidence of burns was 389 per 100,000 per year and the highest incidence was in preschool children (1044 per 100,000 per year). The mechanisms of injury included scalds (53%), flame (37%), contact (7%), chemical (1%), electrical (1%) and explosives (1%). Most burns occurred at home (83%; male 68%, female 96%). There were 884 admissions during the year amounting to an admission rate of 40.4 (males 34.6, females 46.2) per 100,000 per year with the highest rate being in preschool children (82.3 per 100,000 per year). Flame injuries accounted for most women admissions (91%) and scalds for most child admissions (84%). The mortality rate was 9.1 (males 2.5, females 15.6) per 100,000 per year. The median total body surface area (TBSA) burnt was 18% and median hospital stay was 8 days. In-

hospital mortality was 28%. Adjusted odds ratios for death were 36.4 (95% confidence interval 15.9-83.3) for TBSA burnt ≥ 40%; 5.4 (1.7-18.5) for age of 60 and over; 3.6 (1.7-7.3) for inhalation injury; 5.6 (2.5-12.9) for self-inflicted burns and 3.0 (1.3-6.8) for autumn season.

Regarding self-harm burns, there were 197 cases of intentional self-harm burns during the year (male 6%, female 94%) amounting to an incidence rate of 8.4 (male 1.2, female 15.5) per 100,000 per year. The median age of patients was 20 years, the median TBSA burnt was 74%, the median hospital stay was 4 days and in-hospital mortality was 88%. The adjusted odds ratios for the risk factors for self-harm were 13.8 (6.9-27.4) for female sex; 3.9 (2.2-7.0) for young age of 11-18 years; 2.5 (1.2-5.5) for lower levels of education; 2.4 (1.3-4.4) for spring season; and 2.7 (1.4-5.2) for small family size of 1-3 members.

The three-year admissions study: There were 2829 acute burn admissions from 1st January 2006 until 31st December 2008 with an in-hospital mortality rate of 27%. There was similar number of patients in each year with no significant differences in terms of sex, median age, median TBSA burnt, and in-hospital mortality.

The case-control study: The case-control study included 248 cases & 248 controls. 79% of cases were scalds, 17% contact and 4% flame injuries. Burns most commonly occurred in sitting rooms (53%) and in the kitchen (36%) and were most commonly caused by tea utensils (42%) and kerosene stoves (36%). The adjusted odds ratios for risk factors for burns were 5.4 (2.6-11.7) for poor living standard; 5.3 (3.4-8.5) for child activity score; 2.8 (1.5- 5.2), for family history of burns; 1.3 (1.0- 1.7) for a one unit increase in presence of home hazards; 0.4 (0.2- 0.7) for presence of a second carer; and 0.14 (0.03-0.6) for presence of disabilities.

Conclusion

Burns are an important public health problem with high incidence and mortality rates. Morbidity is highest in pre-school children and mortality is highest in young females. Suicide by self-burning is common and mostly affects adolescents and young women. Collective action is required from the health authorities and their partners to address these issues through developing prevention strategies incorporating further research to the situation, improvement of service delivery to those affected and preventive interventions particularly addressing burns in pre-school children and intentional self-harm burns in women.

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Chapter One

Introduction

1.1. Problem statement

Burn injuries remain a major cause of morbidity and mortality in low and middle income countries. During the past 2 decades the Iraqi population has being struggling to cope with the impact of wars, sanctions and internal conflicts with poor public services and deteriorating living standards. While health statistics are generally lacking in the country, published data about burn injuries are scarce in Iraqi Kurdistan and their epidemiology has not being studied. Therefore investigating the epidemiological characteristics and risk factors for burns is essential to provide a better understanding of the problem and to plan preventive services.

This chapter reports on a review of the relevant epidemiological literature around the world including a systematic review of burns in the East Mediterranean Region. Firstly, methods of the literature review will be described. Secondly, pathophysiology and management of burn injuries will be explained briefly. Thirdly, the global epidemiological features of burn injuries will be described and finally, the epidemiology of burn injuries in the East Mediterranean Region will be described in more detail with a

concluding section on the context in which the studies presented in this thesis were undertaken.

1.2 Methods of the literature review

1.2.1 Building the bibliography

While preparing the research protocol, a Medline search was undertaken using MeSH terms "burn" as a major heading and "epidemiology" as a subheading excluding certain types of articles such as editorials, case reports and letters. The results were limited to humans, with a date range of 1/1/1980-31/12/2006 and to articles in English or with English abstracts. More than 800 results were retrieved initially. The same search was re-run for updates and the last update was done on 18 June 2009. During the work some other articles cited by retrieved articles were added as well as certain reference books, national and agency reports and website resources. All references were stored in an EndNote library which contained more than 1700 references including those later included in the systematic review (next section).

1.2.2 Methods of the systematic review

A systematic review was undertaken to describe the epidemiology of burns in the East Mediterranean Region (EMR) of the WHO programme operation which includes 22 Arab and Islamic countries extending from Morocco to Pakistan including Iraq. The review covered the period between the years 1997 and 2007. All published studies relevant to the epidemiology of burns in the region were considered for inclusion in the review. The main outcomes included the incidence of burns, the mechanisms of burns and mortality.

1.2.2.1 Search strategy

Medline, Embase and CINAHL were searched for publication dates between 01/01/1997 and 16/4/2007. The search strategy included the following text terms: burn*, scald*, thermal injur*, combined by OR; AND the names of all 22 countries of the region

combined by OR. In addition a manual search was undertaken of the WHO's East Mediterranean Health Journal from its website. Articles in all languages were retrieved and included.

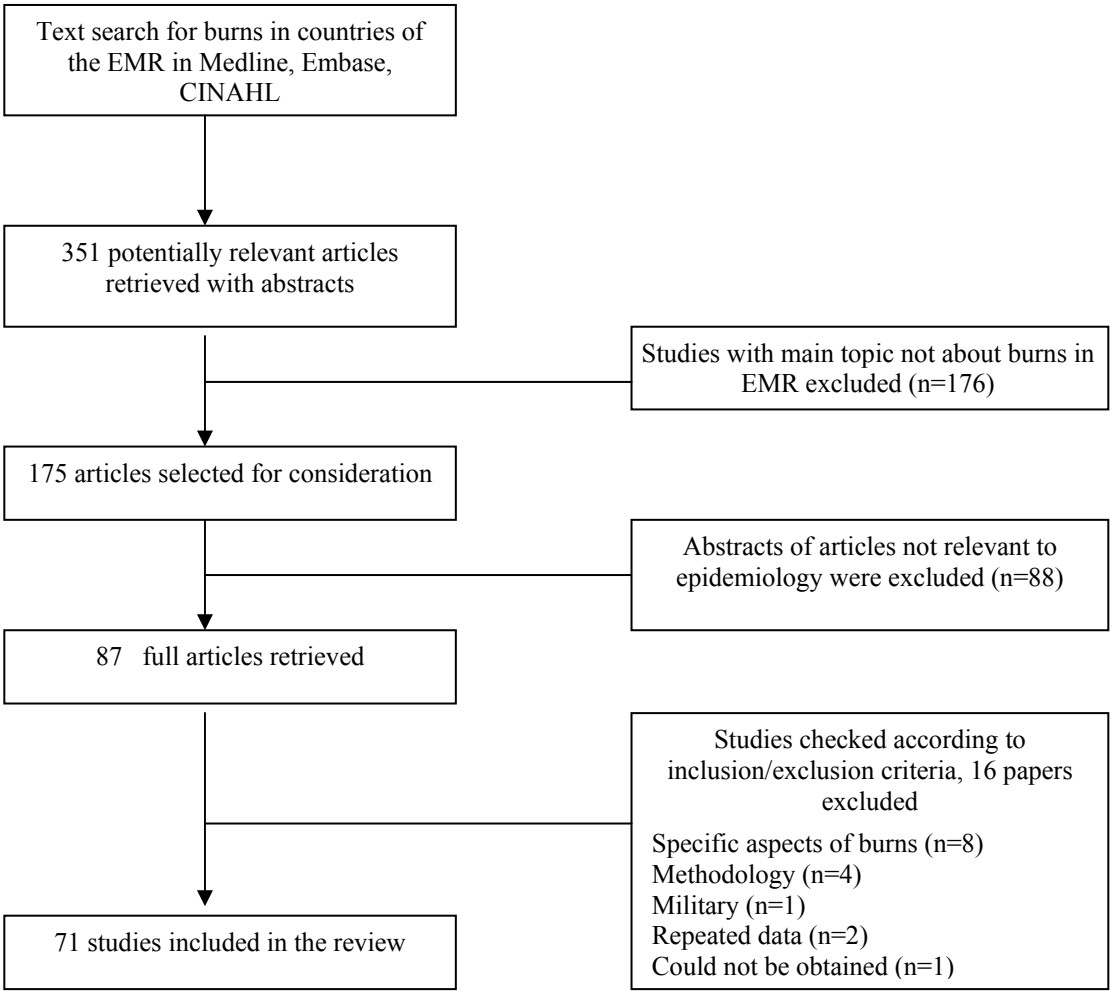
1.2.2.2 Inclusion/ exclusion criteria

Studies investigating the epidemiology of burns in the countries of the region were included if they were published between 1997 and 2007 using methodologies including cross sectional surveys, retrospective and prospective studies, systematic reviews and case-control studies. The following types of articles were excluded: 1) articles about specific aspects of burn management; 2) methodologies apart from those mentioned above e.g. case reports, editorials etc.; 3) military hospital reports of war related studies involving combatants and 4) articles repeating data from other articles already included.

1.2.2.3 Selection of the studies

The search strategy retrieved 351 potentially relevant articles with abstracts (see figure 1). The researcher reviewed the abstracts and excluded studies which were not about EMR countries or the main topic was not about burns. The titles and or abstracts of the remaining 175 articles were assessed for inclusion independently by the researcher and another reviewer (the supervisor) to select those relevant to epidemiology of burns. Eighty seven articles were selected and their full texts were obtained. Using the inclusion/exclusion criteria, the two researchers independently reviewed these articles and finally selected 71 studies for inclusion in the review.

Figure 1.1 Selection of studies for inclusion in the review



1.2.2.4 Data extraction

Data were extracted from full copies of published articles using a standard data extraction spreadsheet. Data were synthesised using a narrative synthesis. No attempt has been made to quantitatively synthesise the data due to the large degree of clinical and demographic heterogeneity between study populations.

1.2.2.5 Quality of studies

The quality of included studies was assessed using a modification of checklists described by Downs et al[1] and Macfarlane et al[2]. This checklist was developed

further to make it feasible to apply on a range of study methodologies included in this review. The checklist included 20 items to assess different stages of the research and paper writing (table 1.3). The two reviewers discussed and agreed how to apply each item to studies, and then 20 studies were assessed by both reviewers and agreement was measured. The agreement between the two reviewers on individual items ranged from 70% to 100% and kappa coefficients ranged from 0.35 (P=0.037) to 1.0 (P<0.001). Following this, more discussions were held between the reviewers on the application of the checklist. Quality for the remaining studies was assessed by one reviewer (the researcher).

1.2.3 Definition and international classification of burns

Burns are injuries of skin, mucous membranes and/ or underlying soft tissue which may be caused by a variety of agents such as heat, electricity, radiation, and corrosive substances.

According to the World Health Organization (WHO)'s International Classification of Diseases version 10 (ICD-10), burns and corrosions are described by site of injury under T20-T32. In terms of aetiology, burns could be caused by exposure to smoke, fire and flames (X00-X09); contact with heat and hot substances (X10-X19); exposure to electric current (W85-87) and lightning(X33); exposure to corrosive substances (X46, X49); intentional self-harm by smoke, fire and flames (X76); assault by smoke, fire and flames (X97); assault by steam, hot vapours and hot objects (X98); and assault by corrosive substances (X86). Therefore this definition includes scalds as well as burns caused by electrical heating appliances, electricity, flame, friction, hot air and hot gases, hot objects, lightning, and chemical burns (both external and internal corrosions). Radiation-related disorders of the skin and subcutaneous tissue and sunburn are not included in the WHO classification of burns[3].

1.3 Pathophysiology of burns

1.3.1 Structure and functions of the skin

Normal skin consists of two layers, the epidermis and the dermis. The epidermis, which is derived from the embryonic ectoderm, is a layer of stratified squamous epithelium of several cell layers. The cells of the deepest "basal" layer of epidermis divide and produce the epidermal cells "keratinocytes" which gradually migrate to the upper layers and are eventually shed. As these cells move to the upper layers, they undergo morphological and biochemical changes "keratinisation" until eventually they turn to the dead horny layer "stratum corneum" of the epidermis. The epidermal turnover time i.e. time from basal layer till shedding normally takes around 50 days[4]. The keratinized cells of the stratum corneum are devoid of nuclei, flattened and packed together providing a good protective barrier to the inner structures. The stratum corneum is thicker on palms and soles.

The dermis, which forms the main bulk of the skin, consists of a layer of connective tissue composed of an interlacing network of collagen and elastin fibres that is responsible for the strength and elasticity of the skin. The dermis also contains blood and lymphatic vessels, nerves, sensory receptors, sweat and sebaceous glands and hair follicles. The dermis is thicker in certain areas such as palms, soles and dorsal aspects of the body and it is very thin in the eyelids, scrotum and penis[5]. Beneath the dermis is the subcutaneous fat that separates the dermis from the underlying structures.

The "eccrine" sweat glands, which are spread all over the body, lie deep in the dermis and their ducts pass through the epidermis to open on the surface to secrete water, electrolytes, urea and ammonia. The "apocrine" sweat glands are found in the axilla and groin. The wax glands of the ear and the milk glands of the breast are specialized types of these glands. Apocrine glands secrete an oily liquid containing proteins, carbohydrates, ammonia and lipids. The sebaceous glands are also spread all over the body, though more on the head and chest. Their oily secretion "sebum" pours into the

hair follicles. Hair grows through these hair follicles which are small invaginations in the epidermis extending down to the dermis.

Skin is an important physical barrier for the loss of body fluids and entry of microorganisms and toxic materials. In addition, various cell types in the dermis have immunological functions against invading agents. The thermoregulatory roles of the skin include vasoconstriction in response to cold in order to preserve body heat; and vasodilatation and perspiration in response to heat in order to cool down the body. Other functions of the skin include sensory perception, the protective role of melanin against the destructive effect of the ultra violet (UV) light and the production of vitamin D through the action of UV light on dehydrocholesterol[4, 5].

1.3.2 The body's response to burn injuries

Depending on the severity, burn injuries can lead to variable degrees of damage in the skin and adjacent tissues. Three zones of tissue damage have been described in response to burn trauma. The zone of coagulation is the area of maximum damage where irreversible tissue loss results from protein coagulation. Surrounding this zone is the zone of stasis which is characterised by decreased tissue perfusion. Around the area of low perfusion, there is a zone of hyperaemia where tissue perfusion is increased. The zone of stasis could be saved and zone of hyperaemia usually recovers unless it suffers further damage by later complications[6].

In mild superficial burns, dermal capillary dilatation may cause redness, and fluid loss from the capillaries to the interstitial tissue may stimulate nerve endings and cause pain. In more severe burns, more capillary fluid accumulates in blisters formed in the dermis or at the junction with the epidermis leading to death of overlying epidermal cells. These cells will regenerate later from the adjacent epithelium. When the upper part of the dermis is also damaged regeneration takes a longer time. Deep dermal burns recover slowly resulting in thin skin. Destruction of the full thickness of skin and underlying tissue usually requires surgical intervention[5].

In addition to the local effects, more severe burn injuries cause systemic responses which could be life-threatening such as cardiovascular, respiratory, gastrointestinal, metabolic and immunological responses[5, 6]. Systemic hypotension and organ hypoperfusion could result from fluid loss due to increased capillary permeability as well as direct loss from the wound. When the burns size is less than 30% total body surface area (TBSA) the fluid leakage is limited to the site of injury. Haemolysis and a reduced life span of the red blood cells are responsible for anaemia after burn injury.

Respiratory effects of burn injury include oedema of the airways, increased mucus production, reduced ciliary activity, bronchoconstriction and adult respiratory distress syndrome. Gastric dilatation and dysfunction of the intestines may occur. The metabolic effects of burn injury include disturbance of the thermoregulatory function of the skin, rapid breakdown of proteins and increased basal metabolic rate. Glucose tolerance is impaired and catecholamines and cortisol levels are raised. Lowered immunity is also observed in burns patients resulting from impairment of both cell mediated and humoral mechanisms[5, 6].

1.3.3 Degrees of burn injuries

The depth of the injury depends on the intensity of the burning agent and the time of exposure. Depending on the depth of skin damage, burns are divided into 3 degrees: first degree (superficial) burns, second degree (partial thickness) burns, and third degree (full thickness) burns. Partial thickness burns are again subdivided into superficial and deep dermal burns. In superficial burns, only the surface epithelium is damaged with erythema, dry skin, slight oedema and mild pain. These burns heal in a few days. In partial thickness burns, both the epidermis and variable depths and structures of the dermis are damaged. In superficial partial thickness burns there is erythema, blisters, marked oedema, and pain. These burns spare the hair follicles and sweat and sebaceous glands and heal with mild or no scarring. Deep partial thickness burns involve deeper parts of the dermis with fewer blisters which may heal with scarring. In full thickness burns, all layers of the skin and variable depths of subcutaneous tissue are damaged and the skin function is lost. These burns are charred, brown or white in appearance and

there is usually no pain. Full thickness burns heal with granulation tissue and scarring[4, 5].

1.3.4 Mechanisms of burn injuries

Burns can be divided into several types according to the mechanism of injury[5-8].

1. Scalds: Injuries due to exposure of the skin to hot fluids such as water, tea, milk etc. Most scald burns are superficial but boiling fluids can cause full thickness burn. Boiling fat causes more severe burns because of its higher temperature.
2. Flame burns: Injuries caused by direct contact with flames from gas, kerosene and electric equipment, open fires and other sources of flames. Flash burns are caused by momentary exposure of the skin to flames such as those produced by a high voltage electric current. Flame burns tend to be deeper than scald burns and they may be associated with inhalation injury.
3. Contact burns: Injuries caused by contact with hot objects such as cooking and heating equipment, hot kitchen utensils, hot ground and other hot objects. Friction burns may occur when skin is sheared against another surface such as in road traffic accidents.
4. Chemical burns: Injuries caused by exposure of the skin and mucous membranes to corrosive agents such as acids and alkalis, bleaches, domestic cleaners, cement, napalm and phosphorus. The severity of injury depends on the nature and concentration of the chemical and exposure time, but alkalis usually penetrate deeper into tissues and cause more severe burns than acids.
5. Electrical burns: Injuries produced when an electric current travels through tissue while the body is earthed. A variable amount of heat and resultant tissue damage is produced by the current depending on the voltage and tissue resistance. Contact with high voltage of 1000 volts or more often produces extensive soft tissue and bone necrosis while contact with very high voltages of 70,000 volts or more is invariably fatal[6]. Contact with domestic 240 volts alternating current produces deep burns at the sites of entry and exit of the current. Electrical burns

may be accompanied by arrhythmias and other injuries due to violent propulsion of the patient.

1.3.5 Measurement of the size of burn injuries

The burn size is calculated by the percentage of total body surface area affected by the injury excluding areas affected by first degree burns. In adult patients this can be assessed by the Wallace "rule of nines" according to which the anterior part of the trunk, the posterior part of the trunk and each of the legs are 18%; the head and each of the arms are 9% and the genitalia is 1%. In children, since the body proportions are different from adults the "rule of nines" is not appropriate and instead the burn size is estimated by Lund and Browder method as shown in figure 1.2[8].

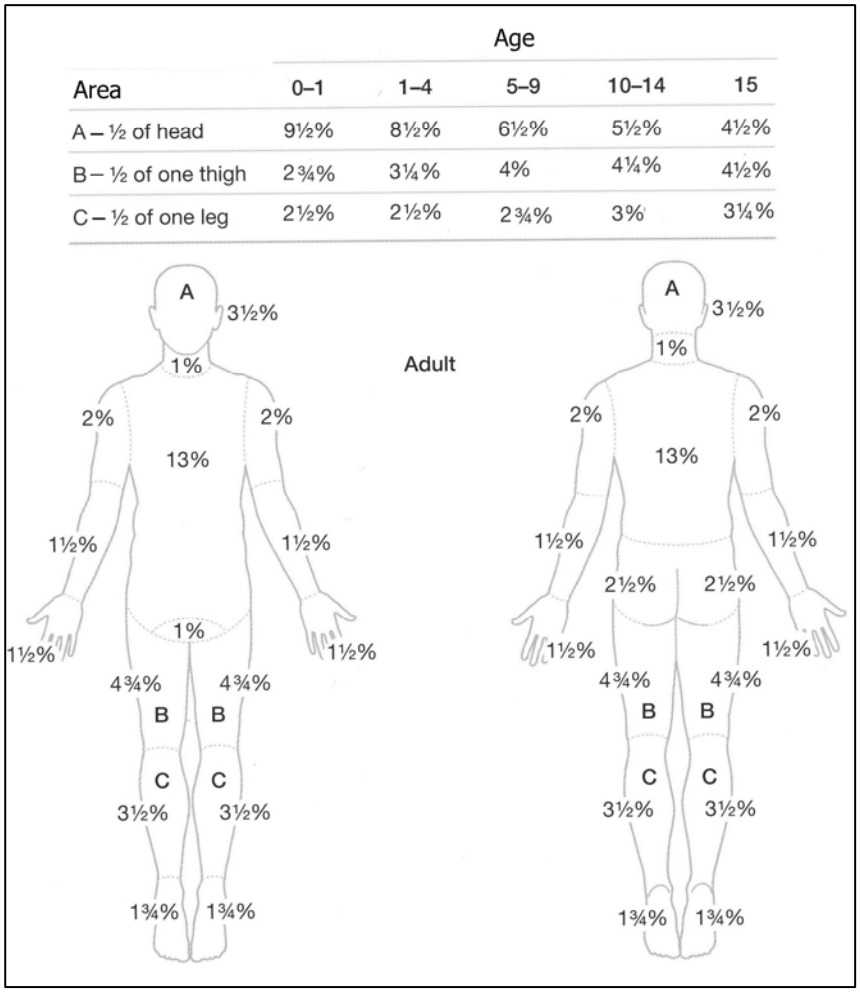


Figure 1.2 Estimation of burn size using Lund and Browder method in relation to adult baseline (reproduced from Total Burn Care by Herndon)

1.4 Global epidemiology of burn injuries

1.4.1 Incidence

The true incidence of all burn injuries is difficult to estimate from hospital-based studies and indeed, the majority of published studies, which are based on admissions, do not report burn incidence. As minor injuries are less likely to attend hospitals, burns are probably more common than figures calculated from hospital-based reports and studies. A population-based study in 1997 in Spain estimates that 23% of the population interviewed had ever suffered at least one burn of any degree not necessarily requiring medical attention[9]. Another survey among rural students in China reports an annual (home and medically treated) burn incidence of 5%[10]. A Turkish survey based on a 10-year recall of burns reports that 10-year prevalence of burns in the population was 12.6%[11]

The estimation of the incidence of medically reported injuries is usually based on patients attending health facilities (emergency departments and burn units) in a particular area. Therefore such estimates may not be taken for national estimates but reflects incidence in the study area. A review of published papers in the developed countries in the late 1980s found that the reported incidence of all medically reported burns by different studies ranged from 200-400 per 100,000 per year[12]. More recent papers from individual countries around the world report similar estimates. For example in Netherlands, data based on emergency department and hospital admissions suggest that the incidence of medically reported burn injuries was 420 per 100,000 per year in 1994[13]. A study reporting on all medically reported burn injuries during 1991-2004 in Lithuania estimates the incidence as 260 per 100,000 population per year in this country[14]. Hospital-based studies from Norway and Iran report incidence figures of 170[15] and 410[16] per 100,000 per year respectively.

The Centers for Disease Control and Prevention in the United States estimates that there were more than 410,000 reported nonfatal unintentional burn injuries during 2006

amounting to a crude annual incidence rate of 140 per 100,000 population[17]. In the United Kingdom, a study estimates that 250,000 people sustain burn injuries each year of whom around 175,000 attend accident and emergency departments and 13,000 are admitted to hospitals[18]. According to Hospital Episode Statistics for England, there were 10,853 admissions for burns (74% of them emergency admissions) during the financial year 2007-2008[19]. UK fire statistics from the Fire and Rescue Services report 14,100 nonfatal fire-related injuries throughout the UK in the year ending September 2005[20].

Globally, according to the WHO there were more than 7.1 million fire-related unintentional burns (X00-X09) in 2004, equivalent to a global incidence risk of 110 per 100,000 per year[21]. The lowest incidence is reported for the Americas with 19 and the highest for South East Asia with 243 per 100,000 per year per year. It has to be said that these estimates do not include scalds, contact, chemical and electrical burns, which are not separately reported in the WHO statistics. Scalds and contact burns are important contributors in overall morbidity from burns especially in children although fire-related burns are responsible for the majority of burns deaths[22].

In terms of hospitalized patients, the annual hospital admission figures reported around the world are variable. A study about burn admissions in several US states reports an admission rate of 19.3 per 100,000 per year based on hospital discharge data of 2000-2004 which included acute and non-acute hospitalizations[23]. A UK study reports that acute burn admissions including smoke inhalation injuries for the 2-year period (1997–1999) in Lancashire and South Cumbria was 29.0 per 100,000 per year[24]. Other reported acute burn admission rates include 6.6 per 100,000 per year in Catalonia[25], 7.0 in Singapore [26], 13.5 in Norway[27], 13.5 in Iran[16, 28] and 39.5 in Lithuania[14]. It is likely that these variations in burn admission rates may be partly explained by variations in burn admission policies and variations in burn incidence and severity.

1.4.2 Sex

The 2009 report of the American Burns Association[29] which includes more than 127,000 acute burn admissions from 1999-2008 states that almost 71% of admitted burn patients were males[29]. Similar patterns in male predominance are reported by studies from high-income countries such as 60% in Kuwait[30], 62% in Japan[31], 66% in UK [24], 67% in Spain[32], 71% in Norway[33] and 74% in Australia[34]. However, in the low-income and middle-income countries where mechanisms and circumstances of burn injuries differ, studies suggest variable results. Many studies report that females comprise a higher percentage of burn admissions such as 53% in Egypt[35], 56% in India[36], 56% in Iran[28], 64% in Sri Lanka[37] and 67% in Turkey[38]. However, other studies report a higher proportion of males such as 52% in Malawi[39], 55% in Nigeria,[40], 67% in Columbia[41], 67% in Brazil[42] and 75% in China[43]. Cultural and life style differences may be responsible for these discrepancies as well as differences in the population structure of catchment areas of hospitals included in the study.

1.4.3 Age

People of all ages are susceptible to burns but living circumstances, work and physical conditions may increase or decrease this susceptibility. Studies that have included all age groups mostly provide a mean age (or a median) ranging from 11-40 years [25, 26, 28, 44-53]. The mean age is reported as 32 years in the American burns report[29].

It is generally agreed that young children are at a higher risk of burn injuries both in high-income and low- and middle-income countries[22, 54]. Published studies do not follow a standard definition for children; however, broadly speaking children comprise a considerable proportion of burn admissions and the majority of those children are young. For example a large south Korean study reports that 60% of all burn admissions were aged below 15 years and 26% of them were below 5 years[55]. Another study from Nepal reports that 61% of all admissions were aged 0-14 years and 40% of them were aged below 5 years[56]. In an Iranian study 44% of all admissions were children 0-15 and 25% were below 5 years of age[44]. A study from Israel reports that 51% of burn

admissions were for children below 15 years of whom 74% were below 5 years of age[57]. A study from several American states reports that 70% of childhood admissions (0-14 years) were under five years of age[23]. A French study reports that 59% of childhood (0-15 years) admissions were aged 0-3 years[58]. Similarly a Chinese study reports that 63% of childhood (0-14 years) admissions were in children aged 0-3 years[59]. Studies from other countries have shown similar patterns[60-63].

1.4.4 Degree, size and mechanism of burn injuries

Burn injuries that report to health facilities are usually of partial thickness or full thickness affecting variable proportions of the TBSA. In the United States, the criteria for referral of patients to burn units include partial thickness burns involving more than 10% of the TBSA; third degree burns; inhalation injury, burns involving hands, face, feet, genitalia and joints; burns in patients who have other medical conditions or special requirements, and chemical and electrical burns[64]. Hospitalization depends on a combination of the above criteria but the admission policies are not globally uniform[65].

The mean and median TBSA burnt in admitted patients reported by individual studies varies in relation to such factors as hospital admission policies, age and sex of the patients and burn mechanisms that are included in the study. The majority of studies report the mean TBSA burnt and a minority report the median with or without the mean. The reported mean TBSA burnt of admitted patients in the published literature therefore varies greatly from as low as 9% to as high as 48% [15, 16, 28, 46, 49, 52, 53, 66-75]. The reported TBSA burnt is much higher in intentional self-harm burns ranging from 30-80% [76-84].

In terms of the body parts most affected, a review of burns in middle- and low income countries reports that generally the upper extremities are most commonly affected followed by the lower extremities although flame burns more commonly affect the lower extremities[54]. Burn injuries are more commonly not limited to isolated parts of the body but affect more than one area. A Korean study for example, reports that 73% of

burns affected more than one area and only 9% of burns involved either the upper limbs or the lower limbs alone[55].

In terms of mechanisms of burn injuries, the vast majority of burns are caused by flame and scalds. Flame burns are usually the commonest in all ages. For example in the United States flame injuries account for 42% of burn admissions followed by 30% for scalds[29]; in Japan flame 46%, scalds 32%[47], in Iran flames 57%, scalds 31%[44]; in Sri Lanka flame 64%, scalds 28%[56] and Zimbabwe flame 51%, scalds 47%[85].

In children aged up to 15 years, however, scalds are more common and they are responsible for the majority of burns including 51% in UK[86], 56% in Iran[87], 58% in Turkey[88], 64% in India[89], 68% in Israel[57], 75% in Netherlands[13] and 81% in Japan[90].

1.4.5 Place of burn injury

Most studies of hospitalized patients indicate that the majority of burn patients come from urban populations [9, 70, 91-95]. Studies involving admissions for all burns and all ages indicate that the majority of injuries occur at home [17, 37, 38, 50, 69, 79-90] including 56% in Nigeria[96], 57% in Turkey[97], 58% in Israel[98], 63% in Norway[15], 73% in Iran [44] and 86% in India[99]. In the United States 66% of all hospitalized burns are reported to have occurred at home[29]. In the low-income and middle-income countries, the kitchen is the room where burn incidents most commonly occur[54].

1.4.6 Season of injury

Seasonal variations in the occurrence of burn injuries are reported by a number of studies. Many studies around the world report winter as the peak season for burn occurrence [28, 35, 44, 49, 53, 54, 61, 100-105] including Taiwan with 38% of burns occurring in winter[105], Iran 31%[28], Egypt 29% and Turkey 34%[97]. This predominance in winter is likely to be related to cold weather and use of heating devices which could increase the risk of flame, scald and contact burns. Fewer studies report that

more burns occur in summer such as in Korea[55], China[106] and Turkey[107]. Yet, some other studies have not found any seasonal variations such as in Zimbabwe[108] and Australia[34].

1.4.7 Mortality

The WHO estimates that 310,000 people died in fires in 2004; 69% of them were females and 31% were males[109] which amounts to a global mortality rate of 4.8 per 100,000 per year. The highest mortality is observed in the countries of south east Asia with 11.1 deaths per 100,000 per year and the lowest the Americas with 0.9 deaths per 100,000 per year [109].

Fire statistics from the Fire and Rescue Services reports 489 fatalities in fires throughout the UK in the year ending September 2005 which was the lowest since1959[20]. A two-year population-based study from the northwest of England estimates mortality rate of burn as 0.5 per 100,000 per year[24]. In the United States, the total number of deaths from unintentional burns during 2006 was 3,202 which is equal to a crude mortality rate is 1.1 per 100,000 population[17]. Mortality rate in some other countries are reported as 1.8 per 100,000 per year in Korea, 2.3 in Chile[110], 4.5 in Iran[16], 8.0 in Lithuania[14] and 15.1 in India[111].

An important indicator of the outcome of burn management is in-hospital mortality which is likely to be related to case mix. Studies involving all burns and all age groups have reported variable in-hospital mortality rates including 2% in Australia[34]; 3% in Sweden[112] and Taiwan[113]; 4% in Portugal[114], United States[29] and Israel; 6% in UK[115]; 7% in Netherlands; 8% in Korea; 12% in Malawi; 14% in Turkey[46]; 20% in Iran[44]; 20% in Lithuania; 22% in Zimbabwe[85]; 27% in Sri Lanka[37] and 52% in India[36].

Greater TBSA burnt, presence of inhalation injury, full thickness burns, female sex and older age are reported by many researchers as risk factors for death[31, 116-122]. These risk factors were combined in a scoring system to a measure of burn severity called

Abbreviated Burn Severity Index (ABSI) which was developed by Tobiasen et al[123] to predict burn mortality.

According to Brusselaers et al[116] retrospectively analysing burn admissions over 20 years, the independent risk factors for death were inhalation injury (odds ratio 17.6, 95% CI 9.4-33.2)), age of 60 and over (odds ratio 16.9, 95% CI 8.7-32.9) and TBSA ≥ 40% (odds ratio 6.6, 95% CI 3.4-12.9). Retrospective analysis of 249 burn admissions by Meshulam-Derazon et al.[117] has only found 2 significant risk factors for death; TBSA and inhalation injury. According to them every 1% increase in TBSA was significantly associated with 6% increase in risk of death and presence of inhalation injury increased the risk of death by 9-fold. A multi-centre retrospective study by Suzuki et al[31] has found that significant risk factors were inhalation injury (odds ratio 2.6, 95% CI 2.0-3.3), full-thickness burn size (odds ratio 1.10, 95% CI 1.09-1.11-), partial-thickness burn size (odds ratio 1.06, 95% CI 1.06-1.07), and age (odds ratio 1.05, 95% CI 1.05-1.06). A study on intentional self-harm burns [118] reports that the risk of death was more when TBSA was over 75% (risk ratio 2.6, 95% CI 1.6-4.3), head and neck were involved (risk ratio 2.5, 95% CI 1.1-5.2) and lower limbs were involved (5.8, 95% CI 2.2-14.9). Reporting on burns in the elderly, Lionelli et al[119] report that TBSA, inhalation, age and the ABSI were significant predictors of death. Each unit increase in ABSI score increased the risk of death by 200%. In a study by McGwin et al.[121] the risk of death was similar in males and females over 60 years of age but amongst patients aged up to 60 years, females sex was a significant risk factor (odds ratio 2.3, 95% CI 1.4-3.8). A study on differences in burn mortality between males and females[122] reports that female sex, after adjusting for age, race, TBSA and inhalation injury, was a significant risk factor for death (odds ratio 1.3, 95% CI 1.2-1.5). A similar study [120] found that sex after adjustment for the same factors above, was only significant amongst patients aged 20-34 years (male to female odds ratio 0.5; 95% CI 0.2-0.9).

Since burn size is the most important factor in predicting death, it has been used to report the 50% lethal dose (LD_{50}) or lethal area (LA_{50}) in large datasets which is the percent TBSA burnt associated with 50% mortality. For example in the American burn

report of 2009, the LA_{50} is 70% TBSA. This is therefore an indicator of the survival of patients in relation to burn size in that particular setting.

1.4.8 Risk factors for burns in children

Young children aged 0-5 years are generally considered one of the risk groups for burns and comprise approximately one third of burn injuries around the world. However, the reasons for the vulnerability of these children to burn injuries are not well established. The WHO report on child injuries in 2008 states that "while the existing data identify children and young people as a high-risk population for burns, information on mechanisms and causal factors is largely missing"[22]. Broadly speaking, factors related to the child and the family and housing conditions are generally thought to be important in causation of childhood burns. Identification of factors that put these children at a greater risk for burn injuries has been subject of several case-control studies.

Table 1.1 shows factors found to be significantly associated with childhood burns by different studies. Certain risk factors are reported by more than one study such as fewer years of maternal education, overcrowding, poor standard of living, presence of disabilities, and history of burns in siblings. Burns are also reported to be significantly more common in children of migrants/gypsies and non-native ethnic groups; children of families with no piped water supply; children of families with fewer bedrooms and families who do not own their house. Fitted smoke detectors are also reported as a significant factor in reducing injuries amongst children in high-income countries[124, 125].

Table 1.1 Statistically significant risk factors for childhood burns reported by several case-control studies

Study/ risk factors	Age range	Adjusted OR (95% CI)
Forjuoh et al[126]*	0-5	
Presence of disabilities		6.6 (2.8-16.0)
History of burns in siblings		1.8 (1.2-2.5)
History of sibling death from burns		4.5 (1.2-16.9)
Storage of flammable material at home		1.5 (1.02-2.2)
Werneck et al[127]**	0-11	
Age 1-2 years vs. below one		4.1 (1.5-11.1)
Overcrowding		2.2 (1.1-4.7)
Birth order not first		2.5 (1.2-5.2)
Stressful life events in family in past 6 months		2.2 (1.2-42)
Delgado et al[128] ***	0-17	
No piped water supply at house		5.2 (2.1-12.3)
Presence of living room at house		0.6 (0.4-0.8)
Own house		0,7 (0.6-0.9)
Patient not son or daughter of household head		2.2 (1.5-3.2)
Per capita income less than $28.5 per month		2.8 (2.0-3.9)
Mother with high school education & more		0.6 (0.5-0.9)
Crowding		2.5 (1.7-3.6)
Petridou et al[129] †	0-17?	
Children of migrants/gypsies vs. other Greek		5.2 (1.0-27.3)
Two bed rooms in house vs. one		3.6 (1.1-12.2)
Child activity score (per quintile increase)		0.8 (0.7=1.0)
Burn avoidance index (per 1 score increase) $		0.6 (0.5-0.8)
Van Rijn et al[130] ††	0-4	
Ethnicity not Dutch vs. Dutch		4.5 (2.6-11.9)
High school education of parents		0.4 (0.1-0.6)
Housing: small house vs. large house		2.1 (1.3-4.7)
Use of gas cooker vs. electric cooker		2.5 (1.1-10.0)
Keep hot drinks in original pots vs. using flask		1.6 (1.2-3.1)
Daisy et al[131] †††	0-12	
Maternal education		Odds ratio not calculated, significance reported based on univariate associations.
Father's education		
Disabilities		
History of burns in siblings		
Income		
Cooking equipment beyond reach of children		
Maternal awareness of danger of burns		

* Matched by age, sex, area of residence; also adjusted for maternal education, father's employment, bad living conditions, mother spending time away from home

** Adjusted by sex, living conditions, parity, maternal age and education

***Matched by age and sex, also adjusted for father's education and occupation

† Matched by age and sex; also adjusted for maternal age, work, number of residents, child activity score, birth order. Study includes children over 11 but maximum age of not clear.

$ Composed of 1)no use of table cloth 2) handle of pan inwards on stove 3) using rear hobs of cooker 4) keep hot objects away from children.

†† Adjusted for age, sex, house hot water temperature, maternal age and employment, presence of separate cold and hot taps

††† Matched by age, sex, area of residence. This study has only reported that the mentioned factors were significantly different between cases and controls

Factors not found to be associated with childhood burns by some of these studies include, maternal age and employment and father's employment. It is obvious that aetiology of childhood burns is complex and could be viewed in the context of a range of factors related to the child, the family and the physical and social environment, which are not all universal to children in different communities.

1.5 Burns in the East Mediterranean Region: findings of the systematic review

Seventy-one studies were included in the review, which came from 12 of the 22 countries of the region. Fifty-five of the studies specifically described the epidemiology of burns, whilst 16 described the epidemiology of a range of injuries, including burns. As shown in table 1.2, most studies came from Iran (44%), Saudi Arabia (13%) and Egypt (10%). There were 2 studies from Iraq. Thirty studies were published in the first five years of the period under review (1997-2001) and 39 studies were published in the second half of the period (2002-2006). Most studies (62%) were surveys or used retrospective patient data and 38% were prospective. There were no case control studies.

1.5.1 Quality of the studies

The quality of included studies was assessed by the checklist shown in table 1.3. Most studies reported objectives and outcomes, described the research setting and presented the results clearly. Few studies elaborated on sample size calculation and justification (14%), representativeness (14%), response rate (13%), limitations of retrospective records (12%), description of non-participants (9%) and limitations of the study in the discussion section (23%).

Table 1.2 Main characteristics of studies included in the review (n=71)

Characteristic	Number of studies	Percent
Country		
Iran	31	44
Saudi Arabia	9	13
Egypt	7	10
Kuwait	6	9
Pakistan	6	9
Tunisia	3	4
Jordan	2	3
Iraq	2	3
UAE	2	3
Afghanistan	1	1
Morocco	1	1
Oman	1	1
Year of Publication		
2007(first 3 months)	2	3
2006	11	15
2005	8	11
2004	8	11
2003	4	6
2002	8	11
2001	3	4
2000	6	8
1999	3	4
1998	7	10
1997	11	15
Study design		
Survey/ retrospective	44	62
Prospective	27	38
Setting		
Hospital	62	87
Community	8	11
Forensic records	1	1
Patient type		
Only admissions	46	65
Admissions & outpatients	15	21
Only outpatients	10	14
Injury type		
Burns only	55	77
All injuries	16	23

1.5.2 Burns and injury morbidity and mortality

A surveillance study in several provinces of Iran found that burns are the most common cause of unintentional home-related injuries accounting for 40% of those injuries in all ages[132]. Another survey from Iran reports that 12% of all deaths in all ages are from unintentional injuries and burns are the second cause after road traffic accidents[133]. This finding is supported by a review of forensic records of Tehran reporting that burn

injuries account for 18% of unintentional deaths in children aged 15 years or less, second only to road traffic accidents[134]. A survey in rural areas of Iran also reports similar findings that 12% of all childhood unintentional injury deaths and 10% of all-age unintentional injury deaths were due to burn injuries[135, 136]. In the United Arab Emirates, burns are responsible for 9% of all childhood injuries and 14% of childhood injury deaths[137] being the third most common cause of injury mortality and morbidity [138]. Similar findings are reported by studies elsewhere in the region [139, 140].

Table 1.3 Assessment of the quality of included studies

Item	Number of studies with criteria (%)
1. Hypothesis/ aims of the study clearly stated	71 (100)
2. Main outcomes clearly described in the introduction/methods	71 (100)
3. Study design clearly described	62 (87)
4. Setting of the study clearly described	63 (88)
5. Source of the subjects clearly described	36 (51)
6. Sample size calculation stated and justified	7 (14)
7. Sample representative of the target population	10 (14)
8. Participation/response rate stated	9 (13)
9. (Retrospective studies) Study covers all the records of the specified time	31 (72)
10. (Retrospective studies) Limitations of the records described	5 (12)
11. (Prospective studies) Strategies described to improve participation/ follow up	2 (7)
12. Non-participants/ subjects lost to follow up described	4 (9)
13. Exposures accurately measured to minimize bias	67 (94)
14. Outcomes accurately measured to minimize bias	69 (97)
15. Results clearly described	71 (100)
16. Statistical methods sound and justified	68 (96)
17.P-values reported	42 (59)
18. Confidence intervals reported	44 (62)
19. Limitations of the study described	17 (23)
20. Main outcome measurements can be considered valid	71 (100)

1.5.3 Incidence of burn injuries

The WHO estimates that 982,000 fire-related burns occurred in the EMR in 2004 which is equivalent to an incidence rate of 187 per 100,000 per year[21]. Amongst studies

included in the systematic review, few studies have reported the incidence of burn injuries. Two studies based on attendance to health facilities in Iran, report incidence rates of 518[141] and 410 per 100,000 per year[16]. Two community surveys from Iran and Pakistan have reported similar rates of 418[45] and 476 per 100,000 per year[142] respectively. Studies involving burns attending specialized burn centres report a lower incidence such as 273[28] and 112[72] in Iran and 123 per 100,000 per year in Pakistan[143].

Few studies have reported incidence rates of burn admissions, which is usually higher in females than males. Burn admission rates reported by studies from different provinces of Iran include 19.0 (male 15.5, female 22.8) [53], 13.5 (male 9.1, female 18.0)[16], 13.4 (male 11.6, female 15.2)[28], 17.2 [141], and 13.4 per 100,000 per year[144]. Admission rates in children are higher particularly in small children. For example a study from Kuwait including children aged 0-14 years reports an incidence of 17.5 per 100,000 per year with the highest rate of 34.0 admissions per 100,000 per year amongst children aged 0-4 years[145]. Another study from Iran reports an admission rate of 20.8 per 100,000 per year amongst children aged 0-15 years with the highest rate of 102.8 admissions per 100,000 amongst children aged 0-1 years[87].

1.5.4 Age and sex

The overall mean age reported by the studies varies depending on the age range of participants and type of burns included, but it is close to 20 years in most cases (table 1.4). Similar to other parts of the world, the majority of burns in childhood occur in the 0-5 year age group, which in one study[146] comprises 78% of all childhood burns and in another 38% of burns in all ages [45]. In terms of sex distribution among children, all studies report a higher proportion of males compared to females. In terms of burns in all ages, majority of the studies report a higher proportion of females but studies from the more affluent gulf countries report a higher proportion of males (table 1.4).

1.5.5 Mechanism of burn injuries

As shown in table 1.4, the majority of the studies report a higher proportion of flame injuries than scalds amongst admitted patients ranging from 41-76% of all burns [16, 28, 35, 72-74, 143, 147-149]. However, a community-based study of all accidental burns (both medically attended and not attended) found that 76% of burns were scalds [45]. Fewer studies report a higher proportion of scalds than flame injuries in admitted patients[49, 150, 151]. Amongst children aged 0-15 years, all studies report that scalds are more common than flame injuries accounting for 46-67% of all childhood burns (table 1.4). Scalds are also common amongst older people accounting for 61% as reported by one study[152]. Predominance of scalds amongst children and the older people is probably related to their own physical vulnerability and the home environment and where they spend most of their time.

Contact burns are reported by a few studies with the highest proportion being 13% of all burns reported by a community survey[49]. Chemical burns (contact with skin) are not common comprising from less than 1% to 4% of all burns [44, 45, 74, 87, 143, 146, 153]. According to a study exclusively on chemical burns, 75% of cases were due to sodium hydroxide drain cleaners, 11% due to acid substances and 4% due to application of herbs used as traditional medication[154]. Ingestion of caustic material is another cause of chemical burns in children 0-14 years as reported by 4 studies[155-158]. In these studies, males were more commonly affected comprising 57-60% of the sample. The most common causative agents for these chemical burns were alkali compounds accounting for 85% [155] and 89%[157] of the burns followed by acids accounting for 9% and 7% in the same studies respectively.

1.5.6 Place and season of burn injuries

All studies that have reported on the place of the incident, indicate that burns most commonly occur at home ranging from 72% [87] to 94% [28]. In almost all studies, winter is the commonest season for burn occurrence. Winter accounts for 28-31% of burns in several studies [16, 28, 35, 44, 53, 159]. Winter is even a more common season

for burns of children and the elderly accounting for 44% of childhood burns [153] and a similar proportion of burns amongst the older people [152].

Table 1.4 Age and sex distribution and mechanism of burn injury in included studies

Study				Sex %		Age in years		Mechanism of burn %				
Year	Country	Burn type	n	Male	Female	Range	Mean(median)	Flame	Scald	Contact	Chemical	Electrical
Study population: All ages												
2002	Afghanistan[151]	all burns	388	57	43	0-70	13.0 (8)	37.0	44.0			2.0
1997	Egypt[147]	All burns	533	50	50	0-81	22.9	66.8	26.3		3.0	3.9
2000	Egypt[160]	Stove burns	304	51	49	1-75	23.6					
2003	Egypt[35]	All burns	880	47	53	0-75	27.8	41.0	32.0			27.0
1998	Iran[71]	All burns	1239	63	37	0-93	25.6					
2001	Iran[28]	All burns	2043	44	56	0-98	21.9	76.0	17.0		2.0	3.0
2002	Iran[75]	All burns	1082	40	60	6-100	27.0					
2002	Iran[16]	All burns	1089	34	66	0-90	20.6	64.0	24.0			
2003	Iran[49]	All burns	1493	53	47	0-95	21.8	25.0	53.0	13.0		2.0
2005	Iran[72]	All burns	2963	56	44	0-89	22	55.0	36.7			3.0
2005	Iran[53]	All burns	235	41	59	0-85	19.4					
2006	Iran[45]	All burns	1179	41	59		18.8	16.2	74.9	9.8	0.7	1.5
2005	Iraq[161]	All burns	48	48	52	0-45						
1997	Iraq[148]	All burns	127	46	54	1-67	20.0	63.0	22.0			11.0
1997	Kuwait [149]	All burns	1213	67	33	0-93	23.0	53.7	37.6			6.8
1997	Kuwait[162]	All burns*	234	48	52	1-93	30.0	92.3	7.7			
2005	Kuwait[74]	All burns	2111	70	30	1-94	(25)	52.0	37.8		1.3	7.8
1998	Oman[163]	all burns	168	58	42							
1998	Pakistan[143]	All burns	716	49	52	1-85	23.0	67.4	20.7	4.2	1.9	2.6
2006	Pakistan[150]	All burns	111	55	45	0-	19.0	41.0	40.5		10.0	5.0
1997	Saudi Arabia[164]	All burns	277	60	40	0-85		37.5	49.0		3.6	7.6
1997	Saudi Arabia[73]	All burns	90	51	49	0-55	15.0	52.0	40.0		4.4	3.3
2001	Saudi Arabia[154]	Chemical	59	75	25	2-70	25.0					

Table 1.4 ***Continued***

Study				Sex %		Age in years		Mechanism of burn %				
Year	**Country**	**Burn type**	**n**	**Male**	**Female**	**Range**	**Mean(median)**	**Flame**	**Scald**	**Contact**	**Chemical**	**Electrical**
Study population: Children												
1998	Egypt[153]	All burns	305	54	46	0-14		39.0	57.0		2.0	3.0
2005	Iran[165]	All burns	1160	61	39	0-14	2.2	30.5	66.6			1.3
2001	Iran[87]	All burns	1454	73	27	0-15	5.3 (4)	35.7	56.0		0.5	3.9
2002	Iran[144]	All burns	760	58	42	0-15	7.1 (6)	43.0	46.0	1.3	0.1	1.8
1998	Jordan[155]	Chemical	216	60	40	0-14						
1997	Kuwait[162]	Scalds	388	60	41	0-12	3.0					
2006	Kuwait[145]	All burns	826	64	36	0-14	4.1 (3)	23.0	67.0			8.0
1997	Morocco[166]	All burns	59	58	42	0-12	3.5	41.0	54.0			3.0
2004	Saudi Arabia[146]	All burns	380	50	50	0-12		28.0	64.0		1.8	5.0
2004	Tunis[167]	Chemical	56	57	43	1-11	4.0					
2004	Tunis[156]	Chemical	330	59	41	0-14	3.4					
Study population: Older people												
2003	Egypt[152]	All burns	97	45	55	60-75	64.4	31.0	61.0			7.0

** Only deaths included in this study*

1.5.7 Mortality

The WHO estimates that 29,000 people have died in fires in 2004 in the region which is equivalent to 5.6 deaths per 100,000 per year[109]. A Kuwaiti study [74] reported an all age mortality rate of 0.6 per 100,000 per year while two Iranian studies have reported rates similar to the WHO estimates being 4.6 [28] and 5.6 [72] deaths per 100,000 per year. In children 0-15 years the reported rates include 0.2 [74], 2.0[144] and 3.2 deaths per 100,000 per year[87].

In-hospital mortality from burn injuries amongst all ages ranges from as low as 5% (mean TBSA=10) in Kuwait[74] to 37% (mean TBSA=38) in Iran[71]. The hospital mortality exceeds 20% in many studies (table 1.5). Mortality in children is less than adults and ranges from 1% (mean TBSA=14) in Kuwait [63] to 17% (mean TBSA=30.2) in Iran [144].

Factors associated with in-hospital mortality according to various studies are similar to factors reported globally as discussed in section 1.4.7. These factors, as reported by individual studies, usually based on univariate analysis, include old age, TBSA burnt, female sex, degree of burn and delay to hospital[147]; TBSA burnt and age [73]; inhalation, delay and female sex[168], TBSA burnt and inhalation[165], TBSA burnt, flame injuries, female sex and age[16]; and TBSA burnt and head and neck burns [118]. Mortality for flame injuries is reported as much higher than for scald injuries. While flame burn mortality rates are reported as 42% [150] and 44%[53] in all ages and 31% in children[144], mortality rates for scald injuries are reported by the same authors as 11%, 5% and 4% respectively.

Table 1.5 In-hospital mortality, percent TBSA burnt and hospital stay in included studies

Study			Mortality %	%TBSA burnt Mean (Median)			Stay in days Mean (median)
Year	Country	Patients		All	Deaths	Survivors	
1998	Iran[71]	all ages	37	38	-	-	12
2001	Iran[28]	all ages	34	42 (35)	67 (67)	27 (25)	-
2002	Iran[16]	all ages	33	48 (40)	73 (88)	-	13 (9)
1997	Egypt[147]	all ages	33	-	-	-	16 (20)
2006	Pakistan[150]	all ages	30	-	-	-	-
2005	Iran[53]	all ages	21	-	-	-	-
2005	Iran[72]	all ages	19	26	65	17	12
2002	Afghanistan[151]	all ages	16	19 (15)	-	-	11 (7)
1997	Kuwait[162]	all ages	6	-	70	20	16
1997	Saudi Arabia[73]	all ages	6	23	-	-	-
2005	Kuwait[74]	all ages	5	10	80	10	-
2002	Iran[75]	>6 years	37	38	-	-	16
2002	Iran[144]	Children	17	30	-	-	-
2001	Iran[87]	Children	16	26 (23)	48	22	16
2005	Iran[165]	Children	6	19	-	-	-
1997	Saudi Arabia[164]	children	3	15	70	-	20
2006	Kuwait[145]	Children	1	(13)	-	-	15
2004	Saudi Arabia	Children	1	-	-	-	9
1997	Kuwait	Children	1	14	-	-	17
2003	Egypt[152]	Elderly	49	22	-	-	22
2006	Iran[169]	Pregnant	39	38	69	18	-
1997	Egypt[170]	Women	39	-	-	-	-

1.5.8 Intentional self-harm

Burn injuries appear to be a common method of deliberate self-harm in some countries of this region. In Iran, burns are responsible for 22% (male 14%, female 31%) of all suicide attempts and 17% (male 9%, female 26%) of suicide deaths[171]. The incidence of intentional self-harm burns as reported from different provinces of Iran ranges from 2.9 to 21.0 per 100,000 per year[80, 83, 118, 141, 172-174]. The TBSA burnt is higher than in accidental burns; the mean TBSA burnt ranging from 45 to 76%. The mortality is also expectedly high in correspondence with the high TBSA ranging from 56 to 80% in these burns (table 1.6).

Intentional self-harm is responsible for a variable proportion of burn admissions ranging from 2% in Pakistan[143] to 37% [53] of all burn admissions in some hospitals of Iran. However, most proportions fall between 10 and 20% of all burn admissions.

Table 1.6 Incidence, sex, age, TBSA burnt and mortality in intentional self-harm burns

Study			Incidence / 100,000	Sex %		Age		%TBSA mean	Mortality %
Year	Country	n		Male	Female	Range	Mean (median)		
1997	Egypt[82]	23	-	9	91	14-55	23	45	74
2002	Iran[83]	318	8.2	17	83	-	27	63	79
2003	Iran[84]	110	-	100	-	14-68	27 (25)	76	77
2004	Iran[80]	412	12.5	1	99	15-72	26	66	80
2005	Iran[81]	35*	-	-	100	15-35	24	-	-
2005	Iran[172]	98	7.7	23	77	11-68	27	63	76
2006	Iran[173]	358	6.5	26	74	-	-	-	66
2006	Iran[141]	54**	18	18	82	13-19	17	70	58
2006	Iran[118]	117	4.9	22	78	-	28	63	78
2007	Iran[174]	89	2.9	21	79	13-62	26(24)	63	56
2007	Iran[79]	37***	2.1	19	81	14-50	25		-

* Only deaths included in this study
** Only Adolescents aged 13-19 years
*** Only deaths included in this study but rate is for self-harm burns

According to these studies, the victims of intentional self harm burns are mostly young; with a mean age ranging from 17 to 27 years although they include individuals as young as 11 years and as old as 72 years[80, 172]. More than three quarters of these patients are women comprising at least 74%[173] of all intentional self-harm burn admissions. The most frequently reported precipitating factors for these burns are marital problems, psychological and psychiatric disorders, family problems, poverty and emotional relationships.

1.6 The situation in Iraq

Published data regarding burns in Iraq including Kurdistan are scarce. The WHO estimates that there were 3, 390 fire-related deaths in 2004 in Iraq which is equivalent to a death rate of 12.3 per 100,000 per year, which is higher than the global rate [21]. A study reporting on 45 days experience of the Italian Red Cross in Baghdad in 2004 reports that during that short period 1,350 burn patients visited the hospital of which 48 (23 males & 25 females) were admitted[161]. There is no further data about the non-admitted patients but there is some analysis about the 48 admissions. The mortality was 27% among these admitted patients (13% in males and 40% in females). Eight percent of the admissions were for intentional self-harm burns and the rest were accidental including two war-related burn injuries. The majority of these admitted patients were burnt at home. An earlier study about 127 admissions[148] reports that 46% of the admissions were male and 54% were female; the mean age was 20 years; 63% were flame injuries and 22% were scalds; and that 84% of burns happened at home.

A retrospective analysis of patients admitted to the burns centre in Erbil province recently published in a local journal, provides some descriptive analysis about burn admissions in Iraqi Kurdistan[175]. In this study, females comprised 54%, children up to 12 years of age 50% and children 0-6 years 38% of the burn admissions. The most common mechanism of injury was scalds accounting for 48% of all burns (68 % in children) and flame injuries accounting for 47% of all burns (61% in adults). The TBSA burnt was more than 20% in 39% of all patients and 58% of adults. Winter was the commonest season for burns and the overall mortality was 21% (36% in adults).

Another study on childhood burns (0-12 years) highlights the problem of burns amongst children in the region[176]. There were similar numbers of males and females in this study where scalds accounted for 79% of burns and flame injuries accounted for 19%. Home was the commonest place where childhood burns occurred (75%) and winter was the commonest season (38%). The mean TBSA burnt was 12% and in-hospital mortality was 12% (65% of them caused by flame injuries).

The researcher is not aware of other epidemiological studies on burn injuries in Iraqi Kurdistan. The print media regularly report on individual cases of suicide of young women by self-burning and the women's organizations have being trying to highlight the problem of self-burning which, according to them, is becoming more evident and, in absence of scientific research, appears to a local observer to be the commonest way of suicide amongst the Kurdish women.

According to unpublished statistics obtained in person from the Directorate of Civil Defence in Sulaymaniyah, which is the department in charge of fire and accident rescue response, there were 1461 fires throughout the year 2008 in the province of Sulaymaniyah. The majority of these fires (30%) were caused by electricity problems followed by leakages and explosions of cooking gas cylinders (20%). These statistics report 25 deaths and 159 injuries during 2008 but it is not clear how many of these causalities were due to fires as the statistics includes in addition to fires 20 instances of floods and one bomb explosion. However, according to the department officer, around 20 fatalities were due to burring in fires on the scene.

According to the practitioners in the field, burn injuries have been a cause of concern for the health department not only because of the large number of patients but also because of the cost and logistics required to maintain provision of appropriate care for the victims. Indeed this may be the reason why the burns centre has been run or supported by international agencies for the most part of its existence.

In absence of detailed data on such an important public health issue, the need for further studies is quite evident. Comprehensive epidemiological studies are required to collect detailed information about burn injuries in order to be able to provide reliable analyses about the incidence, mechanisms, risk factors, circumstances, outcomes and other epidemiological features of burn injuries. Such information could provide a better insight to the problem and furnish grounds for evidence-based planning for future interventions. The main part of the current study aims to achieve this goal. In addition and since small children are globally reported to be at a higher risk, the case-control part

of the study aims to investigate the risk factors of burn injuries amongst pre-school children aged 0-5 years.

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1.7 Objectives

This study aims to provide an insight to the understanding of burn injuries in Iraqi Kurdistan through pursuing the following objectives:

1. To investigate the epidemiology of burns in Sulaymaniyah province in terms of incidence, patient characteristics, socioeconomic background, circumstances of injury, mechanisms, degree, size and other injury characteristics.
2. To study outcome of burn injuries in patients admitted to hospital particularly in-hospital mortality and investigate factors associated with death.
3. To calculate incidence of intentional self harm-burns and investigate their risk factors.
4. To investigate risk factors for burns amongst children aged 0-5 years.
5. To provide recommendations for prevention of burn injuries in Iraqi Kurdistan.

Chapter two

Methods

Iraqi Kurdistan which occupies the north-eastern part of Iraq spans an area of around 40,000 square kilometres. The climate of the region is semi-arid continental; very hot and dry in summer and cold and wet in winter. July and August are the hottest months with mean highs of 39-43 Celsius while winter is generally mild with mean lows of 2-7 Celsius except in the mountains[177]. Administratively the area is divided to the three provinces of Erbil, Sulaymaniyah (also written as As-Sulaymaniyah) and Dohuk. The population of the region is estimated to be around 4 million; the vast majority being Kurds in addition to Assyrians, Chaldeans, Turkmans, Armenians and Arabs[177]. There has been no census in the Kurdish region since 1987, when the last national census of Iraq included Kurdistan. Since the Kurdish areas were outside the control of the central government from 1991 onwards, the Iraqi census of 1997 did not cover these areas. Therefore population data largely depend on extrapolations from data collected by the World Food Programme (WFP) for the

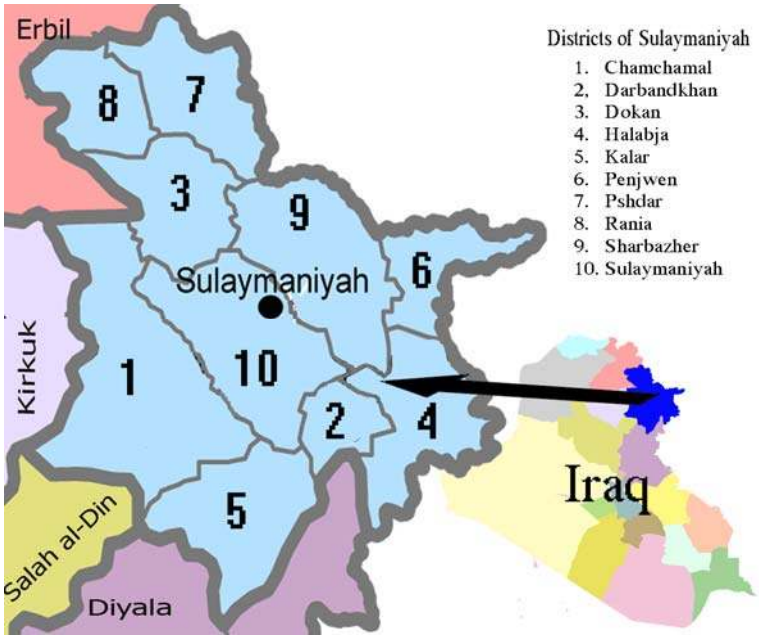


Figure 2.1 Map of Sulaymaniyah province and its districts

purpose of food ration distribution during the Oil for Food programme. The last update of these data being 2002.

The present study has been undertaken in the province of Sulaymaniyah and its population provides the reference population for the study. According to the Department of Statistics of Sulaymaniyah and based on extrapolations from the 2002 WFP data, the province is inhabited by 1,708,000 people of whom 704,000 live in the city of Sulaymaniyah and the remainder live in the district towns and rural areas of the province (table 2.1). The 10 districts of Sulaymaniyah as shown in figure 2.1 are Chamchamal, Darbandikhan, Dokan, Halabja, Kalar, Penjwen, Pshdar, Rania, Sharbazher and Sulaymaniyah. Throughout this report "Sulaymaniyah province" means all 10 districts; "Sulaymaniyah city" means the municipal city of Sulaymaniyah, "outside Sulaymaniyah" refers to the rest of the province excluding Sulaymaniyah city; and "other provinces" refers to any areas outside the boundaries of Sulaymaniyah province.

Table 2.1 Population of Sulaymaniyah province and city used for calculation of incidence and mortality rates

	Sulaymaniyah province				Sulaymaniyah city			
Age group	**%**	**Total**	**Male**	**Female**	**%**	**Total**	**Male**	**Female**
All	100.0	1,708,103	848,140	859,963	100.0	704,100	351,048	353,052
0-5 years	13.8	235,718	117,043	118,675	11.8	83,084	41,424	41,660
0-15 years	37.15	634,560	315,084	319,476	32.0	225.312	112,335	112,977
≥ 16 years	62.85	1,073,543	533,056	540,487	68.0	478,788	238,713	240,075

Source:
Department of Statistics of Sulaymaniyah (personal communication)
Central Organization for Statistics & Information Technology[178]

This thesis reports on 3 studies; a incidence and outcome study, a retrospective study and a case-control study. In the following sections of this chapter, each study will be described separately in line with STROBE (Strengthening the Reporting of Observational studies in Epidemiology) guidelines[179].

2.1 The incidence and outcome study

2.1.1 Study design

The incidence and outcome study was designed to interview all patients who sustained a new burn injury during the period from 3rd of November 2007 to 2nd of November 2008 and visited Sulaymaniyah burns centre. This study also included a follow up study on quality of life of adult patients after discharge from hospital.

2.1.1.1 Justification

It was not possible to base the study on retrospective hospital records to calculate incidence of burn injuries and investigate their epidemiological characteristics since in relation to outpatients, it was not possible to make a distinction between new and follow-up patients. This is because both new and returning outpatients are recorded in a common logbook without allowing differentiation between the two. The amount of information collected on outpatients is limited to name, sex, age, date of visit, and mechanism of injury which is not sufficient for thorough epidemiological investigation. Detailed information are not collected on the mechanism and circumstances of injury, residence, intent, materials and equipment causing injury and demographic characteristics. In addition such information is more likely to have limitations in terms of accuracy and completeness. Therefore a one year incidence and outcome study was considered more appropriate to achieve the study objectives.

2.1.1.2 Objectives

The objectives of the incidence and outcome study were to:

1. Calculate the incidence of burn injuries and describe their epidemiological characteristics in Sulaymaniyah city;
2. Calculate the incidence of intentional self-harm burns and investigate their risk factors in Sulaymaniyah city and province;
3. Investigate in-hospital mortality amongst all patients admitted to hospital; and

4. Investigate the quality of life of adult participants after discharge from hospital.

2.1.2 Setting

2.1.2.1 Location of the study

The incidence and outcome study was undertaken in the Burns and Plastic Surgery Centre of Sulaymaniyah (hereafter referred to as the burns centre). This hospital is more commonly known as the Emergency Hospital as it was originally established by the Italian Non-Governmental Organization "Emergency" in 1996 as a centre for treatment of war victims. From 2005 onwards the centre has been run by the Department of Health of Sulaymaniyah (DoH) and used exclusively as a burns centre. In June 2007 Médecins sans Frontières (MSF) France took over responsibility for the centre and added a ward for trauma victims while retaining the burn wards and developing them further. This centre is the only burns centre in the province and hence serves its entire population. In addition, it frequently receives patients from adjacent provinces of Kirkuk, Dialah and Salah-Aldin. The centre has 70 beds allocated exclusively for burns in 4 wards; the major burns ward for burns of ≥ 20% TBSA; the paediatric ward for children aged 12 years or less irrespective of the TBSA burnt; the men's recovery ward for men with burns below 20% TBSA and the women's recovery ward for women with burns below 20% TBSA. Men and women admitted to the major burns ward are also transferred to the corresponding recovery ward when their condition is stable.

In addition to the above-mentioned wards, the centre has a very busy outpatient department (OPD). This OPD provides services for new patients as well as follow-up services for patients requiring further treatment weather being an outpatient or an admitted patient discharged from the hospital.

The criteria for admission to the burns centre include burns of 15% TBSA and over in adults, or 10% TBSA and over in children; burns of smaller TBSA to the face, genitalia, hand or foot; and burns associated with blast injuries. However these criteria are not strictly adhered to due to social and logistic considerations and patients with minor burns are frequently admitted for a few days especially if they come from outside the city.

2.1.2.2 Dates of the study

Initially the researcher visited the director general of the DoH in the beginning of September 2007 to obtain his approval to undertake the study in the burns centre. Then communication was established with the management of the burns centre and the piloting stage was undertaken during September and October. The duration of exposure i.e. the period of time when the target population were at risk of sustaining a burn injury was one year starting from 3rd of November 2007 to 2nd of November 2008. Therefore participants who sustained an acute burn injury during this period were recruited and interviewed starting from 3rd November 2007 until 9th November 2008. Follow-up interviews to investigate the quality of life of recruited participants continued until the end of December 2008.

2.1.3 Participants

2.1.3.1 Eligibility criteria

Case definition: a newly burnt patient was defined as a person of any age and sex attending the burns centre for a burn injury which occurred at any time between 3rd of November 2007 and 2nd of November 2008. A burn injury was diagnosed as defined by the WHO's ICD-10 classification system (T20-T32) which includes injuries caused by exposure to smoke, fire and flames (X00-X09), contact with heat and hot substances (X10-X19), exposure to electric current (W85-87), lightning(X33) and exposure to corrosive substances (X46, X49). This definition includes scalds as well as burns caused by electrical heating appliances, electricity, flame, friction, hot air and hot gases, hot objects, lightning, and chemical burns. This definition does not include sunburn.

Inclusion criteria: All patients fulfilling the requirements of the above case definition were included.

Exclusion criteria: Outpatients who sustained a burn injury before 3rd of November 2007 even if attending for the first time during the study period; 2) inpatients who were admitted to hospital before the start of the study; 3) patients suffering from sunburn.

2.1.3.2 Recruitment of participants

All participants were recruited by the researcher either at the OPD during their first visit or subsequent follow-up visits to the burns centre or on the wards after admission.

Participants aged 18-70 years who were admitted to hospital and subsequently discharged were also eligible for a follow-up interview to investigate their quality of life. These participants were recruited after they had obtained their final police report. The preliminary and a final police reports are two legal requirements for any burn injury patient admission in Iraq and are produced by the attending doctor directed to the police and legal authorities. The preliminary report is given during the first 24 hours after injury and the final report is given when the wounds are healed. Therefore the timing of the final report and hence the follow-up interview was variable depending on the severity of the injury.

2.1.4 Exposures and outcomes

The exposures: The exposures of interest for the incidence and outcome study were the following:

1. Socioeconomic exposures including age, sex, residence, employment, education, marital status, living standard, household size, number of children 0-5 years per household, house ownership, number of rooms per household and car ownership.
2. Burn characteristics including day, month and season of injury, place of injury, mechanism of injury, injury intent, equipment and materials causing injury, material causing injury, TBSA burnt and duration of time from injury to hospital attendance.
3. In addition to the above-mentioned exposures measured for all participants, a range of other exposures were measured for participants who were admitted to hospital including day of admission and discharge, length of hospital stay, presence of inhalation injury, complications, wound infection and number of operations.

The outcomes: The outcomes of interest for the incidence and outcome study were the following:

1. Burn incidence: The primary outcome for the whole sample (outpatients and admissions) was the annual incidence of burn injuries and burn deaths amongst males and females and in different age groups in Sulaymaniyah city.
2. Mortality: In-hospital mortality was the primary outcome investigated amongst participants admitted to hospital.
3. Intentional self-harm: The incidence and risk factors for intentional self-harm was investigated as an outcome amongst males and females aged 11 years and over who were admitted to hospital.
4. Other outcomes investigated amongst admitted participants included readmission, long term consequences and quality of life.

2.1.5 Data sources and collection

2.1.5.1 Data sources

Data on variables included in the incidence and outcome study were obtained from the following combination of sources.

1. Face-to-face interviews: The majority of exposures were measured through a questionnaire administered to the participant or his/her companion by the researcher. These variables included socioeconomic variables, burn characteristics and quality of life. Questions about the quality of life were always answered by the patients.
2. Patients' records: Certain burn characteristics were obtained from patient files and outpatient charts such as TBSA burnt, dates of admission and discharge, presence of inhalation injury, complications, wound infection, operations, death and readmission.
3. OPD register: The burn centre's OPD register is the book where certain information is routinely recorded on all attenders including name, age sex, date

of burn and mechanism of injury. This source was used to record information on attenders who failed to be interviewed by the researcher (non-participants).

2.1.5.2 Developing the questionnaires

Two questionnaires were developed for data collection of the incidence and outcome study; the burns questionnaire and the quality of life questionnaire.

Development of the burns questionnaire (appendix 1) included the following stages:

1. Review of the relevant literature: During the preparatory period of the study, a thorough review of the relevant literature was undertaken searching Medline, Embase and CINHL and a bibliography was developed in EndNote on epidemiology of burn injuries. The findings of this review are reported in chapter one of this thesis.
2. Identification of existing relevant questionnaires: Several burn registry forms and questionnaires from other studies were identified which were useful most especially one from a community-based study in Iran [45]. The latter was more relevant to the current study because it included outpatients and collected more detailed information than hospital-based studies.
3. Development of the questionnaire: A detailed English questionnaire was then developed comprising mainly closed questions intended to elicit answers corresponding to binary, categorical, ordered or continuous variables. All questions were pre-coded. There were also some open questions to elicit descriptions of additional answers such as names of places, circumstances of the injury and pre-existing health conditions.
4. Translation of the questionnaire into Kurdish: The questionnaire was translated by a professional translator with a medical background into Kurdish which is the official language of the study area. The Kurdish version was then formatted appropriately and the translation was checked by informally administering the questionnaire to 2 colleagues and a family member and it was found to be satisfactory.

5. Assessment of face and content validity: To make sure that the questionnaire was acceptable, comprehensible and valid [180, 181] the face and content validity of the questionnaire was checked by 9 burn care professionals. After appropriate briefing about the purpose of the study in a first meeting, the questionnaire was given to two burn experts and seven nurses to check completeness, wording and comprehensibility. The nurses were the heads of all major wards/sections of the burns centre namely the OPD, the physiotherapy section, the adult burns ward, the female and male burns wards and the paediatric ward as well as the head nurse. The nurses were encouraged to discuss the questionnaire with their respective colleagues. In the second meeting after one week, the feedback of the professionals was discussed and by agreement the questionnaire was finalized after a few changes including adding/deleting certain questions or items and changing the wording and order of some questions.
6. Assessment of test-retest reliability: In a test re-test procedure, the questionnaire was administered to mothers of 12 patients on two occasions 1-3 days apart. The test questionnaire was administered when the mother was first seen in the OPD and the re-test was administered when she brought her child for dressing at the next appointment. The reliability of the questionnaire was assessed by measuring agreement of the values of the binary and categorical variables (49 variables) between the test and retest samples. For the 39 questions which had enough rating categories i.e. no zero values, the observed agreement ranged from 83% (kappa=0.59, P=0.005) to 100% (kappa=1, P<0.001).

Development of the quality of life questionnaire (appendix 2) included the following stages:

1. Identification of relevant questionnaires: Review of the relevant literature indicated that several instruments have been used to assess the quality of life of burns survivors. Some researchers have used general health assessment tools such as the Quality of Life Scale (QOLS) [182], SF-36 [183, 184], Euroqol-5D[184], and others have used different versions and adaptations of a more specific tool called the Burn-Specific Health Scale(BSHS) [185-195]. The BSHS

was originally developed in 1982 with 114 items [191] which was then revised into an abbreviated form (BSHS-A) including 80 items [196], and later into a shorter revised version (BSHS-R) including 31 items [185]. Another version of the tool, the brief BSHS (BSHS-B) of the tool was developed in 2001 [188] incorporating 40 items. The latter was considered for use in this study.

2. Translation of the existing questionnaire: The self-administered BSHS-B was translated by a professional translator with a medical background into Kurdish. The questionnaire was then formatted appropriately and the translation was checked by informally administering the questionnaire to 2 colleagues and a family member and it was found to be satisfactory.
3. Piloting: The 40-item questionnaire was then piloted on a group of 12 burn survivors (3 males, 9 females) to check comprehensibility and acceptability. All participants preferred to have the questions read for them instead of answering themselves justifying that by either poor literacy (7 out of 12) or just as a preference. Before starting the interview they were asked whether they wanted to be asked questions about sexual activity and all of them preferred not to be asked these questions.
4. Assessment of face and content validity: After appropriate briefing about the purpose of the study in a first meeting, the questionnaire was given to two burns experts and seven nurses to check completeness, wording and comprehensibility. The group provided several valuable suggestions including administration by an interviewer; dropping the sex domain as questions were considered an embarrassment for participants; and dropping some other questions which were considered not applicable, embarrassing, and too general or repetition. Examples included signing one's name (high rate of illiteracy), picking up coins from the ground (no coins in Iraq), getting out in the sun (repetition), being rather alone than with family (embarrassing) and having no one to talk about one's problems (too general). Two questions were also added; the first was on presence of pain and discomfort which was considered an essential item for assessment of quality of life; and the second was on difficulty in going to the toilet alone which was

also considered essential because of the structure of toilets used in the study area which requires squatting.

5. Taking into account the observations provided by the experts and feedback from participants, the questionnaire was revised to a face-to-face tool containing 25 questions coving 8 domains which were hand function, simple abilities, work, pain and discomfort, treatment regimens, body image, affect, and interpersonal relationships. Like the BSHS-B questionnaire, response to each question in the Kurdish BSHS was recorded through a 5 point scale describing a particular condition or state as extreme (0), quite a bit (1), moderate (2), a little bit (3) and not at all (4).

The Euroqol-5D questionnaire: Euroqol-5D (appendix 3) was also translated into Kurdish and used to assess the quality of life alongside the Kurdish BSHS. Euroqol-5D is designed to measure general health in five domains of mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Euroqol-5D is a simple tool administration of which does not require much additional effort when the BSHS is used yet it provides useful information on quality of life. Results of Euroqol-5D, being the standard tool, will be used to assess validity of the Kurdish BSHS by checking correlation between the two.

2.1.5.3 Data collection

All prospective data were collected in the burns centre by the researcher himself working seven days a week. Since most of the patients arrived during the first part of the day, the researcher worked from 8:30 am until around 4:00 pm. In busy days like winter months, and whenever there were patients admitted to the wards, he returned in the evenings to resume data collection.

The study logbook: the researcher kept a study logbook (appendix 4) to record the identification information (name, unique interview number, patient's number in the OPD register or admission file) for all patients being interviewed day by day. Additional observations and reminders were also recorded in the logbook. Each morning the names

of both outpatients and admitted patients who had visited the burns centre the day before but were not yet interviewed by the researcher, were noted down in the study logbook. This procedure made it possible to identify patients who needed to be interviewed during the follow-up visits as well as names of non-participants.

The interviews: All outpatient cases were interviewed at the OPD. Most participants were interviewed after they had been treated by the nurses, but others were interviewed prior to treatment whilst waiting to be seen. Patients not recruited during their first visit were interviewed during follow-up visits. The patient or his/her companion (father, mother, other), if he/she was a child, was approached by the researcher, the purpose of the research was explained, a written information sheet (appendix 5) was provided if he/she could read, and then a verbal consent was taken for the interview (section 2.1.9.2). The interviewee was assured of the confidentiality of the information and that he/she was free to respond or not to any particular question without this affecting the care the patient was entitled to. Then the interview was undertaken and at the end of the interview the interviewee was thanked for participating in the study.

Each new patient was routinely issued an OPD visit card which contained some information about the burn such as TBSA burnt, site, mechanism and date of injury and date of the next visit. Completing this form was a routine task for the OPD staff, but the researcher undertook to do it, in their place, for patients he interviewed. This was a welcome move which facilitated OPD staff cooperation with the study.

Patients who were admitted to hospital were either interviewed in the OPD or on the wards. If circumstances allowed and the researcher was available, the interview was undertaken in the OPD otherwise it was done later, usually at the evenings on the wards. In patients who were not capable of providing an interview i.e. in children and in adults not fully conscious because of the severity of their condition, the companion (usually parents and close relatives) were interviewed.

Interviews for quality of life study were also undertaken in the OPD but after discharge from hospital when the patient was provided with the final police report. This usually

took place several months after discharge. This time point was chosen for the interviews firstly to increase the chance of recruitment as patients are legally required to obtain a final police report; secondly to have a uniform point for recruitment as the police report is provided when the patient's wounds are healed; and lastly to assess the quality of life after the acute stage of the injury has passed and the wounds have healed because at that stage the quality of life is likely to be more stable than during the acute stage.

Medical records: The medical records of patients were accessed on several occasions. For outpatients, the OPD visit card was used to record the TBSA burnt which was recorded by the attending doctor or nurse on the card using Lund-Browder chart. Presence of inhalation injury was ascertained clinically by the attending doctor based on history and physical examination. For admitted patients, the patient's file was accessed to record information regarding the admission period including date of admission and discharge, TBSA, presence or absence of inhalation injury, laboratory investigations, amount of blood and fluid given, days on antibiotics, wound cultures, antibiotic sensitivity tests, complications, death and its time and cause. When the patient was discharged, transferred or died, the file was sent to the archiving section. At this stage the file was accessed by the researcher and the above-mentioned data were transcribed. All files were accessed once more at the end of the year to record readmission history of the patient.

Ascertainment of outcomes: Death, readmission, and long term consequences were ascertained from the hospital records. Intentional self-harm was ascertained when the patient and/or the companion clearly stated that the incident was "self-burning". Quality of life was measured using the face-to-face questionnaire.

Since information on readmission rate is important for planning and resource management purposes, this was measured from total index admissions during the year including those who died. Readmission was ascertained if a patient admitted for the first time during the study period, was subsequently re-admitted in the hospital during the same year of data collection. To ascertain this outcome, the files of all patients who had

an index admission during the study period were checked for history of readmission at the end of the year.

2.1.5.4 Data processing

Collecting and checking the questionnaires: Each day the questionnaires were sorted according to unique number and double-checked against the study logbook by name and unique number. Each questionnaire was then checked for missing questions, values and inconsistencies. Whenever possible inconsistencies were corrected from the questionnaire and notes were taken on missed information and efforts were made to collect them during the follow-up visits.

Data entry: The final version of the questionnaire was developed into a database in EpiData version 3[197] and used for data entry. Certain features of the programme were used to minimize data entry errors such as must-enter, range, legal values and skip. Since the majority of the questions were pre-coded categorical and numeric, using these features was both necessary and efficient for data entry fluency and speed as well as accuracy. Data were entered by the researcher on daily bases starting from the second week of data collection. Text answers which were in Kurdish were translated into English.

Data quality: A range of measures were taken in order to ensure that high data quality was maintained throughout the study. Firstly the questionnaires were pre-tested, well-formatted, pre-coded and administered in the native language. Secondly, the interviews and questionnaires were completed to a high standard by the researcher himself equipped with enthusiasm, knowledge of the procedures as well as previous experience in undertaking interviews. Thirdly, the questionnaires were checked daily and corrections made when possible and finally, the use of EpiData limited errors in data entry, and enabled running consistency checks and data cleaning. When all data were entered the final copy was exported to Stata version 9 [198] for analysis.

Double data entry and validation: Resource and time constraints arising from the unfunded nature of the project made it impossible to re-enter all data. Therefore only a random sample was double-entered. When data of all participants were entered a random sample of 50 observations was drawn in Stata and re-entered in EpiData and validated against the original entry.

2.1.6 Bias

The potential sources of bias in the incidence and outcome study are discussed under selection bias and information bias below.

2.1.6.1 Selection bias

In terms of recruitment of admitted participants, selection bias was not possible since all patients admitted to the burns centre were included in the study. In terms of outpatients, however, it is likely that selection bias has occurred. Since the researcher was less likely to be present in the evenings, patients who visited the burns centre in the evenings were more likely to be missed. This could be true especially for patients with less severe injuries since they required no or less follow-up visits while more severe injuries required more follow-up visits during which they had a more chance to be recruited.

In terms of bias affecting outcomes, selection bias is unlikely to have biased the calculation of the incidence of burn injuries since all patients including non-participants were included this calculation. But in terms of mortality some participants were lost to follow-up; the outcome of those discharged against medical advice or transferred to other hospitals could not be ascertained. It is likely that these patients were different from the remainder in certain risk factors that could make their mortality different from the rest. Theses two groups were compared in the analysis.

Selection bias could also have occurred in recruitment of participants for the quality of life study. Although all patients discharged from hospital were eligible, only those who visited the burns centre afterwards were interviewed and no active efforts were made to

follow-up those who failed to attend the burns centre. It is likely that interviewed participants were not a random sample of all eligible patients. Since the quality of life interview was undertaken after the final police report which was provided on healing of all wounds, it is possible that patients with more extensive burns and complications that require more time to heal, were less likely to be included in the interviews than those with less extensive burns. The effect of this selection bias will be in the direction of a better quality of life of participants. It is also likely that patients who had their wounds healed but suffered from more long-term consequences were more likely to be included since they were more likely to visit the burns centre. The effect of this selection bias will in the direction of a worse quality of life of participants. People from other provinces were also probably less likely to be recruited because of their geographic distance from the burns centre irrespective of the severity of their injuries.

2.1.6.2. Information bias

Reporting bias: Since most of the information was collected using face-to-face interviews with participants or their companions, reporting bias may have occurred. The following measures should have helped to minimize reporting bias: undertaking the interview in the burns centre and as soon as possible after the injury which probably facilitated participant cooperation and remembering; helping the participant or his/her companion to provide information and recall by conducting a friendly interview and providing encouraging feedback, and using medical records to ascertain certain information.

In terms of reporting bias involving the outcomes, incidence, mortality and long-term consequences were probably not affected since they were obtained from medical records. Reporting bias was also less likely to have affected the quality of life as it was measured using a more objective 5-point scale. Intentional self-harm was likely to be affected by differential misclassification if patients have not reported the true intent; for example it will be biased towards underestimtion if some self-harm patients have denied the true intent. To minimize this bias, this outcome was ascertained whenever

throughout the course of hospitalization, the patient or his/her companion confirmed self-harm.

Observer bias: There was only one interviewer, the researcher himself, for all the incidence and outcome study. Blinding in relation to the objectives of the study was therefore not possible. There was no financial conflict of interest towards any particular result and the researcher has tried to be as neutral and as accurate as possible, however, these judgments still remain subjective.

2.1.7 Study size

The incidence and outcome study was a census of all new burns patients who reported to the burns centre for a burn injury that occurred during one year of data collection extending from 3 November 2007 to 2 November 2008. Based on informal talks with the head nurse of the burns centre prior to the study, it was expected that approximately 2000 participants will be recruited.

2.1.8 Statistical methods

Analysis was undertaken using Stata version 9 [198]. After checking the variables, descriptive analysis was undertaken to describe the sample and the epidemiological characteristics of burn injuries. Univariate and then multivariate analyses were undertaken to investigate the effect of risk factors on outcomes. Separate analyses were undertaken for all participants (outpatients and inpatients), admissions, intentional self-harm burns and quality of life. The level of confidence was set to 95% and P values were reported as such if they were larger than or equal to 0.001 but smaller P values were reported as <0.001.

2.1.8.1 Checking and grouping variables

Continuous variables were checked for normality by examining their distribution and subsequently appropriate parametric or non-parametric methods were used in their analysis. Age was grouped in accordance with WHO injury reports to 0-5 years, 6-14

years, 15-39 years, 40-59 years and 60 years and over. TBSA was grouped into deciles and quartiles in the univariate analysis and into two groups (< 40% and ≥ 40%) in the multivariate analysis to allow sufficient participants in the analysis.

2.1.8.2 Descriptive analysis

Categorical variables were described using frequencies and percentages. In terms of numeric variables, for normally distributed variables the mean and standard deviation and for skewed variables the median and inter-quartile ranges (IQR) were reported. Association between categorical variables were explored using Chi-square test. The TBSA, age, hospital stay and quality of life were not normally distributed and therefore the Mann-Whitney U test and Kruskal-Wallis test were used depending on the number of groups being compared.

The incidence rate of burn injuries, admission rate, incidence rate of self-harm and death rate were calculated assuming a Poisson distribution. Rate ratios and 95% confidence intervals were calculated by sex and age group.

2.1.8.3 Logistic regression

Factors associated with mortality were investigated by identifying the potential risk factors at the univariate level using odds ratios calculated by logistic regression. Linearity of the effect of continuous variables (age, TBSA, hospital stay) were assessed by adding higher order terms, and where there was evidence of non-linearity, variables were categorised. The ordered categorical variables such as deciles of TBSA categories were checked for linear effect using Likelihood ratio test. When there was evidence of linearity the common odds ratio was calculated and reported and when there was no linear effect the odds ratios for each category of the variable were reported.

Multivariable analysis was then undertaken by multiple logistic regression using Collett's procedure [199] with a model initially including all variables which were associated with death in the univariate analyses at a level of significance equal to or less

than P=0.20. Variables were removed one at a time and the models with and without the variable were compared using likelihood ratio test. Variables not significantly improving the model were removed from the model. All excluded variables were then re-examined for inclusion by adding the removed variables one at a time back into the model to check their significance. Interactions were examined between theoretically plausible variables using likelihood ratio tests. The final model was checked for goodness of fit using Hosmer-Lemeshaw test. Outliers were checked by plotting leverages and residuals to detect observations with large influence or residuals. Multicollinearity was checked by examining the variance inflation factor (VIF). It is suggested that if the largest VIF is greater than 10, multicollinearity is present[200].

Factors associated with intentional self-harm were investigated by comparing intentional burns with accidental burns within the admitted patients. The potential risk factors were identified at the univariate level and then multiple logistic regression was undertaken as mentioned above.

2.1.8.4 Analysis of quality of life data

Initially the data were used to validate the Kurdish questionnaire by investigating the inter-item and item-total correlations and Cronbach's Alpha. The correlation between the total score of the Kurdish BSHS and Euroqol-5D was also reported. The mean and median scores were reported for individual domains and the descriptive summery was reported for the Euroqol-5D dimensions. The quality of life score was skewed to left and could not be transformed to a normal distribution using squared values, log transformation and reflection. Therefore linear regression was not performed and the association of the quality of life score with the patient and injury characteristics was investigated using non-parametric methods (Mann-Witney U test and Kruskall-Wallis test).

2.1.9 Ethical considerations

2.1.9.1 Ethical approval

The study was submitted to the Medical School Research Ethics Committee of the University of Nottingham which provided a favourable response and considered the study of a high standard and lacking any serious ethical problems (appendix 6). Before starting the study, the opinion of the newly established ethics committee of the College Of Medicine of the University of Sulaimani was also sought which approved it (appendix 7). In addition since the study was undertaken in health facilities approval of the DoH of Sulaymaniyah was also obtained (appendix 8).

2.1.9.2 Participant consent and confidentiality

The study only involved face-top-face interviews and medical records. Therefore the main inconvenience for the patients was the time and effort taken for the interviews.

Informed consent was obtained from all study participants and or their companions (parents and close relatives). The information sheet (appendix 5) and consent form (appendix 9) were provided or read to each participant (companion) before the interview. The participants were also assured about the confidentiality of the information provided. It was practically not feasible to obtain written consent from participants because of a high illiteracy rate amongst the adult population. In addition, according to anecdotal evidence form local researchers, it is believed that while people are normally very responsive for interviews in health setting, if a signed consent form was to be requested, they will be less likely to participate. For these reasons a verbal consent was considered sufficient and indeed this is the normal practice in research undertaken by the Central Organization for Statistics and the departments of statistics in Iraq.

The interviewees were given a full explanation about the aims and objectives of the study, and about the questions they were going to be asked. They were reassured about the confidentiality of the information and that it would never be disclosed by name or in

any other form by which the participant could be identified. The participants were also reassured that participation would not affect the care they were entitled to; whether they accepted to participate or not, they would still receive the care they required. After this explanation the interview started.

2.2 The three-year admissions study

2.2.1 Study design

Data were collected retrospectively from files of all patients admitted to the burns centre during 2006 and 2008.

2.2.1.1 Justification

The three-year admissions study was undertaken to explore the epidemiology of burn admissions over time and to investigate whether in-hospital mortality in 2008 when the burns centre benefited from MSF support, was different from the previous years. Therefore, a retrospective study was necessary to achieve these objectives.

2.2.1.2 Objectives

The objectives of the three-year admissions study were to describe the epidemiology of burn admissions in 2006-2008 and investigate whether in-hospital mortality changed over time.

2.2.2 Setting

The study was undertaken in the burns centre. Data from files of all patients admitted to the burns centre from 1st January 2006 to 31st December 2008 were used.

2.2.3 Participants

Participants included all patients admitted to the burns centre for an acute burn injury during 2006-2008.

2.2.3.1 Eligibility criteria

Case definition: A patient admitted to the burns centre from 1st January 2006 to 31st December 2008 for an acute burn injury.

Exclusion criteria: Patients admitted for reconstructive surgery for an old burn injury.

2.2.3.2 Recruitment of participants

All files were obtained from the hospital archives section.

2.2.4 Exposures and outcomes

The exposures: The exposures of interest were sex, age, residence, mechanism of injury, season of injury, TBSA burnt, date of admission and discharge, length of hospital stay, presence of inhalation injury and number of operations.

The outcome: In-hospital mortality.

2.2.5 Data sources and collection

2.2.5.1 Data sources

All data were extracted from patients' files which were obtained from the hospital archives.

2.2.5.2 Data collection

The researcher was provided with access to the archives section where the files were stored. Files were accessed according to date of admission starting from 1st January 2006. The files were stored in drawers each containing 100 consecutive files making it easy to transcribe data consecutively by date of admission. File numbers were unique to patients so each patient had one file which was used every time the patient is admitted to hospital. Data of 2006 and 2008 were transcribed by the researcher from the files. Data of 2007 was already available in form of an Excel database transcribed and entered by a hospital staff in charge of statistics of the burns centre. A copy of this database was handed to the researcher.

Ascertainment of the outcome: Death was ascertained from the files.

2.2.5.3 Data processing

Data entry: Data were entered into EpiData by the researcher as describe in section 2.1.5.4.

Data quality: All data were obtained from medical records which are normally subject to limitations in accuracy and completeness. It is hard to estimate the accuracy of all information recorded on a patients' file but information on the basic exposures (age, sex, TBSA etc.) recorded on the first page of the file on admission, which were of interest to this study, are likely to be more complete and accurate.

Re-entry and validation: Resource and time constraints arising from the unfunded nature of the project made it impossible to re-enter all data. Data from a randomly selected sample of 20 files was re-transcribed and re-entered to estimate the data entry error.

2.2.6 Bias

2.2.6.1 Selection bias

Files of all patients who were admitted during the 3 years were included in the study. There were no missing files. Each patient has one unique file and the numbering of the files was consecutive for each year from 1st January to 31st December so any missing number will be easy to observe. Therefore this could not be a source of selection bias. Death was ascertained from patients' files but for patients who were discharged against advice or transferred to other hospitals, death could not be ascertained. These patients were all considered alive by hospital records; a situation which leads to underestimation of mortality rate.

2.2.6.2. Information bias

As this study only depended on medical records, reporting bias was not likely. Issues of accuracy and completeness are likely in medical records. But this study only

investigated the basic demographic and clinical exposures which are probably less prone to mistakes in recording. Besides mistakes in such exposures are likely to be detected and corrected during the course of hospitalization. Data transcribers were aware of the objectives of the study therefore blinding was not possible.

2.2.7 Study size

This study was a census of all patients who were admitted to the burns centre from 1st January 2006 to 31st December 2008 for a new burn injury.

2.2.8 Statistical methods

Descriptive analysis was undertaken to describe the main characteristics of admitted patients over the three years. Univariate analysis of risk factors for in-hospital mortality was undertaken using logistic regression. The main objective of this study was the effect of year of admission therefore the adjusted effects of other risk factors for death were not of interest and not reported. However, multiple logistic regression using the procedure explained in section 2.1.8.3 was used to identify these risk factors in order to obtain and report the effect of year of admission adjusted to these factors.

2.2.9 Ethical considerations

This is discussed under section 2.1.9.

2.3 The case-control study

2.3.1 Study design

The case-control study was designed to investigate the risk factors for childhood burns in the city of Sulaymaniyah. This was a case-control study in which incident cases were recruited consecutively from amongst children reporting to the burns centre during the study period and controls were recruited in another hospital.

2.3.1.1 Justification

The incidence and outcome study was not designed to compare injured and uninjured children so it cannot answer the question about risk factors associated with childhood burns. Such risk factors could be explored either through a cohort study or a case-control study. Undertaking a cohort study requires collection of basic information from a large cohort of the population of Sulaymaniyah and their follow-up for some time to ascertain the outcome. Such a study will be time-consuming and expensive far beyond the limits of human and financial resources available to the researcher. A case-control study was therefore the better and more practical option in view of the concurrent incidence and outcome study from which cases could be recruited.

2.3.1.2 Objectives

The objective of the case-controls study was to investigate risk factors for burns among children aged 0-5 years in Sulaymaniyah.

2.3.2 Setting

2.3.2.1 Location of the study

The recruitment of cases was undertaken in the burns centre which was described in section 2.1.2.1 and recruitment of controls in the Children's Teaching Hospital of Sulaymaniyah. This hospital is the only children's hospital in the city and is located in

the centre of the city near the burns centre. The Children's Hospital provides in-patient services in a wide range of specialties for children from birth up to the age of 12 years. Since it is the only children's hospital in the city, it admits patients referred from the health centres, hospitals and private clinics across the city.

2.3.2.2 Dates of the study

The preparations discussed under the incidence and outcome study apply to the case-control study too. Data collection for the case-control study commenced on 3rd November 2007 and finished on 5th April 2008.

2.3.3 Participants

The study participants included cases of pre-school age i.e. aged 0- 5 years attending the burns centre for a new burn injury during the data collection period commencing on 3rd November 2007. Controls were children of the same age admitted to the Children's Hospital during the same period for other diseases.

2.3.3.1 Selection of cases

Case definition: a newly burnt child of 0-5 years of age and a resident of Sulaymaniyah city attending the burns centre for a burn injury occurring at home (including the yard) during the data collection period. A burn injury was defined using the WHO's ICD-10 classification system (T20-T32) which includes injuries caused by exposure to smoke, fire and flames (X00-X09), contact with heat and hot substances (X10-X19) and exposure to electric current (W85-87). This definition includes scalds as well as burns caused by electrical heating appliances, electricity, flame, friction, hot air and hot gases, hot objects and chemical burns. This definition does not include sunburn.

Inclusion criteria*:* A child was included if he/she fulfilled the above case definition i.e.:

1. A new burn injury as defined above;
2. Aged from birth to 5 years; and

3. Resident of Sulaymaniyah city.

Exclusion criteria: A child was excluded if he/she was:

1. Burnt outside the house; or
2. Burnt in natural and man-made disasters or by lightning; or
3. A sibling of another child already recruited as a case.

Source and recruitment of cases: Any child who was seen in the burns centre and interviewed for the incidence and outcome study was considered a case if he/she fulfilled the inclusion criteria after obtaining informed consent. The recruitment of cases commenced on 3rd of November 2007 and lasted 14 weeks (figure 2.2).

2.3.3.2 Selection of controls

Controls were selected at the Children's Hospital from residents of Sulaymaniyah city, the same population from which the cases were derived.

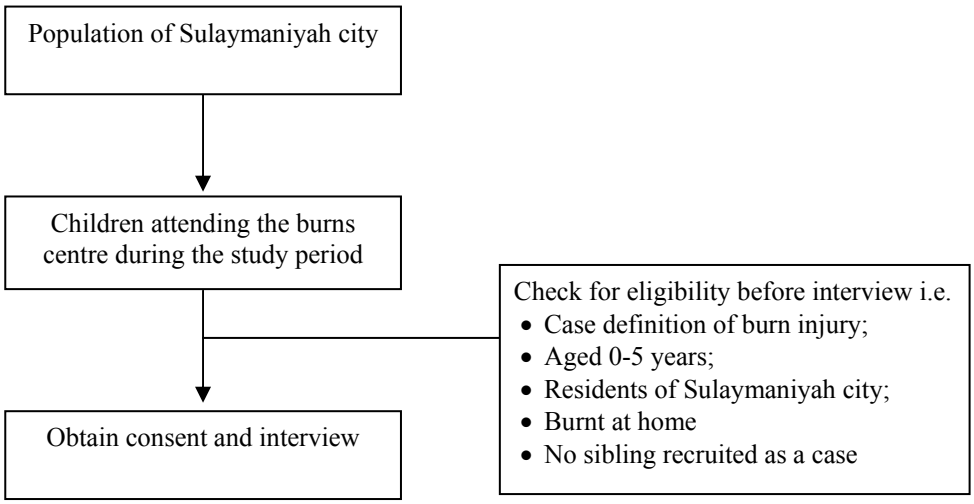
Inclusion criteria: A child was included if he/she:

1. Was aged from birth to 5 years; and
2. Was resident of Sulaymaniyah city.

Exclusion criteria: A child was excluded if he/she

1. Had history of previous burn injury as this is the main outcome under study and a control having the outcome in the past is likely to be more similar to the cases in terms of risk factors than the general population i.e. such a control will not be a good representation of the child population. Indeed, such a control would be recruited as a case in a retrospective case-control study.
2. Was a sibling of another child already recruited as a control to avoid including the same family twice; or

Selection of cases



Selection of controls

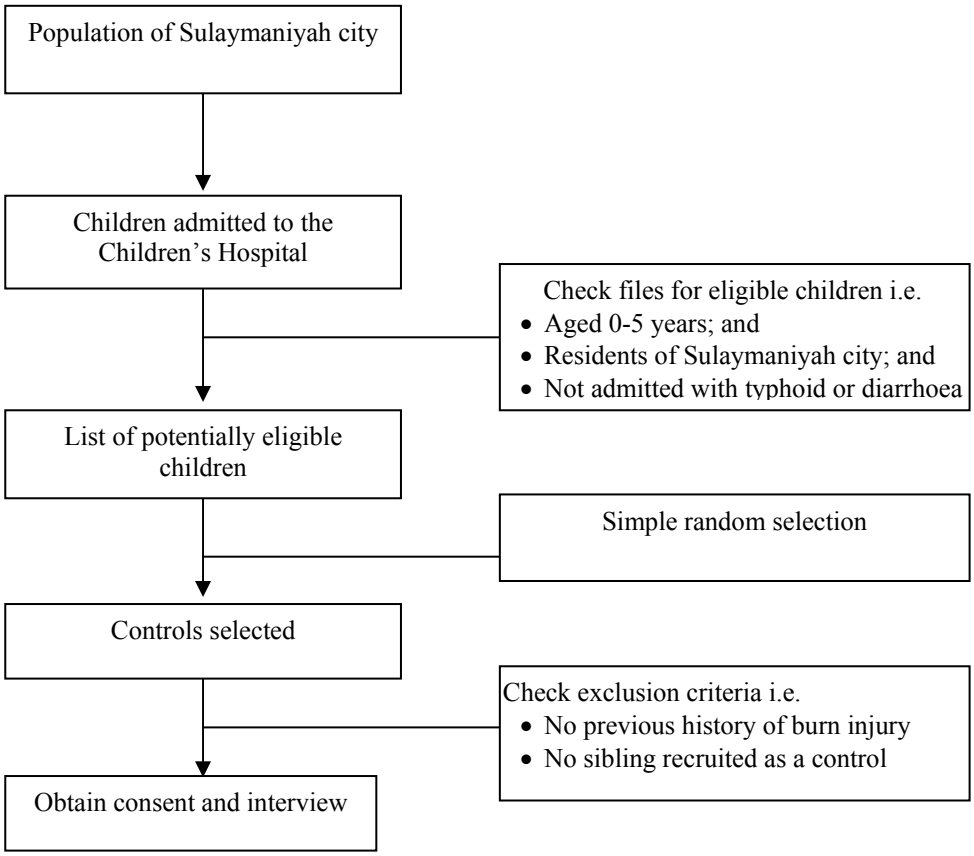


Figure 2. 2 Selection of cases and controls

3. Was admitted for typhoid or diarrhoea because at the time of the study there was an epidemic of these two diseases in the city and around 80% of the admissions in the Children's Hospital were suffering from them. To have included these 2 diseases would have meant that the majority of controls would be children with typhoid and diarrhoea. This would obviously have not been a good representation of the child population of Sulaymaniyah as well as the fact that it would have led to over-representation of the poorer children as the mentioned diseases are associated with poverty. Other infections were not excluded.

Source and recruitment of controls: After considering available sources of controls in the light of feasibility and resources available to the researcher, and keeping in mind that the cases were also hospital-based, it was decided to depend on hospital-based controls. Theoretically it would have been better to recruit community-based controls had it been possible to draw a random sample representing the whole population of the city. Ideally a household survey would be used, however, accurate sampling frames are not available, postal services are elementary and phone coverage is very low in peripheral areas of the city and among the poorer families. In such circumstances, obtaining a representative sample of 248 controls from a population of more than 100,000 households was not logistically possible for the researcher. Besides, postal and telephone surveys have never been used in health and demographic research in the area before.

Apart from a household survey, several places were considered where pre-school children of 0-5 years could be recruited as controls such as health centres, kindergartens and hospitals. Around 30 primary health centres (PHC) and hundreds of private clinics are present in the city making it practically impossible for a single researcher to recruit a representative sample from all these PHCs and clinics. A team of researchers could have used a cluster survey in the PHCs but this was not feasible for a single researcher who was meanwhile doing another study in the burns centre. In addition, people from lower socioeconomic classes are more likely to attend PHCs where services are freely provided while the more affluent families tend to use private clinics resulting in selection bias. Kindergartens were also not a feasible source for controls because the

pre-school education coverage is only around 6% and it is more likely to involve more affluent families.

Therefore the decision to use hospital-based controls was considered both realistic and appropriate in the researcher's circumstances. The Children's Hospital was selected for this purpose bearing in mind the following points about feasibility and minimizing selection bias:

1. Similar to the burns centre where cases were recruited, the Children's Hospital is the only children's hospital in the city and therefore covers the same population which has produced the cases. Admission in this hospital is not restricted to children from a particular area or socioeconomic background.
2. The hospital admits children for a range of diseases and conditions. It has been suggested that selecting controls from different diagnostic groups is a good strategy to minimize bias[201]. This strategy decreases the probability of over-representation of children with diseases associated with the exposures of interest and makes the selected controls more similar to the general population than if they were derived from a single disease category.
3. Being located in the centre of the city close to the burns centre where the researcher was based, the children's Hospital was practically a convenient facility for the study in view of resource and time constraints arising from the unfunded nature of the project.

Number of controls: One control was recruited for each case. Probably the best strategy would have been to recruit another group of controls from another setting but this was not possible due to time and resource constraints. Recruiting more than one control is especially useful if there is shortage of cases but in the current study this condition did not apply so the sample was calculated based on one control per case.

Frequency matching: The controls were frequency matched to cases by sex and age in one year intervals. Since sex and age are two common confounders, controlling for them decreases the number of exposures studied and hence improves the efficiency of the

study. Since the effect of age and sex could be investigated in the incidence and outcome study it was deemed unnecessary to explore their effects in the case-control study as well.

Recruitment of controls was undertaken on a daily basis commencing on the 18th November 2007 and lasting 20 weeks.

2.3.4 Exposures and outcomes

The exposures: The exposures of interest for the case-control study were the following:

1. Socioeconomic exposures including age, sex, residence, father's and mothers employment and education, living standard, overcrowding and house ownership.
2. Home hazards including the following:

    - Use of kerosene stoves for cooking
    - Use of samovars for making tea
    - Use of kerosene stoves for space heating
    - Use of kerosene stoves for bathwater heating
    - Lack of awareness of the bathwater temperature
    - Use of generator at home
    - Storing petrol at home
    - Not having a smoke alarm fitted at home
    - Absence of a fire extinguisher at home

3. Child-specific exposures including birth order, living with the mother, main carer, presence of a second carer, pre-school education, child activity and child disability. Disability was reported by presence of any of the followings: visual impairment, hearing impairment, epileptic seizures, learning disabilities and walking problems. Child activity score was measured using three criteria from DSM-IV hyperactivity criteria used in the definition of Attention Deficit Hyperactivity Disorder (ADHD) [202]. Since the objective for measuring this

exposure was not to diagnose AHHD, but to assess how mothers rated their children's behavior in terms of activity, only these three behaviors were used (fidgeting, running about, being on the go). Reporting of these behaviors were coded 0 (never/rarely), 1(sometimes), 2 (often) or 3 (very often) and applied for children aged one year and more who had started walking.

4. Other exposures: Mother's awareness of danger of burns and history of burns in other family members.

The Outcome: The outcome of interest in this study was occurrence of a medically attended burn injury amongst children 0-5 years of age in Sulaymaniyah city.

2.3.5 Data sources and collection

2.2.5.1 Data sources

Data on variables included in the case-control study were all obtained from face-to-face interviews. All exposures were measured through a pre-coded questionnaire (appendix 10) administered to the child's companion (parents or close relatives) by a trained interviewer.

2.3.5.2 Developing the questionnaires

The face to face questionnaire which was used for the case control study was part of the main questionnaire which was used for the incidence and outcome study (section 2.1.5.2*)*.

2.3.5.3 Interviewer training

Since the researcher could not simultaneously undertake the interviews of the incidence and outcome study (which included the cases) as well as controls, therefore there was a need to recruit an interviewer for controls. A junior doctor who was doing his internship in the Children's Hospital volunteered to undertake the interviews. The researcher provided him with detailed training prior to the start of the work which included

explanation of the objectives of the study, case definition, inclusion and exclusion criteria, selection procedures, interviewing, and rehearsal of the questionnaires. The researcher also accompanied the interviewee during the first 2 days of data collection to observe his performance. In addition the researcher was in regular contact with the interviewer throughout the data collection process.

2.3.5.4 Data collection

All data from cases and controls were collected using face-to-face interviews with the child's companion (parents or close relatives). Data from all cases were collected in the burns centre by the researcher himself as part of the incidence and outcome study. Data collection of cases commenced on 3rd November 2007 and lasted 14 weeks (section 2.1.5.3).

Data from controls were collected in the Children's Hospital by the interviewer. At the end of each week of case recruitment, an updated list of required controls stratified by sex and age was given to the interviewer. Interviewing controls commenced on 18th November 2007 and lasted 20 weeks. As the interviewer was based in the hospital throughout the study, he checked for new admissions on daily basis and prepared a list of potentially eligible controls (i.e. aged 0-5 years, resident of Sulaymaniyah, without typhoid or diarrhoea) from patients' files. Controls were recruited by simple random selection from this list. This means that the required number of controls were drawn blindly from a pool containing all names of potentially eligible controls produced from the list mentioned above. The other exclusion criteria i.e. history of burn injury and sibling being recruited as a control, were checked before starting the interview. The eligible children were interviewed if they were required according to the cumulative list of required controls stratified by sex and one year age group which was updated weekly by the researcher and provided to the interviewer (figure 2.2).

Before the interview, the child's companion (parent or close relative) was approached by the researcher, the purpose of the research was explained, a written information sheet was provided if she/he could read, and then verbal consent was taken for the interview.

The interviewee was assured of confidentiality of the information and that he/she was free to respond or not to any particular question without this affecting the care the patient was entitled to. Then the interview was undertaken. At the end of the interview the interviewee was thanked for participation.

2.3.5.5 Data processing

This is the same as for the incidence and outcome study (section 2.1.5.4).

Double data entry and validation: When data of all 248 controls had been entered into the database, a random sample of 20 observations was drawn in Stata and re-entered in EpiData and validated against the original entry.

2.3.6 Bias

2.3.6.1 Selection bias

The reference population of cases and controls was the population of Sulaymaniyah city. It is likely that cases were representative of the city's 0-5 years old child population because selection of cases was prospective and all newly burnt children seen in the burns centre during the period of case recruitment had the same chance of being included in the study. However, there were 69 children aged 0-5 years who did not participate in the incidence and outcome study 70% of whom were likely to be from Sulaymaniyah city (judging from proportion of children in the incidence and outcome study who were from Sulaymaniyah) and hence were potentially eligible. This could be a potential source of selection bias but there is no reason to think that these children were systematically different from those included in the study in terms of their risk factors. Exclusion of these children was related to the injury rather than the risk factors; they were missed (i.e. excluded) mostly because they attended the burns centre in the evenings and/or probably for mild injuries because if they had more severe injuries they would have attended for follow-up visits and hence recruited by the researcher during these visits.

Controls were also derived from the city's 0-5 years-old population. Hospital-based controls are more prone to selection bias than community-based controls because admission to hospital may be associated with some of the exposures under study. Since controls were admitted for all kinds of health conditions, rather than a single disease, probably this bias is less likely. However, it is possible that some socioeconomic exposures such as poor living standard may be associated with admission of children to hospital in which case the effect of this exposure will be underestimated. Exclusion of children with diarrhoea and typhoid, on the other hand, is likely to lead to overestimation of the effect of a poor living standard assuming that these diseases are associated with a poor living standard.

Presence of disabilities is an exposure of interest in this study which could be associated with admission to the Children's Hospital because disabled children are probably more likely to be in hospital. This condition leads to underestimation of the effect of disability as a risk factor for burns. The Children's Hospital is the city's only paediatric hospital and hence admitted children are likely to represent the city's child population. In addition selection of controls was undertaken form a range of diagnostic condition using simple random selection which is likely to reduce selection bias. Because of the nature of the outcome being studied, misclassification of the outcome was not likely in cases or controls.

2.3.6.2 Information bias

Reporting bias: In both cases and controls, the child's companion (parent or close relative) was interviewed using the same face-to face questionnaire. The participants were not explicitly told about the hypothesis under study but the broad aim was explained to them and therefore they could probably guess what the researcher was looking for. The following measures were probably effective in minimizing reporting bias: undertaking the interview in the burns centre and the Children's Hospital as soon as possible after injury or admission which will facilitate participant cooperation and remembering; helping the participant to provide information and recall by conducting a friendly interview and providing encouraging feedback.

Reporting bias was likely regarding family history of burns and child activity. Mothers of cases might have been better than controls in remembering family history of burns because they were in hospital for a burn injury. This situation could lead to overestimation of the effect of family history. Mothers of cases might have also been more likely to over-rate the activity of their children than mothers of controls to imply that they were not to blame for what happened to the child. This bias could lead to overestimation of the effect of child activity.

Observer bias: Both interviewers were properly trained and used the same tool. Blinding in relation to the objectives of the study was therefore not possible. There was no financial conflict of interest towards any particular result and the researchers have tried to be as neutral and as accurate as possible, however, these judgments still remain subjective.

2.3.7 Study size

Since lower levels of maternal education have been reported as a risk factor for childhood burns this exposure was used to calculate the sample size. Data from other studies indicate that the odds ratio for childhood burns in children of mothers with lower levels of education compared to more educated mothers is 1.9[129, 131]. It is also known from local data that 60% of women of child bearing age (15-49) in Iraq[203] have none or primary education. Using these figures and assuming equal numbers of unmatched cases and controls, the sample size was calculated for 90% power and a 2-sided significance level of 5% and a continuity-correction, as 248 cases and 248 controls. The sample size was calculated in PS-Power and Sample Size Calculations Version 2.1.30 [204]. See appendix 11 for the calculation.

2.3.8 Statistical methods

2.3.8.1 Checking and grouping variables

The general principles are explained in section 2.1.8. The variables related to home hazards were grouped to a continuous variable which had a linear relation with the

outcome. The relationship between child activity score and the outcome was not linear therefore it was grouped around the median (≤median, >median) as it was not normally distributed. Overcrowding (number of persons per room) was normally distributed and had a nonlinear relationship with the outcome therefore it was grouped around mean (≤mean, >mean).

2.3.8.2 Descriptive analysis

Initially the cases and controls were described and compared on demographic, household and child characteristics. Controls were also compared with the general population where data on the population were available. Categorical variables were described using frequencies and percentages. In terms of numeric variables, for normally distributed variables the mean and standard deviation and for skewed variables the median and inter-quartile ranges (IQR) were reported. Association between categorical variables were explored using Chi-square test.

2.3.8.3 Logistic regression

Univariate analysis was undertaken using logistic regression to calculate odds ratios and 95% confidence intervals for the risk factors. Linearity of the effect of continuous variables (e.g. overcrowding, child activity score, and home hazards) were assessed by adding higher order terms, and where there was evidence of non-linearity, variables were categorised. The effect of age and sex was controlled by frequency matching during the design. Other confounding factors were controlled for by multivariable logistic regression analysis. Multivariable models were built using Collett's procedure (section 2.1.8.3). Interactions were examined between theoretically plausible variables using likelihood ratio tests. The final model was checked for goodness of fit using Hosmer-Lemeshaw test. Outliers were checked by plotting leverages and residuals to detect observations with large influence or residuals. Multicollinearity was checked by examining the variance inflation factor (VIF). It is suggested that if the largest VIF is greater than 10, multicollinearity is present[200].

2.3.9 Ethical considerations

This is discussed under section 2.1.9

Chapter Three

Results

3.1 The incidence and outcome study: all participants

During the one year prospective data collection a total of 3657 patients with a new burn incident attended the burns centre of whom 2975 were successfully interviewed by the researcher amounting to a participation rate of 81%. The remaining 682 (19%) attenders were missed because they attended the burns centre while the researcher was not available. None of the 2975 participants who were approached by the researcher declined an interview so the response rate was 100%. Certain information about non-participants such as age, sex and date and mechanism of injury were available for analysis and comparing participants and non-participants which is presented later in this chapter. The overall missing data (i.e. no answers by participants, missed questions by interviewers and missed values during data entry) for all variables was 1% but it was much less (0.3%) for variables specific to the characteristics and circumstances of the burn injury.

3.1.1 Socioeconomic and household characteristics

The socioeconomic characteristics of the participants are shown in table 3.1. Participants from Sulaymaniyah province comprised 92% of the sample including 72% from Sulaymaniyah city. Almost 18% of the participants were housewives and 56% of them were dependants (children, students and unemployed unmarried girls and boys living with their parents). Regarding parental employment, 62% of fathers were either self-employed or employed in the private sector and 32% were in governmental employment while 85% of mothers were housewives. Regarding parental education, 17% of fathers and 36% of mothers were unable to read and write. Amongst people aged 18 and more which is the age of majority by law, 60% of the men and 69% of the women were married. In addition there were more widows than widowers in this age group as 6% of the women were widows and just 2% of the men were widowers.

Twenty percent of the interviewees considered themselves having a poor living standard and 67% of them owned their own accommodation. Household size was normally distributed ranging from 1 to 24 (mean 5.3, SD 2.4). The number of children aged 0-5 in the family ranged from 0 to 5 (mean 1.0, SD 0.9) and number of rooms (including the kitchen) in the house ranged from 1 to 8 (mean 3.0, SD 1.0). The mean number of persons per rooms was 1.9 (SD 1.1).

Table 3.1 Socioeconomic characteristics of participants (n=2975)

Characteristics (number non-missing) [number missing]*	Number	Percent
Residence (2,975) [0]		
Sulaymaniyah city	2,138	71.9
Outside the city but within the province	592	19.9
Other provinces	245	8.2
Participant role/employment (2,964) [11]		
Child/dependant	1,644	55.5
Housewife	528	17.8
Private sector/self-employed	430	14.5
Government employment	295	10
Other	67	2.2
Father's employment (1,551) [93]		
Private sector/self-employed	965	62.2
Government employment	489	31.5
Farmer	35	2.3
Pensioner	32	2.1
Unemployed	30	1.9
Mother's employment (1,595) [49]		
Housewife	1,354	84.9
Government employment	221	13.9
Private sector/self-employed	15	0.9
Pensioner	5	0.3
Father's education (1,538) [106]		
None (unable to read and write)	268	17.4
Primary/ informal	626	40.7
Middle/secondary	459	29.9
Higher education	185	12.0
Mother's education (1,581) [63]		
None (unable to read and write)	570	36.1
Primary/ informal	577	36.5
Middle/secondary	288	18.2
Higher education	146	9.2
Education of participants aged 15 and over (1,609) [59]		
None (unable to read and write)	335	20.8
Primary/ informal	549	34.1
Middle/secondary	564	35.0
Higher education	162	10.1
Marital status of men aged 18 and over (656) [11]		
Married	394	60.1
Never married	243	37.0
Widower	11	1.7
Separated/divorced	8	1.2
Marital status of women aged 18 and over (820) [8]		
Married	568	69.3
Never married	190	23.2
Widow	45	5.5
Separated/divorced	17	2.1
Self-reported living standard (2,879) [96]		
Poor	576	20.0
Fair	1,820	63.2
Good/very good	483	16.8
House ownership (2,878) [97]	1,932	67.1
Car ownership (2,852) [123]	1351	47.4
Mean household size (2,877) [98]	5.3 (SD 2.4)	
Mean number of children aged 0-5 per household (2,872) [103]	1.0 (SD 0.9)	
Mean number of rooms per household(2784} [191]	3.0 (SD 1.0)	
Mean number of persons per room (2772) [203]	1.9 (SD1.1)	

* Percentages are calculated from non-missing observations only

The household characteristics are shown in table 3.2. Gas operated cookers were the most commonly used cooking equipment being used by 96% of households and kerosene stoves were used by 98% of households for space heating. A small kerosene primus stove "chule" which is placed under a metallic water container such as a barrel was the most commonly used bathwater heating equipment being used by 34% of households. Amongst households who were using electric boilers for bathwater heating (33%), only 38% were aware of the thermostat temperature of the boiler. Petrol was stored by 17% of the households at home and only 13% of households had a fire extinguisher at home.

Table 3.2 Other household characteristics of the participants (n=2,975)

Characteristics (number non-missing) [missing]	Number	Percent
House material (2,859) [116]		
Concrete	2,562	89.6
Mud/wood	297	10.4
Cooking equipment (2,859) [116]		
Gas cooker	2,744	96.0
Other (Kerosene burner, fireplace)	114	4.0
Tea equipment (2835) [140]		
Kettle and teapot	2536	89.5
Samovar	299	10.5
Space heating equipment (2,856) [119]		
Kerosene stove	2810	98.4
Other (air conditioner, gas stove, wood stove)	46	1.6
Bathwater heating equipment (2,856) [119]		
Kerosene primus stove	967	33.9
Electric boiler	941	33.0
Primus	821	28.7
Wood/other	127	4.4
Using home generator (2,853) [122]	1275	44.7
Storing petrol at home (2,848) [127]	472	16.6
Smoke alarm installed in house(2856) [119]	0	0.0
Fire extinguisher available at home(n=2856) [119]	375	13.1
Using boiler and aware of boiler temperature (941) [0]	357	37.9

* Percentages are calculated from non-missing observations only

3.1.2 Individual characteristics of the participants

The characteristics of participants in relation to injury are shown in table 3.3. The participants included 1,550 females (52%) and 1,425 males (48%).

Table 3.3 Individual characteristics of participants (n=2975)

Characteristics (number non-missing) [missing]	Number	Percent
Sex (2,975) [0]		
Male	1,425	47.9
Female	1,550	52.1
Age (2,975) [0]		
0 to 5 years	944	31.7
6 to 14 years	363	12.2
15 to 29 years	884	29.7
30 to 59 years	673	22.6
60 and over	111	3.7
Season of injury (2,975) [0]		
Winter	932	31.3
Spring	726	24.4
Summer	664	22.3
Autumn	653	22.0
Place of injury (2,973) [2]		
Home including yard	2,454	82.6
Work	323	10.9
Outdoors/school	195	6.5
Mechanism of injury (2,975) [0]		
Flame	1,087	36.5
Scald	1,587	53.3
Contact	199	6.7
Other	102	3.4
Intent of injury (2,951) [24]		
Accident by self	2,406	81.5
Accident by other	331	11.2
Intentional self-harm	201	6.8
Intentional harm by other	13	0.4
Admission [0]	884	29.7*
Time between injury and health facility attendance (2962) [13]	Median 1.0 hour (IQR: 0.5, 1.5)	

* True admission rate is 24.2% from n=3657 (2975 participants + 682 non-participants who were all outpatients)

Age was not normally distributed and ranged from one month to 94 years (median 18.0, IQR 3.3, 30.0; mean 20.0, SD 17.8). While 74% of the participants were aged below 30 years, children aged 0-5 were the largest group accounting for 32% of the total. More burns occurred in winter (31%) compared to other seasons and most burns occurred at home (83%). Almost 93% of burns were accidental and 7% were intentional self-harm. The majority of patients (75%) attended a heath facility or the burns centre within one hour of the incident. The median time between injury and health facility attendance was 1.0 hour (IQR: 0.5, 1.5). Out of the 2,975 participants interviewed, 884 were admitted to hospital giving an admission rate of 30%. If we include in the denominator the 682 non-

participants who attended the burns centre but missed the interview, the true admission rate will be 24% (table 3.3).

3.1.3 Incidence

Table 3.4 shows incidence rates and female to male rate ratios in different age groups in Sulaymaniyah city calculated from all patients (participants and non-participants) who visited the burns centre. The incidence of medically reported burn injuries was 389 per 100,000 per year for all ages. The incidence was not significantly different between males and females except amongst people aged 16 and over. The all ages incidence was 398 in females and 379 in males (rate ratio 1.05, 95% CI 0.97-1.13, P= 0.22). In children aged 0-5 years, the incidence was 1044 per 100,000 per year; 1030 in females and 1057 in males (rate ratio 0.97, 95% CI 0.85-1.12, P 0.70). Similarly the incidence in children 0-15 years was 543 per 100,000; 527 in females and 560 in males (rate ratio 0.94, 95% CI 0.84-1.05, P= 0.28). Amongst people aged 16 and more, the incidence was 316 per 100,000 per year with a significantly higher incidence in females compared to males (females 337 and males 295, rate ratio 1.14, 95% CI 1.03-1.27, P= 0.009).

Table 3.4 Annual incidence rates of burn injuries and female to male rate ratios in Sulaymaniyah city

Age group	Sex	No. of patients	Population	Incidence rate per 100,000	Female/male rate ratio (95% CI)	P value
All	Both	2,736	704,100	389		
	Female	1,404	353,052	398		
	Male	1,332	351,048	379	1.05 (0.97-1.29)	0.22
0-5 years	Both	867	83,084	1,044		
	Female	429	41,660	1,030		
	Male	438	41,424	1,057	0.97 (0.85-1.11)	0.70
0-15 years	Both	1,224	225,313	543		
	Female	595	112,977	527		
	Male	629	112,335	560	0.94 (0.84-1.05)	0.28
≥ 16 years	Both	1,512	478,788	316		
	Female	809	240,075	337		
	Male	703	238,713	294	1.14 (1.03-1.27)	0.01

3.1.4 The mechanism of burn injuries

The mechanisms of burn injuries are shown in tables 3.5. Overall, scalds were the most common mechanism of injury accounting for 53% of the participants followed by flame injuries accounting for 37%. Hot water and tea accounted for 78% of scalds. There were 29 burns (1%) caused by flames from explosions; mostly due to bomb explosions but a few of them occurred during careless handling of explosives.

Table 3.5 The mechanism of burn injury (n=2975)

Mechanism	Number	Percent
Flame	1,087	36.5
Scalds, all	1587	53.3
Hot water	910	57.3
Tea	320	20.2
Hot liquid food	164	10.3
Hot oil	108	6.8
Hot steam	60	3.8
Hot milk	17	1.1
Other liquid	8	0.05
Contact	199	6.7
Chemicals	37	1.2
Electricity	35	1.2
Explosives	29	1.0
Lightning	1	0.0

The mechanisms of burn injury were compared between males and females across different age groups (table 3.6). Overall, burns caused by flames were more common in females and other mechanisms (electrical burns, chemical burns and burns from explosions) were more common in males ($\chi^2 = 44.7$, 3 df, $P<0.001$).

Amongst children aged 0-5 years in whom scalds comprised 80% of all injuries, the difference between males and females was not significant regarding the mechanism of injury. In this age group contact burns were the second most common mechanism of injury after scalds. In older children aged 6-14 years, scalds comprised 57% of all injuries and flame burns were more common in males while scalds were more common in females ($\chi^2 = 9.9$, 3 df, $P=0.02$). Amongst the adult population aged 15 and over, flame burns were more common than scalds (55% vs. 37%), and scalds and flame burns

were more common in females while contact burns and other mechanisms were more common in males (χ^2 = 45.9, 3 df, P<0.001).

Table 3.6 The mechanism of burn injury by sex and age group

	All	Male Number (%)	Female Number (%)	P value
All ages				
Flame	1,087 (36.5)	490 (34.4)	597 (38.5)	
Scalds	1,587 (53.3)	745 (52.3)	842 (54.3)	χ^2 = 44.7, 3 df,
Contact	199 (6.7)	111 (7.8)	88 (5.7)	P<0.001
Other*	102 (3.4)	79 (5.4)	23 (1.5)	
Children age 0-5 years				
Flame	56 (5.9)	30 (6.0)	26 (5.8)	χ^2 = 4.1, 3 df,
Scalds	757 (80.2)	390 (78.3)	367 (82.3)	P=0.24
Contact	114 (12.1)	70 (14.1)	44 (9.9)	
Other*	17 (1.8)	8 (1.6)	9 (2.0)	
Children aged 6-14 years				
Flame	112 (30.9)	65 (33.7)	47 (27.7)	χ^2 = 9.9, 3 df,
Scalds	206 (56.8)	100 (51.5)	106 (62.7)	P=0.02
Contact	24 (6.6)	11 (5.7)	13 (7.7)	
Other*	21 (5.8)	17 (8.8)	4 (2.4))	
Children age 0-14 years				
Flame	168 (12.9)	95 (13.8)	73 (11.9)	χ^2 = 6.9, 3 df,
Scalds	963 (73.7)	490 (70.9)	473 (76.8)	P=0.08
Contact	138 (10.6)	81 (11.7)	57 (9.3)	
Other*	38 (2.9)	25 (3.6)	13 (2.1)	
Adults aged 15 and over				
Flame	919 (55.1)	395 (53.8)	524 (56.1)	χ^2 = 45.9, 3 df,
Scalds	624 (37.4)	255 (34.7)	369 (39.5)	P<0.001
Contact	61 (3.7)	30 (4.1)	31 (3.3)	
Other*	64 (3.8)	54 (7.4)	10 (1.1)	

* "Other" includes electrical and chemical burns and burns caused by explosions

3.1.5 Equipment and products responsible for burn injuries

Table 3.7 shows equipment and products responsible for injury. The pressurized kerosene stove used for cooking, baking bread and boiling water was the most common equipment causing flame burns (19%) followed by propane gas cylinders (18%) and kerosene primus stoves (15%). In terms of scalds, the most common containers holding the liquid responsible for the burn injury were tea utensils including teapots, kettles and teacups which collectively accounted for 57% of all scalds. Cooking and eating utensils and bowls accounted for 26% of scalds.

There were 35 electrical burns due to contact with electric current as well as 20 flash burns (counted as flame injuries) caused by instant exposure to flame form electric short-circuit. The responsible equipment in the electrical burns was contact with mains in 24 cases (69%) and contact with generator-produced electricity in the remainder. Electrical burns most commonly involved the hand (70%) as the body part which first came into contact with the electric current.

In terms of contact burns, kerosene stoves were responsible for 43%, hot kitchenware for 15% and hot bathroom floor for 12% of injuries. Other causes of contact burns included hot engine parts, electric equipment, primus stove, gas cookers and others.

There were 37 chemical burns in the study of which 10 (27%) were caused by contact with kerosene-soaked clothes, 9 (24%) by application of herbs and traditional medications and 7 (19%) by contact with nitric acid. Other less frequent causes of chemical burns included contact with bleach, adhesives, cement and liquid gas.

Table 3.7 Equipments and products responsible for injury

Equipment/product	Number	Percent
Flame burns	1,081	100
Pressurized kerosene stove	206	19.1
Gas cylinder	197	18.2
Kerosene primus stove	158	14.6
Open fire	116	10.7
Gas cooker	87	8.1
Matches /lighter	65	6.0
Kerosene space heater	51	4.7
Car, petrol ignition	47	4.3
Spirit burner	28	2.6
Other equipment*	126	11.7
Scalds	1,580	100
Kettle and teapot	772	48.9
Cooking and eating utensils	406	25.7
Cups and glasses	113	7.2
Car radiator	74	4.7
Samovar	55	3.5
Tap	50	3.2
Bath containers	46	2.9
Pressure cooker	36	2.3
Other containers**	28	1.8
Contact burns	199	100
Kerosene stove	85	42.7
Cooking and eating utensils	30	15.1
Hot bath ground	24	12.1
Other hot objects	60	30.2
Electrical burns	35	100
Mains	24	68.6
Generator	11	31.4
Chemical burns	37	100
Kerosene	10	27.0
Herbs and traditional medications	9	24.3
Nitric acid	7	18.9
Other (bleach, cement, adhesives)	11	29.7

*Includes generator, electricity, welding equipments, lantern & mud oven
** includes hot water flasks, baby bottles and iron

3.1.6 Place of burn injuries

The home was the most common place of burn injuries. Almost 83% of all burns occurred at home (table 3.8). More females than males were burnt at home (96% vs. 68%, χ^2 = 425.5, 2 df, P<0.001). Over 21% of males and 1% of females were burnt at work. The kitchen was the most common room where the burn injury occurred (40%) followed by the living room (26%). Amongst children aged 0-5 years, 97% of burns

occurred at home and the remainder occurred outdoors. Of the burns occurring at home amongst these children, 43% occurred in the kitchen, 43% occurred in the living room, 10% in the yard and porch, and the remainder in the bathroom and the bedroom.

The place of burn injury was significantly associated with the mechanism of injury (χ^2 = 611.2, 15 df, P<0.001). Scalds most commonly occurred in the kitchen (49%), flame burns in the porch/yard (36%) and contact burns in the sitting room (44%).

Table 3.8 Distribution of the place of burn according to sex

Place of burn	Number (%) of participants			P Value *
	All	Male	Female	
Home total	2,457 (82.6)	966 (67.8)	1,491 (96.3)	
Kitchen	982 (40.4)	359 (37.7)	623 (42.2)	
Living room	640 (26.4)	300 (31.5)	340 (23.0)	
Porch/yard	429 (17.7)	155 (16.2)	274 (18.6)	χ^2 = 425.5, 2
Bathroom	313 (12.9)	107 (11.2)	206 (13.9)	df, P<0.001
Bedroom/other	65 (2.7)	31 (3.3)	34 (2.3)	
[Missing]	[28]	[5]		
Work	323 (10.9)	302 (21.2)	21 (1.4)	
Outdoors	193 (6.5)	156 (10.9)	37 (2.4)	
All	2,973 (100.0)	1,426 (100.0)	1,547 (100.0)	

* For comparison of place of burn (home total, work, outdoors) by sex

3.1.7 The injury intent

Burns were accidental in 93% and intentional self-harm in 7% of participants. The burn injury was accidentally inflicted through an accident for which the person himself/herself was responsible in 81% of all participants (e.g. tumbling on a kettle and spilling on oneself) while in 11% of all participants, another person was responsible for the accident (e.g. tumbling on a kettle and spilling on another person). More females than males had intentional self-harm (12% vs. 1%, χ^2 =145.4, 3 df, P<0.001); females accounted for 92% of all intentional self-harm burns. In addition to accidental and self-harm burns, there were 9 burns (6 males and 3 females) deliberately caused by non-accidental injuries and occurring to children aged 8 to 17 years and a woman aged 30 who was burnt by her brother. The children were all abused by parents or siblings as a punishment or in a quarrel. In most cases a heated utensil, such as a spoon, was used.

3.1.8 The day, month and season of burn injuries

Calculation of the day, month and season of injury was based on both participants (n=2975) and non-participants (n=682) as data for the latter group were available as well. The number of patients sustaining a burn injury was similar across all days of the week ranging from 13% on Tuesdays to 15% on Mondays. These differences were not statistically significant from the expected proportion of 0.143 (i.e. 1/7) assuming equal proportions for weekdays. There was also no significant difference between males and females in terms of the day of burn injury (χ^2 = 2.8, 6 df, P=0.80)

In terms of the month of injury (figure 3.1), burns most commonly occurred in January (11%) and least commonly in September (6%). The expected proportion assuming equal proportions for each month is 0.083 (i.e. 1/12) but the actual proportion was significantly different from this in several months of the year (January, February and March were significantly higher and June, September and October were significantly lower). There was no significant difference between males and females in terms of the month of burn injury (χ^2= 11.1, 11 df, P=0.40).

Spring, summer and autumn each accounted for almost 23% of all burns while 31% of the burns occurred in winter. All these seasonal figures were significantly different from the expected proportion of 0.25 assuming equal distribution of burn occurrence across the four seasons. There was no significant difference between males and females regarding the season of burn injury (χ^2 = 3.1, 3 df, P=0.40). Winter was even a more common season for scalds (34%), burns amongst the older persons aged over 60 (37%) and burns amongst children aged 0-5 years (36%).

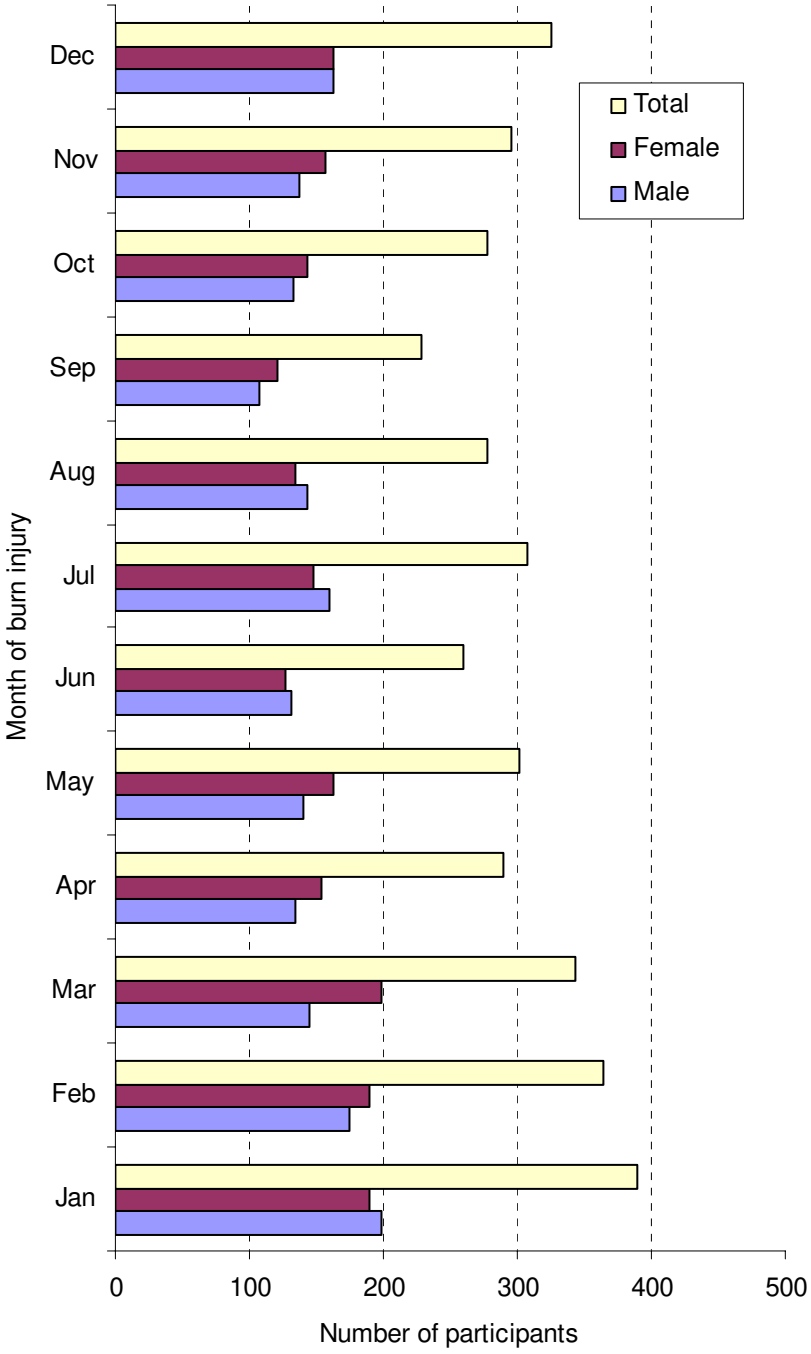


Figure 3.1 The month of burn injury stratified by sex (n=3,657)

3.1.9 Time of burn injuries

Most burns (41%) occurred between 7:00 am and 12:59 pm followed by 34% between 1:00 pm and 6:59 pm, 22% between 7:00 pm and 12:59 am and only 3% after 1:00 am. Figure 3.2 shows time of injury in single hours. The number of burns starts rising sharply after 6 am until it reaches its peak at 12 noon where 9% of all burns occur. This peak corresponds to lunchtime. There is another rise in the number of burns in the afternoon, which peaks at 7 pm corresponding to dinnertime. This time trend is similar between males and females.

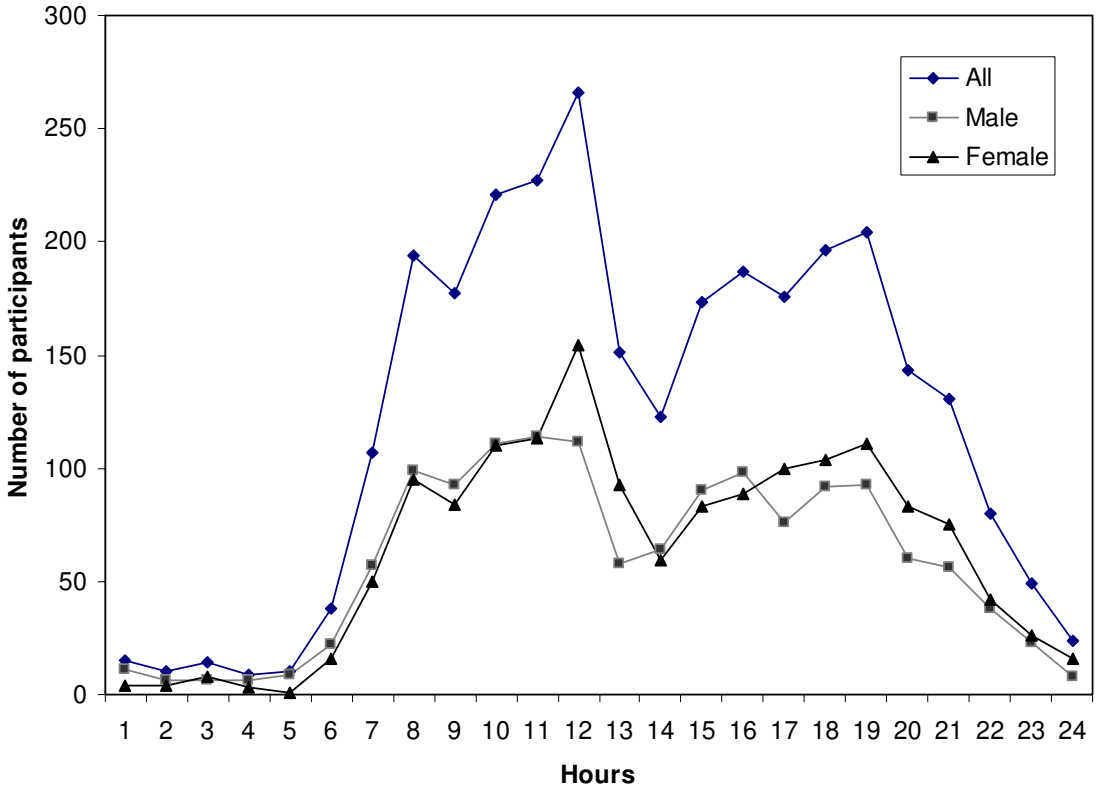


Figure 3.2 Time of burn injury amongst all participants and males and females

3.1.10 Site of burn injuries

The most common site of injury was upper limbs, which were affected in 57% of participants followed in order of frequency by lower limbs (55%), head and neck (30%) and trunk (28%). Amongst children 0-5 years of age, the lower limbs were the commonest site of injury (55%) followed in order of frequency by the upper limbs (47%), trunk (24%) and head and neck (15%).

When site of injury was analysed in relation to the mechanism of injury, the differences were significant for all sites (table 3.9). Flame injuries most commonly affected the upper limbs (79%) followed by head and neck (58%). Scalds mainly affected lower limbs (56%) and upper limbs (49%). Contact burns also most commonly affected the upper limbs (42%) and lower limbs (37%).

Table 3.9 Distribution of site of injury by mechanism of injury

Mechanism	Head & neck Number (%)	Trunk Number (%)	Upper limbs Number (%)	Lower limbs Number (%)
Flame	630 (58.0)	415 (38.2)	863 (79.4)	615 (56.6)
Scald	198 (12.5)	346 (21.8)	98 (49.3)	895 (56.4)
Contact	23 (11.6)	21 (10.6)	663 (41.8)	74 (37.2)
Other	33 (32.4)	33 (32.4)	66 (64.7)	36 (35.3)
Total	884 (29.7)	815 (27.4)	1690 (56.8)	1620 (54.5)
P Value	X^2 = 672.7, 3 df, P<0.001	χ^2 = 118.1, 3 df, P<0.001	χ^2 = 379.3, 3 df, P<0.001	χ^2 = 43.4, 3 df, P<0.001

3.1.11 Clothing during the incident

Overall, 63% of participants were wearing cotton/wool clothing during the incident, 34% were wearing nylon/synthetic clothing and 3% were burnt during bathing without any clothing on. Type of clothing was significantly different by sex. Females were more likely to wear nylon clothing than males (females 59%, males 8%, $\chi 2$=835.3, 1 df, P<0.001).

3.1.12 Circumstances of injury in children

A description of the incident was obtained from all participants. Children aged 0-5 years were mainly burnt at home (97%), accompanied by other people (70%) or alone during the incident (30%) which mainly occurred in the kitchen (43%) or the sitting room (42%). In terms of scalds, the incident mainly occurred when children pulled or tumbled on hot liquid containers such as kettles, teapots, samovars and food bowls spilling the liquid on themselves. Many toddlers were burnt while they pulled these hot liquid containers or when they dipped hands in them e.g. in hot liquid food bowls during serving food. Many burns happened to small children while they were on their mothers' laps.

Most contact burns happened when children accidentally fell against hot objects mainly kerosene stoves while playing. Some children were pushed by other children while playing and others were burnt walking on hot ground such as bath floor and heated concrete ground of a bread-baking place.

Flame injuries in children mostly happened with other family members when heating and cooking equipment caught fire such as gas cookers, malfunctioning gas cylinders, kerosene stoves and pressurized kerosene stoves. Some children were burnt while they were playing with matches or near an open fire outside the house.

3.1.13 Home treatment

Immediately after the incident before being taken to health facilities, 36% of participants were managed by pouring cool water on the burnt area, 14% were managed by applying medical preparations, 12% by traditional remedies and 38% were not given any treatment for the injury at home. The traditional remedies applied to the burnt area in order of frequency included toothpaste (36%), yogurt (27%), tomato paste (15%) and egg yolk (6%). Other less commonly used remedies included kerosene, sugar solution, cooking oil, ashes and honey.

3.1.14 Pre-existing conditions

Of all participants, 160 (5%) reported a pre-existing disease or condition. The most common reported conditions among these participants were diabetes (24%), heart disease (15%), pregnancy (13%), epilepsy (10%) and psychological and mental problems (8%).

3.1.15 Non-participants

There were 682 patients with burn injuries during the year who did not participate in the study. These patients were not approached for participation because they attended the burns centre during the researcher's absence. These non-participants were all outpatients. Some data about these patients was recorded in the OPD logbook which was transcribed by the researcher and used for analysis. The available information included age, sex, mechanism of burn injury and date of burn (and hence day, month and season). This information was used for comparing characteristics of participants and non-participants (table 3.10).

There was no significant difference between the participants and non-participants in term of sex (χ^2 = 0.9, 1 df, P=0.34) and day of burn (χ^2 = 5.8, 6 df, P=0.44). The median age of non-participants was 22.0 years (IQR 5.0, 32.0) which was significantly higher than the median age of the participants (median 18.0, IQR 3.3, 30.0; z= -3.3, P<0.001). There were fewer children and more adults among non-participants. There was also a significant difference between the two groups in terms of the mechanism of injury (χ^2=22.2., 3 df, P<0.001) with more scalds found amongst non-participants. There was a significantly higher proportion of burns that occurred in summer and autumn amongst non-participants compared to participants (χ^2 =20.7, 3 df, P<0.001).

Table 3.10 Comparison of participants and non-participants

Characteristics	Participants Number (%) (n=2975)	Non-participants Number (%) (n=682)	P value
Sex			
Male	1425 (47.9)	341(50.0)	χ^2 = 0.9, 1 df,
Female	1,550 (52.1)	341 (50.0)	P=0.34
Age			
0 to 5 years	944 (31.7)	8 (26.1)	χ^2 =17.1, 4 df,
6 to 14 years	363 (12.2)	74 (10.9)	P=0.002
15 to 29 years	884 (29.7)	223 (32.7)	
30 to 59 years	673 (22.6)	190 (27.9)	
60 and over	111 (3.7)	17 (2.5)	
Season of burn injury			
Winter	932 (31.3)	190 (27.9)	χ^2 =20.7, 3 df,
Spring	726 (24.4)	127 (18.6)	P<0.001
Summer	664 (22.3)	179 (26.3)	
Autumn	653 (22.0)	186 (27.3)	
Mechanism of burn injury			
Flame	1,087 (36.5)	158 (31.0)	χ^2 =22.2., 3 df,
Scald	1,587 (53.3)	323 (63.5)	P<0.001
Contact	199 (6.7)	16 (3.1)	
Other	102 (3.4)	12 (2.4)	
Median age (IQR)	18 (3.3, 30)	22 (5, 32)	z= -3.3, P<0.001*

*Mann-Whitney U test

3.2 The incidence and outcome study: Participants admitted to hospital

There were 884 participants admitted to the burns centre during the one year incidence and outcome study. These comprised 24% of all acute burn patients who attended the centre during that period. All 884 patients were included in the study. The interview was undertaken with the patient him/herself in 41% of participants, with the mother of the patient in 35% of participants and with siblings, father and other close relatives in the remainder of participants.

3.2.1 Background characteristics

Table 3.11 summarizes the main characteristics of participants. The sample included 508 females (57.5%) and 376 males (42.5%). The age of participants ranged from 1 month to 94 years (median 18.0, IQR 4.7, 28.0; mean 19.7, SD 16.4). The age distribution at one year intervals was bimodal; one mode at age of one with 7% of participants and the other mode at age 17 and 18 years each with 4 % of participants. Of all participants, 38% were children aged 0-14 years and 40% were aged 15 to 29 years. The majority (78%) were residents of Sulaymaniyah province and 22% came from surrounding provinces of Kirkuk, Diala, Salahuddin and others. Flame burns were the most common (64%) followed by scalds (30%). The injury occurred at home in 84% of participants. More burns occurred in spring (28%) than other seasons. The injury was accidental in 77% of participants and intentional self-harm in 22%. The outcome of admission was recovery in 66%, death in 26% of participants and the remaining 8% of participants were either discharged against medical advice before recovery or transferred to other hospitals. The median TBSA burnt was 18.0 (IQR 9.5, 39.0) and the median hospital stay was 8 days (IQR 3, 14).

Table 3.11 Characteristics of admitted participants (n=884)

Characteristics [missing]	Number	Percent
Sex [0]		
Male	376	42.5
Female	508	57.5
Age [0]		
0 to 5 years	237	26.8
6 to 14 years	101	11.4
15 to 29 years	349	39.5
30 to 59 years	169	19.1
60 and over	28	3.2
Residence [0]		
Sulaymaniyah city	304	34.4
Outside Sulaymaniyah city	386	43.7
Other provinces	194	21.9
Living standard [69]		
Poor	219	26.9
Fair/good	596	73.1
Season of burn injury [0]		
Winter	229	25.9
Spring	244	27.6
Summer	209	23.6
Autumn	202	22.9
Place of burn injury [2]		
Home including yard	739	83.8
Work	79	9.0
Outdoors/school	64	7.2
Mechanism of burn injury [0]		
Flame	567	64.1
Scald	263	29.8
Contact	14	1.6
Other	40	4.5
Injury intent [0]		
Accidental	682	77.1
Intentional self-harm	197	22.3
Intentional harm by other	5	0.6
Outcome of admission [0]		
Discharged	581	65.7
Death in hospital	230	26.0
Transferred to another hospital	4	0.5
Discharge against advice	69	7.8
Readmission [0]	73	8.3
Time between injury and hospital attendance [10]	Median 0.5 hours (IQR 0.5, 1.0)	
Age in years [0]	Median 18.0 (IQR 4.7, 28.0)	
% Total body surface area burnt [0]	Median 18.0 (IQR 9.5, 39)	
Length of hospital stay in days [0]	Median 8 (IQR 3, 14)	

3.2.2 Incidence of burn admissions

Table 3.12 shows burn admission rates in the city and province of Sulaymaniyah in different age groups and by sex.

Table 3.12 Annual burn admission rates per 100,000 in Sulaymaniyah province and city

	Age group	Sex	No. of patients	Population	Incidence rate per 100,000	Female/male rate ratio (95% CI)	P value
Sulaymaniyah Province	All	Both	690	1,708,103	40.4	1.34 (1.15- 1.55)	<0.001
		Female	397	859,963	46.2		
		Male	293	848,140	34.6		
	0-5 years	Both	194	235,718	82.3	0.69 (0.52- 0.92)	0.01
		Female	80	118,675	67.4		
		Male	114	117,043	97.4		
	0-15 years	Both	295	634,560	46.5	0.82 (0.65- 1.03)	0.09
		Female	234	319,476	41.9		
		Male	161	315,084	51.1		
	≥ 16 years	Both	395	1,073,543	36.8	1.97 (1.59- 2.42)	<0.001
		Female	263	540,487	48.7		
		Male	132	533,056	24.8		
Sulaymaniyah city	All	Both	304	704,100	43.2	1.33 (1.06-1.67)	0.01
		Female	174	353,052	49.3		
		Male	130	351,048	37.0		
	0-5 years	Both	79	83,084	95.1	0.83 (0.53- 1.30)	0.40
		Female	36	41,660	86.4		
		Male	43	41424	103.8		
	0-15 years	Both	121	225,312	53.7	0.83 (0.58- 1.18)	0.30
		Female	55	112,977	48.7		
		Male	66	112,335	58.8		
	≥ 16 years	Both	183	478,971	38.2	1.85 (1.36- 2.50)	<0.001
		Female	119	240,194	49.5		
		Male	64	238.777	26.8		

The overall admission rate was 43.2 admissions per 100,000 per year (49.3 in females and 37.0 in males) in the city with a female to male rate ratio of 1.33 (95% CI 1.06-1.67, P=0.01). The highest Admission rate was found in children 0-5 years of age with an admission rate of 95.1 per 100,000 per year and no significant difference between males and females. Females were particularly more likely to be admitted than males in the adult population aged 16 and over with an admission rate of 48.5 in females vs. 26.7 in males and a rate ratio 1.84 (95% CI 1.35-2.55, P<0.001). The admission rate of burn admissions in the province as a whole was similar to Sulaymaniyah city.

3.2.3 Mortality from burn injuries

Table 3.13 shows burn mortality rates in the city and province of Sulaymaniyah. In the city, the all age mortality rate from burn injuries was 8.0 per 100,000 per year. Females

had a significantly higher mortality rate than males (13.9 vs. 2.0 per 100,000 per year) with a female to male rate ratio of 6.96 (95% CI 3.15-15.37, P<0.001). Except in children aged 0-5 years, females had a significantly higher mortality rate than males. The highest mortality rate was observed in the province's female population aged 16 years and over which was 19.4 deaths per 100,000 per year.

Table 3.13 Burn mortality rates per 100,000 per year in Sulaymaniyah city and Sulaymaniyah province

	All	Female	Male	Female/male rate ratio (95% CI)	P value
Sulaymaniyah city					
All ages	8.0	13.9	2.0	6.96 (3.15-15.37)	<0.001
0-5 years	4.8	9.6	0.0	Incalculable	
0-15 years	4.9	8.9	0.9	9.94 (1.27- 77.67)	0.007
16 years and over	9.4	16.2	2.5	6.46 (2.74- 15.27)	<0.001
Sulaymaniyah province					
All ages	9.1	15.6	2.5	6.29 (3.97- 9.97)	<0.001
0-5 year	3.8	5.1	2.6	1.97 (0.49- 7.9)	0.33
0-15 years	5.5	9.1	1.9	4.77 (1.98- 11.48)	<0.001
16 years and over	11.2	19.4	2.8	6.90 (4.02-11.86)	<0.001

3.2.4 The mechanism of burn injuries

Overall, 64% of burns were flame burns and 30% were scalds. Electrical burns accounted for 3% of cases. Hot water alone was responsible for 68% of all scalds. Other mechanisms are shown in table 3.14.

Table 3.14 Mechanism of burn injury in admitted participants (n=884)

	Number	Percent
Flame	567	64.1
Scalds	263	29.8
Hot water	178	67.7
Hot liquid food	36	13.7
Tea	25	9.5
Other hot liquids	24	9.1
Electricity	24	2.7
Contact with hot object	14	1.6
Explosives	14	1.6
Chemicals	2	0.2

The mechanism of burn injury was compared by age and sex (table 3.15). Flame injuries were significantly more common in females and other mechanisms (i.e. contact,

electrical and chemical burns and burns from explosives) were more common in males (χ^2= 71.4, 3 df, P<0.001). While 74% of females suffered from flame burns only 51% of males did so. Conversely 12% of males suffered from mechanisms other than flame and scald while only 1% of females did so. Amongst children aged 0-5 years, scalds were responsible for 84% of burns with no significant difference between males and females (χ^2 = 4.0, 2 df, P=0.14). Contrary to this, amongst the adult population aged 15 and over, 86% of burns were caused by flame. More females than males suffered from flame injuries (91% vs. 86%) and more males than females suffered from other mechanisms (16% vs. 2%). Only one of the 24 electrical burns and two of 14 explosion burns occurred in females. These differences were statistically significant (χ^2 = 42.1, 2 df, P<0.001).

3.2.5 Place of burn injuries

The place where burn injuries occurred differed significantly between males and females (χ^2=138.6, 2 df, P<0.001). More females than males (96% vs. 68%) were burnt at home and more males than females were burnt at work (21% vs. 0%). Similarly 12% of males were burnt outdoors i.e. on streets and outside home and working environments while only 4% of females were so.

Table 3.15 Mechanism of burn injury in admitted participants by sex and age group

	All Number (%)	Male Number (%)	Female Number (%)	P value
All ages				
Flame	567(64.1)	190(50.5)	377(74.2)	
Scalds	263(29.8)	140(37.2)	123 (24.2)	χ^2 = 71.4, 2 df,
Other*	54(6.1)	46 (12.2)	8 (1.6)	P<0.001
Children 0-5 years				
Flame	30 (12.7)	16 (11.9)	14 (13.7)	χ^2 = 4.0, 2 df,
Scalds	198(83.5)	111 (82.2)	87 (85.3)	P=0.14
Other*	9 (3.8)	8 (5.9)	1(1.0)	
Children 0-14 years				
Flame	97 (28.7)	48 (25.4)	49 (32.9)	χ^2 = 9.6, 2 df,
Scalds	223(66.0)	125 (66.1)	98 (65.8)	P=0.008
Other*	18 (5.3)	16 (8.5)	2 (1.3)	
Adults aged 15 and more				
Flame	470(86.1)	142 (75.9)	328 (91.3)	χ^2 = 42.1, 2 df,
Scalds	40 (7.3)	15 (8.0)	25 (7.0)	P<0.001
Other*	36 (6.6)	30 (16.0)	6(1.7)	

* Other includes contact, electrical, chemical burns and explosions

3.2.6 Month and season of burn injuries

A higher proportion of all burns occurred in spring (28%) and winter (26%) compared to summer (24%) and autumn (23%) but these differences were not significantly different from a hypothesized 0.25 assuming equal distribution of burn injuries across the 4 seasons. Although scalds were most common in winter (36% of winter burns) and least common in summer (25%) and flame injuries were most common in spring (68% of spring burns) and least common in winter (59%), these differences were not statistically significant (χ^2 =9.6, 6 df, P=0.14).

In terms of the month of burn injuries, the highest proportion of all burns occurred in May (11%) and the lowest in September (6%). When all months were tested individually against a hypothesized 0.083 (1/12) assuming equal distribution of burn injuries across the 12 months of the year, only May (z=3.1, P=0.002) and March (z=2.2, P=0.03) showed a significantly higher than expected proportion of burn injuries, and September (z=-2.4, P=0.02) showed a significantly lower than expected proportion of burn injuries. Other months were not significantly different from the expected 0.083.

3.2.7 TBSA burnt

Table 3.16 shows distribution of TBSA burnt by sex. The % TBSA burnt which was not normally distributed ranged from 0.5% to 100% (median 18.0%, IQR 9.5%, 39.0%). The mean TBSA burnt was 29.6% (SD 29.1%). The TBSA burnt was ≤ 25% in 63%, between 25.1-50% in 17% of patients, between 50.1-75% in 8% and over 75% in 12% of patients. Eighty seven percent of patients with TBSA over 50% were females. There were consistently more females than males when TBSA exceeded 30%. These sex differences in TBSA burnt were statistically significant (χ^2=117.8, 9 df, P<0.001).

Table 3.16 Percent TBSA burnt in admitted participants in deciles of TBSA by sex

	All	Male	Female	
% TBSA Burnt	Number (%)	Number (%)	Number (%)	P value
0-10%	251 (28.4)	158 (42.0)	93 (18.3)	
10.1-20%	239 (27.0)	110 (29.3)	129 (25.4)	
20.1-30%	121 (13.7)	58 (15,4)	63 (12.4)	
30.1-40%	65 (7.4)	19 (5.10)	46 (9.1)	χ^2=117.8, 9 df,
40.1-50%	29 (3.3)	7 (1.9)	22 (4.3)	P<0.001
50.1-60%	23 (2.6)	4 (1.1)	19 (3.7)	
60.1-70%	36 (4.1)	7 (1.9)	29 (5.7)	
70.1-80%	28 (3.2)	4 (1.1)	24 (4.7)	
80.1-90%	33 (3.7)	2 (0.5)	31 (6.1)	
90.1-100%	59 (6.7)	7 (1.9)	52 (10.2)	

There was a highly significant difference in median TBSA burnt between males and females; across different age groups; by different injury mechanisms; by intent; and by outcome of admission (table 3.17). In terms of age, participants aged 15 to 29 years had the greatest TBSA burnt (median 30%, IQR 14.0%, 70.0%). Greater TBSA burnt was also found with flame burns (median 26%, IQR 14.0%, 62.5%), intentional self-harm burns (median 74%, IQR 54.5%, 91.0%) and amongst those who died (median 70%, IQR 48.0%, 90.3%).

3.2.8 Burn severity

It was not possible to calculate the Abbreviated Burn Severity Index (ABSI) which depends on sex, age, inhalation injury, TBSA burnt and degree of burn because data on the degree of burn were not available in the study. Therefore a burn severity score was calculated only using the first four criteria. Burn severity score calculated in this way ranged from 2 to 16 (median 5, IQR 3, 7). The burn severity score was significantly higher in females (median 6, IQR 4, 10) than males (median 3, IQR 2, 5; z=-15.7, P<0.001). The burn severity score was also significantly higher amongst patients who died (median 11, IQR 8, 13) than survivors (median 4, IQR 3, 5; z=-20.6, P<0.001).

Table 3.17 Percent TBSA burnt in admitted participants by sex, age group, mechanism of injury, intent and outcome

	% TBSA Median (IQR)	P value
Sex		
Male	13.0 (7.0-23.0)	z=-10.4,
Female	25.0 (13.0-63.6)	P<0.001*
Age		
0 to 5 years	11.0 (7.0-18.3)	
6 to 14	16.0 (7.0-32.5)	χ^2=136.9, 4 df,
15 to 29	30.0 (14.0-70.0)	P<0.001**
30 to 59	20.0 (13.0-35.0)	
60 and over	18.0 (7.4-25.8)	
Mechanism of injury		
Flame	26.0 (14.0-62.5)	
Scald	11.0 (7.0-17.0)	χ^2=194.7, 2 df, P<0.001**
Other	7.0 (2.0-23.0)	
Intent		
Intentional self-harm	74.0 (54.5, 91.0)	z=-19.9,
Accidental	14.0 (8.0, 23.0)	P<0.001*
Outcome		
Survivors	13.0 (7.0-21.0)	z=-21.1,
Deaths	70.0 (48.0-90.3)	P<0.001*
Unknown***	14.0 (9.0, 24.5)	

* Mann-Whitney U test
** Kruskal-Wallis test for equality of populations
*** Patients discharged against medical advice or transferred

3.2.9 Hospital stay

Hospital stay was not normally distributed and ranged from zero to 91 days (median 8.0, IQR 3.0, 14.0). There was no significant difference in median stay between male and female patients (z=-0.26, P=0.80).

The median hospital stay was significantly associated with age, mechanism of burn injury, intent of burn injury, TBSA burnt and outcome of admission (table 3.18). The median hospital stay was significantly shorter in intentional self-harm burns (median 4.0 days, IQR 1.0, 8.0) than accidental burns (median 9.0 days, IQR 1.0, 15.0; z=-7.0, P<0.001). Hospital stay was also shorter for patients who died (median 4.0 days, IQR 1.0, 7.0) than survivors (median 10.0 days, IQR 6.0, 17.0; z=-10.1, P<0.001).

Table 3.18 Median hospital stay in days in admitted participants by sex, age, mechanism of injury, TBSA, intent and outcome

	Median (IQR)	P value
Sex		
Male	8.0 (3.0, 14.0)	z=-0.26, P=0.8*
Female	8.0 (3.0, 14.0)	
Age		
0 to 5 years	7.0 (3.0, 11.0)	χ^2=9.7, 4 df,
6 to 14	9.0 (3.5, 15.0)	P=0.045**
15 to 29	7.0 (3, 16)	
30 to 59	10.0 (4.0, 17.0)	
61 and over	7.5 (3.0, 14.8)	
Mechanism of burn injury		
Flame	8.0 (3.0, 16.0)	χ^2=7.9., 3 df,
Scald	7.0 (3.0, 10.0)	P=0.047**
Contact	7.5 (2.8, 11.8)	
Other	9.0 (1.0, 25.8)	
TBSA burnt		
0-25%	8.0 (4.0, 13.0)	χ^2=281.4, 4 df,
25.1-50%	17.5 (9.3, 32.8)	P<0.001**
50.1-75%	5.0 (3.0, 8.0)	
75.1-100%	2.0 (1.0, 4.0)	
Intent		
Intentional self-harm	4.0 (1.0, 8.0)	z=-7.0, P<0.001*
Accidental	9.0 (4.0, 15.0)	
Outcome		
Survivors	10.0 (6.0, 17.0)	z=-10.1, P<0.001*
Deaths	4.0 (1.0, 7.0)	

* Mann-Whitney U test
** Kruskal-Wallis test for equality of populations

3.2.10 Mortality

Of the 884 admissions, 230 patients died in hospital, 69 patients left hospital against medical advice before recovery and 4 were transferred to other hospitals. The outcome of these 73 patients could not be ascertained therefore they were not included in the mortality analysis. A separate analysis of these patients is presented later in this chapter. Out of the remaining 811 patients, 230 died in hospital giving a mortality rate of 28%. Mortality by deciles of TBSA burnt is shown in table 3.19. Out of 438 patients with TBSA≤ 20%, 433 (99%) survived but of 170 patients with TBSA burnt of greater than 50%, only 3 survived (2%).

Table 3.19 In-hospital mortality by deciles of total body surface area burnt

% TBSA burnt	Number of patients	Number (%) died	P Value
0-10%	230	0 (0.0)	
10.1-20%	208	5 (2.4)	χ^2=600.7, 9 df,
20.1-30%	113	17 (15.0)	P<0.001
30.1-40%	63	23 (36.5)	
40.1-50%	27	18 (66.7)	
50.1-60%	23	21 (91.3)	
60.1-70%	33	32 (97.0)	
70.1-80%	25	25 (100.0)	
80.1-90%	32	32 (100.0)	
90.1-100%	57	57 (100.0)	
Total	811	230 (28.4)	

The graphic display of the crude association between TBSA burnt and cumulative mortality in different age groups is shown in figure 3.3. The cumulative mortality curve rises sharply after 20% TBSA, obviously more so amongst participants aged 60 and over, and it plateaus after 50% TBSA where most patients die.

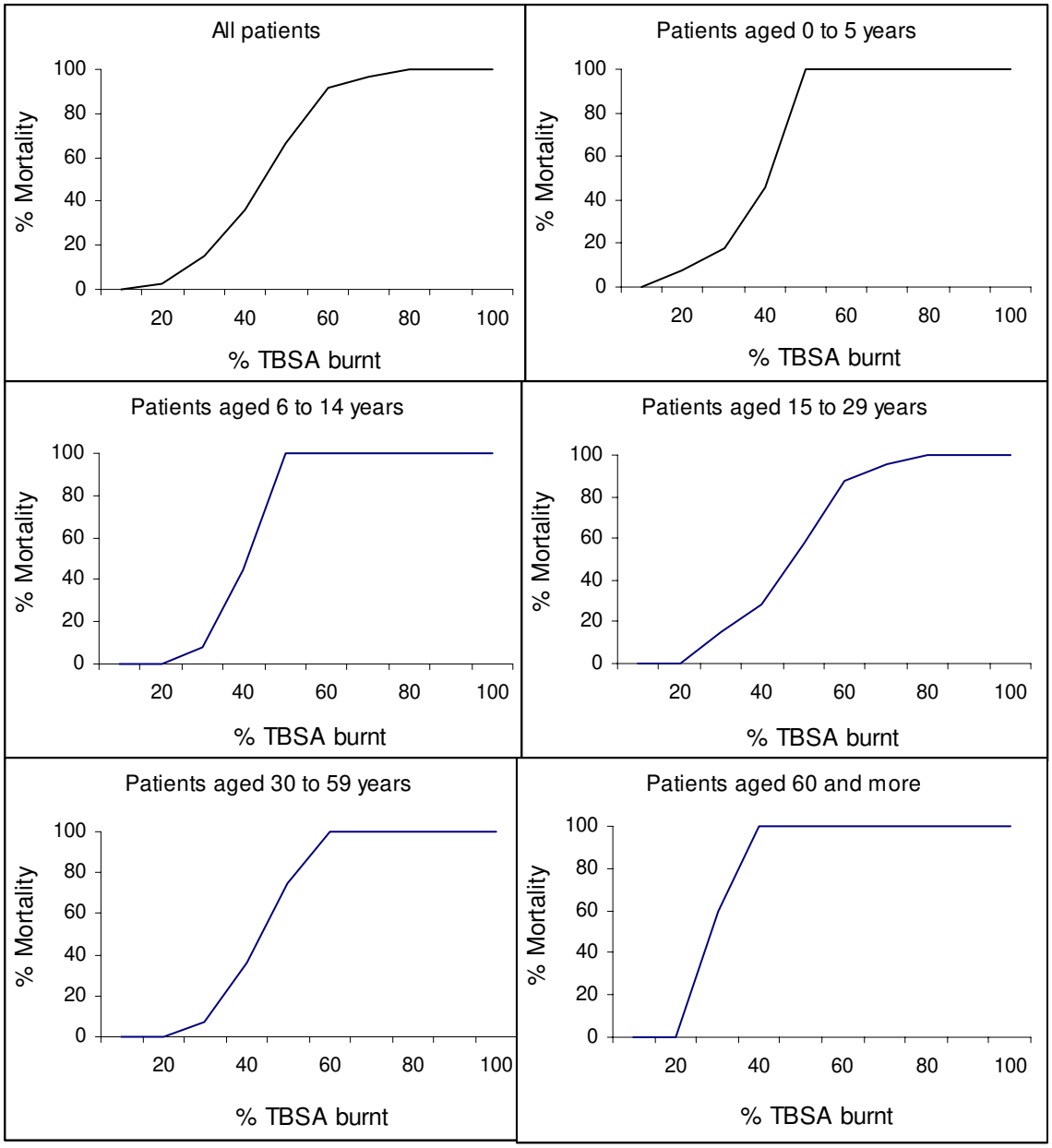


Figure 3.3 Cumulative mortality by TBSA burnt in different age groups

Comparison of mortality rate by different characteristics of participants and the injury are shown in table 3.19. A significantly higher mortality rate was found in females (40%), patients aged 15 to 29 years (44%), a greater TBSA burnt, patients coming from other provinces (42%), flame burns (40%), burns occurring at home (32%) and in autumn (35%), intentional self-harm burns (88%), burns accompanied by inhalation injury (77%), patients who arrived in the health facility within one hour (33%), patients who had more than 5 operations under general anaesthesia(36%) and patients who did not receive antibiotics (32%).

The highest mortality in relation to age was found amongst participants aged 15 to 29 years where of 320 patients 141 (44%) died, and the highest survival was observed in children aged 0-5 years where of 214 patients 195(91%) survived. In the paediatric ward of the hospital where children aged 12 years or less are admitted, mortality was 10%. For the men's and women's wards where patients over 12 years of age with burns of less than 20% TBSA are admitted, survival was 100%. But in the major burns ward where patients over 12 years of age with burns with TBSA≥ 20% are admitted, 202 of 313 patients died giving a mortality rate of 65% (72% in females and 39% in males).

The univariate odds ratios for death for potential risk factors are also shown in table 3.20. The following factors were associated with death: female sex, age, residence outside Sulaymaniyah city, other seasons compared to winter, burn at home, intentional self-harm, flame burns, number of operations, no antibiotic therapy and early arrival in hospital.

Females were significantly more likely to die than males (OR 5.16, 95% CI 3.52-7.55, P<0.001) as were participants coming from other provinces compared to those from Sulaymaniyah city (OR 2.83, 95% CI 1.87-4.30, P<0.001). Flame burns were significantly more likely to result in death than scalds (OR 11.08, 95% CI 6.16-19.90, P<0.001). Compared to burns occurring in winter, burns occurring in each of spring, summer and autumn were also significantly more likely to result in death.

Table 3.20 Mortality rate by patient and injury characteristics and the univariate odds ratios for death in admitted participants

Characteristics	Number of patients	Number (%) died	Odds ratio (95% CI)	P value Likelihood ratio test
Sex				
Male	337	39 (11.6)	Reference group	χ^2=86.6, 1 df P<0.001
Female	474	191(40.3)	5.16 (3.52- 7.55)	
Age				
0 to 5 years	195	19 (8.9)	Reference group	
6 to 14	91	22 (24.2)	3.27 (1.67- 6.41)	χ^2=87.4, 4 df, P<0.001
15 to 29	320	141 (44.1)	8.08 (4.81- 13.6)	
30 to 59	158	39 (24.7)	3.36 (1.86- 6.09)	
60 and over	28	9 (32.1)	4.86 (1.93- 12.23)	
Residence				
Sulaymaniyah city	278	56 (20.1)	Reference group	
Outside Sulaymaniyah	353	99 (28.1)	1.55 (1.06- 2.25)	χ2=24.8, 2 df, P<0.001
Other provinces	180	75 (41.7)	2.83 (1.87- 4.30)	
Education if aged 6 & more				
None/primary	369	120 (32.5)	Reference group	
Middle/secondary	164	58 (35.4)	1.36 (0.77-1.62)	χ^2=2.2 2 df, P=0.34
Higher education	24	5 (20.8)	0.55 (0.20-1.50)	
Living standard				
Poor	199	59(29.7)	Reference group	χ^2=2.6, 1 df, P=0.11
Fair/good	558	133(23.8)	1.35 (0.94- 1.93)	
Season of burn				
Winter	210	37 (17.6)	Reference group	
Spring	226	74 (32.7)	2.28 (1.45- 3.57)	χ^2=18.6, 3 df, P=0.001
Summer	196	57 (29.1)	1.92 (1.20- 3.07)	
Autumn	179	62 (34.6)	2.48 (1.55 4.0)	
Place of burn				
Home	678	214 (31.6)	Reference group	χ^2=23.5, 1 df, P<0.001
Work/outdoors	132	16 (12.1)	3.34 (1.93- 5.78)	
Mechanism of burn				
Scald	229	13 (5.7)	Reference group	
Flame	530	212 (40.0)	11.08 (6.16-19.90)	χ^2=121.1, 2 df, P<0.001
Other	52	5 (9.6)	1.77 (0.60-5.20)	
Intent				
Accidental	625	67 (10.7)	Reference group	χ^2=402.3, 1 df, P<0.001
Intentional self-harm	186	163 (87.6)	59.02 (35.63- 97.78)	
Inhalation injury				
No	566	42 (7.4)	Reference group	χ^2=402.2, 1 df, P<0.001
Yes	245	188(76.7)	41.15 (26.71- 63.38)	
TBSA burnt				
0-25%	501	13(2.6)	Reference group	χ^2=345.2, 3 df,
25.1-50%	140	50 (35.7)	20.85 (10.88- 39.96)	P<0.001
50.1-75%	69	66 (95.7)	825.84 (229.29- 2974.52)	
75.1-100	101	101(100)	Incalculable as all died	
Each 10% increase in TBSA within 0-69.9%			4.06 (3.13-5.29)	χ^2=239.6, 1 df, P<0.001
Number of GA operations				
0 to 2 operations	637	189 (29.7)	Reference group	
3 to 5 operations	121	22 (18.2)	0.53 (0.32- 0.86)	χ^2=8.7, 2 df, P=0.013
6 and over	53	19 (35.9)	1.32 (0.74- 2.38)	
Time from injury to hospital attendance				
Less than 1 hour	423	139 (32.9)	Reference group	
1 to 5 hours	321	82 (25.6)	0.70 (0.51- 0.97)	χ^2=17.1, 2 df, P<0.001
6 hours and more	59	6 (10.2)	0.23 (0.01-0.55)	
Antibiotic therapy				
No	503	162 (32.2)	Reference group	χ^2=10.6, 1 df, P=0.001
Yes	304	66 (21.7)	0.58 (0.42-0.81)	

The strongest effects were observed for TBSA burnt, intentional self-harm and inhalation injury. The TBSA had a linear effect when it was grouped in deciles within 0 to 69.9% TBSA where both survivors and deaths were found. The odds ratio of death for each 10% increase in the TBSA was 4.06 (95% CI 3.13-5.29) within this range. Compared to burns with TBSA≤ 25%, the odds ratio for TBSA 25.1 to 50% was 20.85 (95% CI 10.88- 39.96, P<0.001). Intentional self-harm burns were significantly more likely to result in death than accidental burns (OR 59.02, 95% CI 35.63- 97.78, P<0,001). Burns accompanied by inhalation injury were also significantly more likely to result in death than those with no inhalation injury (OR 41.15, 95% CI 26.71- 63.38, P<0.001).

The adjusted odds ratios were calculated using multiple logistic regression. Risk factors which remained significant in the final model were TBSA, inhalation, age, burn intent, season and residence. There were no significant interactions or multicollinearity between these variables. The Hosmer-Lemeshaw test for goodness of fit for the logistic model was not significant (χ^2=125.9, 115 df, P=0.23). The Highest Variance Inflation Factor (VIF) for the variables in the final model was 3.8 (TBSA) and the mean VIF was 1.9. This model explained 63% of the variability in death.

Table 3.21 shows the adjusted odds ratios for these risk factors. The strongest predictor of death was TBSA. The odds ratio for death in patients with TBSA ≥ 40% compared to those with TBSA <40% was 36.43 (95% CI 15.93-83.31, P<0.001). Old age (60 and over) was a significant risk for death with odds ratio of 5.36 (95% CI 1.56-18.48, P<0.001) compared to patients aged 15-59 years. Patients with inhalation injury were significantly more likely to die than those without inhalation injury (OR 3.55, 95% CI 1.72- 7.32, P<0.001). Intentional self-harm injuries were also more likely to result in death than accidental injuries (OR 5.63, 95% CI 2.45- 12.92, P<0.001). Burns that occurred in autumn were significantly more likely to result in death compared to those occurring in summer (OR 2.98, 95% CI 1.29- 6.84, P=0.01). Participants coming from other provinces were also more likely to die compared to patients from Sulaymaniyah city (OR 2.77, 95% CI 1.30- 5.90, P=0.008).

Table 3.21 The adjusted odds ratios for death in admitted participants (n=811)

Risk factor	Odds ratio (95% CI)	Wald test z	P value
TBSA burnt			
TBSA<40%	Reference group		
TBSA ≥40%	36.43 (15.93-83.31)	8.52	<0.001
Inhalation injury			
No	Reference group		
Yes	3.55 (1.72- 7.32)	3.43	0.001
Age			
15 to 59 years	Reference group		
0 to 14 years	1.84 (0.93-3.64)	1.76	0.08
60 years & over	5.36 (1.56-18.48)	2.66	0.008
Injury intent			
Accidental injury	Reference group		
Intentional self-harm	5.63 (2.45- 12.92)	4.08	<0.001
Season of burn injury			
Summer	Reference group		
Spring	1.03 (0.45- 2.37)	0.06	0.95
Autumn	2.98 (1.29- 6.84)	2.57	0.01
Winter	1.32 (0.57- 3.06	0.64	0.52
Residence			
Sulaymaniyah city	Reference group		
Outside Sulaymaniyah city	1.49 (0.74- 3.0)	1.11	0.27
Other provinces	2.77 (1.30- 5.90)	2.65	0.008

Log likelihood =-180.71, LR test χ^2= 605.8, df 10, P<0.001

3.2.11 Non-participants in the mortality analysis

Of the 884 admissions 73 patients were not included in the mortality analysis since they were either discharged against medical advice before recovery (69) or transferred to another hospital because of complications (4). No mortality information was available for these non-participants. The age of these non-participants ranged from 6 months to 44 years, the TBSA burnt ranged from 3% to 98% and hospital stay ranged from 0 to 36 days. These non-participants were not significantly different from those included in the mortality analysis in relation to age, residence, season and TBSA burnt. But compared to those included in the analysis, there were significantly more males (53% vs. 42%), more scalds (47% vs. 28%), lower probability of inhalation injury (12% vs. 30%) and a

shorter hospital stay (median 3 days vs. 8 days) amongst those not included in the analysis (table 3.22).

Table 3.22 Comparison of patients included and patients excluded from the mortality analysis

Characteristics	Included (=811) Number (%)	Excluded (n=73) Number (%)	P value
Sex			
Male	337 (41.6)	39 (53.4)	χ^2 = 3.7, 1 df,
Female	474 (58.4)	34 (46.6)	P=0.05
Age			
0 to 5 years	214 (26.4)	23 (31.5)	χ^2 =4.2, 4 df,
6 to 14 years	91 (11.2)	10 (13.7)	P=0.38
15 to 29 years	320 (39.5)	29 (39.7)	
30 to 59 years	158 (19.5)	11 (15.1)	
60 and over	28 (3.5)	0 (0.0)	
Residence			
Sulaymaniyah city	278 (34.3)	26 (35.6)	χ^2 =0.4, 2 df,
Outside Sulaymaniyah city	353 (43.5)	33 (45.2)	P=0.83
Other provinces	180 (22.2)	14 (19.2)	
Season of burn			
Winter	210 (25.9)	19 (26.0)	χ^2 =4.0, 3 df,
Spring	226 (27.9)	18 (24.7)	P=0.26
Summer	196 (24.2)	13 (17.8)	
Autumn	179 (22.1)	23 (31.5)	
Mechanism of burn			
Flame	531 (65.4)	37 (50.7)	χ^2 =11.6., 3 df,
Scald	229 (28.2)	34 (46.6)	P=0.009
Contact	13 (1.6)	1 (1.4)	
Other	39 (4.8)	1 (1.4)	
Intent			
Accidental	625 (77.1)	11 (84.9)	χ^2 =2.4., 1 df,
Intentional self-harm	186 (22.9)	62 (15.1)	P=0.12
Inhalation injury	245 (30.2)	9 (12.3)	χ^2 =10.5, 1 df, P=0.001
TBSA burnt			
0-25%	501 (61.8)	56 (76.7)	χ^2 =6.9, 3 df,
25.1-50%	140 (17.2)	8 (11.0)	P=0.07
50.1-75%	69 (8.5)	5 (6.8)	
75.1-100	101 (12.5)	4 (5.5)	
Hospital stay, median(IQR)	8 (4.0, 15.0)	3.0 (1.0, 5.5)	z= 7.0, P<0.001*

*Mann-Whitney U test

3.2.12 Readmissions

Of the 884 participants who were admitted during the year, 73 (8%) of them were readmitted at least once throughout the same year. The main characteristics of these participants and their comparison with the other patients who had no readmissions

during the year are shown in table 3.23. The readmitted participants were mostly females (53%), aged 15 to 29 years (47%), with flame burns (69%) and accidental injuries (86%). The two groups were not significantly different in terms of sex, age, residence, living standard, season of burn injury and % TBSA burnt. However, there were significantly more work-related/outdoor injuries (27% vs. 15%), fewer scald injuries (16% vs. 31%), and fewer intentional injuries (14% vs. 24%) amongst participants with at least one readmission compared to those with no readmission. The median hospital stay of the first admission of participants with at least one readmission was significantly longer (16.0 days, IQR 9.5, 30.0) than those without readmission (7.0 days, IQR 3.0, 13.0).

The number of readmissions per participant ranged from 1 to 4 (median 1, IQR 1, 2). Seven participants (10%) were readmitted more than twice, 11 (15%) twice and 55 (75%) only once. The median hospital stay was 5 days (IQR 1, 10), for the first readmission, 3 days (IQR 1, 5) for the second readmission and 2 days (IQR 1,5) for the third readmission. Participants were readmitted for the following reasons: release of contractures (27%), dressing (22%), skin graft (21%), wound debridement (15%), repair of deformity (mainly month and eyelid) (13%) and limb amputation (1%). The reasons for the first readmission were skin graft (33%), dressing (25%), release of contracture (18%), debridement (14%) and deformity repairs. The reasons for later readmissions were release of contractures and deformity repairs.

Table 3.23 Characteristics of patients by whether or not they had at least one readmission during the year

Characteristics	At least one readmission (n=73) Number (%)	No readmissions (n=811) Number (%)	P Value
Sex			
Male	34 (46.6)	342 (42.5)	χ^2=0.53, 1 df,
Female	39 (53.4)	508 (57.5)	P= 0.47
Age			
0 to 5 years	14 (19.2)	223 (27.5)	χ^2 = 3.9, 4 df,
6 to 14 years	10 (13.7)	91 (11.2)	P= 0.42
15 to 29 years	34 (46.6)	315 (38.8)	
30 to 59 years	14 (19.2)	155 (19.1)	
60 and over	1 (1.4)	27 (3.3)	
Residence			
Sulaymaniyah city	32 (43.8)	272 (33.5)	χ^2 = 3.3, 2 df,
Outside Sulaymaniyah city	26 (35.6)	360 (44.4)	P=0.19
Other provinces	15 (20.6)	179 (22.1)	
Living standard			
Poor	21 (30.0)	198 (26.6)	χ^2 =0.38, 2 df,
Fair/good	49 (70.0)	547 (73.4)	P=0.54
Season of burn			
Winter	27 (37.0)	202 (24.9)	χ^2 = 7.5, 3 df,
Spring	18 (24.7)	226 (27.9)	P=0.06
Summer	10 (13.7)	199 (24.5)	
Autumn	18 (24.7)	184 (22.7)	
Place of burn			
Home including yard	53 (72.6)	686 (84.8)	χ^2 = 7.3, 1df,
Work/ outdoors	20 (27.4)	123 (15.2)	p=0.001
Mechanism of burn			
Flame	50 (68.5)	517 (63.8)	χ^2 = 15.4, 2 df,
Scald	12 (16.4)	251 (30.9)	p<0.001
Other	11 (15.1)	43 (5.3)	
Intent			
Accidental	62 (86.1)	603 (75.8)	χ^2 = 4.0, 1df,
Intentional	10 (13.9)	193 (24.2)	P=0.047
% Total body surface area burnt	Median 18% (IQR 10, 30)	Median 18% (IQR 9, 41)	z=-0.88, P=0.38*
Length of hospital stay in days during the first admission	Median 16.0 (IQR 9.5, 30.0)	Median 7.0 (IQR 3.0, 13.0)	z=.6.2, P<0.001*

* Mann-Witney U test

3.2.13 Wound Infections

Wound swabs were routinely sent for culture and sensitivity when infection was suspected. Amongst the 884 participants 223 patients had wound swabs taken at least once of which 219 yielded positive results (98% of the swabs and 25% of all patients). The mortality rate was 19% (41 patients) in patients with positive cultures and 32% in the remainder of the sample (patients with no culture done or culture negative). The reported cause of death was septicemia in 40 of the 41 patients.

Many of the positive cultures yielded more than one species of microorganisms and in total there were 472 isolates. As shown in figure 3.4, the most common isolates were pseudomonas (28%), staphylococcus aureus (25%), Klebsiella (11%) Acinetobacter (8%) and *Eschirishia coli* (8%). Other less frequent isolates included *Staphylococcus capitis*, *Staphylococcus hominis*, *Staphylococcus warneri*, *Staphylococcus luteus*, *Staphylococcus simulans* , *Staphylococcus chromogenes*, *Staphylococcus ludgunensis*, *Staphylococcus zylosus*, *Staphylococcus haemolyticus*, coagulase negative Staphylococci, *Aeronomas hydrophila*, Serratia species, Burkkolderia, Proteus, *Chromobacterium violaceum*, Shigella, *Citrobacter braakii*, Micrococcus, *Morganella morganii*, Pantoea, Pasteurella and Salomonella species.

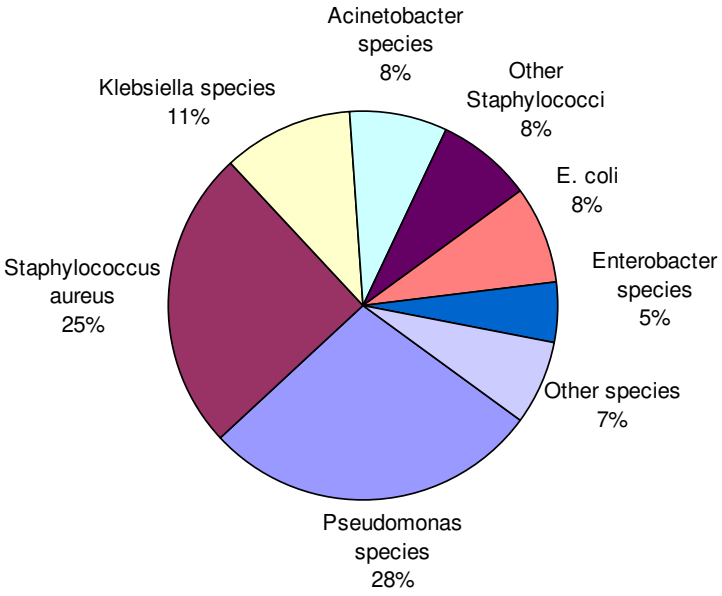


Figure 3.4 Microorganisms isolated from wound cultures

Almost 78% of patients with positive wound cultures were treated with systemic antibiotics and the remainder were not. Many of these microorganisms were resistant to

routine antibiotics and therefore patients were frequently treated with more powerful antibiotics such as ciprofloxacin, amikacin, piperacillin, imipenem, colistine and vancomycin.

3.2.14 Long-term consequences

Long-term consequences were recorded in 91 participants who visited the burns centre for follow up and treatment in the subsequent months after discharge from hospital. Some patients had developed more than one long-term problems; there were 140 reported problems in 91 patients (14% of all patients who survived hospitalization, n=654). The commonest of reported consequences was hypertrophic scars occurring in 8% of all survivors (58% of survivors with long-term consequences), followed by deformities such as of hand, ear and mouth (5% of survivors, 39% of survivors with consequences), limitation of joint movement (5% of survivors, 33% of survivors with consequences), gross disfigurement (2% of survivors, 14% of survivors with consequences) and others.

3.2.15 Cause of death

Cause of death was assigned by the forensic medicine department and the consultant treating the patient and then it was recorded in the patient's file by the consultant. According to this information, of the 230 patients who died during the year, 81 (35%) died from inhalation injury and 149 (65%) died from septicemia. No other causes were reported for death and no further information was reported in the files regarding underlying causes of death. There was no statistically significant difference between males and females in terms of cause of death (66% of females and 55% of males died from septicemia). Amongst children 0-5 years, the reported cause of death was septicemia in 84% of patients, and amongst people aged 60 and over the reported cause was inhalation in 56% of participants. The TBSA burnt was significantly greater in inhalation deaths than septicemia deaths (inhalation: median TBSA 91.0%, IQR 76.0, 98.0; septicemia: median TBSA 59.0%, IQR 36.5, 77.0; $z=8.1$, $P<0.001$). Likewise the hospital stay was significantly longer in septicaemia deaths (septicaemia: median 6

days, IRQ 5.0, 7.0; inhalation: median 1 day, IRQ 1.0, 1.0; $z=10.8$, $P<0.001$). Amongst the flame injuries, 37% of deaths were caused by inhalation and 63% by septicaemia.

3.2.16 Quality of life of admitted participants

3.2.16.1 Validation of the questionnaire

The Kurdish BSHS was composed of 25 items in 8 domains. The mean score for each domain was calculated from the sum of its items divided by number of items in the domain. There were no missing scores for any items. The mean total score for the questionnaire was calculated from the sum of the scores of all 25 questions divided by 25. The mean total score was not normally distributed therefore the median score was calculated and used in the analysis. The inter-item and item-total correlations were calculated within each domain and between the domains and the total. The scale reliability coefficient was calculated using Chronbach's alpha.

Correlation between the scores for different items i.e. inter-item correlation of each domain were as follows: hand function from 0.75 to 0.81, simple abilities from 0.6 to 0.78; work from 0.91 to 0.97; pain and discomfort from 0.50 to 0.94; treatment regimens 0.66; body image from 0.87 to 0.94; affect from 0.88 to 0.91; and interpersonal relationships from 0.64 to 0.97. The Cronbach's alpha for the questionnaire was 0.96 and for individual domains it was as follows: hand function 0.91, simple abilities 0.68, work 0.98, pain and discomfort 0.86, treatment regimens 0.77, body image 0.97, affect 0.96 and interpersonal relationships 0.93. The only item having poor correlation with other items in its domain was ability to sit on a chair in the simple abilities domain. All other inter-item correlations were over 0.37.

Inter-domain and domain-total correlations are shown in table 3.24. There were high correlations between the mean score for individual domains and the total score for the questionnaire. The lowest domain-total correlation coefficient was with hand function (0.67) and the highest was with body image (0.86). All other domain-total correlations

were over 0.75. Inter-domain correlations were all positive; the lowest being 0.37 (between hand and each of pain and treatment regimens) and the highest being 0.75 (between work and simple abilities).

The correlation was also high (0.81) between the mean total score for the Kurdish BSHS and Euroqol-5D (items scored 3, 2, 1 in the same direction as the Kurdish BSHS).

Table 3.24 Inter-domain and domain-total correlations of the Kurdish BSHS questionnaire

	Total	Hand	Simple	Work	Pain	Treatment	Image	Affect	Interpersonal
Total	1.0								
Hand function	0.67	1.0							
Simple abilities	0.76	0.66	1.0						
Work	0.80	0.66	0.75	1.0					
Pain & discomfort	0.81	0.37	0.50	0.57	1.0				
Treatment	0.78	0.48	0.68	0.58	0.60	1.0			
Body image	0.86	0.41	0.48	0.54	0.68	0.61	1.0		
Affect	0.84	0.37	0.51	0.48	0.66	0.64	0.83	1.0	
Interpersonal	0.77	0.45	0.44	0.51	0.65	0.47	0.68	0.63	1.0

3.2.16.2 Characteristics of participants

A total of 59 of 311 admitted participants (19%) who were eligible for the quality of life study according to the inclusion criteria were interviewed. (survivors who had been admitted to hospital for a new burn injury during the study period and aged 18-70 years) Table 3.25 shows characteristics of these patients which included 32 females (54%) and 27 males (46%) males. The age ranged from 18 to 64 years (median 29.0, IQR 24.0, 38.0) and TBSA burnt ranged from 2% to 54% (median 16.0, IQR 12.0, 25.0). Most participants were from Sulaymaniyah city (59%), married (74%), accidental burns (90%) and flame injuries (88%). The hospital stay ranged from 1 to 63 days (median 15, IQR 9, 25) and the participants were interviewed between 1 month and 12 months after injury. The majority (62%) had zero to 2 operations under GA and 38% had undergone more than 2 operations.

Table 3.25 Characteristics of patients included in the quality of life study and comparison of the quality of life score using Kurdish BSHS by these characteristics

Characteristics	Number (%)	Median score (IQR)	P value *
Sex			
Male	27 (45.8)	3.41 (3.06, 3.75)	z=1.24,
Female	32 (54.2)	3.11 (2.44, 3.73)	P=0.21
Age			
18 to 29 years	30 (50.9)	3.11 (2.48, 3.6)	z=-1.78,
30 year and over	29 (49.1)	3.58 (2.91, 3.77)	P=0.076
Residence			
Sulaymaniyah city	35 (59.3)	3.41 (2.77, 3.75)	χ^2 =2.23, 2 df,
Outside Sulaymaniyah city	21 (35.6)	3.24 (2.45, 3.64)	P= 0.33
Other provinces	3 (5.1)	2.55 (1.95, 3.71)	
Living standard			
Poor	18 (31.6)	3.24 (2.53, 3.65)	z=-0.80,
Fair/good	39 (68.4)	3.41 (2.79, 3.75)	P=0.42
Employment			
Employed	31 (52.5)	3.39 (2.62, 3.75)	z=0.24,
Unemployed	28 (47.5)	3.25 (2.52, 3.73)	P=0.81
Education			
None/primary	24 (41.4)	3.47 (2.57, 3.74)	z=0.05, p=0.96
Middle and more	34 (58.6)	3.3 (2.59, 3.75)	
Marital status			
Married	15 (25.9)	3.35 (2.48, 3.77)	z=-0.12,
Never married	43 (74.1)	3.35 (2.63, 3.75)	P=0.90
Mechanism of burn			
Flame	52 (88.1)	3.22 (2.49, 3.68)	z=-2.51,
Other	7 (11.9)	3.77 (3.35, 3.83)	P=0.012
Intent			
Accidental	53 (89.8)	3.41 (2.83, 3.75)	z=-2.58,
Intentional self-harm	6 (10.2)	2.63 (2.41, 2.84)	P=0.024
TBSA burnt			
Below 20% TBSA	39 (66.1)	3.54 (3.13, 3.75)	z=-2.8,
20% TBSA and more	20 (33.9)	2.70(2.25, 3.54)	P=0.005
Stay in hospital			
0-15 days	32 (54.2)	3.68 (3.38-3.75)	z=-3.4
> 15 days	27 ((45.8)	2.86 (2.55-3.25)	P=0.001
Time from injury			
Up to 3 months	17 (28.8)	3.65 (3.24, 3.79)	z=2.35,
More than 3 months	42 (71.2)	3.14 (2.4, 3.69)	P=0.019
Number of operations			
0-2 operations	37 (62.7)	3.58 (3.14, 3.76)	z=3.40,
3 and more operations	22 (37.3)	2.63 (2.15, 3.4)	P<0.001

* Mann-Whitney U test when quality of life of 2 groups are compared and Kruskal-Wallis test when more than 2 groups are compared

The participants in the quality of life study were similar to non-participants in relation to age (z=-0.21, P=0.2), sex (χ^2=0.23, P=0.90), mechanism of injury (χ^2=2.20, P=0.14), injury intent (χ^2=0.50, P=0.50) and TBSA burnt (z=-1.09, P=0.28). There were significantly fewer residents of other provinces amongst participants than non-

participants (5% vs. 23%, P=0.001). Participants stayed significantly more days in hospital (median 15, IQR 6, 26 vs. 10, IQR 5, 17; z=-3.2, P=0.002) and underwent more operations (median 2, IQR 0, 4 vs. 1, IQR 0, 2; z=-2.9, P=0.004) than non-participants.

3.2.16.3 Quality of life scores

The quality of life score of participants ranged from 1.25 to 3.93. The median total quality score was 3.35 (IQR 2.63, 3.75). The highest (best quality) median score was reported for hand function and interpersonal relationships, and the lowest (worst quality) median score was reported for pain and discomfort (table 3.26).

Table 3.26 Mean and median quality of life scores measured (ordered by median from worst to best quality)

	Mean score (SD)	Median (IQR)	Range*
Pain and discomfort	2.43 (0.90)	2.67 (1.67, 3.0)	0.67, 4.0
Body image	2.72 (1.12)	3.0 (1.33, 4.0)	1.0, 4.0
Work	2.84 (1.10)	3.0 (2.0, 4.0)	0.0, 4.0
Affect	3.03 (1.10)	3.33 (2.3, 4.0)	1.0, 4.0
Treatment regimens	3.36 (0.67)	3.50 (3.0, 4.0)	1.5, 4.0
Simple abilities	3.60 (0.52)	3.75 (3.50, 4.0)	2.25, 4.0
Hand function	3.61 (0.70)	4.0 (3.33, 4.0)	1.0, 4.0
Interpersonal relationships	3.59 (0.74)	4.0 (3.5,4.0)	1.0, 4.0
All domains	3.14 (0.68)	3.35 (2.63, 3.75)	1.25 ,3.93

** Possible quality scores range from 0"worst quality" to 4" best quality"*

These results were similar to results obtained by the Euroqol questionnaire. The responses of the participants to the five Euroqol dimensions are shown in table 3.27. Pain and discomfort were the commonest problems with 83% of participants reporting moderate or extreme pain and discomfort followed by problems with usual activities (54%) and anxiety and depression (46%). The least frequently reported problem was with mobility where only 13% of participants reported this.
The quality of life score was skewed to left and could not be made normal by transformation. Therefore non-parametric methods were used to investigate associations between the quality of life and patient and injury characteristics. When the median total quality of life score was compared by different characteristics, significant differences were found by mechanism of injury, TBSA burnt, number of operations, duration of hospital stay and time since injury (table 3.25). Participants who had TBSA burnt of

20% and more had a lower quality of life score (i.e. a lower quality of life) than those with burns of less than 20% TBSA (median 2.70, IQR 2.25, 3.54 vs. 3.54, IQR 3.13, 3.75; z=-2.8, P=0.005). Flame injuries were associated with a lower quality of life compared to other mechanisms of injury (median 3.22, IQR 2.49, 3.68 vs. 3.77, IQR 3.35, 3.83; z=-2.51, P=0.012). Participants who had more than 2 operations had a lower quality of life compared to those with fewer operations (median 2.63, IQR 2.15, 3.40 vs. 3.58, IQR 3.14, 3.76; z=3.4, P<0.001). Patients Who stayed >15 days in hospital had a lower quality of life score (median 2.86, IQR 2.55, 3.25 vs. 3.68, IQR 3.38, 3.75; z=2.35, P=0.019) Time from injury was also a significant factor as participants who were interviewed after 3 months from injury reported a worse quality of life than those who were interviewed within 3 months of injury (median 3.14, IQR 2.4, 3.69 vs. 3.65, IQR 3.24, 3.79; z=2.35, P=0.019).

Table 3.27 Frequency of reported problems according to the five dimensions of Euroqol-5D

Dimension	Number (%) with this response
Mobility	
No problem	51 (86.4)
Problems	8 (13.6)
Self-care	
No problem	43 (72.9)
Problems	16 (27.1)
Usual activities	
No problem	27 (45.8)
Problems	32 (54.2)
Pain/Discomfort	
No problem	10 (17.0)
Problems	49 (83.0)
Anxiety/Depression	
No problem	32 (54.2)
Problems	27 (45.8)

3.3 The incidence and outcome study: participants admitted for intentional self-harm

Intentional self-harm burns comprised 197 (22%) of the total 884 admissions in the one year incidence and outcome study. Self-harm accounted for 36% of admissions in females and 3% of admissions in males. The participation in the study rate was 100% but in only 31% of cases the interview was undertaken with the patient him/herself. In 23% of cases the mother was interviewed and in the remainder father, siblings and other close relatives were interviewed.

3.3.1 Participant characteristics

The sample included 185 females (94%) and 12 males (6%). The age of participants ranged from 11 to 78 years (median 20.0, IQR, 17.0, 27.5) and 79% of them aged below 30 years. They were mostly from outside the city of Sulaymaniyah (45%); had no or only primary education (68%); were married (50%); and of self reported good or fair living standard (72%). Other characteristics of the participants are shown in table 3.28.

Table 3.28 Background characteristics of participants admitted for intentional self-harm (n=197)

Characteristics	Number	Percent
Sex		
Male	12	6.1
Female	185	93.9
Age		
11 to 18 years	85	43.2
19 to 29 years	70	35.5
30 to 59 years	37	18.8
60 and over	5	2.5
Residence		
Sulaymaniyah city	55	27.9
Outside Sulaymaniyah city	88	44.7
Other provinces	54	27.4
Living standard		
Poor	45	28.0
Fair/good	116	72.0
Education		
None	44	25.6
Primary	73	42.4
Middle	45	26.2
High school/ higher	10	5.8
Occupation/role		
Child/dependant	89	46.4
Housewife	84	43.8
Employed	14	12.0
Other	5	2.6
Marital status		
Never married	93	47.1
Married	88	49.7
Separated	6	3.2
Median age in years	20 (IQR, 17, 27.5)	

The injury characteristics are shown in table 3.29. The incident mostly occurred at home (98%) and the flammable product used by the patient was kerosene in 92% of participants. Almost 35% of burns occurred in spring and only 16% in winter. The TBSA burnt > 50% in 78% of patients. Only 12% of participants recovered in hospital while 6% left hospital before recovery against medical advice and 83% died in hospital. The hospital stay ranged from zero to 70 days (median 4, IQR 1, 8).

Table 3.29 Burn characteristics of participants admitted for intentional self-harm (n==197)

Characteristics	Number	Percent
Place of burn		
Home including yard	192	97.5
Outdoors/school	5	2.5
Burning material		
Kerosene	181	91.9
Petrol/ gasoline	16	8.1
Season of burn		
Winter	31	15.7
Spring	68	34.5
Summer	50	25.4
Autumn	48	24.4
Inhalation injury	175	88.8
TBSA burnt		
0-25%	4	2.0
25.1-50%	40	20.3
50.1-75%	58	29.4
75.1-100	95	48.2
Outcome		
Discharged	23	11.7
Death in hospital	163	82.7
Discharge against advice	11	5.6
Time between injury and hospital attendance in hours (median)	0.5 (IQR 0.5, 1)	
Length of hospital stay in days (median)	4 (IQR 1, 8)	

3.3.2 Incidence

The annual incidence rates and ratios are shown in table 3.30. The annual incidence of intentional self-harm burns in the province of Sulaymaniyah was 8.4 per 100,000 per year. The incidence rate was significantly higher in females (15.5 per 100,000) than in males (1.2 per 100,000) with a rate ratio of 13.12 (95% CI 6.90- 24.94, P <0.001).

The incidence rate of intentional self-harm burns in the city of Sulaymaniyah was similar to the province being 7.8 per 100,000 per year. The incidence was significantly higher in females (14.5 per 100,000) than in males (1.1 per 100,000) with a rate ratio of 12.67 (95% CI 4.58- 35.07, P <0.001). Outside the city, the incidence was 8.8 per 100,000 per year. The incidence was significantly higher in females (16.2 per 100,000) than males (1.2 per 100,000) with a rate ratio of 13.40 (95% CI 5.85-30.70, P<0.001). There was no significant difference in the incidence of intentional self-harm burns in

females outside Sulaymaniyah city compared to females from the city (rate ratio 1.1, 95% CI 0.78-1.62, P=0.52).

Table 3.30 Annual incidence rates of intentional self-harm burns and female to male rate ratios in Sulaymaniyah province, city and outside the city

Residence	Sex	No. of patients	Population	Incidence rate per 100,000	Female/male rate ratio (95% CI)	P value
Province	Both	143	1,708,103	8.4	13.12 (6.90=24.94)	<0.001
	Female	133	859,963	15.5		
	Male	10	848,140	1.2		
City	Both	55	704,100	7.8	12.68 (4.58-35.08)	<0.001
	Female	51	353052	14.5		
	Male	4	351048	1.1		
Outside city	Both	88	1,004,003	8.8	13.40 (5.85-30.7)	<0.001
	Female	82	506,911	16.2		
	Male	6	497,092	1.2		

3.3.3 TBSA burnt

The TBSA burnt was not normally distributed and ranged from 5% to 100% (median 74%, IQR 54.5, 91.0). There was no significant difference in median TBSA burnt between males and females (z=-0.55, P=0.58) and across different age groups (χ^2=4.1, 3 df, P=0.25). The median TBSA burnt was 36% (IQR 31.0, 41.5) in survivors and 80% (IQR 64.0, 93.0) in those who died and this was highly significant (z=-7.2, P<0.001). The median TBSA of patients who left hospital against medical advice was 71% (IQR 48.0, 90.0). The outcome of these patients is unknown (table 3.31).

Table 3.31 Total body surface area by sex, age and outcome of participants

	% TBSA Median (IQR)	P value
Sex		
Male	72 (37.8, 92.0)	Z=-0.55, P=0.58*
Female	74 (55.0, 91.0)	
Age		
11 to 18	76 (56.8, 91.5)	χ^2=4.6, 3 df,
19 to 29	76 (54.8, 93.3)	P=0.30**
30to 59	67 (41.3, 88)	
61 and over	73 (57, 94.5)	
Outcome		
Survivors	36 (31.0, 41.5)	Z=-7.2, P<0.001*
Deaths	80 (64.0, 93.0)	
Unknown	71 (48.0, 90.0)	

*Mann-Whitney U test
**Kruskal-Wallis test

3.3.4 Precipitating factors

Family problems including disagreements and quarrels between members, disapproved emotional relationships, presence of a stepmother and financial conflicts were the reported precipitating factor in 95 cases (49%). Marital problems including disagreements and quarrels between spouses, disharmony, violence against wife, re-marriage of husband, infertility and separation were reported in 85 cases (43%). Mental health conditions such as depression and psychiatric disorders were reported in 5% of participants. Poverty was the reported precipitating factor in 3 cases, debilitating disease in 2 and poor achievement at school in 2 cases.

3.3.5 Place of injury and burning material

Almost 97% of self-harm burns occurred at home (male 92%, female 98%) and in 82% of cases the person was alone when he/she committed the act of self-harm (male 67%, female 83%). The burning material was kerosene in 92% of case (male 83%, female 92%), followed by petrol which was responsible for 7% of cases (male 16%, female 6%) and gasoline 1%. A typical case of self-harm, if this can be described from data and observations of the researcher, is a young woman wearing her synthetic clothing at home

who, with the intention to terminate her life, takes a bottle of kerosene and while no one is with her, pours it on herself and sets herself on fire. Other people in the house or neighbours become aware of her condition when she runs about seeking help.

3.3.6 Risk factors for intentional self-harm

A range of potential risk factors were investigated by logistic regression for their association with intentional self-harm burns amongst all participants admitted to hospital and who were aged 11 years and over. Since the minimum age of intentional self-harm burns was 11 years, only participants aged 11 and over were included in this part of the analysis (n=597). The crude odds ratios for these factors are shown in table 3.32. Female sex was the strongest risk factor with an odds ratio of 15.6 (95% CI 8.41- 21.83, P<0.001). Compared to those aged 30 and over, younger age groups were more likely to suffer intentional self-harm burns particularly the age group of 11 to 18 years with an odds ratio of 3.34 (95% CI 2.13- 5.23, P<0.001). Intentional self-harm was significantly more common in other seasons compared to winter with spring having the highest odds ratio of 2.3 (1.37- 3.72, P=0.008). More education particularly high school and beyond had a protective effect compared to none or primary education. Other factors significantly associated with a higher ratio of intentional-self harm were residence outside the city and small family size. Self reported living standard and marital status were not significantly associated with self-harm (table 3.32).

The factors which were significant at P≤ 0.20 were considered for inclusion in the multiple logistic model. These were sex, age, residence, education, season, marriage, car ownership and household size. The following variables remained significant in the final model: age, sex, education, season and household size. There were no significant interactions or multicollinearity between these variables. The Hosmer-Lemeshaw test for goodness of fit for the multivariable model was not significant (χ^2= 100.3, 91 df, P=0.24). The highest VIF for the variables in the model was 1.48 (for age) and the mean VIF was 1.25. The logistic model explained 23% of the variability in intentional self-harm burns.

Table 3.32 Univariate analysis of the risk for intentional self-harm burns in participants admitted to hospital (n=597)

	All admissions	Self-harm Number (%)	Odds ratio (95% CI)	P value Likelihood ratio test
Sex				
Male	213	12 (5.6)	Reference group	χ^2=133.0, 1 df
Female	384	185 (48.2)	15.6 (8.41- 28.83)	P<0.001
Age				
30 and over	197	42 (21.3)	Reference group	χ^2=29.4, 2 df,
19 to 29 years	221	70 (31.7)	1.71 (1.10- 2.67)	P<0.001
11 to 18 years	179	85 (47.5)	3.34 (2.13- 5.23)	
Residence				
Sulaymaniyah city	207	55 (26.6)	Reference group	χ^2=6.29, 2 df,
Outside Sulaymaniyah	248	88 (35.5)	1.52 (1.02- 2.28)	P=0.04
Other provinces	142	54 (38.0)	1.70 (1.07-2.68)	
Education				
None	119	44 (37.0)	Reference group	
Primary	233	73 (31.3)	0.78 (0.49- 1.24)	χ^2=13.7, 4 df,
Middle	129	45 (34.9)	0.91 (0.54- 1.53)	P=0.008
High school	41	5 (12.2)	0.24 (0.09- 0.65)	
Higher education	29	5 (17.2)	0.36 (0.13- 1.0)	
Living standard				
Fair/good	394	116 (29.4)	Reference group	χ^2=0.3, P=0.5
Poor	143	45 (35.5)	1.1 (0.73- 1.67)	
House ownership				
Yes	398	118 (29.7)	Reference group	χ^2=0.8, 1df,
No	139	43 (30.9)	1.06 (0.70- 1.62)	P=0.78
Car ownership				
Yes	211	53 (25.1)	Reference group	χ^2=4.25, 1 df,
No	323	108 (33.4)	1.5 (1.02- 2.21)	P=0.04
Marital status				
Married	296	88 (29.7)	Reference group	χ^2=3.8, 2 df,
Single	260	93 (35.8)	1.32 (0.92- 1.88)	P=0.15
Other*	24	6 (25.0)	2.36 (0.74- 7.53)	
Season of burn				
Winter	142	31 (21.8)	Reference group	
Spring	176	68 (38.6)	2.3 (1.37- 3.72)	χ^2=11.7, 3 df,
Summer	139	50 (36.0)	2.0 (1.19- 3.41)	P=0.008
Autumn	140	48 (34.3)	1.9 (1.1- 3.17)	
Household size				
7 and more	183	48 (26.2)	Reference group	χ^2=4.8, 3 df,
4 to 6	249	75 (30.1)	1.21 (0.79- 1-86)	P=0.09
1 to 3	109	42 (38.5)	1.77 (1.06- 2.93)	

* Divorced/separated/widowed

Table 3.33 shows the adjusted odds ratios calculated from the multivariate model. Female sex was the strongest predictor of self-harm with an odds ratio of 13.75 (95% CI 6.91- 27.36, P<0.001) compared to male. Participants aged 11 to 18 years were

significantly more likely to be victims of self-harm than those aged 30 and over (OR 3.92, 95% CI 2.20-7.0, P<0.001). Participants who had education below secondary school were also significantly more likely to be victims of self-harm than those having more education (OR 2.50, 95% CI 1.15- 5.45, P=0.02). Spring was also a significant risk factor compared to winter with an odds ratio of 2.39 (95 CI 1.3-4.41, P=0.005). Participants with small family size (1-3 members) were more likely to be victims of self-harm than those with larger families (OR 2.72, 95% CI 1.44- 5.15, P=0.002).

Table 3.33 Adjusted odds ratios for intentional self-harm burns in participants admitted to hospital (n=535)

Risk factor	Odds ratio (95% CI)	Wald test z	P value
Sex			
Male	Reference group		
Female	13.75 (6.91-27.36)	7.47	<0.001
Age			
Age 30 years and more	Reference group		
Age 19 to 29 years	1.39 (0.80-2.42)	1.19	0.24
Age 11 to 18 years	3.92 (20.2-7.0)	4.63	<0.001
Education			
Secondary school and more	Reference group		
None to middle school	2.50 (1.15-5.45)	2.32	0.02
Season			
Winter	Reference group		
Spring	2.39 (1.30-4.41)	2.8	0.005
Summer	1.73 (0.91-3.27)	1.67	0.1
Autumn	1.7 (0.89-3.22)	1.61	0.1
Household size			
7 and more	Reference group		
4 to 6	1.59 (0.95- 2.64)	1.78	0.08
1 to 3	2.72 (1.44- 5.15)	3.09	0.002

Log likelihood= -253.3, LR test χ^2=149.5, 9 df , P<0.001

3.3.7 Mortality

Of 186 participants who remained in hospital under treatment, 163 patients died giving an in-hospital mortality of 88%. There was no significant difference in mortality between females and males (OR 1.85, 95% CI 0.37-9.28, P=0.48). Age, living standard and season of burn injury were not significantly associated with death but TBSA burnt, inhalation and residence were all associated with a significant increase in odds of mortality (table 3.34). Presence of inhalation injury was significantly associated with

death (OR 15.7, 95% CI 5.44-45.33, P<0.001) and compared to TBSA below 40%, TBSA of 40% and more was a significant risk for death (OR 63.14, 95% CI 19.02-209.61, P<0.001). Residence was another significant risk factor with mortality being significantly higher amongst patients coming from outside the city compared to those coming from the Sulaymaniyah city (OR 3.76, 95% CI 1.31-10.74, P=0.032).

Further analysis exploring factors associated with mortality was not undertaken here because participants with intentional self-harm burns comprise the majority of all burn deaths (163 of 230) and multivariate analysis of factors associated with mortality amongst all burn admissions has already been described in section 3.2.10.

Table 3.34 Univariate analysis of risk factors for death in intentional self-harm burns (n=186)

	Number of patients	Number (%) died	Odds ratio (95% CI)	P value Likelihood ratio test
Sex				
Male	10	8 (80.0)	Reference group	χ^2=0.5, 1 df
Female	176	155 (88.1)	1.85 (0.37-9.28)	P=0.48
Age				
11 to 18 years	82	74 (90.2)	Reference group	χ^2=1.71, 2df, P=0.43
19 to 29 years	66	55 (83.3)	0.54 (0.20-1.43)	
30 and over	38	34 (89.5)	0.92 (0.26-3.26)	
Residence				
Sulaymaniyah city	53	41 (77.4)	Reference group	χ^2=6.89, 2 df, P=0.032
Outside Sulaymaniyah	83	77 (92.8)	3.76 (1.31-10.74)	
Other provinces	50	45 (90.0)	2.63 (0.85-8.10)	
Living standard				
Poor	42	37 (88.1)	Reference group	χ^2=0.43, 1 df, P=0.51
Fair/good	112	94 (83.9)	1.42 (0.49-4.10)	
Season of burn				
Winter	29	22 (75.9)	Reference group	χ^2=3.83, 3 df, P=0.28
Spring	64	58(90.6)	3.08 (0.93-10.16)	
Summer	48	43 (89.6)	2.74 (0.78-9.62)	
Autumn	45	40 (88.9)	2.55 (0.72-8.97)	
Inhalation injury				
No	20	9 (45.0)	Reference group	χ^2=25.5, 1 df, P<0.001
Yes	166	154 (92.8)	15.7 (5.44-45.33)	
TBSA burnt				
TBSA<40%	24	7 (29.2)	Reference group	χ^2=58.88, 1 df, P<0.001
TBSA ≥40%	162	156 (96.3)	63.14 (19.02-209.61)	

3.4 The three-year admissions study

As part of the study, data from patients who were admitted to the burns centre during the calendar years of 2006 and 2007 were obtained from hospital records retrospectively. In addition, data of participants who were admitted during the remainder of 2008 after completion of the incidence and outcome study i.e. from 3rd November to 31st December were obtained from the hospital records. There were 2829 acute burn admissions from 1st January 2006 until 31st December 2008. The combined data transcription and data entry error was 1%.

3.4.1 Main characteristics

Table 3.35 summarizes the main characteristics of these patients. The sample included 1,596 females (56%) and 1,233 males (44%). The age of patients ranged from 1 month to 94 years (median 18.0, IQR 5.0, 28.0). Children aged 0-5 years comprised 27% of participants and 39% were aged 15 to 29 years. The majority (81.5%) were residents of Sulaymaniyah province and 19.5% came from surrounding provinces. Flame injuries were the most common mechanism (62%) followed by scalds (33%). In-hospital mortality was 27%. The median TBSA burnt was 18% (IQR 10%, 41%) and the median hospital stay was 6 days (IQR 3, 12).

Table 3.35 Characteristics of burn admissions during 2006-2008 (n=2829)

Characteristics	Number	Percent
Year of admission		
2006	947	33.5
2007	975	34.5
2008	907	32.1
Sex		
Male	1,233	43.6
Female	1,596	56.4
Age		
0 to 5 years	763	27.0
6 to 14 years	345	12.2
15 to 29 years	1,097	38.8
30 to 59 years	545	19.3
60 and over	79	2.8
Residence		
Sulaymaniyah province	2,277	80.5
Other provinces	552	19.5
Season of burn		
Winter	758	26.8
Spring	707	25.0
Summer	692	24.5
Autumn	672	23.7
Mechanism of burn		
Flame	1,744	61.7
Scald	934	33.0
Electricity	67	2..4
Explosives	50	1.8
Other	34	1.2
TBSA burnt		
0-25% TBSA	1,754	62.0
25.1-50% TBSA	477	16.9
50.1-75% TBSA	274	9.7
75.1-100%TBSA	324	11.4
In-hospital mortality	767	27.1
Readmission*	119*	7.4
Age in years (median)	18 (IQR 5, 28)	
% Total body surface area burnt (median)	18 (IQR 10, 41)	
Length of hospital stay in days (median)	Median 6 (IQR 3, 12)	

* Data for 2007 not available

3.4.2 Mortality

Mortality by different characteristics of patients is shown in table 3.36. Of the 2,829 admissions 767 patients died in hospital (600 females and 167 males) giving a mortality rate of 27%. In-hospital mortality was 14% amongst males and 38% amongst females (OR 3.85, 95% CI 3.17-4.66, P<0.001). Mortality was 89% when TBSA was ≥40% and 5% when TBSA burnt was less than 40% (OR 136.02, 95% CI 101.23-182.80, P<0.001).

Mortality was also significantly higher for flame injuries, older age and in people coming from other provinces. These mortality calculations assume alive patients who were discharged against advice because no information was available for the year 2007 regarding the number of patients discharged against advice.

Table 3.36 Univariate analysis of in-hospital mortality by characteristics of patients admitted during 2006-2008

	Number of patients	Number (%) died	Odds ratio (95% CI)	P value Likelihood ratio test
Sex				
Male	1,233	167 (13.5)	Reference group	χ^2=215.1, 1 df,
Female	1,596	600 (37.6)	3.85 (3.17-4.66)	P<0.001
Age				
0 to 5 years	763	55 (7.2)	Reference group	χ^2=323.2, 4 df,
6 to 14 years	345	67 (19.4)	3.10 (2.12-4.55)	P<0.001
15 to 29 years	1,097	456 (41.6)	9.16 (6.79-12.34)	
30 to 59 years	545	155 (28.4)	5.12 (3.67-7.13)	
60 and over	79	34 (43.0)	9.73 (5.76-16.41)	
Residence				
Sulaymaniyah province	2,277	535 (23.5)	Reference group	χ2=72.4, 1 df,
Other provinces	552	232 (42.0)	2.37 (1.94-2.87)	P<0.001
Season of burn				
Winter	758	138 (18.2)	Reference group	χ^2=49.3, 3 df,
Spring	707	200 (28.3)	1.78 (1.38-2.27)	P<0.001
Summer	692	233 (33.7)	2.28 (1.79-2.91)	
Autumn	672	196 (27.1)	1.85 (1.44-2.37)	
Mechanism of burn injury				
Scald	934	49 (5.3)	Reference group	χ^2=453.4, 2 df,
Flame	1,744	697 (40.0)	12.02 (8.88-16.28)	P<0.001
Other	151	21 (13.9)	2.92 (1.69-5.02)	
TBSA burnt				
<40%	2,089	124 (5.4)	Reference group	χ^2=1905.4, 1 df,
≥40% and more	740	643 (88.5)	136.02 (101.23-182.80)	P<0.001

3.4.3 Comparison by year of admission

Table 3.37 compares characteristics of patients by year of admission. The number of admissions was similar across the three years. There were no significant differences in the three years in terms of sex, median age, season of injury and mortality. Compared to later years, there were significantly fewer patients from other provinces (χ^2=7.0, 2 df, P=0.03), more scalds (χ^2=22.7, 2 df, P<0.001), fewer operations (χ^2=115.1, 2 df, P<0.001) and a shorter hospital stay (z=22.5, P<0.001) in 2006.

Including variables shown in table 3.36, multiple logistic regression showed that sex, age, TBSA and mechanism of injury were significant risk factors for death. As the objective of this study was to investigate the effect of year of admission on mortality, only this effect is reported here. In-hospital mortality was not significantly different between the 3 years. Compared to 2006 and controlled for the factors mentioned above, the odds ratio of death for 2007 was 0.99 (95% CI 0.69-1.41, z=-0.06, P=0.95) and for 2008 it was 0.97 (95% CI 0.67-1.40, z=0.16, P=0.87).

Table 3.37 Comparison of patients by year of admission

	Year of admission			
	2006 Number (%)	2007 Number (%)	2008 Number (%)	P value
All	947	975	907	
Sex				
Male	440 (46.5)	407 (41.7)	386 (42.6)	χ^2=4.9, P=0.09
Female	507 (53.5)	568 (58.3)	521 (57.4)	
Age				
0 to 5 years	263 (27.8)	259 (26.6)	241 (26.6)	χ^2=19.1, 8 df,
6 to 14	128 (13.5)	115 (11.8)	102 (11.3)	P=0.015
15 to 29	331 (35.0)	418 (42.9)	348 (38.4)	
30 to 59	199 (21.0)	162 (16.6)	184 (20.3)	
60 and over	26 (2.8)	21 (2.2)	32 (3.5)	
Residence				
Sulaymaniyah province	783(82.7)	788 (80.8)	706 (77.8)	χ^2=7.0, 2 df,
Other provinces	164 (17.3)	187 (19.2)	201 (22.2)	P=0.03
Season of burn				
Winter	248 (26.2)	276 (28.3)	234 (25.8)	χ^2=11.9, 3 df,
Spring	207 (21.9)	255 (26.1)	245 (27.0)	P=0.065
Summer	250 (26.4)	230 (23.6)	212 (23.4)	
Autumn	242 (25.5)	214 (22.0)	216 (23.8)	
Mechanism of burn injury				
Flame	554 (58.5)	614 (63.0)	576 (63.5)	χ^2=22.7, 2df,
Scald	360 (38.0)	302 (31.0)	272 (30.0)	P<0.001
Other	33 (3.5)	59 (6.0)	59 (6.5)	
TBSA burnt				
0-25%	576 (60.8)	598 (61.3)	580 (74.0)	χ^2=6.3, 3df,
25.1-50%	169 (17.9)	159 (16.3)	149 (16.4)	P=0.40
50.1-75%	99 (10.5)	103 (10.6)	72 (7.9)	
75.1-100	103(10.9)	115 (11.8)	106 (11.7)	
Number of GA operations				
0 to 2 operations	890 (94.0)	895 (91.8)	727 (88.8)	χ^2=115.1, 2 df,
3 to 5 operations	49 (5.2)	67 (6.9)	239 (8.5)	P<0.001
6 and over	8 (0.8)	13 (1.3)	78 (2.8)	
In-hospital mortality	263 (27.8)	268 (27.5)	236 (26.0)	χ^2=0.82, 2 df, P=0.66
Median age (IQR)	18 (4, 29)	18 (5, 26)	18 (5, 28)	χ^2=0.69, 2 df, P=0.70*
Hospital stay, median (IQR)	5 (3, 10)	6 (3, 12)	8 (3, 14)	χ^2=22.6, 2 df P<0.001*

* Kruskal-Wallis test

3.5 The case-control study

A total of 496 participants (248 cases and 248 controls) were included in the study. During the case recruitment period 329 children aged 0-5 years with an acute burn injury were seen in the burns centre of whom 71 children were excluded because they were either from outside Sulaymaniyah city (66) or from the city but burnt outside the home (5). Therefore 258 eligible children remained based on the case definition of whom 10 (4%) were not recruited because information on the child could not be obtained as the person available to be interviewed was not the child's parent or sibling. All controls who were approached were interviewed. The response rate for the interviews was 100% in both cases and controls. The overall missing data for all variables was 0.4% (cases 0.6%, controls 0.2%).

3.5.1 Background characteristics

Table 3.38 shows background characteristics of cases and controls. Frequency matching was undertaken on sex and age by one year intervals. The cases were recruited prospectively so the differences in number of children in each age interval reflect real differences in children burnt during the data collection period. Cases were derived from 39 neighborhoods of the city and controls were derived from 37 of these neighborhoods. The person interviewed was the mother of the child in 94% of controls and 80% of cases. Controls were admitted to hospital for 34 different conditions the most common ones being asthma, congenital diseases, febrile convulsions, acute bronchitis and anemia. The mechanism of injury in cases included scalds (79%). Contact burns (17%) and flame burns (4%). The most common equipment associated with injury were tea utensils (42%), kerosene stoves (36%) and cooking and eating utensils (15%). The sitting room was the commonest room of injury (53%) followed by the kitchen (36%) and other rooms. The TBSA burnt ranged from 0.5% to 30% (median 2%, IQR 1%, 3%).

Table 3.38 Characteristics of cases and controls

Characteristics	Cases Number (%)	Controls Number (%)
Total	248 (100)	248 (100)
Sex		
Male	126 (50.8)	126 (50.8)
Female	122 (49.2)	122 (49.2)
Age		
Below 1 year	35 (14.1)	35 (14.1)
1 year	88 (35.5)	88 (35.5)
2 years	56 (22.6)	56 (22.6)
3 years	37 (14.9)	37 (14.9)
4 years	16 (6.5)	16 (6.5)
5 years	16 (6.5)	16 (6.5)
Residence		
Number of neighbourhoods	39	37
Neighbourhoods common to cases and controls	37	
Person interviewed		
Mother	199 (80.2)	234 (94.3)
Other	49 (19.8)	14 (5.7)
Conditions resulting in admission in controls		
Asthma		60 (24.4)
Congenital (haemophilia, DDH, G6PD, anomalies)		33 (13.3)
Febrile convulsion		32 (13.0)
Acute bronchitis/croup		22 (8.9)
Anaemia/ favism		20 (8.1)
Injury (bite, foreign body, poisoning)		18 (7.3)
Pyrexia of unknown origin		10 (4.0)
Allergy		10 (4.0)
Other		43 (17.3)
Mechanism of burn in cases		
Scald	195 (78.6)	
Contact	43 (17.3)	
Flame	9 (3.6)	
Electrical	1 (0.4)	
Place of injury in cases		
Sitting room	131 (52.8)	
Kitchen	88 (35.5)	
Other	29 (11.7)	
Equipment and products responsible for injury		
Tea utensils	103 (41.5)	
Kerosene stoves	89 (35.9)	
Crockery	36 (14.5)	
Other	20 (8.1)	

Table 3.39 compares controls with the population in terms of characteristics where data were available. Controls are similar to the population in terms of household size (4.6 vs. 5.0), father's employment in the government sector (42% vs. 43%), house ownership (68% in both) and child attending pre-school education (7% vs. 6%). Car ownership was more common in controls than in the population (51% vs. 42%) and generator use was less common in controls than in the population (36% vs. 49%). Direct information was

not available on parental education in the populating for comparison. Female literacy rate is reported as 74% amongst women aged 15-24 years and as 72% amongst females aged >10 years; these figures are not very different from maternal literacy rate amongst controls (78%). Male literacy was reported as 86% amongst males aged >10 years and father's literacy rate was 92% amongst controls.

Table 3.39 Comparison of controls with the general population

Characteristics	Controls	Population	Source
Household size	4.6	5.0	
Father working in government sector	42.4	43.3	
House ownership	68.2	68.0	COSIT [178]
Use of gas cooker	99.2	100.0	
Use of kerosene space heater	94.8	97.0	
Child attending pre-school education	6.9	6.1	COSIT [205]
Car ownership	51.2	42.0	
Use of home generator	35.9	49.0	
Father's literacy	91.5	85.8 *	COSIT [178]
Mother's literacy	78.0	72.4 **	
		73.6 ***	COSIT [205]

COSIT: Central Organization for Statistics & Information Technology
* Literacy rate in males aged >10 years
** Literacy rate in females aged >10 years
*** Literacy rate in females aged 15-24 years

3.5.2 Household characteristics

Table 3.40 describes household characteristics of cases and controls. Cases and controls were not significantly different in terms of mean household size (t=0.93, P=0.35), number of pre-school children in the household (t=1.7, P=0.09), mother's employment (χ^2=1.7, 2 df, P=0.42), father's employment (χ^2=5.8, 2 df, P=0.12), and car ownership (χ^2 =1.2, 1 df, P=0.28). In terms of education, parents of cases and controls were similar in terms of none and primary education, but they were different in terms of higher education. Mothers of controls were significantly more likely to have attended higher education than cases (20% vs. 12%, χ^2= 14.1, 4 df, P=0.007). Fathers of controls were significantly more likely to have attended higher education than cases (26% vs. 14%, χ^2 = 24.7, 4 df, P<0.001).

Cases were more likely to describe themselves as having a poor living standard than controls (22% vs. 7%, χ^2=24.4, P<0.001). Family ownership of the house was also significantly more common amongst controls than cases (68% vs. 58%, χ^2=25.4, P=0.02). The mean number of rooms in the house was 3.41 (SD 1.14) in controls and 3.06 (SD 1.10) in cases (t=3.53, 486 df, p<0.001). The overcrowding index was significantly different between them; there were 1.7 (SD 0.91) persons per room amongst cases and 1.49 (SD 0.77) amongst controls (t=-2.68, 486 df, P=0.008). The families also had a different experience in relation to previous history of burn injury amongst family members excluding the child under study. While 25% of cases reported past history of burns only 10% of controls did so (χ^2 = 17.9, P<0.001).

Table 3.40 Household characteristics of cases and controls

Characteristics	Cases Number (%)	Controls Number (%)	P value
Mother's education			
None	59 (24.0)	54 (22.0)	
Primary/ informal	91 (37.0)	95 (38.6)	
Middle	43 (17.5)	39 (15.9)	χ^2 = 14.1, 4 df, P=0.007
High school	24 (9.8)	8 (3.2)	
Higher education	29 (11.8)	50 (20.3)	
Father's education			
None	37 (15.0)	21 (8.5)	
Primary/ informal	85 (34.6)	63 (25.6)	
Middle	52 (21.1)	75 (30.5)	χ^2 = 24.7, 4 df, P<0.001
High school	37 (15.0)	22 (8.9)	
Higher education	35 (14.2)	65 (26.4)	
Mother's employment			
Housewife	194 (78.7)	187 (76.3)	
Government sector	49(19.9)	57 (23.3)	χ^2 = 1.7, 2 df, P=0.42
Private sector	3 (1.2)	1 (0.4)	
Father's employment			
Government sector	80 (32.3)	103 (42.4)	
Private sector	166(66.5)	135 (57.0)	χ^2 = 5.8, 2 df, P=0.12
Unemployed	3 (1.2)	4(1.6	
Poor living standard	54 (22.0)	16 (6.5)	χ^2 = 24.4, 1 df, P<0.001
House ownership	144 (58.1)	169 (68.2)	χ^2 = 25.4, 1 df, P=0.02
Car ownership	114 (46.3)	127 (51.2)	χ^2 = 1.2, 1 df, P=0.28
History of burn in other family members	60 (24.5)	25 (10.1)	χ^2 = 17.9, 1df, P<0.001
Mother's awareness of danger of burns	159 (81.1)	216 (92.3)	χ^2 = 12.0, 1df, P=0.001
Household size, mean (SD)	4.47 (1.36)	4.59 (1.53)	t = 0.93, 494 df, P=0.35
Number of room, mean (SD)	3.06 (1.10)	3.41 (1.14)	t=3.53, 486 df, P<0.001
Children 0-5 years per family, mean (SD)	1.51 (0.63)	1.42 (0.59)	t = 1.7, 494 df, P=0.09
Overcrowding index, mean (SD)	1.70 (0.91)	1.49 (0.77)	t=-2.68, 486 df, P=0.008

Maternal awareness of the danger of burn injuries was measured by a direct question to the mother. Just over 81% of cases and 92% of controls said they were often/very often aware of the danger of burns while cooking or working near fire and the remainder said they were never or only sometimes aware (χ^2 = 12.0, 1 df, P=0.001).

3.5.3 Home hazards

Information was collected on a range of home hazards related to burn injury (table 3.41). The most commonly used cooking equipment was kerosene cooker in 1% of both cases and controls while 99% used gas cookers; the most commonly used space heating equipment was kerosene space heater in 100% of cases and 95% of controls and the remainder used air conditioners, electric heaters and gas heaters. Samovars were the most commonly used equipment for making tea in similar proportions of cases and controls (7%); the remainder of families used teapots and kettles. Similar proportions of cases and controls (67% vs. 64%, P=0.53) used kerosene primus stoves, pressurized kerosene stoves and wood for heating bathwater and the remainder used electric boilers. Of those using electric boilers, significantly more cases were not aware of the temperature setting of the boiler thermostat than controls (cases 64%, controls 43%,; χ^2=7.7, 1 df, P=0.006). Home generators were sometimes used by similar proportions of cases and controls (43% vs. 36%, P=0.13) and home storage of petrol was also similar (cases 17%, controls 19%, P=0.59). Smoke alarms were not installed in the homes of any cases or controls. Fire extinguishers were present in similar proportions of homes of cases and controls (16% vs. 20%, P=0.25).

Table 3.41 Comparison of cases and controls in relation to presence of home hazards

Home hazards	Cases Number (%)	Controls Number (%)	P value
Main cooking equipment kerosene cooker	2 (0.8)	2(0.8)	χ^2 = 0.0, 1df, P=1.0
Main heating equipment kerosene heater	245(99.6)	235 (94.8)	χ^2 =10.5, 1 df, P=0.001
Main tea equipment samovar	18 (7.4)	16 (6.5)	χ^2 = 0.2, 1 df, p=0.67
Main bath equipment not electric boiler	165 (66.8)	159 (64.1)	χ^2 = 0.4, 1 df, P=0.53
Boiler temperature not known	52 (64.2)	43 (43.4)	χ^2 = 7.7, 1 df, P=0.006
Home generator sometimes used	105 (42.5)	89 (35.9)	χ^2 =2.3, 1 df, P=0.13
Petrol sometimes stored at home	42 (17.1)	47 (19.0)	χ^2 = 0.3, 1 df, P=0.59
Fire extinguisher not available at home	208 (84.2)	199 (80.2)	χ^2 = 1.3, 1 df, P=0.25
Smoke alarm not installed at home	248 (100.0)	248 (100.0)	
Home hazards score , mean (SD)	3.38 (0.88)	3.18 (0.87)	t=-2.54, 486 df, P=0.01

For further analysis, home hazards described in table 3.39 were summed to form a continuous variable where presence of the hazard was scored as 1 (unsafe) and its absence as zero (safe). The missing values (8 in total) were left as such without recoding. The resulting continuous variable was normally distributed with a mean of 3.28 (SD 0.88). The mean score of the home hazards was significantly higher in cases (mean 3.38, SD 0.88) than in controls (3.18, SD 0.87; t=-2.54, 486 df, P=01)

3.5.4 Child-related risk factors

As shown on table 3.42, child-related risk factors included the following: living with mother or not, main carer, presence of a second carer in absence of the first carer, birth order, presence of an elder sister, pre-school education, child activity score and disability. Cases and controls were similar in relations to living with the mother (χ^2=0.18, 1df, P=0.7), having the mother as the main carer (χ^2=1.2, 2 df, P=0.55), having an elder sister (χ^2=0.0, 1 df, P=1), having attended pre-school education (χ^2=0.3, 1 df, P=0.61), and birth order (χ^2=0.29, 2 df, P=0.87),

There were significantly more disabled children amongst controls than cases (10% vs. 2.0%, χ^2=13.2, 1 df, P<0.001). Controls were significantly more likely to have a second carer than cases (84% vs. 70%, χ^2=14.1, 1 df, P<0.001).

Table 3.42 Comparison of child-related risk factor in cases and controls

Risk factor	Cases Number (%)	Controls Number (%)	P value
Child lives with mother	242 (98)	244 (98.4)	χ^2=0.18, 1df, P=0.7
Child's main carer is mother	240 (96.8)	242 (97.6)	χ^2=1.2, 2 df, P=0.55
Child has elder sister	78 (31.5)	78(31.5)	χ^2=0.0, 1 df, P=1
Child has a second carer	172 (69.6)	208 (83.9)	χ^2=14.1, 1 df, P<0.001
Child has disability	5 (2.0)	24 (9.7)	χ^2=13.2, 1 df, P<0.001
Child attended pre-school education	17 (6.9)	20 (8.1)	χ^2=0.3, 1 df, P=0.61
Birth order			
First child	82 (33.2)	77 (31.1)	χ^2=0.29, 2 df, P=0.87
Second child	71 (28.7)	75 (30.2)	
Third and more	94 (38.1)	96 (38.7)	
Child activity score, median (IQR)	7 (4,8)	4 (3, 6)	z=-9.8, P<0.001*

*Mann-Whitney test

Child activity score was calculated using three behaviors (fidgeting, running about, being on the go) which were coded 0 (never/rarely), 1(sometimes), 2 (often) or 3 (very often). The reliability of the scores were investigated by inter-item and item total correlations and Cronbach's Alpha reliability coefficient. The inter-item correlation coefficients were 0.75, 0.79 and 0.89; the item-total correlations were 0.88, 0.95 and 0.96; and Cronbach's Alpha was 0.93.

The scores of the three questions were summed to form a total score for child activity. Before summation missing values (only one) was recoded to the median score of the item. The child activity score was not normally distributed and ranged from 0 to 9 with the median of 5 (IQR 3, 7). The median child activity score was significantly higher in cases than controls (cases: median 7, IQR 4, 8; controls median 4, IQR 3, 6; z=-9.8, P<0.001).

3.5.5 Univariate odds ratios

Parental education were grouped to 3 logical categories i.e. none to primary education, middle to secondary education and higher (university) education. Child activity which was a continuous variable did not have a linear relationship with the outcome therefore it was dichotomized around the median (≤ median, >median). Home hazards, the other continuous variable had a linear relationship with the outcome therefore it was analyzed as such.

The univariate odds ratios for childhood burns are shown in table 3.43. Parental employment, birth order and pre-school education were not significantly associated with childhood burns while poor living standard, home hazards, family history of burns, higher child activity score and maternal lack of burn awareness were significant risk factors. Children from families with a poor living standard were significantly more likely to sustain burn injuries compared to those from families with fair/good living standard (OR 4.08, 95% CI 2.26-7.35, χ^2=25.6, 1df, P<0.001). Each one score increase in the presence of home hazards significantly increased the risk of child burn by odds ratio of 1.30 (95% CI 1.06-1.60, 1 df, P=0.011). Children coming from families with

previous history of burn injuries were significantly more likely to sustain a burn injury (OR 2.89, 95% CI 1.74- 4.8, χ^2=18.4, 1 df, P<0.001). More active children were more likely to sustain a burn injury; the OR for children with child activity score > median was 5.31 (95% CI 3.51- 8.03) compared to those with score ≤ median (χ^2=64.8, 1 df, P<0.001). Children of mothers who described themselves as sometimes/never aware of the danger of burn injury were more likely to sustain a burn injury by odds ratio of 2.79 (95% CI 1.53- 5.08) compared to children of mothers who said they were often/very often aware (χ^2=12.0, 1 df, P<0.001).

Higher parental education, presence of a second carer for the child, house ownership and disability were significant protective factors. Father's higher levels of education were protective with odds ratios of 0.63 (95% CI 0.42-0.94,) and 0.37 (95%CI 0.23- 0.61) for middle/secondary education and higher education respectively compared to non/primary education (χ^2=16.5, 2 df, P<0.001). Children of mother's with university education were significantly less likely to suffer from burns compared to children from mothers with non/primary education (OR 0.58, 95 CI 0.35-0.95, χ^2=9.2. 2 df, P=0.01).

Children with a second carer were significantly less likely to sustain a burn injury (OR 0.44, 95% 95% CI 0.29- 0.68, χ^2=14.2, 1 df, P<0.001). House ownership was a significant protective factor with odds ratio of 0.65 (95% CI 0.45-0.93, χ^2=25.6, 1 df, P<0.001). Compared to children without disabilities, disabled children were significantly less likely to sustain a burn injury (OR 0.19, 95% CI 0.07- 0.51, χ^2=14.3, 1 df P<0.001).

Table 3.43 Univariate odds ratios for the potential risk factor for childhood burns

	Odds ratio (95% Confidence Interval)	P value Likelihood ratio test
Mother's education		
None/primary	Reference group	
Middle/secondary	1.42 (0.92- 2.19)	χ^2=9.2, 2 df P=0.01
Higher education	0.58 (0.35- 0.95)	
Father's education		
None/primary	Reference group	
Middle/secondary	0.63 (0.42- 0.94)	χ^2=16.5, 2 df, P<0.001
Higher education	0.37 (0.23- 0.61)	
Mother's employment		
Employed	Reference group	χ^2=0.6, 1 df, P=0.5
Housewife	1.16 (0.76- 1.77)	
Father's employment		
Employed	Reference group	χ^2=0.2, 1 df, P=0.68
Unemployed	0.73 (0.16- 3.30)	
Living standard		
Fair/good	Reference group	χ^2=25.6,1 df, P<0.001
Poor	4.08 (2.26- 7.35)	
House ownership		
No	Reference group	χ^2=25.6, 1 df, P<0.001
Yes	0.65 (0.45- 0.93)	
Home hazards		
Increase per score	1.30 (1.06- 1.60)	χ^2=6.5, 1 df, P=0.011
Family history of burn		
No	Reference group	χ^2=18.4, 1 df, P<0.001
Yes	2.89 (1.74- 4.8)	
Overcrowding		
No	Reference group	χ^2=7.12, 1 df, P=0.008
Yes	1.65 (1.14- 2.39)	
Disability		
No	Reference group	χ^2=14.3, 1 df, P<0.001
Yes	0.19 (0.07- 0.51)	
Child activity score		
≤ Median	Reference group	χ^2=64.8, 1 df, P<0.001
> Median	5.18 (3.41- 7.86)	
Presence of second carer		
No	Reference group	χ^2=14.2, 1 df, P<0.001
Yes	0.44 (0.29- 0.68)	
Pre-school education		
No	Reference group	χ^2=0.26, 1 df, P=0.6
Yes	0.84 (0.43- 1.64)	
Birth order		
First	Reference group	
Second	0.89 (0.57-1.39)	χ^2=0.29, 2 df, P=0.8
Third and more	0.92 (0.60-1.4)	
Burn awareness of mother		
Often/very often	Reference group	χ^2=12.0, 1 df, P<0.001
Never/sometimes	2.79 (1.53- 5.08)	

3.5.6 Adjusted odds ratios

Variables which were independently associated with burn injury included poor living standard, child activity score, presence of a second carer, home hazards, disability and family history of burns. The adjusted odds ratios for these factors are shown in table 3.44. There were no interactions or multicollinearity between these variables. The test for goodness of fit for the logistic model was not significant (χ^2=42.7, 52 df, P=0.82). The highest Variance Inflation Factor for the variables was 1.03 (for family history of burns) and the mean VIF was 1.02. This model explained 21% of the variability in burn injury.

Table 3.44 Adjusted odds ratios for risk factor for childhood burns (n=406)

	Odds ratio (95% Confidence Interval)	Wald test z	P value
Living standard			
Fair/good	Reference group	4.48	0.001
Poor	5.54 (2.62- 11.72)		
Child activity score			
≤ Median	Reference group	7.07	0.001
> Median	5.32 (3.35- 8.45)		
Family history of burn			
No	Reference group	3.15	0.002
Yes	2.76 (1.47- 5.20)		
Home hazards			
Increase per score	1.32 (1.02- 1.71)	2.09	0.04
Second carer			
Absent	Reference group	-3.08	0.002
Present	0.42 (0.24- 0.73)		
Disability			
No	Reference group	-2.67	0.008
Yes	0.14 (0.03-0.59)		

Log Likelihood -221.5, χ^2=119.4, P<0.001

Poor living standard and child activity score were the strongest risk factor for childhood burns. Children from families with a poor living standard were more likely to sustain a burn injury than those coming from families with fair/good living standards (OR 5.54, 95% CI 2.62- 11.72, z=4.48, P<0.001). More active children were also at higher risk compared to other children with odds ratio of 5.32 (95% CI 95% CI 3.35- 8.45, z=7.07, P<0.001). Previous family history of burns was significantly associated with a higher

risk of burns to the child with odds ratio of 2.76 (95% CI 1.47- 5.2, z=3.15, P=0.002). Each one score increase in home hazards increased the risk of burns to the child by odds ratio of 1.32 (95% CI 1.02- 1.71, z=2.09, P=0.04).

Presence of a second carer and disability were protective factors. Children with disabilities were significantly les likely to sustain a burn injury compared to children with no disabilities with odds ratio of 0.14 (95% CI 0.03-0.59, z=-2.67, P=0.008). Children who had a second carer were also significantly less likely to have burns than those with no second carer with odds ratio of 0.42 (95% CI 0.24- 0.73, z=-3.08, P=0.002).

Since frequency matching was undertaken for age and sex, these two variables were included in the final logistic model to assess their effect on the odds ratios. The two models were compared using likelihood ratio test. Inclusion of the matched variables did not significantly improve the model (likelihood ratio test χ^2=2.11, P=0.35) and the adjusted odds ratios for the other risk factors were similar to the model without the matched variables.

Theoretically, previous history of burns in other family members could have resulted in safer practices in the family and hence lower probability of burns in the child under study. To check for this possibility the logistic model was repeated without this variable. This had little effect on the model which explained 19% instead 21% of variability in childhood burns. The odds ratios for other variables were as follows: poor livings standard 5.18 (2.48-10.81), child activity score 5.40 (3.42-8.53), home hazards 1.39 (1.08-1.80), second carer 0.41 (0.24-0.72) and disability 0.15 (0.36-0.64).

Chapter four

Discussion

The main sections of this chapter are divided into 4 sub-sections in line with study objectives i.e. incidence and other characteristics of burn injuries, mortality, intentional self-harm burns, and risk factors for childhood burns.

4.1 Key results

4.1.1 The incidence and outcome study

4.1.1.1 Incidence and other characteristics of burn injuries

During one year of prospective data collection 2975 patients including outpatients and admissions participated in the study of whom 52% were females. The median age was 18 years and the largest single group was children aged 0-5 years accounting for 32% of all burns.

For the first time in the region, this study calculated the incidence rate of burn injuries in Sulaymaniyah city, which was 389 (female 398, male 379) per 100,000 per year. The highest incidence was observed in children aged 0-5 years being 1044 (female 1030, male 1057) per 100,000 per year. The incidence rate was not significantly different between males and females except amongst people aged 16 years and over which was 316 (female 337, male 295) per 100,000 per year with a female to male incidence ratio of 1.14 (1.03-1.27).

Scalds comprised 53% of all burns in all participants, 80% in children aged 0-5 years and 37% in adults aged 15 years and over. Scald and flame injuries were significantly more common in females while contact burns and other mechanisms were more common in males. The majority of flame burns (52%) were caused by three types of equipment i.e. pressurized kerosene stoves, gas cylinders and small kerosene primus stoves while the majority of scalds were caused by tea utensils i.e. teapots, kettles and cups (56%). The most common sites of injury were upper limbs for flame injuries (79%), lower limbs for scalds (56%) and upper limbs for contact burns (42%).

Overall, 83% of burns occurred at home with the kitchen being the commonest room for home burns (40%). Significantly more females were burnt at home than males (female 96%, male 68%). The most common time of injury was around lunchtime. Burns were significantly more common in January (11% of all burns) and in winter (31% of all burns).

Treatment used by patients and their families immediately after the incident included no treatment (38%), pouring cool water on the burnt site (36%), application of medical preparations (14%) and application of traditional remedies (12%) including toothpaste, yogurt, tomato paste and others.

Admitted patients: There were 884 admissions during the year of whom 58% were females (female to male ratio 1.35). The median age was 18 years and young people aged 15-29 years were the largest group accounting for 40% of all admissions.

The annual admission rate in Sulaymaniyah province was 40.4 (female 46.2, male 34.6) admissions per 100,000 per year with a rate ratio of 1.34 (1.15-1.55). The highest admission rate in the province was amongst children 0-5 years of age being 82.3 (female 67.4, male 97.4) per 100,000 per year with a female to male rate ratio of 0.69 (0.52-0.92). The strongest sex difference in admission rates was amongst people aged 16 and over with an overall admission rate of 36.8 (female 48.7, male 24.8) per 100,000 per year and a female to male rate ratio of 1.97 (1.59-2.42).

Flame burns comprised 64% of all admissions and 86% of admissions in adults aged 15 years and over while scalds comprised 30% of all admissions and 84% of admissions in children aged 0-5 years. Significantly more females than males were burnt at home (96% vs. 68%). The median TBSA burnt was 18% (mean 30%) and the TBSA was >50% in 20% of patients. The median TBSA burnt was significantly greater in females (25%), in young adults aged 15-29 years (30%), in flame burns (26%) and intentional self-harm burns (74%). The median hospital stay was 8 days, which was significantly shorter in intentional self-harm burns (4 days) and in patients who died (4 days).

4.1.1. 2 Mortality and other outcomes

The all-age mortality rate from burn injuries was 9.1 (female 15.6, male 2.5) per 100,000 per year in Sulaymaniyah province with a rate ratio of 6.29 (3.97-9.97). The highest mortality rate was observed in female adults aged 16 years and over which was 19.4 deaths per 100,000 per year.

In-hospital mortality was 28%. In-hospital mortality was significantly higher in females (40%); young adults aged 15-29 years (44%); flame burns (40%); inhalation injuries (78%); and intentional self-harm burns (88%). The independent risk factors for death were TBSA, older age, inhalation injury, self-harm, autumn season, and residence in other provinces. The adjusted odds ratios for death were as follows: 36.43 (15.93-83.31) for TBSA burnt ≥ 40%; 5.36 (1.56-18.48) for age ≥ 60; 3.55 (1.72-7.32) for inhalation injury; 5.63 (2.45-12.92) for intentional self-harm burns; 2.98 (1.29-6.84) for autumn season and 2.77 (1.30-5.90) for residence in other provinces.

The causes of death were reported as septicaemia (65%) and inhalation injury (35%). Wound infection was common (98% of examined swabs) and the most commonly isolated species were pseudomonas (28%), *Staphylococcus aureus* (25%) and Klebsiella 11%). Readmission rate was 8% during the year. Compared to patients who had no readmissions, readmitted patients included significantly less scald injuries (16% vs. 31%), less self-harm burns (14% vs. 24%) and more burns that occurred outside the home (27% vs. 15%). Of the survivors, 14% reported long-term consequences. Amongst

these patients with consequences, hypertrophic scars were the most common (58%) followed by deformities (39%) and limitation of joint movements (33%).

On a scale with the highest quality being 4, the median quality of life score of patients was 3.35. The highest quality of life scores were reported for hand function and interpersonal relationships, and the lowest scores were reported for pain and discomfort. The majority of patients (83%) reported pain and discomfort, 54% reported problems with usual activities and 46% reported anxiety and depression. A lower quality of life was associated with flame injuries, a greater TBSA burnt, more operations and more than 15 days of hospital stay.

4.1.1.3 Intentional self-harm

Intentional self-harm burns comprised 22% of all admissions. The annual incidence rate of intentional self-harm burns was 8.4 (female 15.5, male 1.2) per 100,000 in Sulaymaniyah province with a female to male rate ratio of 13.12 (6.90-24.94). These patients were most commonly females (94%), aged below 30 years (79%) and with no or only primary education (68%) and the incident most commonly occurred at home (98%) and in spring season (35%). The median age was 20 years, the median TBSA burnt was 74% and in-hospital mortality was 88%. The most commonly reported precipitating factors for self-harm included family problems (49%) and marital problems (43%).

The independent risk factors for attempting self-harm were female sex, young age of 11-18 years, education below secondary school, spring season and small family size. The adjusted odds ratios for self-harm were as follows: 13.75 (6.91-27.36) for female sex; 3.92 (2.20-7.0) for young age of 11-18 years; 2.50 (1.15-5.45) for education below secondary school; 2.39 (1.3-4.41) for spring season; and 2.72 (1.44-5.15) for small family size of 1-3 members.

4.1.2 The three-year admissions study

There were 2,829 acute burn admissions from January 2006 to December 2008 with an overall in-hospital mortality rate of 27%. There was similar number of patients in each year with no significant differences across the three years in terms of sex, median age, median TBSA burnt, season of burn and in-hospital mortality. Hospital stay was longer and there were more patients from other provinces in 2008 compared to the previous years.

4.1.3 The case-control study

The case-control study included 248 cases of children aged 0-5 years attending the burns centre for a new burn injury that occurred at home, and 248 control children of similar age admitted for 34 different conditions at the Children's Hospital. Cases and controls were residents of 39 neighbourhoods of Sulaymaniyah (37 in common). Cases included scalds (79%), contact burns (17%) and flame burns (4%). The most common equipment associated with injury were tea utensils (42%), kerosene stoves (36%) and kitchen crockery (15%). The sitting room was the commonest room of injury (53%) followed by the kitchen (36%).

A range of risk factors for childhood burns were analysed in the case-control study. The independent risk factors were a poor living standard, higher child activity score, family history of burns, home hazards, disability (protective) and presence of a second carer (protective). The adjusted odds ratios for these factors were as follows: 5.54 (2.26-11.72, P=0.001) for a poor living standard; 5.32 (3.35-8.45) for higher child activity score; 2.76 (1.47-5.20) for history of burns in family members; 1.32 (1.02-1.71) for each one score increase in home hazards; 0.42 (0.24-0.73) for presence of a second carer to the child and 0.14 (0.03-0.59) for presence of disabilities.

4.2 Strengths and limitations

To the researcher's knowledge, the current study is the most comprehensive study undertaken on epidemiology of burn injuries in Iraq involving both outpatients and admissions using prospective data collection and more than one study methodology.

Data in the current study were not limited to hospital records. Using a well-researched questionnaire, comprehensive information was collected covering demographic data about the patient, his/her family and home environment; circumstances of the injury; burn characteristics and clinical data from admission until discharge or death.

The prospective data collection for a complete year was another strength of the study. Information was prospectively collected from patients soon after injury when they attended the burns centre. Face-to-face interviews with the patient or close relatives in the burns centre made it possible to collect detailed and good quality data about all exposures of interest.

The study included several methodologies, which enabled achievement of several objectives at the same time. The one-year incidence and outcome study provided detailed information on incidence and epidemiology of burns; the case-control study investigated the risk factors for childhood burns and the three-year admissions study provided an overview of hospital admission during 2006-2008. Apart from providing more information, undertaking these studies together saved time and resources.

The sample was large. The analysis of burn epidemiology in Sulaymaniyah was based on data from 2975 participants interviewed during one year. In addition, participation rate was high (81%) and the proportion of missing data was low (0.3%). Therefore, the results are likely to be more inclusive and accurate. Some data were available on non-participants, which made it possible to compare them with the participants.

Another strength of the incidence and outcome study was investigation of the risk factors for intentional self-harm which is rare in the published literature. This was

possible through comparison of the prospectively collected information on demographic characteristics of accidental burns with those of self-harm burns.

The strengths of the case-control study lie in use of incident cases, the high participation rate (100%), its restriction to children 0-5 years burnt at home, and investigation of a wide range of risk factors related to the child, the family and the home environment.

Despite the strong points mentioned above, there were some limitations and possibility of bias in the results. The potential sources of bias in each study methodology were discussed under relevant sections of chapter two. In this section, the possible effects of such bias on the study results as well as other limitations will be discussed in line with study objectives.

Since this study was undertaken in Sulaymaniyah province the results could not be automatically generalized to other parts of Kurdistan and Iraq. Regarding Kurdistan, however, all provinces share the same culture, ethnicity and socioeconomic circumstances and they are ruled by the same political administration. Therefore, until data from other provinces are available, the results of the current study could be considered the best estimates of the Kurdish region for reporting and health planning purposes.

It is also worth mentioning that the population figures used in the current study are only the best estimates for 2008 provided by the department of statistics since there has not been a general census in the Kurdish region since 1987. Therefore, the accuracy of incidence rates calculated in this study depends on the accuracy of the population figures.

Lack of funds was a constraint, which influenced the study particularly the fieldwork. The researcher had to undertake almost all the fieldwork alone including interviewing all participants of the incidence and outcome study, the cases and participants of the quality of life study (more than 3,000 interviews). In addition, he had to extract all information from hospital records of patients admitted to hospital during 2006 and 2008. He also

undertook all data entry. This workload was one of the practical reasons in favour of using hospital-based controls rather than community-based controls, which obviously requires financial and human resources more that what was available for the researcher. The workload also contributed to the low participation rate in the quality of life study because the researcher had no time to make an active effort to find patients who failed to come to hospital. The study would have been more efficient had there been no such constraints in terms of financial and human resources.

The proportion of missing data was 0.3% in the incidence and outcome study and 0.4% in the case-control study. The error rate in data entry was 1.9% in the incidence and outcome study, 1.8% in the case-control study and 1% in the three-year admissions study. The errors and missing values were not restricted to particular variables. For example, 194 errors in data entry of a sample of observations were distributed amongst 93 out of 204 data points and the missing values were distributed over 43 variables out of 97. This is an indication that the errors and missing values were probably random and have not biased the results.

4.2.1 The incidence and outcome study

4.2.1.1 Incidence and other characteristics of burn injuries

Participation rate was high in the incidence and outcome study (81%) and there was only 0.3% missing data for the main variables. The non-participants were all outpatients so participation rate for admissions was 100%.

Enough information was available for non-participants to include them in calculation of the incidence of burn injuries. Therefore, the incidence rate of 389 per 100,000 per reflects the true incidence of burns attending the burns centre. However, it is likely that some minor burns have not attended the burns centre but reported to the health centres in the city. The best estimate for the number of these patients could be obtained from a pilot programme for burn registration in all health centres of Sulaymaniyah. The

Preventive Health Department of Sulaymaniyah (PHD) introduced this pilot programme after a suggestion from the researcher but unfortunately, it was discontinued after one month when the manager of the PHD was replaced. During October 2007, the only month of the programme, 30 new burns patients were treated in health centres in the city who did not require referral to the burns centre. Based on this number, there was an estimated 360 patients during the year of the study who were treated in the health centres without attending the burns centre. If we account for these patients, the more accurate incidence rate of all medically reported burn injuries in the city including those who have reported to the burns centre and other health facilities is likely to be around 440 per 100,000 per year.

It has to be noted that the incidence calculated above is for medically-reported injuries. It is likely that there were burn patients who did not present to the burns centre or any other health facility. This study was not designed to estimate the number of those patients and therefore it is likely that the incidence of all burn injuries, both medically-reported and not-reported will be higher than the incidence calculated in this study.

The admission rate of 40.4 per 100,000 per year is likely to be a true representation of the reality in Sulaymaniyah since all admissions were included in the calculation and there are no other hospitals where burns patients might be admitted. The population data used for all incidence calculations were the best available which was provided by the department of statistics for 2008.

The non-participants (n=682) who were all outpatients, were significantly different from participants (n=2975) in terms of age and mechanism of injury; there were less children and more scald injuries amongst non-participants. These people were more likely to be adults with less severe scald injuries who did not require follow-up visits or they attended other facilities for follow-up. Exclusion of this group has probably biased the results related to some characteristics of all burn injuries. Based on the little information available on non-participants, we can estimate the effect of non-participation on certain results. For example, the proportion of children 0-14 years was 44% in participants but if we include both participants and non-participants in the calculation, the overall

proportion of children will decrease by 1% to 43%. In the same way, the proportion of scald injuries was 53% in participants but if we include both participants and non-participants in the calculation, the proportion of scalds will increase only by 1.5% to 54.5%. As these non-participants were all outpatients, mortality and other characteristics of admitted patients are not affected.

Since information on the exposures was mainly collected using face-to-face interviews or from medical records, reporting and observer bias could not be ruled out. Interviewer blinding was not possible. Information about the intent of injury is potentially subject to bias in terms of self harm (see also page 187) and assault especially as legal implications were involved. The probability of denial of the true intent could lead to misclassification of intent, especially self-harm and assault, to other categories of intent leading to their under-estimation. Certain measures were probably effective in minimizing reporting bias such as undertaking the interview in the burns centre and as soon as possible after the injury which encourages participation and recall which is likely to be better in hospital; encouraging the interviewee to participate and provide information by conducting a friendly interview and giving feedback.

4.2.1.2 Mortality and other outcomes

All patients admitted to the burns centre were included in the study and the main outcome (death or survival) was ascertained for all of those who stayed in hospital (91%). The remaining 9% were discharged against advice or transferred to other hospitals and their outcome could not be ascertained. When these two groups were compared in relation to risk factors for death i.e. TBSA burnt, inhalation injury, age, season of burn, intent and residence, they were only significantly different in terms of inhalation injury. As inhalation injury was only one of several significant predictors of death, of which the TBSA burnt was the strongest (table 3.21), it is likely that the mortality rate of the excluded groups was lower than that of the included group, although probably not considerably. Therefore, in-hospital mortality of 28% is probably a little higher that the actual mortality had all patients stayed in hospital.

The accuracy of the mortality rate in the population of Sulaymaniyah province (9.1 per 100,000 per year) depends on accuracy of the numerator and denominator data. The denominator i.e. the province population was the estimate for 2008 obtained from the department of statistics. The accuracy of this figure could not be substantiated since no census has been undertaken in the region since 1987. However, it is the best estimate available at the department of statistics. Any possible inaccuracy of the population figure will inversely affect the calculated mortality rate.

The numerator, i.e. number of burn deaths is likely to be an underestimation. In the current study, there were 155 deaths amongst residents of Sulaymaniyah province but obviously, some deaths have occurred outside the burns centre. An estimate of the number of deaths that occurred outside the burn centre could be obtained from two sources; the 73 patients who were excluded from the mortality analysis and statistics obtained from the Civil Defence Department (fire services).

Seventy-three patients were excluded from the mortality study because they were discharged against advice or transferred of whom 59 patients were from Sulaymaniyah province. The in-hospital mortality of patients from Sulaymaniyah province was 22% in the current study. If we apply this in-hospital mortality on the 59 patients, we would expect that 13 of them would have died. Statistics from the fire services report 25 deaths in the province on the scenes of their activities during 2008, around 20 of them in fires. These deaths were not brought to hospital. Therefore, there will be at least 33 deaths (13+20) not included in our calculation of the mortality rate in the population of Sulaymaniyah province. If we account for these deaths, the more accurate mortality rate of burns in Sulaymaniyah province is likely to be around 11.0 per 100,000 per year rather than 9.1.

The adjusted odds ratios for death should be interpreted with several considerations in mind. The TBSA burnt, which was the strongest predictor of death, was measured by the clinician using a standard chart with no missing values. In terms of its effect, since survival was very rare when TBSA was greater than 50% and the effect was not linear, TBSA was dicotomized at 40%. The presence or absence of inhalation injury was

ascertained clinically by the attending doctor based on history and physical examination. Other risk factors were measured by the interviewer with no missing data for any of them and probably no major concern about lack of accuracy.

A wide range of risk factors for death were included in the analysis and their confounding effects were controlled using logistic regression. A potential confounder which was not possible to control was the degree of burn injury because information on degree of burn was not recorded on patients' files. Therefore, the probable effect of degree of burn has likely confounded the association of death with one or more other risk factors. Judging from the P-values, the probability of type I error (false positive result) was less than 0.1% for some risk factors (TBSA, inhalation, intent) and only 1% for other (old age, autumn season and residence in other provinces).

Only two causes of death are reported in this study namely septicaemia and inhalation. This reflects the actual practice in the burns centre where cause of death was ascertained and reported based on clinical judgement. Therefore, one has to be cautious about interpreting the cause of death in this study.

The quality of life results are subject to selection bias since patients did not have the same chance to be recruited. As a result of limited resources, only patients who visited the burns centre after discharge were interviewed and no active efforts were made to follow-up those who failed to attend the burns centre. Therefore the sample was small and hence probability of random error and type II error (false negative) are likely to be high. It is likely that interviewed participants were not a random sample of all those who were eligible. It is possible that patients with more post-burn problems were more likely to have been included in the study, as they required more follow-up visits to the burns centre. However, it is also possible that patients with more extensive and severe injuries were less likely to have been included as they needed more time to have their wounds healed in order to be eligible to the final police report, which was the time of recruitment for the study. The effects of these two potential sources of bias are in opposite directions; the former towards a lower quality of life and the latter towards a higher

quality of life. It is therefore difficult to estimate the likely effect of such bias on the results of the study.

In addition the probability of selection bias, the quality of life questionnaire was modified and certain embarrassing questions were removed. Although the validity of the remaining items were analysed by inter-item and item-total correlation and Chronbach's alpha, the questionnaire was nonetheless not as inclusive as before in measuring quality of life. Information could not be obtained on certain aspects of quality of life such as sexuality because this domain was removed from the questionnaire and hence the content validity of the questionnaire may be in question. This is a limitation of the study which was deliberately introduced during piloting to respect the will of the patients.

4.2.1.3 Intentional self-harm

Intentional self-harm as an outcome was ascertained for the cohort of all patients admitted to hospital during the year. There were 884 admissions including 197 self-harm burns. The comparisons were made between self-harm burns (n=197) and non-self-harm burns aged 11 years and over (n=400) because the youngest self-harm victim was 11 years old. Both comparison groups were derived from the same population which was the catchment area of the burns centre. It is likely that both self-harm and accidental groups were good representations of the same reference population because each group included all patients who were admitted for the corresponding reason (i.e. self-harm or accidental burns) during the year.

It has to be remembered though that the comparison group was accidental burns. The burnt population is probably different from the normal population in certain characteristics in which case the burnt patients would not be as good as a random sample from of the population. A study comparing self-harm burns with a random sample from the population of non-burnt patients could be more inclusive in terms of risk factors studied and probably less likely to be affected by selection bias.

Information bias leading to misclassification is theoretically likely because some patients might have denied the true intent of their injury. The need to produce a police report and the legal implications of intentional self-harm might have strengthened this probability. Such bias could lead to differential misclassification which could affect the odds ratio in either direction depending on how more or less patients were likely to report self-harm. To minimize this information bias, the question about real intent was repeated for suspected patients (high TBSA, inconsistent story, and suspicious behaviour of relatives) throughout the course of hospitalization, and the outcome was ascertained whenever the patient or his/her companion confirmed it Information bias in measurement of the exposures is less likely as discussed in the previous section.

Calculation of the incidence rate of self-harm was based on the number of self-harm patients who where residents of Sulaymaniyah province (n=143) and admitted to hospital. Therefore, the incidence rate reported in this study represents self-harm burns ending in admission. It is likely that some less severe self-harm may be not require admission or attend other health facilities. It is also likely that some very severe self-harms burns die before arriving at hospital. Therefore, the incidence of self-harm burns including both admissions and outpatients will be higher that the incidence rate reported here for admitted self-harm burns.

4.2.2 The three-year admissions study

The way the files of each year were numbered sequentially according to date of admission and their proper storage in separate bundles of 100 files each, made it possible to be sure that all files were included in the study. Data for most variables were complete except inhalation which was therefore excluded in the analysis. Complete data was also not available on the number and outcome of patients who were discharged against advice or transferred to other hospitals. In-hospital mortality was therefore calculated assuming alive all these patients, which could cause the mortality figure to be different from the actual had the mortality experience of these patients been known.

4.2.3 The case-control study

One of the strengths of the case-control study was the prospective recruitment of cases (incident cases) whereby all eligible newly burnt children seen in the burns centre during the period of case recruitment were included in the study. This makes selection bias less likely. There were some potentially eligible cases that were missed, but there is no reason to think that these children were systematically different from those included in the study in terms of their risk factors. Exclusion of these children was related to the pattern of their injuries rather than the risk factors; they were missed (i.e. excluded) mostly because they attended the burns centre in the evenings and/or for mild injuries.

Controls were also derived from the city's child population. Like the cases, controls were hospital-based based and certain measures were taken to minimize possibility of selection bias and make sure that they represented the reference population (section 2.3.3.2). As mentioned in section 3.5.1, the controls were similar to the population in terms of household size, employment, female education, pre-school education, house ownership and use of cooking and heating devices. Another indication of representativeness of the controls was that controls were derived from 37 of the 39 neighbourhoods from which cases were recruited.

Cases and controls were interviewed by different interviewers but both of them were adequately trained. Blinding of the interviewers was not possible because both the researcher himself and the other interviewer were aware of the hypothesis being tested. This could have biased the effects towards a stronger association of burns with the hypothesized risk factors such as education and poor living standard. However, while poor living standard was ultimately found to be a strong risk factor, poor education was not found to be so.

The measurement of certain risk factors and the probability of reporting bias must be kept in mind while interpreting the odds ratios. For example, child activity score was applied to children aged one year and more who have started walking and a more active child is one having a child activity score higher than the median score for the sample.

Since measurement was based on carer reporting, reporting bias could not be excluded. It could be easily argued that a mother of a case will be likely to exaggerate in reporting the activity of her child to imply that she was not to blame for what has happened to the child. The mother of a control child, though, may not have to do this. This situation leads to exaggeration of the effect of child activity score.

Measuring the living standard was based on self-reporting. However, to increase the accuracy of the measurement, a 4-point scale from "poor", "fair", "good" and "very good" was used. In the analysis "poor" was compared with other categories combined. An indication for validity of this measurement is its significant association with house ownership and car ownership. Only 24% of "poor" families lived in their own houses vs. 70% of other families (χ^2 =53.0, P<0.001) and only 10% of "poor" families owned a car vs. 55% of other families (χ^2=49.1, P<0.001).

Family history of burns is another risk factor that could be subject to reporting bias. Mothers of cases, who were in hospital for a new burn injury, might have had better recall of a family history of burns compared to mothers of control children, although it could be argued that a traumatizing experience like that of a burn injury is probably less likely to forget than less dramatic health conditions A better recall of family history of burns in cases may lead to exaggeration of the odds ratio.

Disability was found to be a protective factor in this study. This may be logical in the sense that disabled children may be more supervised and less active physically and therefore may be less prone to burns especially as child activity score was a strong risk factor in this study. However, selection bias could also have contributed to its effect. It is possible that disabled children had a higher chance of being included in the controls than cases because the controls were hospital-based and disabled children are more likely to be in hospital than non-disabled children. Such bias could lead to exaggeration of the protective effect of disability on childhood burns. However, the same thing could be said about community-based controls. If disabled children are more likely to be in hospital, then they will have less chances of inclusion in a community-based sample of controls.

4.3 Comparison with other studies and Interpretation

4.3.1 The incidence and outcome study

4.3.1.1 Incidence and other characteristics of burn injuries

Incidence of burns: The overall incidence rate of 389 burns per 100,000 is higher than the EMR rate of 187 per 100,000 per year[21] and rates reported from other countries such as 140 in the United States[17], 170 in Norway [15], 260 in Lithuania[14], 273 in Iran[28] and 280 per 100,000 per year in Netherlands [206]. However, other studies from the region have reported similar or higher rates such as 410 and 418 in Iran [16, 45] and 476 per 100,000 per year in Pakistan [142]. It is noteworthy that the incidence rate in the current study is very close to the former rate of 410 reported by Groohi et al from Kurdistan province of Iran, which is geographically adjacent to Sulaymaniyah province and shares a similar ethnicity and culture. Although the all-age incidence rate is higher in females but the difference is not significant. Conversely, in children aged 0-5, the incidence rate is more in boys but again the difference is not significant.

Children aged 0-5 years have the highest burn incidence rate of 1044 per 100,000 per year. This means that out of every 100 children one suffers a burn injury each year. This is consistent with the fact that young children are at a higher risk for burn injuries. High rates in young children are reported from other countries such as 660 per 100,000 amongst children aged 0-4 years in the USA[91], 782 (only non-fatal burns) in Bangladesh[207] and 1,388 per 100,000 reported amongst children below 5 years by a study from Pakistan based on recall[142].

The calculated incidence rate indicates that burn injuries are a major public health problem in Sulaymaniyah. In the absence of data on other injuries, it is not possible to estimate how much burns contribute to injury morbidity, but probably it would be one of the most common causes particularly amongst children. In Iran, a neighbouring country with burn incidence similar to that of Sulaymaniyah, burns have been reported as the most common cause of home-related injuries[159].

Some of the factors that contribute to the high incidence of burns in Sulaymaniyah could be related to the unavailability of sufficient electricity. Power has been a constant problem since 1992 in Iraqi Kurdistan. During the time of the current study, families in Sulaymaniyah were getting around 10 hours electricity from the national grid and for the remainder of the day they relied on generators providing enough power only for lighting purposes. Many families have no choice but to depend on kerosene for space-heating, bathwater heating and occasionally even for cooking. A wide variety of kerosene stoves are available for use by the families. As kerosene is very expensive especially during cold seasons (over $100 per barrel), families store kerosene at home in big containers sufficient to cover their need during the cold season. In addition, because of fluctuations in its price, many families store petrol at home for their generators. It is likely that presence and use of heating and cooking devices and other equipment and products (such as malfunctioning gas cylinders) at home as well as family attitudes and practices regarding home safety, contribute to the high incidence of burn injuries.

Admission rates: According to this study, one of every four patients attending the burns centre for a new burn injury was admitted to hospital (admission rate 24%). The reason for this high admission rate in the burns centre is that the majority of patients who came from outside the city and from other provinces were admitted to hospital (69%) because of more severe injuries. Fewer outpatients from these areas attended the burns centre because of their geographical distance. A more realistic admission rate will be admission rate for Sulaymaniyah city alone calculated from only patients who were residents of the city. Admission rate for patients coming from Sulaymaniyah city was 11%.

The annual population admission rate of burns in Sulaymaniyah province was 40.4 (female 46.2, male 34.6) admissions per 100,000 per year which is higher than rates reported by Iranian studies although the higher rates in females are consistent with those studies. Reported admission rates from different provinces of Iran range from 13.0 to 19.0 admissions per 100,000 per year, males from 9.1 to 15.5 and females from 15.2 to 22.8 admissions per 100.000 per year [16, 28, 53, 141, 144]. Studies from other countries have also reported lower admission rates than the current study including USA, UK, Norway, Spain and Singapore [23-27]. Only a study from Lithuania[14] has

reported an admission rate of 40.0 per 100,000 per year which is close to the current study. This high admission in Sulaymaniyah rate could reflect a higher incidence of burn injuries. However, it could also be due to different admission policies and/or presence of more severe burn injuries in Sulaymaniyah. The last two reasons could be more relevant in comparison with Iran, which has a comparable incidence rate of burn injuries to that of Sulaymaniyah but a lower burn admission rate.

The higher admission rate in children aged 0-5 years (82.3 per 100,000 per year) is consistent with other studies although the reported incidence rates are not as high as that of the current study. For example a study from Kuwait including children aged 0-14 years reports an incidence of 17.5 per 100,000 per year with the highest rate of 34.0 admissions per 100,000 per year amongst children aged 0-4 years[145]. A study from Iran reports an admission rate of 20.8 per 100,000 per year amongst children aged 0-15 years with the highest rate of 102.8 admissions per 100,000 amongst children aged 0-1 years[87]. Other reported rates in children are 67.0 amongst children aged 0-4 in New York[23] and 22.3 amongst children aged 0-5 in Iran[16]. In terms of the higher admission rate in boys compared to girls (boys 97.4, girls 67.4), other studies have reported similar findings such as 25.5 per 100,000 in boys aged 0-5 years and 18.8 in girls of the same age[16]; 45.8 in boys aged 2-3 years and 28.1 in girls of the same age[87].

Age: The median age for all burns including outpatients and for admitted patients separately was 18 years (mean 20 years) in both cases which is similar to the mean age reported by other studies from the EMR (table 1.4). This reflects the fact that burn patients are mostly children and youth; indeed 74% of burns in Sulaymaniyah were below 30 years of age. Children 0-5 years of age comprised 32% of all burns in the current study which is consistent with the WHO injury report stating that children under 5 are at the highest risk of burn injuries [22] and with many studies around the world that report similar findings [23, 45, 49, 57, 61, 65, 145, 149]. A recent study from Erbil Province of Iraqi Kurdistan reports that 49% of admissions were to children aged 0-12 years[175]. Pre-school children spend most of their time at home near various kinds of

heating and cooking equipment and products that put them in the danger burns particularly scald and contact injuries.

Sex: Females comprised 58% of admissions in the current study. This higher proportion of female burn admissions is consistent with that of many low-income and middle-income countries such as 53% in Egypt[35], 56% in India[36], 56% in Iran[28], 64% in Sri Lanka[37] and 67% in Turkey[38]. Studies from high-income countries report higher proportions in males [24, 29-34]. This preponderance of female burns in the current study is likely to be related to the role of women in the family where they take care of cooking, baking and other functions involving heating and cooking equipment. In addition, young females are more likely to be affected by intentional self-harm burns. This interpretation becomes more convincing when we notice that 84% of burns occurred at home and 94% of intentional self-harm burns were females.

The nature of clothing is also an important factor in causation of female burns. The majority of females in this study (59%) were wearing flammable synthetic/nylon clothing during the incident compared to only 8% in males. The style of traditional Kurdish women's dress being a long loose gown covering the body from shoulders to heels may also be important. This nature and style of clothing increases the likelihood of flame burns, both in number and severity, in women when they work near fire.

Mechanisms of injury: Scalds comprised the majority of all burns (52%) but only 30% of those admitted to hospital while flame injuries comprised the majority of admissions (64%) but only 34% of all patients. Contact burns comprised 7% of all burns and 2% of admissions. This indicates that flame burns are likely to be more severe and require admission. Consistent with this study, the majority of studies from the EMR report a higher proportion of flame injuries than scalds amongst admitted patients ranging from 41-76% of all burns [16, 28, 35, 72-74, 143, 147-149].

Scalds were the most common mechanism of injury amongst all children aged 0-14 years (74%) in the current study which is consistent with other studies from the region reporting 54-67% scalds in children [87, 145, 153, 165, 166, 175]. It is also consistent

with studies from other countries such as 58% in Turkey[88], 64% in India[89], 68% in Israel[57] and 75% in Netherlands[13]. Scalds were even more common amongst younger children comprising 80% of burns in children aged 0-5 years. Hot water alone was responsible for 57% of all scalds, tea for 26% and hot liquid foods for 15%.

Equipment and products: Tea is the main hot beverage in the Kurdish society where according to the current study 89% of families use kettles and teapots for making tea and 11% use a samovar. Tea is served after all meals, for guests, and with snacks. Therefore, it is understandable that these types of tea-making equipment along with cups are responsible for 60% of all scalds. Cooking and eating equipment such as food bowls, dishes and jugs filled with hot water or hot liquid foods such as soup or broth during preparation or serving, were responsible for 26% of all scalds. The majority of these scalds involve children and are potentially preventable through following safe practices in food and drink preparation and serving and child supervision.

Less that 5% of scalds occurred to people, mainly drivers, by water splashed from car radiators especially in hot months while checking their car radiators. Plastic taps fitted to hot water outlets dislodging during use (because of high water temperature and poor quality the plastic taps), and non-standard pressure cookers bursting on the cooker or during handling were responsible for 5% of scald injuries during the year. These scald injuries are potentially preventable if safer equipment and products are used and necessary safety precautions are taken during usage.

Equipment and products responsible for flame injuries were more diverse but the majority of them were home equipment used for cooking or heating. Kerosene-operated pressurized stoves, which are mainly used for baking bread and heating bathwater in homes, is responsible for 19% of flame injuries. According to the patients, one situation in which this equipment causes burns is when the equipment turns off and the person tries to lit it again in which case the accumulated vapour of kerosene in the enclosed area (particularly when used in bathrooms) ignites and burns the person. The second situation according to the patients, usually happens when suddenly the tiny outlet enlarges (probably due to dislodgment of some pieces) and the augmented flame burns the person

near the equipment. The use of this pressurized stove is an old tradition for baking bread in families who still bake their bread at home, as well as an obligation by many families because of lack of power or lack of alternative equipment. Awareness on safe use and handling of this equipment is necessary to prevent some of these flame burns caused by them. The government could also play a role by enforcing certain standards for their manufacturing.

Almost all urban families use propane gas cylinders at home. These cylinders were responsible for 18% of flame injuries. According to patients, the burns were mainly caused by leaking cylinders. Most of these cylinders are decades old and as they are not handled carefully by the vendors (usually the filled cylinder is dropped down from the vehicle when it is exchanged for an empty one), many of them have become indented, unstable and leaking. Another factor contributing to the risk of these cylinders is that families usually place the cylinder near the cooker inside the kitchen. The majority of the so-called "gas explosions", as described by patients, occurred when the cylinder have being leaking for some time and gas accumulated in the kitchen. This accumulated gas was ignited when a source of flame was turned on such as matches, lighters, turning on an electric switch or even by just opening the kitchen door causing a draft of gas to flow to a kerosene stove in the adjacent room.

Prevention of these burns requires action from the government and the families. The government has to make sure that all malfunctioning cylinders are withdrawn from use and a cylinder inspection programme is enforced on vendors. The families can improve their safety by placing their cylinders away from the cooker in an open space and undertake inspection of the cooker and its appendages regularly. They have also to make sure that young children are not allowed to play with the cooker knobs.

Many poor families, who cannot afford to buy safer and more standard equipment, use a small kerosene primus stove (chule) to heat bath water or even for cooking. In the current study, 34% of families used this equipment for bathwater heating. This stove has a low-capacity fuel tank and as it is small and usually used in enclosed places such as under a barrel, the fuel tank gets heated easily causing the pressure inside to rise.

Kerosene primus stoves were responsible for 15% of flame burns. According to patients, the incident usually occurred when the person tried to move and/ or refill the tank whiteout turning it off, which caused the device to catch fire.

Place of injury: Home is the most common place where burns occurred in the current study (overall 83%, female 96%, male 68%). This is similar to studies from the EMR reporting that 72-94% of all burns occurred at home[28, 87]. Similar results are also reported from other countries [17, 37, 38, 50, 69, 79-90]. It is important to note from a preventive perspective that 83% of all scalds and 88% of scalds amongst pre-school children in Sulaymaniyah occurred in the kitchen and sitting room. These two rooms were also responsible for 74% of contact burns amongst the same children. Families and hence small children spend most of their time in these two rooms where food and tea are served and cooking and heating equipment are usually operated.

Season of injury: In the current study winter was the most common season of burn injuries comprising 31% all burns, a finding consistent with other studies from the region where winter accounts for 28-31% of burns in several studies [16, 28, 35, 44, 53, 159]. Winter was even a more common season for burns in pre-school children (36%) and older persons aged over 60 (37%). This finding is also similar to what is reported by other studies in the region [152, 153]. Winter is the coldest season in Sulaymaniyah during which a range of kerosene-operated space-heating equipment is used in houses. These equipment as discussed earlier are responsible for a considerable proportion of burns injuries and may explain why burns are more common in winter.

The peak time for burn injuries in term of single hours was from 12:00-12:59 pm, which corresponds to lunchtime. The majority of burns (75%) occurred during daytime i.e. between 7:00 am and 7:00 pm. This is probably due the fact that preparation and serving of the three main meals and other household activities occur during this time.

Residence: In terms of health planning, it is important to note that 22% of admitted patients were residents of other provinces. In a normal situation, burn patients are admitted to hospitals in their own provinces but in the current insecure circumstances in

the neighbouring provinces of Kirkuk, Diala and Salah-Aldin, many patients from these provinces report directly, or are referred, to hospitals in the Kurdish region including Sulaymaniyah.

TBSA burnt: The median TBSA burnt in admitted patients was 18% and the mean was 30%. Throughout this report, the median TBSA is reported and used for analysis because it was not normally distributed. Although the majority of patients (63%) had TBSA burnt ≤ 25%, there was relatively a large number of patients (12%) with TBSA over 75%, all of whom died contributing to the high mortality in the study. Eighty seven percent of patients with a TBSA burnt over 50% were females. The median TBSA burnt was significantly greater in females, young adults aged 15-29 years, flame burns and in intentional self-harm burns. The mean TBSA burnt reported from the countries of the EMR is variable and ranges from 10% to 48% [16, 28, 71-74, 151]. The median is also reported by a few studies and ranges from 15% to 40%[16, 28, 151]. This variation in TBSA burnt is probably due to variations in distribution of the above-mentioned predictions of TBSA i.e. sex, age, mechanism and intent.

Hospital stay: The median hospital stay was 8 days (mean 11). Most studies from the EMR have reported mean hospital stay longer than this ranging from 11-16 days [16, 71, 72, 75, 147, 151, 162]. The median hospital stay was significantly shorter in intentional self-harm burns (4 days) and in patients who died (4 days). The reasons for the shorter hospital stay in the current study may be due to the higher mortality rate and inclusion of a larger number of self-harm burns than in other studies. Patients with self-harm burn stayed shorter because of the higher mortality (88%) which usually occurred early in the course of hospitalization.

Wound infection: Almost 25% of admitted patients developed wound infections and the most common isolated microorganisms from wound swabs were pseudomonas species (28%), *Staphylococcus aureus* (25%), Klebsiella species (11%) and acinetobacter (8%). Mortality was lower (19%) in patients who had wound cultures taken than in the remainder of patients (32%). One explanation could be that patients who had their swabs taken and examined, received appropriate antibiotics for the isolated microorganisms.

However, antibiotic therapy was not associated with a better survival at the multivariable level. The alternative explanation of this may be that wound cultures were usually taken a few days after admission therefore majority of patients who were admitted for extensive burns died before their swabs were taken for investigation (as the median hospital stay of patients who died was 4 days). Almost all patients who had died with positive wound culture died of septicaemia (40 of 41). Only 78% of patients with positive wound cultures were managed with systemic antibiotics. Probably the decision for antibiotic therapy was based on both the results of wound cultures and the clinical assessment of the patient's condition. Nonetheless, antibiotic therapy was not found to be associated with a better survival. This could be due to resistance to antibiotics or other factors complicating the course of the disease.

4.3.1.2 Mortality and other outcomes

This study indicates that burn mortality in Sulaymaniyah city (9.1 deaths per 100,000 per year) is higher than the global WHO figure of 4.8 per 100,000 per year for 2004 and the EMR mortality of 5.6 but not as high as the highest mortality rates reported for South East Asia being 11.0 deaths per 100,000 per year[109]. Burn mortality in the neighbouring Iran is reported as 4.6 [28] and 5.6 [72] deaths per 100,000 per year. A study from a rural region of India reports a mortality rate higher than the current study being 15.1 deaths per 100,000 per year[111]. Sex differences were quite notable in the current study with female to male rate ratio of 6.29 (3.97-9.97). This female preponderance is consistent with other studies. For example, in the latter study from India 81% of deaths were females and 19% were males[111]. In Iran, the mortality rate was 7.2 in females and 2.1 in males[28] and 65% of the reported EMR fire-related deaths occurred in females[109].

There are several potential explanations for this high mortality rate in Sulaymaniyah. Firstly, the incidence of burn injuries is high in the population. Secondly, admission rate is also high which may be possibly due to the severity of the injuries. Thirdly and probably most importantly, there were a large number of intentional self-harm burns admitted with extensive burns who comprised the majority of burn deaths in this study

(71%). Finally, it has to be noted that the hospital is not structured, equipped and staffed to provide the best quality of care for burn patients.

In-hospital mortality was 28% in this study, which could be considered high compared to mortality rates reported around the world. Many studies from the region have reported mortality rates less than this, but mostly over 20% (table 1.5). Two studies from Iraq report in-hospital mortality rates of 21%[175] and 27%[161]. Studies from high income countries report a much lower mortality than the current study such as 2% in Australia[34], 3% in Sweden[112] and Taiwan[113], 4% in Portugal[114] and the United States[29] and 6% in the UK[115]. A few studies have reported a higher mortality rate. For example two studies from Iran report a mortality rate of 37% for a mean TBSA of 38% which is higher than TBSA in the current study[71, 75]. Another study from India reports a much higher mortality of 52% for a large sample of patients with TBSA burnt > 50% in 47% of the patients [36]. However, in the current study only 20% of patients had TBSA burnt >50%. A study from Sri Lanka with a median TBSA burnt close to the current study (16% vs. 18% in the current study) reports a mortality of 27%, which is close to the current study[37].

In-hospital mortality is likely to be related to the quality of hospital care and case mix in terms of factors associated with mortality. Therefore, it reflects the survival experience of patients at a particular setting and it may not be appropriate to draw conclusions regarding the quality of care on the basis of in-hospital mortality without taking into account differences in case mix between different studies.

As it is generally recognized that burn size is the strongest predictor of death, it may be more appropriate to report in-hospital mortality in relation to TBSA burnt. However, various studies published on burn epidemiology report TBSA and its relation to mortality in different ways that makes comparisons difficult. TBSA burnt is reported as mean or median, or only by various categories. Probably it will be more useful to report the distribution of TBSA in mean or median (depending of its distribution) as well as in deciles of TBSA. It will also be more useful, both for research and clinical purposes, to

report in-hospital mortality by different centiles of TBSA burnt (deciles, quintiles or quartiles).

Table 4.1 demonstrates in-hospital mortality in relation to the mean or median TBSA burnt, sex and age in some studies from the Middle East and other parts of the world that have reported these data. The studies are ordered according to mortality rate to show its relationship with TBSA burnt. As it can be seen from the table, the mortality rate is generally higher with greater mean (median) TBSA but it also shows the differences in mortality rate in different studies even though the mean burn size is similar. Such differences may be due to other risk factors such as age and inhalation injury, but could also be related to differences in quality of care.

Table 4.1 In-hospital mortality by mean(median) TBSA burnt in some studies reporting both characteristics

Year	Country	n	% Female	Age Mean (median)	TBSA Mean (median)	Mortality %
2005	Taiwan[113]	12,381	34	29	14	3
1990	Canada [210]	1,705	21	26	15	4
2005	Kuwait[74]	2,111	30	25	10	5
2001	UK[115]	7,139	-	24	11	6
1995	Saudi Arabia[208]	144	30	19	22	10
2005	Japan[47]	6,988	37	40	19	15
2002	Afghanistan[151]	400	43	8	19 (15)	16
2005	Iran[72]	3023	43	22	26	19
1999	Zimbabwe[85]	451	54	6	13	22
2002	Sri Lanka[37]	345	64	(22)	(16)	27
2002	Iran[16]	1089	66	18	48 (40)	33
2001	Iran[28]	1144	56	22 (18)	42 (35)	34
1998	Iran[71] Tehran	1239	37	26	38	37
2002	Iran[75]	1082	60	27	38	37
2007	Iran[209]	170	100	28	56(29)	64
	This study	884	58	18 (20)	30 (18)	28

A better depiction of mortality and TBSA burnt will be by percentiles of the TBSA burnt as shown in table 4.2. This provides a better understanding of in-hospital mortality by various percentiles of TBSA and demonstrates how studies differ in this regard. It is clear from this table that mortality rates in the current study are similar to other studies

when TBSA is below 20% but when TBSA is greater than 20% mortality in Sulaymaniyah is higher than other studies.

When the TBSA burnt is greater than 50%, very few patients survive in Sulaymaniyah while it is not so in other countries. It is obvious that in the higher percentages of TBSA burnt, survival at Sulaymaniyah burns centre is worse than other studies. However, one point has to be clarified here. The current study used a prospective methodology and all patients who were discharged against advice or transferred were excluded from calculation of the mortality rate. However, studies depending on retrospective data may not have information on patients discharged against advice or transferred and calculate the mortality rate from all admissions which means that the latter group of patients will be counted as survivors although their outcome is not known. In Sulaymaniyah, some patients with very high TBSA burnt were discharged against advice early in the course of the disease or transferred. Had these patients been counted as survivors, the mortality rate would not be 100% in patients with TBSA ≥70%.

Table 4.2 In-hospital mortality by deciles (and quintiles) of TBSA in some studies and in the current study

%TBSA burnt	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100
Study	**In-hospital mortality**									
Iran [28]	1	1	4	15	40	60	74	87	90	94
Iran [16]	0	3	6	12	27	52	60	76	85	94
Singapore[26]	0.4	2.4	2.1	13.6	26.1	61.1	79.0	64.3	95.0	100
USA[29]	1	3	8	16	24	36	42	57	69	80
Iran [44] *	1		7		41		75		94	
Brazil[211]*	1		4		19		79		100	
Iran [209]*	20		12		77		94		100	
This study	0	2	15	37	67	91	97	100	100	100

* Mortality rates are for quintile of TBSA

Although at the univariate level, in-hospital mortality was significantly higher in females, young adults and flame burns, these factors were not significant in the multivariable analysis. The independent risk factors for death were TBSA, older age, inhalation injury, self-harm, autumn season, and residence in other provinces. Different studies have reported a combination of several risk factors for death including greater

TBSA burnt, presence of inhalation injury, full thickness burns, female sex and older age[31, 116-122] but all studies have found that TBSA, inhalation and old age were associated with a higher risk of death.

Most of the studies reporting burn mortality provide a descriptive analysis of risk factors mentioned above based on univariate analysis. A few published studies have reported adjusted effects, which will be discussed below. The adjusted odds ratios for death in the current study were as follows: 36.4 for TBSA burnt ≥ 40%; 5.4 for age≥60; 3.6 for inhalation injury; 5.6 for intentional self-harm; 3.0 for autumn season and 2.8 for residence in other provinces.

Analysing trends of burn mortality over 20 years in Belgium, Brusselaers et al[116] report that the odds ratio for TBSA with the same dichotomization as in the current study was 6.6. The large odds ratio in the current study is another indication of the poor survival experience of patients with higher TBSA burnt as mentioned above. Meshulam-Derazon et al[117] report the linear effect of TBSA and say that every 1% increase in TBSA increased mortality by 6%. In our analysis, within the limits of 0-70% TBSA burnt where both survivors and deaths were present, TBSA had a linear effect, with an in crease in risk of death by odds ratio of 4.1 for each 10% increase of TBSA. Another study [118] reports that the odds ratio for death was 2.6 for TBSA over 75% compared to TBSA of 0-75%. According to Sharma [74], compared to TBSA below 50%, the odds ratio for death for TBSA 70-89% was 4.1 and that of TBSA≥90% was 23.0. El-Danaf[208] also reports that compared to TBSA below 30%, the odds ratio for death for TBSA 30-49 was 16.3 and for TBSA 50-80% the odds ratio was 85.5. Although the above studies have reported the association of TBSA burnt and death in different categorizations, all results indicate that TBSA burnt is a strong risk factor for death.

The odds ratio for inhalation injury in the current study is similar to the relative risk for inhalation injury (3.6) reported by Muller et al[212] from a retrospective analysis of more than 4000 burn admissions. Suzuki et al[31] also report an odds ratio for inhalation injury similar to these results being 2.6. However, some studies report higher odds ratios for inhalation injury such as 9.0[117] and 17.6[116]. These differences in

the effect of inhalation may be related to the distribution of TBSA and its categorization in the analysis as well as overall mortality rate of the sample. Tredget et al[210] have analysed the role of inhalation injury and believe that while it is a strong predictor of death, its effect was more evident when TBSA was between 30-69%.

Muller et al [212] have reported that compared to age of 0-20 years, people aged over 48 years have a higher risk of death with a relative risk of 7.3. Brusselaers et al[116] have reported that old age is a significant risk factor for death. The adjusted odds ratio for age of 60 and over is reported as 16.9. Only 3% of patients in the current study were 60 and over and the majority of these were below 70. Probably the higher odds ratio of the above study is due to difference in age distribution. In the high-income countries more people survive to older age and may have more co-morbidities than the older population of the current study.

Patients coming from other provinces of Iraq have a higher risk of death than patients of Sulaymaniyah. The reason of this could be related to delay in reaching hospital. Patients from other provinces were more likely to reach hospital later than patients from the Sulaymaniyah province. Almost 13% of patients from other provinces vs. 6% of patients from Sulaymaniyah reached hospital after 6 hours from injury. Delayed arrival to health care may deprive patients from the benefits of emergency treatment such as resuscitation and dressing. Such patients may also be more likely to have wound contamination because of lack of dressing. Delay to hospital has been described as a significant risk factor for death by some researchers[213]. In the current study, delay to hospital was included in the logistic model but it was not a significant risk factor.

In the current study, patients who suffered burns in autumn were significantly more likely to die by an odds ratio 3.0 compared to summer. Death in other seasons was not significantly different from summer. The cold weather in Sulaymaniyah starts in autumn and continues through winter. This effect of autumn may be related to cold weather. Studying the effect of weather on mortality in 15 European cities, Analitis et al[214] have found that cold weather is associated with increased deaths from cardiovascular, respiratory and cerebrovascular deaths and that the effect of cold temperature was more

in the warmer cities of Europe than the colder cities. This relationship of cold temperature with increased mortality from non-accidental diseases is also reported from Russia[215] and Japan[216]. An alternative or additional explanation could be in the poor hospital air-conditioning system. During the study, the burns centre in Sulaymaniyah was not centrally air-conditioned and the wards were heated using electric heaters or air conditioners installed inside the rooms. Maintaining the room in an appropriate temperature with such equipment is difficult and patients especially major burns will probably be more likely to develop hypothermia. Infectious disease such as influenza and lower respiratory infections are also more common in the cold season. Major burn patients already immuno-compromised, will be more likely to contract these diseases especially as isolation of patients was not strictly followed in the burns centre. In such circumstances, patients were probably subject to additional risks during the cold season that could contribute to a fatal outcome. The reason why winter was not also a significant risk factor could be due to presence of more children aged 0-5 years in winter (31% in winter vs. 23% in other seasons). Mortality rate was lower in children 0-5 years (9%) especially when they had scald injuries (6%).

The last independent risk factor for death in the current study was suicide intent. It is widely reported in the literature that in-hospital mortality of self-inflicted burns is very high (table 1.6) which is largely due to the greater TBSA burnt. However, there is very little comparative data about mortality in accidental and self-inflicted burns. A study from Sri Lanka comparing these two groups and controlling for burn size and age, has found that mortality was significantly higher in self-inflicted burns[217]. The current study demonstrated that suicide intent in its own right was an independent risk factor for death. Patients with intentional self-harm are more than five times more likely to die than accidental burns (odds ratio 5.6). The degree of burn injury (presence of full-thickness burns) which has been reported by some studies as a risk factor for death[208, 218, 219] was not included in the multivariable model because of lack of data. As they usually burn themselves by pouring kerosene on their commonly synthetic clothing, victims of self-harm burns are likely to sustain deep extensive burns. Therefore, part of the effect of self-harm could be due to degree of injury. However, it is theoretically

plausible to think that victims of suicide might be less responsive or receptive to therapy because of their willingness to die. The other possible factor could be the quality of care provided to these patients. These patients may be more likely to get a less optimal attention compared to other burn patients from both the health staff, prejudiced by the ineffectiveness of their efforts, and their own relatives who care for them in hospital but might not be as sympathetic as those caring for accidental burn patients.

Living standard was not associated with in-hospital mortality although it was a significant risk factor for burns in the case-control study. At the group level, it is understandable that mortality could be associated with poor living standard because there are more injuries amongst these people and subsequently more deaths. The current study investigated in-hospital mortality at the individual level and the finding was that having controlled for other risk factors, a poor living standard did not increase the probability of death in-hospital. Similar to this finding, living standard has not been reported as a risk for death by other studies mentioned above, that have investigated in-hospital mortality in burn patents. Arrival to hospital after injury was prompt (median 0.5 hour) and this was not associated with living standard or mortality.

In terms of quality of life, the commonest quality of life problems in the current study were related to pain and discomfort, body image, usual activities and anxiety and depression. The quality of life of burn patients has been studied using a range of different assessment tools including QOLS[182], SF-36 [183, 184], Euroqol-5D[184], different versions and adaptations of BSHS [182, 185-195] as well psychiatric assessment. Therefore it is not easy to summarize and compare the findings of these studies and in addition most of these studies are about the development and adaptation of these tools.

A review about functional outcome of burn injuries reports that burn patients continue to have problems such as of skin and appearance in up to 43% of patients, restriction of motion in up to fifth of patients, and problems with work in up to 5% of patients while the majority of studies have not seen problems in mental functions[220]. Also related to

pain and discomfort, Willebrand et al [221] report that pruritus was present in more than 50% of their patients.

Depression seems to be common in burn patients. A study about major depression and post-traumatic distress syndrome (PTSD) in Sweden[222] has found that 1 year post-burn, 16% of patients had major depression and 9% had PTSD. A systematic review about depression in burn patients has found that moderate to severe depressive symptoms have been reported in 13-26% of patients by different studies and minor depressive symptoms in as high as 54% of patients[223]. The best quality score in the current study was for interpersonal relationships, which may indicate satisfaction of the patient about the social support they get from their families, relatives and friends. Using QOLS, Moi et al [182] have reported that overall quality of life of their patients was similar to the normal population and they were even more satisfied with their nuclear families.

Factors which were significantly associated with a lower quality of life were flame injuries, greater TBSA burnt, self-harm intent, more operations and a longer hospital stay. All these factors are in favour of more severe injuries in terms of burn size and need for more surgical interventions. Greater burn size and more operations may lead to more scars and subsequent skin problems resulting in a lower quality of life score for pain and discomfort and body image.

Patients who survive severe burn injuries may develop long-tem consequences that may require surgical intervention and rehabilitation. These consequences include scarring, hypertrophic scars, contractures and movement limitations, deformities and others [8, 224, 225]. Some of these problems such as hypertrophic scars could be related to patient characteristics but the type and quality of care patients receives early after the incident are also important[224, 226]. Hypertrophic scars either alone or with contractures are the most common of these consequences. In an overview of the literature, Esselman[225] reports that prevalence of hypertrophic scars in burn patients was 32-67% in different studies. In a retrospective study on 703 burn patients, Gangemi et al[227] have found that 44% of their patients developed hypertrophic scars, 28% hypertrophic scars with

contractures and 5% developed pure contractures. In a study on surgical interventions for these consequences, Belba et al[228] report that 37% of their operations were for contractures, 28% for scars, 11% for alopecia and 7% for hypertrophic scars.

In a study on long-tem consequences in children, Forjuoh et al[229] have found that 17% of the children developed long-term consequences and of these patients 79% had hypertrophic scars and 6% contractures. Bombardo et al who have found that the prevalence of hypertrophic scars in children was 67% in their study in the USA, believe that the true prevalence of this problem is not known and further studies are required globally[230].

In the current study, long-term consequences were observed in 14% of patients who survived hospitalization. This appears to be a low prevalence of long-term consequences compared to the findings of the studies mentioned above. Nonetheless, the results are consistent with those studies in terms of hypertrophic scars being the most common problem (58% in this study). Calculation of the prevalence of long-term consequences in the current study was based on hospital attendance i.e. the numerator only includes patients among all survivors, who attended the hospital for follow-up care and had long-term problems. It is likely that some patients who did not attend the hospital for follow-up visits, might have experienced long-term consequences but were not included in the calculation. Besides patients discharged late in the study period (e.g. in the last few months of data collection) were probably less likely to have reached the point to attend hospital for long-term consequences by the time data collection ended.

4.3.1.3 Intentional self-harm

Globally the highest rates of suicide from all causes were observed in Lithuania with 51.6 per 100,000 per year in 2002[231] while in the countries of the European Union according to a study in 2003[232], suicide rates ranged from 2.8 in Greece to 21.6 per 100,000 population per year in Finland. The estimated global mortality rate from suicide in 2000 was 14.5 deaths per 100,000 per year[231]. Suicide by burns is not restricted to one part of the world although it is more common in parts of the Middle East and South

Asia. In a review of deliberate self-inflicted burns from around the world Laloe[233] has included studies from different regions of the world including the Americas, Europe, Africa, Middles East and Asia.

The incidence rate of intentional self-harm burn in the province of Sulaymaniyah (8.4 per 100,000 per year) is higher that most rates reported from different provinces of Iran ranging from 2.1 to 8.2 per 100,000 per year[81, 83, 118, 172-174]. In the Kurdistan province of Iran, an area of similar culture and ethnicity to Sulaymaniyah, the incidence of suicide by burns among the adolescents (13-19 years) has been reported as 18.2 per 100,000 per year. This is consistent with the current study where 43% of self-harm burns were aged 11-18 years.

Intentional self-harm burns accounted for 22% of all burn admissions which is higher than rates reported by studies from other countries of the region such 2% in Pakistan[143], 3% in Egypt[82], 5% in Turkey[234] and 9-15% in Iran [28, 80, 83, 84]. However, one study from a southern province of Iran reports that 37% of burn admissions were for self-harm[53]. Self-inflicted burns are also reported from high-income countries but account for a smaller proportion of all burn admissions such as 1% in the USA[235], 3% and 5% in the UK[236, 237] and 6% in Finland[238]. According to a review by Laloe[233], the highest rates of self-inflicted burns were observed in the Indian sub-continent accounting for 7-40% of all burn admissions in different studies.

Table 4.3 shows certain characteristics of self-inflicted burns including age, sex, TBSA burnt and mortality as reported by studies from different parts of the world. Almost 94% of the self-inclined burns in the current study were females which is consistent with studies from the region such as 91% in Egypt[82], 74-99% in Iran[79, 80, 83, 118, 141, 172-174], 69-72 in India [36, 239] and 79% in Sri Lanka [217]. In high-income countries however, males usually comprise a higher proportion of self-inflicted burns [233, 235, 236, 238].

Table 4.3 Age, sex, TBSA burnt and mortality in studies on intentional self-harm burns from the Middle East and other countries

Year	Country	n	% of all admissions	% Female	Age range	Mean age (median)	TBSA% Mean(median)	Mortality %
1997	Egypt[82]	23	3	91	14-55	23	45	74
2007	Iran[174]	89	-	79	13-62	26 (24)	63	56
2006	Iran[141] *	54	74	82	13-19	17	70	58
2006	Iran[118]	117	-	78	-	28	64	78
2005	Iran [53]	86	37	88	11-75	25	62 (65)	60
2005	Iran[172]	98	-	77	11-68	27	63	76
2004	Iran[80]	412	11	99	15-72	26	66	80
2003	Iran[84]	110	9	-	14-68	27 (25)	76	77
2002	Iran[83]	318	-	83	-	27	63	79
1998	Jordan[240]	20	4	80	15->40	28	48	70
2009	Turkey[241]	32	-	12		26	70	43
2006	India [239] **	74	19	72	16-78	-	-	-
2002	India[36]	747	7	69	<15->56	-	-	89
2002	Sri Lanka[217]	87	-	79	15-50	(27)	(48)	70
2003	Japan[242]	35	7	51	18-81	48	58	54
2004	Finland[238]	46	6	30	-	35	(24)	17
2004	UK[237]	184		38	16-83	37	41	44
2005	UK[236]	36	5	50		36	(10)	0
1998	USA[235]	34	1	38	<20-80		-	29
2000	Zimbabwe [108]	47	-	89	13-50	25	(60)	68
1997	Brazil [243]	82	8	71	<20-70	-	52	44
	This study	197	22	94	11-78	23(20)	74	88

* Only Adolescents aged 13-19 years are included in this study
** Only deaths included in this study

Almost 79% of patients in the current study were young aged below 30 years with a median age of 20 (mean 24) which is consistent with other studies from the region (table 4.3) such as 23 years in Egypt and 23-27 years in Iran[79, 80, 83, 118, 141, 172-174]. In Europe, the mean age of patients with self-inflicted burns is higher ranging from 36-45 years[233].

Self-inflicted burns are usually more extensive than accidental burns [236, 244]. Both mortality and the mean (or median) TBSA burnt are high in countries of the Middle East and South Asia (table 4.3). The TBSA burnt ranges from 45% in Egypt t[82] to 76% in Iran[84] and mortality rate ranges from 43% in Turkey[241] to 80% in Iran[80]. The

findings of the current study are consistent with these studies as the median TBSA burnt in the self-inflicted burns was 74% and mortality was 88%. These extensive burns occur because of the way these patients burn themselves by pouring kerosene on their clothes.

While self-inflicted burns have been described as more common in females, younger ages, married women and less educated people by studies from the region[79, 80, 82, 83, 118, 141, 172-174], analytical studies on quantification of the risk factors are scarce. In India, the patients with self-inflicted burns are described as mostly young married females of rural areas living with in-laws and having family problems[111]. Iranian studies also include more young females with marital or family problems, lower levels of literacy and with pre-existing mental health conditions [79]. Comparing rates of self-inflicted burns in several towns of Iran, Sadat[245] believes that consanguinity may be a risk factor. In high income countries, the patients with self-inflicted burns include more males than the low-income and middle-income countries, are more likely to be alcoholics, with pre-existing mental health problems and living in institutions [236, 237, 246, 247].

Wagle et al[244] who compared accidental and self-inflicted burns in India did not find significant differences between the two groups by age, sex, occupation, education and income. However, they found that living in extended families and having stressful events in the past were significant risk factors. As this study only included 50 patients (20 self-inflicted and 30 accidental burns) it is likely that the sample power was not strong enough to detect other possible differences. Another comparative study is a case-control study by Horner et al in the UK[236] who have found that sex was not a significant factor, but self-inflicted burns occurred more in institutions and in patients with mental health problems. These patients suffered more severe injuries and had a longer hospital stay. As this study was retrospective, it was not able to compare the patients in relation to socio-demographic characteristics.

In the current study, the independent risk factors for intentional self-harm were female sex, young sex, low levels of education, spring season and small family size. Poor living standard was not found to be a significant factor. This could be a true finding but it

could also be a type II error (false negative) due to low power of the study. But probably the stronger explanation will be the effect of selection bias in the study since the comparison group was other burn patients. Since burn injuries are likely to be associated with poor living standard as also demonstrated by the case-control study in this thesis, it is likely that the comparison group was different from the general population in terms of living standard. If these patients and the self-harm patients are more likely to fall in the same living standard category, such as poor living standard, then it is expected that the effect of living standard will be diluted.

The findings of the current study are consistent with many observations from the descriptive studies. Females are at a significantly much higher risk for self-inflicted burns by almost 14 times, which is consistent with studies from the region reporting that the majority of self-inflicted burns occur in females (table 4.3). The reason of this high rate of self-harm burn in female is likely to be related to the situation of women. The Kurdish society is a patriarchal system in which customs, traditions and even written laws are in favour of men. There are no published studies about the prevalence of violence against women but honour crimes are still sometimes reported in the media and women's organizations and non-governmental agencies have established several safe shelter houses for women who need protection. Women are expected to protect the "honour" of the family or they will be rebuked and subjected to violence. When women face these disadvantageous circumstances and feel helpless and hopeless of finding support, they may reach that point to decide and terminate their lives. The fact that in the majority of cases the precipitating factors were family and marital problems strengthens this theory.

In relation to age, adolescents in Sulaymaniyah (aged 11-18) are at a highest risk with odds ratio of 3.9 compared to people aged 30 and over. This is consistent with the mean (median) age reported by studies from the region (table 4.3). In addition, it confirms the findings of Groohi et al in Kurdistan province of Iran who found high rates of suicide amongst adolescents[141]. The explanation for this is likely to be related to the physiological, psychological and behavioural characteristics of adolescence paired with

lack of awareness or inability of the elder ones to interact positively with the adolescents during this sensitive period of their lives.

The writer believes that the youth, especially females, live in a paradox where they have to cope between the restrictive norms and traditions of the society and the attracting features of modernization brought about by the gradual transition of the country from isolation and dictatorship towards an open market and democracy. Since the spread of technology and its effect on lives of the youth is likely to be quicker than occurrence of change in traditional norms and beliefs among their elders, probably young women will remain to be under increasing pressure in the future.

This study also demonstrated the protective effect of higher levels of education. People who had no or only primary and middle school (9 years) were at a significantly higher risk of self-harm compared to those who had more years of education. This is consistent with the descriptive analysis reported by most studies on self-inflicted burns in the region[80-82, 84, 141, 245]. More years of education empowers people and provides them with more opportunities and life skills which may make them more resilient. In addition to this, less-educated people are more likely to be influenced by traditions such as those related to suicide by self-burning.

Seasonal variations in relation to self-inflicted burns have not been investigated but there is a controversy about seasonal variations in suicide in general. There is no consensus on this issue and the WHO report on self-directed violence does not report on season as a risk factor[231]. However, some researchers believe that there is a positive association with the hot seasons of spring and summer. Analysing suicide deaths that occurred during 200-2004 in the United States, Kposowa et al[248] have found that significantly more suicides occurred in summer and spring which they believe may be related to less interaction with family and friends during these seasons compared to winter. Petridou et al[249] have reported that the highest rates of suicide occur in June in the northern hemisphere and in December in the southern hemisphere and they believe that this may be related to the effect of sunshine on body hormones. Kalendiene et al[250] also report that suicide rates peak between May and June in Lithuania. Analysis of the vital

statistics of Japan from 1970-1999 has shown that there are two peaks in suicide; a biger one in April and a smaller one in autumn[216].

It is not easy to explain why more self-inflicted burns should occur in spring in Kurdistan. The sunshine hypothesis is probably less likely to explain this because there are more sunny days in summer than spring. The hypothesis about social interaction may be more plausible but in a different context. In the Kurdish culture, spring is the symbol of revival and hope. The Kurdish calendar starts on the first day of spring, March 21st, and this day is called Nawroz "new day". On the eve of Nawroz people celebrate the start of spring by lighting fires outside their homes and on hilltops and on the next day they go out to the countryside. These picnics continue in holidays throughout spring. Therefore, the image of spring in people's minds is one of pleasure and enjoyment, which means that people's expectations from spring, will be higher than usual. When expectation is higher, disappointment is likely to be more painful too. Amongst people who are more sensitive and who possess certain personality attributes that could be in some way related to suicide, disappointments in spring may be more likely lead to committing acts of self-harm than in other seasons.

The last significant risk factor in the current study is family size. The fact that individuals from small families of 1-3 members are at a higher risk indicate several possibilities. Such small families include young couples with no or one child, older couples with fertility problems and single parents (e.g. separated and divorced). Although marital status was not a significant factor in this study, some of its effect might have been combined with family size. Young couples in the beginning of their life might have more instances of disagreement and more concerns to worry about. The busier and fuller life in bigger families might have some protective effect from self-harm. Three women in the study attributed their marital problems to infertility, which therefore contributed to the effect of small family size.

The risk factors investigated in this study were mainly demographic. A thorough investigation of risk factors for suicide including self-inflicted burns requires more probing into the past and present life of the individual to investigate other factors such as

genetic factors, personality characteristics, psychiatric and physical disorders, psychosocial crisis, and availability of and access to means of suicide[251].

Finally, to explore why a particular method (self-burning in this study) is used to commit suicide requires more research. The researcher is not aware of any studies about suicide in Iraqi Kurdistan and prevalence of methods used for suicide. Clinical experience and anecdotal evidence indicate that in women, probably self-inflicted burns account for the majority of women suicides in Kurdistan. Self-burning is probably related to the cultural environment where the individual grows. In his review of studies on self-inflicted burns, Ahmadi reports that self-burning could be slowly transmitted unconsciously from persons to person or from generation to generation as a pattern of imitation[79]. Hawton et al[251] report that exposure to suicidal behaviour in other people may influence the individual's risk for suicide. In Kurdistan, all people are in some way exposed to examples of self-burning behaviour through anecdotes, media, or personal knowledge. A phrase, which is frequently used by girls and women when they feel threatened or when their demands are not met, is "I will burn myself". Other reasons for selecting fire to commit suicide may be its practicality. Hawton et al[251] say that when someone is thinking of suicide, his/her access to a particular method of suicide may lead to translation of the thought to actual suicide. In Kurdistan, kerosene is stored in all houses and most women deal with it on daily basis.

4.3.2 The case-control study

There are few analytical studies exploring risk factors associated with burn injuries in children. The literature search undertaken for this thesis found only 6 case-controls studied. One reason for this scarcity of research on aetiology of childhood burns could be related to its complexity because potential risk factors could be related to characteristics of the child, his/her family and housing circumstances and even cultural factors. Probably it is for the same reason that studies mentioned above have investigated a wide range of risk factors many of which are specific to the particular study (table 4.4). Results of these studies were presented in chapter one (table 1.1). These studies also differ in the age range of their participants. Two studies are restricted

to young children i.e. 0-4[130] and 0-5[126] years while others include children from 0-11 and 0-17 years. Younger children are a more uniform group in terms of being more dependent on carers, spending most of their time at home and being mostly affected by scald and contact burns. While older children are more mobile outside the house and therefore these two groups of children may have different risk factors for burns.

Table 4.4 Risk factors investigated by various case-controls studies for childhood burns

Risk factors included in the study	Forjuoh et al[126]	Werneck et al[127]	Delgado et al[128]	Petridou et al[129]	Van Rijn et al[130]	Daisy et al[131]	This study
Child							
Age	Matched	S	Matched	Matched	✓	Matched	Matched
Sex	Matched	✓	Matched	matched	✓	Matched	Matched
Birth order	-	S	-	✓	-	-	✓
Disabilities	S	-	-	-	-	✓	S
child activity score	-	-	-	S	-	-	S
Not living with parents	-	-	S	-	-	-	✓
Presence of a second carer at home	-	-	-	-	-	-	S
Pre-school education	-	-	-	-	-	-	✓
Family/housing							
Residence	✓	-	-	-	-	match	-
Ethnicity (being native or migrant)	-	-	-	S	S	-	-
Maternal age	-	✓	-	✓	-	-	-
Maternal education	✓	-	S	-	S	✓	✓
Maternal employment	-	-	-	✓	✓	✓	✓
Mother spending time away	✓	-	-	-	-	-	-
Parity	-	✓	-	-	-	-	✓
Father's education	-	-	✓	-	✓	✓	✓
Father's employment	✓	-	✓	-	-	-	✓
Living standard /income	✓	S	S	-	-	-	S
Family size/ crowding	-	S	S	✓	-	-	✓
House ownership	-	-	✓	-	-	-	✓
Small house	-	-	-	-	S	-	-
Number of bedrooms	-	-	-	S	-	-	-
Presence of water supply	-	-	S	-	-	-	-
Separate cold and hot water taps	-	-	-	-	✓	-	-
Cooking equipment	-	-	-	-	S	✓	S*
Flask use to store hot drinks	-	-	-	-	S	-	-
Storage of flammable material at home	S	-	-	-	-	-	S*
Other							
Awareness of water temperature	-	-	-	-	✓	-	S*
Family history of burns	S	-	-	-	-	-	S
Maternal awareness of burns	-	-	-	-	-	✓	✓
Sibling death from burns	S	-	-	-	-	-	-
Stressful events in family	-	S	-	-	-	-	-
Burn avoidance index	-	-	-	S	-	-	-

✓ Variable included in the study but it was not found to a significant risk for burns
S Variable included in the study and found to be significant after adjustment for other variables in the study
* Variable included in the scale variable of home hazards

In the current study, the following factors were found to be significantly associated with childhood burns: poor living standard, child activity, home hazards, presence of a second carer, family history of burns, child activity score and disability. The adjusted odds ratios for these factors were: 5.54 (2.26-11.72) for a poor living standard; 5.32 (3.35-8.45) for higher child activity score; 2.76 (1.47-5.20) for family history of burns; 1.32 (1.02-1.71) for each one score increase in home hazards; 0.42 (0.24-0.73) for presence of a second carer and 0.14 (0.03-0.59) for presence of disabilities.

Other case-controls studies have reported results including some of the above risk factors and some others (table 1.1). For example, in Ghana, according to Forjouh et al[126], the significant risk factors for childhood burns were presence of disabilities, family history of burns and burn deaths, and storage of flammable material at home. In Holland, Van Rijn et al[252] have found that being a migrant, living in a small house, using a gas cooker and failure to use a flask to store hot drinks were significant risk factors for childhood burns while higher levels of paternal education were protective. In Brazil, Werneck et al[127] have found young age (1-2 years), overcrowding and second or higher birth order as significant factors. In Peru, Delgado et al [128] have found the following significant factors: lack of water supply, overcrowding and not living with parents while house ownership and higher levels of maternal education were protective factors. Petridou et al[129] in Greece have found that more active children, migrant children and children of families with two bedrooms were at more risk while safe practices during cooking were protective. In the study by Daisy et al from Bangladesh[131], poor maternal education, family history of burns, poverty and maternal awareness of the danger of burns were significantly associated with childhood burns at the univariate level. These authors have not presented multivariable analysis in their study.

This variability in the risk factors reported indicates the complexity of the causation of childhood burns involving the individual, the family and the culture. Since childhood burns, especially burns occurring at home, are related to housing conditions and cooking and heating practices, some of the risk factors could be culture-dependant and differ from one nation to another. In the current study, poor living standard was strongly

associated with childhood burns (adjusted odds ratio 5.5), a finding supported by several case-controls studies reporting adjusted odds ratios of 1.7 [127] and 2.8 [128] and another study based on univariate analysis[131]. Some of the other cases-control studies have found significant associations with being a migrant child (adjusted odds ratio 4.5) [130]; a migrant or a gypsy child (adjusted odds ratio 5.2) [129] and overcrowding (adjusted odds ratios of 2.2 and 2.5) [127, 128]. These factors are likely to be related to a poor living standard. Other observational studies have also described that poverty is associated with higher risk of burns and other injuries amongst children [22, 91, 253, 254].

The strong association of childhood burns with poverty in the current study could be explained by a combination of characteristics, which could be more pertinent to poor families. Examples of such characteristics could be limited ability to provide a safer physical environment for small children in terms of housing and safer cooking and heating equipment; more risky cultural practices (e.g. baking bread at home, serving tea and food); and probably a poorer level of health awareness in general. Almost 96% of the cases were burnt by scalds and contact burns which are mostly related to cooking and heating practices and serving tea. In Iraqi Kurdistan, a kettle of boiling water and a teapot are usually present on the kerosene heater when the latter is working. Tea is served very frequently both for family members and for guests. Such circumstances will be more risky for children in the context of poorer families in Kurdistan who are more likely to live in a smaller space with more basic equipment, having stronger social interaction and probably more adventurous children.

Many children in this study were burnt while they tumbled on hot liquid containers or pulled handles of kettles and teapots and other bowls containing hot liquid and spilling it over. Children who are more active and more curious are more likely to be affected in such circumstances. More active children were found to be at a significantly higher risk in this study (adjusted odds ratio 5.3). One of the case-control studies which included a scoring for child activity has also found such an association (0.8 increase in odds ratio per quintile increase in score) [129] but other studies have not studied this factor. Association of child activity with accidental injuries has been reported by Bijur et

al[255] who have found that the relative risk of injury resulting in hospitalization was 1.9 in overactive children compared to children with lower activity. Although as discussed in section (4.2.3), mothers' rating for child activity score in this study may be exaggerated, but the effect is theoretically plausible especially in context of Iraqi Kurdistan where a range of unsafe circumstances exist in the homes. These include use of unsafe kerosene primus stoves, space-heating kerosene stoves, generators, samovars, kettles and teapots. Such equipment will be more accessible, intentionally or accidentally, by more curious and overactive children

Family history of burns in other family members was another risk factor for burns in the current study (adjusted odds ratio 2.8) which has also been reported as significant by Forjuoh et al (odds ratio 1.8)[126] and Daisy et al (odds/risk ratio not reported)[131]. If it is true that childhood burns is associated with poverty and variables related to housing conditions as found by this and other studies, then the association of family history of burns with childhood burns is theoretically plausible because those previous living conditions and family characteristics are likely to apply to the current child and other family members. Therefore, the explanation of this effect is likely to be related to the family and its environment. Although many socio-demographic risk factors were included in this study, there may be some more factors, especially behavioural and cultural practices at home and in regards to caring for children, which were not investigated. It is possible that previous history of family burns could be an indirect measurement of such factors, which were not included in the current study.

The home hazards which were associated with childhood burn in the current study (adjusted odd ratio for each unit increase 1.3) included presence and use of certain articles and products at home such as use of kerosene stove for cooking and heating bathwater, using samovar for making tea, use of generators, storage of petrol at home and absence of fire extinguishers and smoke alarms. Studies which have included these and other hazards have found them significant risk factors of burns such as cooking equipment and their safe use[127, 130, 131] and storage of flammable material[126]. Others such as presence of separate cold and hot water taps and lack of awareness of the water temperature were not found significant[130]. Use of smoke detectors has been

reported as a significant protective factor in the high-income countries [124, 125] but there is no sufficient evidence about low-income and middle-income countries. None of the cases and controls or any of the participants in the incidence and outcome study (2975 families) had a smoke alarm fitted in their houses. In addition, none of the case-control studies mentioned earlier, have studied the effect of smoke detectors.

During the cold months, when the space heaters are operated, families use them for cooking, boiling water and making tea because in this way they can save money. Many of these stoves are designed to be placed in the middle of the room. Kettles and other containers placed on these stoves can be knocked down accidentally causing scalds. Samovars used for making tea along with the teapot placed on its top is another equipment which is unsafe for children because it is not stable and likely to be knocked down accidentally or when its tap or handles are pulled by a toddler. During the incidence and outcome study some children where encountered who pulled the samovar and spilled over themselves causing severe scalds. Cheaper types of space heaters in use in Iraqi Kurdistan have no fireguards, which may cause contact burns when children accidentally fall against them or when curious toddlers try to examine them.

Presence of a second carer, a protective factor in the current study (adjusted odds ratio 0.4), has not been investigated by other studies. Delgado et al[128] have reported that children who do not live with their own parents are at a significantly higher risk (adjusted odds ratio 2.2). In Iraqi Kurdistan the grandmother, an older sister or sometimes a close relative could take care of the child in absence of his/her mother or when she is busy. The absence of the mother by itself does not seem to be a risk factor as reported by Forjuoh et al[126] and as indicated by the fact that maternal employment is not a risk factor as shown by the current study and other studies[129-131]. What seems to be more important is supervision of the child at all times be it by the mother or someone else. The mother in the Kurdish society, even if not employed, will not be able to provide continuous supervision to her children because of the number of children, home functions and social obligations. Therefore presence of a second carer is important to help in providing better supervision to the children.

Presence of disabilities in the current study was a protective factor with odds ratio of 0.14. Only one of the two case-control studies that have included disabilities in their investigation[126, 131] has reported that disability was a significant risk factor for burns with an odds ratio of 1.8[126]. To understand the reasons for this difference in the effect of disability we have to consider two things; the definition of disability and the recruitment of controls. Both studies have included hearing and vision impairment, walking problems and epilepsy as disabilities but Forjuoh et al have also considered past history of convulsions as a disability while the current study does not consider past isolated convulsions without a diagnosis if epilepsy as a disability. Instead, the current study also includes learning disabilities in its definition of disability, which is not the case in the other study. Since the definition of the risk factor was different, comparison of the findings may not be possible.

Regarding the controls, the current study was hospital-based while the other study was community-based. Generally, community-based selection of controls is more efficient than hospital-based selection in reducing the probability of bias. Probably disabled children were more likely to be included in the current study because disabled children are more likely to be in hospitals than non-disabled children. In such a situation, the effect of disability tends to be more protective. However, the same thing could be said about community-based controls. If disabled children are more likely to be in hospital, they will be less likely to be included in a community-based sample of controls. In such a situation, the causal effect of disability tends to be stronger.

In addition to the above two factors, the current study was investigating burns occurring at home only. Besides having more chances of being in hospital where they will be less at risk of burns, disabled children are less mobile at home and probably more likely to be supervised. These reasons could explain why the effect of disability was protective in the current study.

4.4. Implications for burn prevention and research

This study provides important information on the epidemiology of burn injuries in Sulaymaniyah including the incidence, mechanisms of injury, equipment and products causing burns, mortality rate, intentional self-burns and risk factors for burns in children. These findings are important in providing grounds for actions to address prevention of burn injuries and further research to the problem.

4.4.1 Incidence

This is the first report of the incidence of burn injuries in Sulaymaniyah. Although this incidence rate is for Sulaymaniyah only, until the incidence in other provinces is calculated, probably it will be the best estimate for Iraqi Kurdistan as a whole. Based on this figure, an estimated 16,000 patients attend hospital for a new burn injury each year in Iraqi Kurdistan's population of around 4 millions. In view of the large number of patients, the long-term physical and psychological consequences of burn injuries and the amount of resources required to provide health care to these patients, this public health problem deserves more attention and work. The health authorities and their relevant partners in the government such as the Department of Statistics, the Department of Civil Defence (the fire services), the Ministry of Social Affairs, the Ministry of Culture and others need to coordinate and work together to work in this regard. The civil society organizations such as the media, the women's organizations, the NGOs working on health and social issues can be part of this collective effort. Such an effort requires further research to develop policy documents and guidelines to identify priorities, strategies for action and role of the partners.

Burn surveillance could probably be one of the priorities for the health authorities regarding burn prevention. With the suggestion of the researcher, the Preventive Health Department initiated a pilot project for burn registration in 2007, which was unfortunately discontinued after one month. In view of the magnitude of the problem and lack of data sources, it will be very useful for the health authorities to have a regular

burn registration programme alone or in combination with other injuries. Such a programme will provide valuable hospital and community-level data on burn injuries, which will be very important for prevention and surveillance purposes.

With the pre-school children being at the highest risk, they should be in the centre of any preventive strategy for burn prevention. Studies have shown that burns could be prevented by community-based interventions through education of the children and their families combined with making improvements on the physical environment [256-260]. For example in Norway, a 10-year community programme based on education and provision of some safety equipment has led to 52% decrease in burn rates in children aged 0-5 years[259]. Safety education can also be provided through schools. In a study on safety education in the primary schools in the UK, Kendrick et al[261] have found that the intervention children correctly answered more questions about fire and burn prevention than the control children with a difference of 7%. A study in Israeli elementary schools also reports the role of burn education programmes in improving children's risk-related knowledge[262]. In South Africa, a home visitation programme, which included four visits to the intervention families to provide instructions to caregivers on safety practices regarding a range of injuries in children, found that burn-related safety practices were significantly improved in intervention families compared to the control families[263].

In a systematic review about the effectiveness of community-based interventions to prevent burns in children, Turner et al[264] summarize that the interventions which were effective in reducing thermal injuries in children were education of children and their families, installation of smoke alarms, regulation of hot water temperature below 49 Celsius and using fire-resistant sleepwear. In a review on injury prevention, Towner et al[260], believe that while public information and mass media campaigns can increase people’s knowledge, but there is no evidence about their impact on injury rates.

In the current study, the majority of patients were not provided with proper first aid treatment before arrival to hospital and only 36% were managed with pouring cool water on the site of injury. A number of traditional remedies were used which may be harmful

to the patients. This indicates the limited awareness of people about immediate management of burns at home. Accurate information about this issue must be conveyed to the population through mass media and other appropriate communication channels.

Studies similar to the current one, are required to investigate the epidemiology of burns in other provinces of Kurdistan but also more focused studies are required to research specific issues such as risky groups, quality of life of burn victims, long-term consequences, quality of care provided and feasibility of preventive strategies.

4.4.2 Equipment and products

The equipment and products, which are used and kept at homes and are responsible for a considerable proportion of injuries, are identified by this study. It is obvious from the study that the home is not a safe environment for the family in terms of burn injuries, and the findings of this study are important from a preventive perspective. Most flame injuries were caused by pressurized kerosene stoves, malfunctioning gas cylinders and small kerosene primus stoves.

In the current economic and power shortage circumstances, it is not possible to expect all families to abandon this low-cost heating equipment, therefore preventive efforts must be focused on safety practices in handling of this stove as well as discouraging its use altogether. Reducing the risk of burns from such equipment requires action from the families and the government. The concerned authorities should address the issue of malfunctioning propane cylinders by replacing them and providing regulations for their proper handling by the vendors. Families have to be instructed to keep these cylinders outside the kitchen and away from sources of fire.

Pressurized kerosene stoves are still in common use by many families. These are especially unsafe when used for baking bread and bathwater heating. They are mostly manufactured locally and are not subject to quality control. According to patients, burning from this device occurs either due to a fault in the tiny kerosene aerosol outlet or because of unsafe practices in its use. Production of this and other locally-manufactured

cooking and heating equipment requires standardizing and quality control measures. In addition public awareness is important, and should be promoted on the safe use of these kerosene stoves. As the majority of these flame burns mostly involve women, they should be the primary beneficiaries in prevention interventions on home-related flame injuries.

Awareness of clothing while working near unsafe equipment has to be considered in any prevention strategy of flame burns amongst women although this is not an easy thing to change. The price of synthetic clothing is lower, and the traditional Kurdish women's dress and indoor clothing are usually made of synthetic material.

Scald injuries were mostly caused by spillage of tea and hot water from teapots, kettles, samovars and teacups. These burns mainly involve young children therefore, in addition to the children themselves, parents and guardians should be in the centre of scald prevention strategies, as they will have the biggest share to contribute to prevent burns in their children. For example, they have to supervise their children regularly; refrain from using samovars or keep them out of reach of children; refrain from leaving kettles and teapots on the stove; be careful while serving tea and food, and refrain from leaving hot liquid containers on the ground or serving tea and food while holding a child.

It is important that families are aware of the electric boiler temperature setting and keep the boiler at a lower temperature to avoid scalds to their children. Providing instructions and regulations by relevant authorities may be necessary in this regard. Provision of safer alternatives for unsafe equipment such as installation of electric boilers and provision of guarded kerosene stoves combined with safety education could in theory be effective. However, planning such interventions requires further research about its feasibility. Understanding the attitudes and behaviours of people in relation to these equipment and products was not an objective in the current study. This issue requires further research by social scientists and epidemiologists in order to provide in-depth information about safety practices in the family, which is essential for designing evidence-based preventive strategies.

4.4.3 In-hospital mortality

In-hospital mortality in Sulaymaniyah is high. The reason for this is partly presence of a high proportion of extensive burns but even in lower percentages, mortality rate is high. Better understanding of this requires further research. For example, research is required to investigate the immediate and underlying causes of death in the hospital. The building of the burns centre was originally designed to be a war trauma emergency care hospital. Although during 2007-2008, MSF France undertook some improvements in the interior of the wards mainly for the purpose of isolation but it is still far from an optimal burns centre. MSF also provided some equipment, medications and incentives to the staff, but these actions did not lead to any significant reduction in in-hospital mortality in 2008 compared to 2006. Further research is required to investigate the quality of care provided in the hospital and gaps that may be present in treatment protocols, care provision, hospital management, equipment and staffing.

The assignment of the cause of death in the burns centre needs more attention and revision. It would be better to report the immediate cause as well as underlying causes. The usual practice in the hospital is to report one of two causes for death (inhalation or septicaemia) which is clearly not inclusive. However, this is not restricted to the burns centre; probably there is need for revision and standardization of death reporting by the health authorities in Kurdistan and providing necessary training to the clinicians in this regard.

4.4.4 Intentional self-harm

While no information is available in Kurdistan about rate of suicide in general, it is obvious from this study that suicide by burns in very common. Intentional self-harm burns which mostly involve females are usually severe and fatal. Female adolescents with lower levels of education are at the highest risk and should be in the centre of any preventive programme. Suicide is a complex issue. This study only provides an insight to the magnitude of suicide by self-burning and investigates its demographic risk factors. A better understanding of the circumstances, behaviours and personality characteristics

that could contribute to the act of intentional self-harm requires further studies by psychiatrists and social researchers. Meanwhile, the issue of suicide of women by self-burning has to be explored in the broader context of the situation of women in Kurdistan.

Prevention of intentional self-harm burns requires cooperation of multi-disciplinary teams including legislative bodies, relevant ministries and the civil society. In Kurdistan, there are several women's organizations with bases in the grassroots who have been active in promoting health and education in women. In addition, there are many local NGOs working to promote and protect the rights of women. Presence of these agencies is an opportunity for the local authorities to combine their efforts to address the issue of suicide in women. Prevention of these burns is not easy but research has shown that it may work.

A review of the literature admits that there is lack of empirical studies about prevention of self-inflicted burns but concludes that community-based programmes could be effective [79]. In Sri Lanka, real case scenarios and pictures have been used in the community to stimulate discussion among young women to deter them from committing suicide by self-burning but its impact has not been reported[217]. Ahmadi et al[265] implemented a preventive strategy in two cities in Iran from 1999 to 2003 using the first year to collect baseline data and the other 3 years to implement a community-based programme using active and passive communication methods. At the end of the programme there was a reduction in rates of self-inflicted burns by 47% in one city (which was significant) and 27% in the other city (not significant). The authors conclude that community-based programmes could be effective in preventing suicide by burns.

4.4.5 Risk factors for childhood burns

This study identified the risk factors for childhood burns and this information is important from a preventive perspective. Poor living standard is a strong risk factor therefore targeted interventions addressing the poor families could be a strategy for prevention of childhood burns. Similarly, families with home hazards as defined by this

study, those with history of burn injuries and those with no alternative carer to the chid are more likely to have their pre-school children suffer from burn injuries and therefore must be in the priority for prevention. Families have to be educated how to provide a safer home environment to prevent burns in their children. As more active children are at a higher risk, they require more attention and supervision. Health planners and community workers have to consider these findings when planning prevention programmes or undertaking safety education.

Since family history of burns is associated with childhood burns, families of burn patients have to be targeted in interventions programmes. This provides a very good opportunity for burn prevention because these families visit the hospital for several times until their patients are cured, during which time safety education could be provided. Currently there is no health and safety education in the burns centre. While providing this facility may require additional resources, findings of this study emphasize its importance.

Preventive programmes, such as mass media campaigns and community-based interventions have to target poor families, those using unsafe heating and cooking equipment and families with no alternative carers. As discussed earlier, community-based interventions have been shown to be effective in preventing burn injuries [256-259]. Nevertheless, designing programmes tailored to the local situation requires further Knowledge, Attitude and Practice (KAP) studies on home safety practices to provide baseline data for project design and later evaluation.

Disability was a protective factor in this study but this finding does not mean that disabled children are immune to burns and their families can relax. In fact, this effect could be partly due to better care and supervision families provide to their disabled children.

4.5 Conclusion and recommendations

4.5.1 Concluding findings

1. Overall, burn injuries are very common in Sulaymaniyah and the findings of this study provide a solid ground for action.
2. Pre-school children have the highest burn rates especially those living in poor families and in families with history of burns and those who are more active.
3. Suicide by self-burning is common and the victims are mainly adolescents and young women with lower levels of education. Spring is a more likely season for suicide.
4. The home environment is not safe for many children and women in terms of burn occurrence. Some most unsafe equipment and products include tea making equipment, pressurized kerosene stoves, gas cylinders and small kerosene primus stoves.
5. In-hospital mortality is high especially when burn size exceeds 30% TBSA. There have been no significant changes in mortality from 2006 to 2008.
6. This study had many strong points such as using multiple methodologies, investigating several outcomes, prospective recruitment of patients and covering a full year. However, there were also limitations due to lack of funds, poor existing local data and probability of selection and information bias in some aspects of the study.

4.5.2 Recommendations

The following recommendations which are based on the findings of the current study are structured in accordance with WHO documents on injury prevention[266, 267].

1. Development of a regional strategy for burn prevention in Kurdistan region (preferably as part of a strategy for injury prevention) by the Ministry of Health.

2. Establishment of a section for injury prevention at the Department of Health of each province and development of an action plan for burn prevention (preferably as part of an injury prevention programme) by incorporating surveillance and data collection, service provision, capacity building and prevention programmes.

3. Inter-sectoral coordination: Burns are not only related to the health sector. Several other sectors must be involved in a collective effort led by the Ministry of Health. Identification of the partners for burn prevention in the government and the civil society requires research but potential partners may include the ministries of Education, Social Affairs, Justice, Interior and others as well as the universities, media and civil society organizations.

4. Research: More research is required to provide evidence for prevention strategies to provide a better understanding of the situation, identify partners, capacities and opportunities for action. In addition, research is required on specific aspects of burn injuries such as prevalence of long-term consequences; quality of care; quality of life of burn survivors; circumstances and precipitating factors of self-burning and knowledge, attitudes and practice of people about home safety.

5. Services to patients: Actions are required to address the following areas:

    a) Pre-hospital care: People's knowledge about first-aid care to burn patients is limited as shown by this study. Simple standard

instructions must be disseminated to the public on how to manage a burn patient immediately after the incident.

b) Hospital care: Improving the quality of services provided to patients may require staff training, structural modifications in the hospital building, introduction of new services, development of treatment protocols and coordination between different health facilities. The burns centre will benefit from a revision of its performance to identify best practices and gaps in clinical and administrative functions of the hospital.

c) Rehabilitation of patients: currently the rehabilitation services are limited and restricted to physical rehabilitation. This service has to be assessed and expanded accordingly to make it more accessible and inclusive covering all rehabilitation needs of burn survivors including psychosocial rehabilitation.

6. Prevention: Prevention programmes must be based on research and properly planned to achieve measurable objectives. Planning must allow for situation assessment, identification of risks factors, project design, implementation and evaluation. Preventive programme need to address the following areas:

    a) Legislation and enforcement: Certain aspects of burn prevention may require legislations, rule and regulations. For example suicide of women by self-burning must be explored in the broad context of the rights of women and their situation in the society which may require legal action. Safety standards and regulations are required for workplaces such as bakeries, mechanics, fuel dealers and other places were fire or flammable material are used. Making legal requirements and or instructions for smoke detector installation in these places must be considered. Guidelines and regulations are also required for distributors of gas cylinders, fuel sale, electrical cabling, and manufacturing of certain heating and cooking equipment.

b) Product modification: Certain heating and cooking equipment require modification to make them safer. For example, unguarded kerosene stoves and pressurized kerosene stoves.
c) Modifications in the home environment: Many families keep the gas cylinder inside the kitchen. Simple modifications must allow keeping the cylinder in the porch or yard. Traditional bathrooms with the fireplace beneath the floor are unsafe for children and elderly. Installation of electrical boilers must be encouraged to replace traditional methods of bathwater heating. Some electrical burns occurred because the mains cables were very close to the roofs of 2-story houses. Action is required from departments of electricity and municipalities to address these risks. Installation of smoke detectors must be encouraged with emphasis on newly built residential compounds and workplaces.
d) Home visiting and community-based intervention: appropriate community-based interventions must be designed especially for prevention of burns in children and self-inflicted burns in women. Health authorities and their partners in the government and civil society have to cooperate in this regard.
e) Education and awareness promotion: public awareness through different communication channels and education through schools could be provided about burn-related safety practices and more importantly about immediate first-aid management of burns before arrival in hospital.

5. References

1. Downs, S.H. and N. Black, *The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions.* J Epidemiol Community Health, 1998. **52**(6): p. 377-84.
2. Macfarlane, T.V., A.M. Glenny, and H.V. Worthington, *Systematic review of population-based epidemiological studies of oro-facial pain.* J Dent, 2001. **29**(7): p. 451-67.
3. WHO. *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Version for 2006*. 2006 [cited 2007 15 Jan]; Available from: http://www.who.int/classifications/apps/icd/icd10online/.
4. Graham-Brown, R. and T. Burns, *Dermatology*. 9th ed. 2007, Oxford: Blackwell publishing.
5. Bousfield, C.B., ed. *Burn trauma: management and nursing care*. Second ed. 2002, Whuarr publishers: London.
6. Hettiaratchy, S. and P. Dziewulski, *ABC of burns: pathophysiology and types of burns.* Bmj, 2004. **328**(7453): p. 1427-9.
7. Hettiaratchy, S., ed. *ABC of burns*. 1st ed. 2005, Blackwell publishing: Oxford.
8. Herndon, D., ed. *Total burn care*. Third ed. 2007, Saunders: London.
9. Fernandez-Morales, E., et al., *Epidemiology of burns in Malaga, Spain.* Burns, 1997. **23**(4): p. 323-32.
10. Jia, C., et al., *Incidence rates and risk factors for injury events in high school students in Lijin County, China.* J Safety Res, 2005. **36**(2): p. 133-7.
11. Kara, I.G., et al., *A population-based questionnaire study on the prevalence and epidemiology of burn patients in Denizli, Turkey.* J Burn Care Res, 2008. **29**(3): p. 446-50.
12. van Rijn, O.J.L., L.M. Bouter, and R.M. Meertens, *The aetiology of burns in developed countries: review of the literature.* Burns, 1989. **15**(4): p. 217.
13. den Hertog, P.C., F.A. Blankendaal, and S.M. ten Hag, *Burn injuries in The Netherlands.* Accid Anal Prev, 2000. **32**(3): p. 355-64.
14. Rimdeika, R., M. Kazanavicius, and D. Kubilius, *Epidemiology of burns in Lithuania during 1991-2004.* Medicina (Kaunas), 2008. **44**(7): p. 541-7.
15. Hove, L.M. and B. Lindtjorn, *Epidemiology of burns in Bergen, Norway.* Scand J Plast Reconstr Surg Hand Surg, 1999. **33**(2): p. 225-9.
16. Groohi, B., R. Alaghehbandan, and A.R. Lari, *Analysis of 1089 burn patients in province of Kurdistan, Iran.* Burns, 2002. **28**(6): p. 569-74.
17. CDC. *WISQARS:Web-based Injury Statistics Query and Reporting System* [online] 2009 [cited 2009 June 22]; Available from: http://www.cdc.gov/injury/wisqars/index.html.
18. Hettiaratchy, S. and P. Dziewulski, *ABC of burns. Introduction*, in *Bmj*. 2004. p. 1366-8.
19. HESonline. *Primary diagnosis: summery*. [online] 2006 [cited 2006 20 December]; Available from: http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=202.
20. FRSonline. *Fire deaths reach 45 year low*. [online] 2006 [cited 2006 25 December]; Available from: http://www.frsonline.fire.gov.uk/prevention/article/33/442.
21. WHO. *Annual incidence (000s) for selected causes, in WHO Regions (a), estimates for 2004*. [online] 2004 [cited 2009 June 20]; Available from: http://www.who.int/healthinfo/global_burden_disease/estimates_regional/en/index.html.
22. WHO and UNICEF, *World report on child injury prevention*. 2008, World Health Organization: Geneva.
23. Bessey, P.Q., et al., *The vulnerabilities of age: burns in children and older adults.* Surgery, 2006. **140**(4): p. 705-15; discussion 715-7.
24. Rajpura, A., *The epidemiology of burns and smoke inhalation in secondary care: a population-based study covering Lancashire and South Cumbria.* Burns, 2002. **28**(2): p. 121-30.
25. Barret, J.P., et al., *Epidemiology and mortality of adult burns in Catalonia.* Burns, 1999. **25**(4): p. 325-9.

26. Song, C. and A. Chua, *Epidemiology of burn injuries in Singapore from 1997 to 2003.* Burns, 2005. **31 Suppl 1**: p. S18-26.
27. Onarheim, H. and H.A. Vindenes, *[Hospital admissions for burns].* Tidsskr Nor Laegeforen, 2004. **124**(16): p. 2130-2.
28. Panjeshahin, M.R., et al., *Epidemiology and mortality of burns in the South West of Iran.* Burns, 2001. **27**(3): p. 219-26.
29. American Burn Association, *National Burn Repository 2009 Report: dataset version 5*. 2009, American Burn Association.
30. Bang, R.L., et al., *Burn septicaemia in Kuwait: associated demographic and clinical factors.* Med Princ Pract, 2004. **13**(3): p. 136-41.
31. Suzuki, M., et al., *Prognostic implications of inhalation injury in burn patients in Tokyo.* Burns, 2005. **31**(3): p. 331-6.
32. Koller, J., et al., *Analysis of 1119 burn injuries treated at the Bratislava Burn Department during a five-year period.* Acta Chir Plast, 1994. **36**(3): p. 67-70.
33. Onarheim, H., A.B. Guttormsen, and E. Eriksen, *[Burn treated at the Haukeland University Hospital Burn Centre--20 years of experience].* Tidsskr Nor Laegeforen, 2008. **128**(10): p. 1168-71.
34. Pegg, S.P., *Burn epidemiology in the Brisbane and Queensland area.* Burns, 2005. **31 Suppl 1**: p. S27-31.
35. Hemeda, M., A. Maher, and A. Mabrouk, *Epidemiology of burns admitted to Ain Shams University Burns Unit, Cairo, Egypt.* Burns, 2003. **29**(4): p. 353-8.
36. Ahuja, R.B. and S. Bhattacharya, *An analysis of 11,196 burn admissions and evaluation of conservative management techniques.* Burns, 2002. **28**(6): p. 555-61.
37. Laloe, V., *Epidemiology and mortality of burns in a general hospital of Eastern Sri Lanka.* Burns, 2002. **28**(8): p. 778-81.
38. Aldemir, M., et al., *Factors affecting mortality and epidemiological data in patients hospitalised with burns in Diyarbakir, Turkey.* S Afr J Surg, 2005. **43**(4): p. 159-62.
39. Komolafe, O.O., et al., *Epidemiology and mortality of burns at the Queen Elizabeth Central Hospital Blantyre, Malawi.* Cent Afr J Med, 2003. **49**(11-12): p. 130-4.
40. Kalayi, G.D., *Mortality from burns in Zaria: an experience in a developing economy.* East Afr Med J, 2006. **83**(8): p. 461-4.
41. Franco, M.A., et al., *Epidemiological and clinical profile of burn victims Hospital Universitario San Vicente de Paul, Medellin, 1994-2004.* Burns, 2006. **32**(8): p. 1044-51.
42. De-Souza, D.A., et al., *Epidemiological data of patients hospitalized with burns and other traumas in some cities in the southeast of Brazil from 1991 to 1997.* Burns, 2002. **28**(2): p. 107-14.
43. Yongqiang, F., et al., *Epidemiology of hospitalized burn patients in Shandong Province: 2001-2005.* J Burn Care Res, 2007. **28**(3): p. 468-73.
44. Lari, A.R., R. Alaghehbandan, and R. Nikui, *Epidemiological study of 3341 burns patients during three years in Tehran, Iran.* Burns, 2000. **26**(1): p. 49-53.
45. Arshi, S., et al., *Prevention oriented epidemiologic study of accidental burns in rural areas of Ardabil, Iran.* Burns, 2006. **32**(3): p. 366-71.
46. Kut, A., et al., *Epidemiologic analysis of patients with burns presenting to the burn units of a University Hospital Network in Turkey.* J Burn Care Res, 2006. **27**(2): p. 161-9.
47. Kobayashi, K., et al., *Epidemiological and outcome characteristics of major burns in Tokyo.* Burns, 2005. **31 Suppl 1**: p. S3-S11.
48. Bang, R.L. and I.E. Ghoneim, *Epidemiology and mortality of 162 major burns in Kuwait.* Burns, 1996. **22**(6): p. 433-8.
49. Ansari-Lari, M. and M. Askarian, *Epidemiology of burns presenting to an emergency department in Shiraz, South Iran.* Burns, 2003. **29**(6): p. 579-81.
50. Avsarogullari, L., et al., *Adult burn injuries in an Emergency Department in Central Anatolia, Turkey: a 5-year analysis.* Burns, 2003. **29**(6): p. 571-7.
51. Gali, B.M., A.G. Madziga, and H.U. Naaya, *Epidemiology of childhood burns in Maiduguri north-eastern Nigeria.* Niger J Med, 2004. **13**(2): p. 144-7.
52. Xie, Y., Y. Tan, and S. Tang, *Epidemiology of 377 patients with chemical burns in Guangdong province.* Burns, 2004. **30**(6): p. 569-72.

53. Saadat, M., *Epidemiology and mortality of hospitalized burn patients in Kohkiluye va Boyerahmad province (Iran): 2002-2004.* Burns, 2005. **31**(3): p. 306-9.
54. Forjuoh, S.N., *Burns in low- and middle-income countries: a review of available literature on descriptive epidemiology, risk factors, treatment, and prevention.* Burns, 2006. **32**(5): p. 529-37.
55. Han, T.H., et al., *A retrospective analysis of 19,157 burns patients: 18-year experience from Hallym Burn Center in Seoul, Korea.* Burns, 2005. **31**(4): p. 465-70.
56. Liu, E.H., et al., *A 3 year prospective audit of burns patients treated at the Western Regional Hospital of Nepal.* Burns, 1998. **24**(2): p. 129-33.
57. Goldman, S., L. Aharonson-Daniel, and K. Peleg, *Childhood burns in Israel: a 7-year epidemiological review.* Burns, 2006. **32**(4): p. 467-72.
58. Mercier, C. and M.H. Blond, *Epidemiological survey of childhood burn injuries in France.* Burns, 1996. **22**(1): p. 29-34.
59. Xin, W., et al., *Characteristics of 1494 pediatric burn patients in Shanghai.* Burns, 2006. **32**(5): p. 613-8.
60. Sakallioglu, A.E., et al., *Burns in Turkish children and adolescents: nine years of experience.* Burns, 2007. **33**(1): p. 46-51.
61. Van Niekerk, A., H. Rode, and L. Laflamme, *Incidence and patterns of childhood burn injuries in the Western Cape, South Africa.* Burns, 2004. **30**(4): p. 341-7.
62. Albertyn, R., S.W. Bickler, and H. Rode, *Paediatric burn injuries in Sub Saharan Africa--an overview.* Burns, 2006. **32**(5): p. 605-12.
63. Bang, R.L., M.K. Ebrahim, and P.N. Sharma, *Scalds among children in Kuwait.* European Journal of Epidemiology, 1997. **13**(1): p. 33-39.
64. American Burn Association. *Burn unit referral criteria*. [cited 2009 June 22]; Available from: http://www.ameriburn.org/BurnUnitReferral.pdf.
65. Burd, A. and C. Yuen, *A global study of hospitalized paediatric burn patients.* Burns, 2005. **31**(4): p. 432-8.
66. Chien, W.C., et al., *Epidemiology of hospitalized burns patients in Taiwan.* Burns, 2003. **29**(6): p. 582-8.
67. Mandelcorn, E., M. Gomez, and R.C. Cartotto, *Work-related burn injuries in Ontario, Canada: has anything changed in the last 10 years?* Burns, 2003. **29**(5): p. 469-72.
68. Sarhadi, N.S., G.D. Murray, and W.H. Reid, *Trends in burn admissions in Scotland during 1970-92.* Burns, 1995. **21**(8): p. 612-5.
69. el Danaf, A., et al., *Analysis of 105 patients admitted over a 2-year period to a modern burns unit in Saudi Arabia.* Burns, 1991. **17**(1): p. 62-4.
70. ABA, *National Burn Repository 2005 Report: dataset version 2*. 2006, American Burn Association.
71. Soltani, K., R. Zand, and A. Mirghasemi, *Epidemiology and mortality of burns in Tehran, Iran.* Burns, 1998. **24**(4): p. 325-8.
72. Maghsoudi, H., A. Pourzand, and G. Azarmir, *Etiology and outcome of burns in Tabriz, Iran. An analysis of 2963 cases.* Scand J Surg, 2005. **94**(1): p. 77-81.
73. Mahaluxmivala, S., et al., *A retrospective study of etiopathological and preventive factors in a burns unit in Saudi Arabia.* Burns, 1997. **23**(4): p. 333-337.
74. Sharma, P.N., et al., *Predicting factors influencing the fatal outcome of burns in Kuwait.* Burns, 2005. **31**(2): p. 188-92.
75. Estahbanati, H.K. and N. Bouduhi, *Role of artificial neural networks in prediction of survival of burn patients-a new approach.* Burns, 2002. **28**(6): p. 579-86.
76. Cameron, D.R., S.P. Pegg, and M. Muller, *Self-inflicted burns.* Burns, 1997. **23**(6): p. 519-21.
77. Rastegar Lari, A. and R. Alaghehbandan, *Epidemiological study of self-inflicted burns in Tehran, Iran.* J Burn Care Rehabil, 2003. **24**(1): p. 15-20.
78. Mohanty, M.K., et al., *Self-inflicted burns fatalities in Manipal, India.* Med Sci Law, 2005. **45**(1): p. 27-30.
79. Ahmadi, A., *Suicide by self-immolation: Comprehensive overview, experiences and suggestions.* Journal of Burn Care & Research, 2007. **28**(1): p. 30-41.
80. Maghsoudi, H., et al., *Women victims of self-inflicted burns in Tabriz, Iran.* Burns, 2004. **30**(3): p. 217-20.

81. Amirmoradi, F., et al., *Investigating causes of self-burning in married women.* HAYAT: The Journal of Tehran Faculty of Nursing & Midwifery, 2005. **11**(24/25): p. 111.
82. Mabrouk, A.R., et al., *Suicide by burns: a tragic end.* Burns, 1999. **25**(4): p. 337-9.
83. Zarghami, M. and A. Khalilian, *Deliberate self-burning in Mazandaran, Iran.* Burns, 2002. **28**(2): p. 115-9.
84. Rastegar Lari, A. and R. Alaghehbandan, *Epidemiological study of self-inflicted burns in Tehran, Iran.* Journal of Burn Care & Rehabilitation, 2003. **24**(1): p. 15-20.
85. Mzezewa, S., et al., *A Prospective study on the epidemiology of burns in patients admitted to the Harare burn units.* Burns, 1999. **25**(6): p. 499-504.
86. Rawlins, J.M., et al., *Epidemiology and outcome analysis of 208 children with burns attending an emergency department.* Pediatr Emerg Care, 2007. **23**(5): p. 289-93.
87. Alaghehbandan, R., A. MacKay Rossignol, and A. Rastegar Lari, *Pediatric burn injuries in Tehran, Iran.* Burns, 2001. **27**(2): p. 115-8.
88. Haberal, M., et al., *Epidemiology of adults' and childrens' burns in a Turkish burn center.* Burns Incl Therm Inj, 1987. **13**(2): p. 136-40.
89. Light, T.D., et al., *Demographics of pediatric burns in Vellore, India.* J Burn Care Res, 2009. **30**(1): p. 50-4.
90. Fukunishi, K., et al., *Epidemiology of childhood burns in the critical care medical center of Kinki University Hospital in Osaka, Japan.* Burns, 2000. **26**(5): p. 465-9.
91. Quayle, K.S., et al., *Description of Missouri children who suffer burn injuries.* Inj Prev, 2000. **6**(4): p. 255-8.
92. Mateu, L.P. and J.J. Hernandez, *An analysis of the main predisposing factors of burn injuries in Alicante, Spain.* J Burn Care Rehabil, 1999. **20**(5): p. 417-21; discussion 416.
93. Cutillas, M., et al., *Epidemiology of elderly patients' burns in the South West of France.* Burns, 1998. **24**(2): p. 134-8.
94. Singh, D., et al., *Burn mortality in Chandigarh zone: 25 years autopsy experience from a tertiary care hospital of India.* Burns, 1998. **24**(2): p. 150-6.
95. Maslauskas, K., et al., *The epidemiology and treatment of adult patients with hand burns in Kaunas University of Medicine Hospital in 1985, 1995, 2001 and 2002.* Medicina (Kaunas), 2004. **40**(7): p. 620-6.
96. Dongo, A.E., et al., *A five-year review of burn injuries in Irrua.* BMC Health Serv Res, 2007. **7**: p. 171.
97. Turegun, M., et al., *The last 10 years in a burn centre in Ankara, Turkey: an analysis of 5264 cases.* Burns, 1997. **23**(7-8): p. 584-90.
98. Haik, J., et al., *Burns in Israel: demographic, etiologic and clinical trends, 1997-2003.* Isr Med Assoc J, 2007. **9**(9): p. 659-62.
99. Jayaraman, V., K.M. Ramakrishnan, and M.R. Davies, *Burns in Madras, India: an analysis of 1368 patients in 1 year.* Burns, 1993. **19**(4): p. 339-44.
100. Frans, F.A., S.O. Keli, and A.E. Maduro, *The epidemiology of burns in a medical center in the Caribbean.* Burns, 2008. **34**(8): p. 1142-8.
101. Anlatici, R., et al., *A retrospective analysis of 1083 Turkish patients with serious burns.* Burns, 2002. **28**(3): p. 231-7.
102. Tejerina, C., et al., *An epidemiological study of burn patients hospitalized in Valencia, Spain during 1989.* Burns, 1992. **18**(1): p. 15-8.
103. Gupta, M., O.K. Gupta, and P. Goil, *Paediatric burns in Jaipur, India: an epidemiological study.* Burns, 1992. **18**(1): p. 63-7.
104. Mukerji, G., et al., *Epidemiology of paediatric burns in Indore, India.* Burns, 2001. **27**(1): p. 33-8.
105. Lin, T.M., et al., *Epidemiology of pediatric burn in southern Taiwan.* Burns, 2005. **31**(2): p. 182-7.
106. Zhu, Z.X., H. Yang, and F.Z. Meng, *The epidemiology of childhood burns in Jiamusi, China.* Burns Incl Therm Inj, 1988. **14**(5): p. 394-6.
107. Tarim, A., et al., *Epidemiology of pediatric burn injuries in southern Turkey.* J Burn Care Rehabil, 2005. **26**(4): p. 327-30.
108. Mzezewa, S., et al., *A prospective study of suicidal burns admitted to the Harare burns unit.* Burns, 2000. **26**(5): p. 460-4.

109. WHO, *Summary: Deaths (000s) by cause, in WHO Regions (a), estimates for 2004*. 2004, WHO.
110. Danilla Enei, S., et al., *Mortality trends from burn injuries in Chile: 1954-1999.* Burns, 2004. **30**(4): p. 348-56.
111. Batra, A.K., *Burn mortality: recent trends and sociocultural determinants in rural India.* Burns, 2003. **29**(3): p. 270-5.
112. Akerlund, E., F.R. Huss, and F. Sjoberg, *Burns in Sweden: an analysis of 24,538 cases during the period 1987-2004.* Burns, 2007. **33**(1): p. 31-6.
113. Tung, K.Y., et al., *A seven-year epidemiology study of 12,381 admitted burn patients in Taiwan--using the Internet registration system of the Childhood Burn Foundation.* Burns, 2005. **31 Suppl 1**: p. S12-7.
114. da Silva, P.N., et al., *Burn patients in Portugal: analysis of 14,797 cases during 1993-1999.* Burns, 2003. **29**(3): p. 265-9.
115. Rashid, A., et al., *Revised estimates of mortality from burns in the last 20 years at the Birmingham Burns Centre.* Burns, 2001. **27**(7): p. 723-30.
116. Brusselaers, N., et al., *Outcome and changes over time in survival following severe burns from 1985 to 2004.* Intensive Care Med, 2005. **31**(12): p. 1648-53.
117. Meshulam-Derazon, S., et al., *Prediction of morbidity and mortality on admission to a burn unit.* Plast Reconstr Surg, 2006. **118**(1): p. 116-20.
118. Dastgiri, S., et al., *Incidence, survival pattern and prognosis of self-immolation: A case study in Iran.* Journal of Public Health, 2006. **14**(1): p. 2-6.
119. Lionelli, G.T., et al., *A three decade analysis of factors affecting burn mortality in the elderly.* Burns, 2005. **31**(8): p. 958-63.
120. George, R.L., et al., *The association between sex and mortality among burn patients as modified by age.* J Burn Care Rehabil, 2005. **26**(5): p. 416-21.
121. McGwin, G., Jr., et al., *Gender differences in mortality following burn injury.* Shock, 2002. **18**(4): p. 311-5.
122. Kerby, J.D., et al., *Sex differences in mortality after burn injury: results of analysis of the National Burn Repository of the American Burn Association.* J Burn Care Res, 2006. **27**(4): p. 452-6.
123. Tobiasen, J., J.M. Hiebert, and R.F. Edlich, *The abbreviated burn severity index.* Annals of Emergency Medicine, 1982. **11**(5): p. 260.
124. Watson, M., et al., *Providing child safety equipment to prevent injuries: randomised controlled trial.* Bmj, 2005. **330**(7484): p. 178.
125. LeBlanc, J.C., et al., *Home safety measures and the risk of unintentional injury among young children: a multicentre case-control study.* Cmaj, 2006. **175**(8): p. 883-7.
126. Forjuoh, S.N., et al., *Risk factors for childhood burns: a case-control study of Ghanaian children.* J Epidemiol Community Health, 1995. **49**(2): p. 189-93.
127. Werneck, G.L. and M.E. Reichenheim, *Paediatric burns and associated risk factors in Rio de Janeiro, Brazil.* Burns, 1997. **23**(6): p. 478-83.
128. Delgado, J., et al., *Risk factors for burns in children: crowding, poverty, and poor maternal education.* Inj Prev, 2002. **8**(1): p. 38-41.
129. Petridou, E., et al., *Risk factors for childhood burn injuries: a case-control study from Greece.* Burns, 1998. **24**(2): p. 123-8.
130. van Rijn, O.J., et al., *Aetiology of burn injuries among children aged 0-4 years: results of a case-control study.* Burns, 1991. **17**(3): p. 213-9.
131. Daisy, S., et al., *Socioeconomic and cultural influence in the causation of burns in the urban children of Bangladesh.* J Burn Care Rehabil, 2001. **22**(4): p. 269-73.
132. Mohammadi, R., et al., *Unintentional home-related injuries in the Islamic Republic of Iran: findings from the first year of a national programme.* Public Health, 2005. **119**(10): p. 919-24.
133. Akbari, M.E., M. Naghavi, and H. Soori, *Epidemiology of deaths from injuries in the Islamic Republic of Iran.* East Mediterr Health J, 2006. **12**(3-4): p. 382-90.
134. Roudsari, B.S., M. Shadman, and M. Ghodsi, *Childhood trauma fatality and resource allocation in injury control programs in a developing country.* BMC Public Health, 2006. **6**: p. 117.
135. Soori, H. and M. Naghavi, *Childhood deaths from unintentional injuries in rural areas of Iran.* Inj Prev, 1998. **4**(3): p. 222-4.

136. Soori, H. and M. Naghavi, *Deaths from unintentional injuries in rural areas of the Islamic Republic of Iran.* East Mediterr Health J, 1999. **5**(1): p. 55-60.
137. Bener, A., K.M. Al-Salman, and R.N. Pugh, *Injury mortality and morbidity among children in the United Arab Emirates.* Eur J Epidemiol, 1998. **14**(2): p. 175-8.
138. Bener, A., O.E. el-Rufaie, and N.E. al-Suweidi, *Pediatric injuries in an Arabian Gulf country.* Inj Prev, 1997. **3**(3): p. 224-6.
139. Harahsheh, B.S., B. Hiyasat, and A. Harahsheh, *Audit of paediatric surgical intensive care unit admissions in north Jordan.* Eastern Mediterranean Health Journal, 2002. **8**(4-5): p. 671-673.
140. Razzak, J.A., et al., *Injuries among children in Karachi, Pakistan--what, where and how.* Public Health, 2004. **118**(2): p. 114-20.
141. Groohi, B., et al., *Suicidal behavior by burns among adolescents in Kurdistan, Iran: a social tragedy.* Crisis, 2006. **27**(1): p. 16-21.
142. Ahmed, M., et al., *Survey of surgical emergencies in a rural population in the Northern Areas of Pakistan.* Trop Med Int Health, 1999. **4**(12): p. 846-57.
143. Siddiqui, N.A., *Burn-injury is preventable: An analysis of 716 cases in a burns unit.* Journal of the College of Physicians & Surgeons Pakistan, 1998. **8**(4): p. 148-152.
144. Rastegar, A.L., et al., *Epidemiology of childhood burn injuries in Fars province, Iran.* Journal of Burn Care & Rehabilitation, 2002. **23**(1): p. 39-45.
145. Sharma, P.N., et al., *Paediatric burns in Kuwait: incidence, causes and mortality.* Burns, 2006. **32**(1): p. 104-11.
146. Al-Shehri, M., *The pattern of paediatric burn injuries in Southwestern, Saudi Arabia.* West African Journal of Medicine, 2004. **23**(4): p. 294-299.
147. Attia, A.F., et al., *Epidemiological and sociocultural study of burn patients in Alexandria, Egypt.* Eastern Mediterranean Health Journal, 1997. **3**(3): p. 452-61.
148. Mousa, H.A., *Aerobic, anaerobic and fungal burn wound infections.* J Hosp Infect, 1997. **37**(4): p. 317-23.
149. Bang, R.L., et al., *Beta-haemolytic Streptococcus infection in burns.* Burns, 1999. **25**(3): p. 242-6.
150. Khan, N. and M.A. Malik, *Presentation of burn injuries and their management outcome.* J Pak Med Assoc, 2006. **56**(9): p. 394-7.
151. Calder, F., *Four years of burn injuries in a Red Cross hospital in Afghanistan.* Burns, 2002. **28**(6): p. 563-8.
152. Mabrouk, A., A. Maher, and S. Nasser, *An epidemiologic study of elderly burn patients in Ain Shams University Burn Unit, Cairo, Egypt.* Burns, 2003. **29**(7): p. 687-90.
153. El-Badawy, A. and A.R. Mabrouk, *Epidemiology of childhood burns in the burn unit of Ain Shams University in Cairo, Egypt.* Burns, 1998. **24**(8): p. 728-32.
154. Pitkanen, J. and M.M. Al-Qattan, *Epidemiology of domestic chemical burns in Saudi Arabia.* Burns, 2001. **27**(4): p. 376-8.
155. Hijazeen, R., *Corrosive burns of the upper gastrointestinal tract among Jordanian children.* Annals of Saudi Medicine, 1998. **18**(2): p. 173-175.
156. Chemli, J., et al., *[Accidental caustic ingestion in Tunisian child. Study of 330 cases].* Tunis Med, 2004. **82**(5): p. 411-9.
157. Mazigh Mrad, S., et al., *[Therapeutic management and clinical course of severe caustic oesophageal burns in children treated with methyl-prednisolone. Experience at a digestive endoscopic unit].* Tunis Med, 2004. **82**(10): p. 951-7.
158. Boukthir, S., et al., *[High doses of steroids in the management of caustic esophageal burns in children].* Arch Pediatr, 2004. **11**(1): p. 13-7.
159. Neghab, M., et al., *Home accidents in rural and urban areas of Shiraz, 2000-02.* East Mediterr Health J, 2006. **12**(6): p. 824-33.
160. Mabrouk, A., A. El Badawy, and M. Sherif, *Kerosene stove as a cause of burns admitted to the Ain Shams burn unit.* Burns, 2000. **26**(5): p. 474-7.
161. Carini, L., F.R. Grippaudo, and A. Bartolini, *Epidemiology of burns at the Italian Red Cross Hospital in Baghdad.* Burns, 2005. **31**(6): p. 687-91.
162. Bang, R.L., et al., *Burn mortality during 1982 to 1997 in Kuwait.* European Journal of Epidemiology, 2000. **16**(8): p. 731-739.

163. Prasanna, M. and C. Thomas, *A profile of methicillin resistant Staphylococcus aureus infection in the burn center of the Sultanate of Oman.* Burns, 1998. **24**(7): p. 631-6.
164. Ali, M.H., *Pattern of burn injuries at King Fahad Hospital, Al-Baha: A study of 277 cases.* Annals of Saudi Medicine, 1997. **17**(1): p. 104-107.
165. Maghsoudi, H. and N. Samnia, *Etiology and outcome of pediatric burns in Tabriz, Iran.* Burns, 2005. **31**(6): p. 721-5.
166. Lahbabi, M.S., et al., *Severe burns in children. [French].* Annales de Pediatrie, 1997. **44**(7): p. 485-491.
167. Maziak, W., K.D. Ward, and S. Rastam, *Injuries in Aleppo, Syria; first population-based estimates and characterization of predominant types.* BMC Public Health, 2006. **6**: p. 63.
168. Estahbanati, H.K., P.P. Kashani, and F. Ghanaatpisheh, *Frequency of Pseudomonas aeruginosa serotypes in burn wound infections and their resistance to antibiotics.* Burns, 2002. **28**(4): p. 340-8.
169. Maghsoudi, H., et al., *Burns in pregnancy.* Burns, 2006. **32**(2): p. 246-50.
170. Mabrouk, A.R. and A.E. el-Feky, *Burns during pregnancy: a gloomy outcome.* Burns, 1997. **23**(7-8): p. 596-600.
171. Saadat, M., et al., *High incidence of suicide by burning in Masjid-i-Sulaiman (southwest of Iran), a polluted area with natural sour gas leakage.* Burns, 2004. **30**(8): p. 829-32.
172. Dastgiri, S., L.R. Kalankesh, and N. Pourafkary, *Epidemiology of self-immolation in the North-West of Iran.* European Journal of General Medicine, 2005. **2**(1): p. 14-19.
173. Saadat, M. and Z. Zendeh-Boodi, *Correlation Between Incidences of Self-inflicted Burns and Means of Inbreeding Coefficients, an Ecologic Study.* Annals of Epidemiology, 2006. **16**(9): p. 708-711.
174. Lari, A.R., et al., *Epidemiology of suicide by burns in the province of Isfahan, Iran.* Journal of Burn Care & Research, 2007. **28**(2): p. 307-311.
175. Shabila, N., K. Ismail, and R. Faidulla, *A four-year review of burn injuries in Emergency Management centre in Erbil, Iraqi Kurdistan.* Zanco J Med Sci, 2008. **12** ((special issue)): p. 111-117.
176. Kadir, A., *Paediatric burns in Sulaimani, Iraq.* Annals of Burns and Fire Disasters, 2007. **20**(3): p. 121-125.
177. Kurdistan Regional Government. *The Kurdistan Region in brief*. 2008 [cited 27/4/2009]; Government website]. Available from: http://www.krg.org/articles/?lngnr=12&rnr=140&smap=03010300.
178. Central Organization for Statistics & Information Technology and WFP, *Comprehensive food security and vulnerability analysis in Iraq*. 2008: Baghdad.
179. STROBE. *Strengthening the Reporting of Observational studies in Epidemiology*. 2009 [cited 01.09.09]; Available from: http://www.strobe-statement.org/index.php?id=available-checklists.
180. Bruce, N., D. Pope, and D. Stanistreet, *Quantitative methods for health research: a practical interactive guide*. 2008, Chichester, England: John Wiley &sons.
181. Armstrong, B.K., White, E., Saracci, R., *Principles of exposure measurement in epidemiology*. First ed. 1992, Oxford: Oxford university press.
182. Moi, A.L., et al., *Impaired generic health status but perception of good quality of life in survivors of burn injury.* J Trauma, 2006. **61**(4): p. 961-8; discussion 968-9.
183. Cochran, A., et al., *Self-reported quality of life after electrical and thermal injury.* J Burn Care Rehabil, 2004. **25**(1): p. 61-6.
184. Oster, C., et al., *Validation of the EQ-5D questionnaire in burn injured adults.* Burns, 2009.
185. Blalock, S.J., B.J. Bunker, and R.F. DeVellis, *Measuring health status among survivors of burn injury: revisions of the Burn Specific Health Scale.* J Trauma, 1994. **36**(4): p. 508-15.
186. Noble, J., M. Gomez, and J.S. Fish, *Quality of life and return to work following electrical burns.* Burns, 2006. **32**(2): p. 159-64.
187. Kildal, M., G. Andersson, and B. Gerdin, *Health status in Swedish burn patients. Assessment utilising three variants of the Burn Specific Health Scale.* Burns, 2002. **28**(7): p. 639-45.
188. Kildal, M., et al., *Development of a brief version of the Burn Specific Health Scale (BSHS-B).* J Trauma, 2001. **51**(4): p. 740-6.
189. Litlere Moi, A., et al., *Validation of a Norwegian version of the Burn Specific Health Scale.* Burns, 2003. **29**(6): p. 563-70.

190. Cromes, G.F., et al., *Predictors of quality of life as measured by the Burn Specific Health Scale in persons with major burn injury.* J Burn Care Rehabil, 2002. **23**(3): p. 229-34.
191. Blades, B., N. Mellis, and A.M. Munster, *A burn specific health scale.* J Trauma, 1982. **22**(10): p. 872-5.
192. Adam, M., et al., *Validation of a Turkish version of the burn-specific health scale.* J Burn Care Res, 2009. **30**(2): p. 288-91; discussion 292-3.
193. Willebrand, M. and M. Kildal, *A simplified domain structure of the burn-specific health scale-brief (BSHS-B): a tool to improve its value in routine clinical work.* J Trauma, 2008. **64**(6): p. 1581-6.
194. Ferreira, E., et al., *The cultural adaptation and validation of the "Burn Specific Health Scale-Revised" (BSHS-R): version for Brazilian burn victims.* Burns, 2008. **34**(7): p. 994-1001.
195. Druery, M., T.L. Brown, and M. Muller, *Long term functional outcomes and quality of life following severe burn injury.* Burns, 2005. **31**(6): p. 692-5.
196. Munster, A.M., G.L. Horowitz, and L.A. Tudahl, *The abbreviated Burn-Specific Health Scale.* J. TRAUMA, 1987. **27**(4): p. 425.
197. Lauritsen, J.a.B.M., *Epidata version 3: a comprehensive tool for validated entry and documentation of data*. 2003-2004, The Epidata Association Odense Denmark.
198. Statacorp, *Stata statistical software version 9.2*. 2006, Statacorp: College station, Texas.
199. Collett, D., *Modelling survival data in medical research*. 2nd ed. 2003, London: Chapmann & Hall.
200. Hamilton, L., C., *Statistics using Stata*. 1st ed. 2004, Canada: Brooks/Cole.
201. Schlesselman, K.J., *Case-Control studies: design, conduct, analysis*. First ed. 1982, New York: Oxford university press.
202. American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders*. 4th(DSM-IV) ed. 1994, Washingtonm,DC: American Psychiatric Association.
203. COSIT, et al., *Monitoring the situation of children and women: multiple indicator cluster survey*. 2007.
204. Dupont, W. and W. Plummer, *PS power and sample size program* 2003.
205. Central Organization for Statistics & Information Technology, et al., *Monitoring the situation of children and women: multiple indicator cluster survey*. 2007: Baghdad.
206. van Rijn, O.J., et al., *Incidence of medically treated burns in The Netherlands.* Burns, 1991. **17**(5): p. 357-62.
207. Mashreky, S.R., et al., *Epidemiology of childhood burn: yield of largest community based injury survey in Bangladesh.* Burns, 2008. **34**(6): p. 856-62.
208. el Danaf, A., *Burn variables influencing survival: a study of 144 patients.* Burns, 1995. **21**(7): p. 517-20.
209. Hosseini, R.S., M. Askarian, and O. Assadian, *Epidemiology of hospitalized female burns patients in a burn centre in Shiraz.* East Mediterr Health J, 2007. **13**(1): p. 113-8.
210. Tredget, E.E., et al., *The role of inhalation injury in burn trauma. A Canadian experience.* Ann Surg, 1990. **212**(6): p. 720-7.
211. De-Souza, D.A., W.G. Marchesan, and L.J. Greene, *Epidemiological data and mortality rate of patients hospitalized with burns in Brazil.* Burns, 1998. **24**(5): p. 433-8.
212. Muller, M.J., S.P. Pegg, and M.R. Rule, *Determinants of death following burn injury.* Br J Surg, 2001. **88**(4): p. 583-7.
213. Wong, M.K. and R.C. Ngim, *Burns mortality and hospitalization time--a prospective statistical study of 352 patients in an Asian National Burn Centre.* Burns, 1995. **21**(1): p. 39-46.
214. Analitis, A., et al., *Effects of cold weather on mortality: results from 15 European cities within the PHEWE project.* Am J Epidemiol, 2008. **168**(12): p. 1397-408.
215. Revich, B. and D. Shaposhnikov, *Temperature-induced excess mortality in Moscow, Russia.* Int J Biometeorol, 2008. **52**(5): p. 367-74.
216. Nakaji, S., et al., *Seasonal changes in mortality rates from main causes of death in Japan (1970--1999).* Eur J Epidemiol, 2004. **19**(10): p. 905-13.
217. Laloe, V. and M. Ganesan, *Self-immolation a common suicidal behaviour in eastern Sri Lanka.* Burns, 2002. **28**(5): p. 475-80.
218. Herruzo-Cabrera, R., et al., *Mortality evolution study of burn patients in a critical care burn unit between 1971 and 1991.* Burns, 1995. **21**(2): p. 106-9.

219. Berry, C.C., T.L. Wachtel, and H.A. Frank, *An analysis of factors which predict mortality in hospitalized burn patients.* Burns Incl Therm Inj, 1982. **9**(1): p. 38-45.
220. van Baar, M.E., et al., *Functional outcome after burns: a review.* Burns, 2006. **32**(1): p. 1-9.
221. Willebrand, M., et al., *Pruritus, personality traits and coping in long-term follow-up of burn-injured patients.* Acta Derm Venereol, 2004. **84**(5): p. 375-80.
222. Dyster-Aas, J., et al., *Major depression and posttraumatic stress disorder symptoms following severe burn injury in relation to lifetime psychiatric morbidity.* J Trauma, 2008. **64**(5): p. 1349-56.
223. Thombs, B.D., M.G. Bresnick, and G. Magyar-Russell, *Depression in survivors of burn injury: a systematic review.* Gen Hosp Psychiatry, 2006. **28**(6): p. 494-502.
224. Hamanova H; Brož, L., *Influence of inadequate prehospital and primary hospital treatment on the maturation of scars after thermal injuries.* Acta Chirurgiae Plasticae, 2003. **45**.
225. Esselman, P.C., *Burn rehabilitation: an overview.* Arch Phys Med Rehabil, 2007. **88**(12 Suppl 2): p. S3-6.
226. Stella, M., C. Castagnoli, and E.N. Gangemi, *Postburn scars: an update.* Int J Low Extrem Wounds, 2008. **7**(3): p. 176-81.
227. Gangemi, E.N., et al., *Epidemiology and risk factors for pathologic scarring after burn wounds.* Arch Facial Plast Surg, 2008. **10**(2): p. 93-102.
228. Belba, M.K. and G.P. Belba, *Review of statistical data about severe burn patients treated during 2001 and evidence of septic cases in Albania.* Burns, 2004. **30**(8): p. 813-9.
229. Forjuoh, S.N., B. Guyer, and H.T. Ireys, *Burn-related physical impairments and disabilities in Ghanaian children: prevalence and risk factors.* Am J Public Health, 1996. **86**(1): p. 81-3.
230. Bombaro, K.M., et al., *What is the prevalence of hypertrophic scarring following burns?* Burns, 2003. **29**(4): p. 299-302.
231. WHO, *World report on violence and health*. 2002, World Health Organization: Geneva.
232. Chishti, P., et al., *Suicide mortality in the European Union.* Eur J Public Health, 2003. **13**(2): p. 108-14.
233. Laloe, V., *Patterns of deliberate self-burning in various parts of the world. A review.* Burns, 2004. **30**(3): p. 207-15.
234. Hilal, A., et al., *Deaths due to burns in Adana, Turkey.* Burns, 2008. **34**(7): p. 982-5.
235. Krummen, D.M., K. James, and R.L. Klein, *Suicide by burning: a retrospective review of the Akron Regional Burn Center.* Burns, 1998. **24**(2): p. 147-9.
236. Horner, B.M., et al., *Case-controlled study of patients with self-inflicted burns.* Burns, 2005. **31**(4): p. 471-5.
237. Rashid, A. and J.P. Gowar, *A review of the trends of self-inflicted burns.* Burns, 2004. **30**(6): p. 573-6.
238. Palmu, R., et al., *Self-inflicted burns: an eight year retrospective study in Finland.* Burns, 2004. **30**(5): p. 443-7.
239. Ambade, V.N. and H.V. Godbole, *Study of burn deaths in Nagpur, Central India.* Burns, 2006. **32**(7): p. 902.
240. Haddad S.Y., H.K.J., Abu-Samen M., Wreikat M.W., Haddad A.I., *Suicide attempted by burning: a three-year study.* Annals of Burns and Fire Disasters 1998. **11**(4).
241. Uygur, F., et al., *Profile of self-inflicted burn patients treated at a tertiary burn center in Istanbul.* J Burn Care Res, 2009. **30**(3): p. 427-31.
242. Nakae, H., et al., *Characteristics of self-immolation attempts in Akita Prefecture, Japan.* Burns, 2003. **29**(7): p. 691-6.
243. Marchesan, W.G., et al., *Suicide attempted by burning in Brazil.* Burns, 1997. **23**(3): p. 270-1.
244. Wagle, S.A., A.C. Wagle, and J.S. Apte, *Patients with suicidal burns and accidental burns: a comparative study of socio-demographic profile in India.* Burns, 1999. **25**(2): p. 158-61.
245. Saadat, M., *Correlation between incidences of hospitalised accidental burns and deprivation scores: an ecological study.* Journal of Epidemiology and Community Health, 2006. **60**(12).
246. Malic, C.C., et al., *Burns inflicted by self or by others--an 11 year snapshot.* Burns, 2007. **33**(1): p. 92-7.
247. James, W.A., et al., *Suicide attempts by burning.* J Ky Med Assoc, 2006. **104**(10): p. 459-67.
248. Kposowa, A.J. and S. D'Auria, *Association of temporal factors and suicides in the United States, 2000-2004.* Soc Psychiatry Psychiatr Epidemiol, 2009.

249. Petridou, E., et al., *A role of sunshine in the triggering of suicide.* Epidemiology, 2002. **13**(1): p. 106-9.
250. Kalediene, R., S. Starkuviene, and J. Petrauskiene, *Seasonal patterns of suicides over the period of socio-economic transition in Lithuania.* BMC Public Health, 2006. **6**: p. 40.
251. Hawton, K. and K. van Heeringen, *Suicide.* Lancet, 2009. **373**(9672): p. 1372-81.
252. van Rijn, O.J., L.M. Bouter, and R.M. Meertens, *The aetiology of burns in developed countries: review of the literature.* Burns, 1989. **15**(4): p. 217-21.
253. Locke, J.A., et al., *Socioeconomic factors and burn rates in persons hospitalized for burns in Massachusetts.* Public Health Rep, 1986. **101**(4): p. 389-95.
254. Hippisley-Cox, J., et al., *Cross sectional survey of socioeconomic variations in severity and mechanism of childhood injuries in Trent 1992-7.* Bmj, 2002. **324**(7346): p. 1132.
255. Bijur, P.E., S. Stewart-Brown, and N. Butler, *Child behavior and accidental injury in 11,966 preschool children.* Am J Dis Child, 1986. **140**(5): p. 487-92.
256. Victor, J., et al., *A statewide targeted burn prevention program.* J Burn Care Rehabil, 1988. **9**(4): p. 425-9.
257. McLoughlin, E., et al., *Project Burn Prevention: outcome and implications.* Am J Public Health, 1982. **72**(3): p. 241-7.
258. Ghosh, A. and R. Bharat, *Domestic burns prevention and first aid awareness in and around Jamshedpur, India: strategies and impact.* Burns, 2000. **26**(7): p. 605-8.
259. Ytterstad, B., G.S. Smith, and C.A. Coggan, *Harstad injury prevention study: prevention of burns in young children by community based intervention.* Inj Prev, 1998. **4**(3): p. 176-180.
260. Towner, E., T. Dowswell, and S. Jarvis, *Updating the evidence. A systemic review of what works in preventing childhood unintentional injuries: Part 2.* Inj Prev, 2001. **7**(3): p. 249-53.
261. Kendrick, D., et al., *"Risk Watch": cluster randomised controlled trial evaluating an injury prevention program.* Inj Prev, 2007. **13**(2): p. 93-8.
262. Shani, E. and L. Rosenberg, *Are we making an impact? A review of a burn prevention program in Israeli schools.* J Burn Care Rehabil, 1998. **19**(1 Pt 1): p. 82-6.
263. Swart, L., et al., *Paraprofessional home visitation program to prevent childhood unintentional injuries in low-income communities: a cluster randomized controlled trial.* Inj Prev, 2008. **14**(3): p. 164-9.
264. Turner, C., et al., *Community-based interventions for the prevention of burns and scalds in children.* Cochrane Database Syst Rev, 2004(3): p. CD004335.
265. Ahmadi, A. and B. Ytterstad, *Prevention of self-immolation by community-based intervention.* Burns, 2007. **33**(8): p. 1032-40.
266. WHO, *Preventing injuries and violence: a guide for ministries of health*. 2007, World Health Organization: Geneva
267. WHO, *Child and adolescent injury prevention: a WHO plan of action 2006-2015*. 2006, World Health Organization: Geneva.

Appendices

Appendix 1. The Burns Questionnaire (BQ1)

Sulaymaniyah Burns Study

Burn Questionnaire-BQ1: For all burns patients

Fill in questions 1-4 before starting the interview with the patient/career

Q1. Name of Hospital/PHC:……..
Q2. Name of Interviewer ……
Q3. Date of interview (ddmmyy): ___ / ___ / ___
Q4. Interview No.:…….

Unique Patient ID No.:

Q5. Who is being interviewed:

1. Patient
2. Mother
3. Father
4. Other → specify:…….

Q6. Sex of the patient *(ask if a small child)*

1. Male
2. Female

Q7. Date of Birth *(ddmmyy):* ____ / ___ / ____ OR 8. Age: ……

Q9. Occupation of the patient?

1. Civil servant → specify: ……
2. Private → specify: …….
3. Pensioner
4. Unemployed
5. Farmer
6. House wife
7. Child/student/house girl→ ***Go to Q14***
8. Other → specify: ……

Q10. Marital status of the patient

1. Never Married → ***Go to Q10***
2. Married
3. Divorced
4. Separated
5. Spouse dead

Q11. Occupation of the spouse of the patient?

1. Civil servant → specify: ……
2. Private → specify: …
3. Pensioner
4. Unemployed
5. Farmer
6. Other → specify: ……

Q12. Can the patient's spouse read and write?

1. Yes
2. No → ***Go to Q20***

Q13. What is the patient's spouse's highest level of education?

1. Primary
2. Intermediate
3. Secondary
4. Higher education

Now go to Q20

Q14. Occupation of the father of the patient?

1. Civil servant → specify: ……
2. Private → specify: …….
3. Pensioner
4. Unemployed
5. Farmer
6. Other → specify: ……

Q15. Occupation of the mother of the patient?

1. Civil servant → specify: ……
2. Private → specify: ……
3. Pensioner
4. House wife
5. Other → specify: ……

Q16. Can the patient's mother read and write?

1. Yes
2. No ***Go to Q18***

Q17. What is the patient's mother's highest level of education?

1. Primary
2. Intermediate
3. Secondary
4. Higher educatio

Q18. Can the patient's father read and write?

1. Yes
2. No ***Go to Q20***

Q19. What is the patient's father's highest level of education?

1. Primary
2. Intermediate
3. Secondary
4. Higher education

Q20. Can the patient read and write?

1. Yes
2. No ***Go to Q 22***

Q21. What is the patient's highest level of education?

1. Primary
2. Intermediate
3. Secondary
4. Higher education

Q22. Where do you live?

1. Inside Sulaymaniyah → Name of neighborhood: …….
2. Outside Sulaymaniyah → Town: ……
   Village: ……

Q23. How many persons are there in your household sharing the same kitchen?.....

Q24. How many of them are 0-5 years of age? ……..

Q27. How would you describe the living standard of the family?

1. Poor
2. Fair
3. Good
4. Very good

Q28. Do you live in your own house or other property?

1. Own house 2. Rented
3. Other → specify: ……..

Q30. What is the house made of?

1. Concrete 2. Mud 3. Other → specify: ……..

Q31. How many rooms are there in your house (counting sleeping room, living room, dining room and kitchen)? ……..

Q34. Which <u>one</u> of the following devices do you <u>usually</u> use for cooking?

1. Gas cooker
2. Kerosene cooker
3. Electric cooker
4. Kerosene stove
5. Sepa (tripod)
6. Agrdan (fireplace)

Q36. Which one(s) of the following devices do you use for heating the rooms?

1. Split/air conditioner
2. Kerosene stove
3. Gas stove
4. Electric heater
5. Wood stove
6. Coal stove

Q37. Which one of the following devices do you use for bathroom water boiling?

1. Boiler
2. Element dip
3. Primus
4. Kerosene stove
5. Wood fire (under barrel)

Go to Q 39

Q38. (If using Boiler) Do you know the temperature of your boiler?

1. Yes 2. No

Q39. Do you sometimes use a house generator for electricity?

1. Yes 2. No

Q40. Do you have a car?

1. Yes 2. No

Q41. Do you keep benzene at home?

1. Yes 2 . No → ***Go to Q42***

Q42. How do you keep benzene at home?

1. in plastic containers
2. in metal jerry cans
3. in barrels
4. Other → specify: ….

Q43. Do you have a fire extinguisher cylinder at home?

1. Yes 2. No

Q44. Do you have a fire alarm installed at home?

1. Yes 2. No

Q45. Which of the following device do you usually use for preparing tea?

1. Kettle and teapot
. Samovar and teapot
3. Electric kettle
4. Other → specify: …….

Q49. Has any one else in the family sustained burn in the past?

1. Yes 2. No

Q50. How many time have you (the patient) sustained a burn injury before? …….

Q51. When did the current burn happen? (ddmmyy): ___ / ___ / ___

Q53. What time did the burn happen? *(Write hour)*: ……

Q54. Where did the burn happen?

1, At Home
2. At work
3. At school/nursery
4. Outdoors

→ ***Go to Q55***

Q55. W*here* at home did the burn happen?

1, Kitchen
2. Living rooms
3. Bedroom
4. Bathroom
5. Yard/porch
6. Store
7. Other → specify: ……

Q56. How did the burn happen?

1. Accident (unintentional) by self
2. Accident (unintentional) by another person
3. Deliberate self-inflicted
4. Deliberate by another person
5. Other → specify ……

Q57. Was the person alone when the burn happened?

1. Yes 2. No

Q58. What type of clothes was the person wearing when the burn happened?

1. Nylon/ synthetic fabrics
2. wool/cotton

Q59. What device was responsible for the burn?

1. Gas cooker
2. Kerosene cooker
3. Electric cooker
4. Gas stove (space heater)
5. Kerosene stove (space heater)
6. Boiler
7. Electric stove
8. Electric Iron
9. Primus
10. Wood stove
11. Matches/ cigarette lighter
12. Open fire
13. Other → specify: ……

Q60. What material caused the burn?

1. Direct flame → ***Go to Q 67***
2. Contact with hot object → ***Go to Q64***
3. Hot water
4. Hot tea
5. Hot oil
6. Hot milk
7. Hot food
8. Hot steam
9. Other hot liquid → specify……..

→ ***Go to Q60***

10 Chemicals → ***Go to Q76***
11. Electricity → ***Go to Q80***
12. Lightening → ***Go to Q 84***
13. Explosives → ***Go to Q 85***
14. Other → specify: ……..

Ask the following 4 questions (Q61-Q64)) only if the burn is a <u>scald</u>

Q61. What liquid caused the burn? ……..

Q62 What sort of container contained the liquid which scalded you/your child?

1, Cups/glasses
2. Kettle/teapot
3. Saucepan/ dishes
4. Bathroom utensils
5. Water pipe
6. Other → specify: ……..

Q63. What caused contact between the liquid and skin of the patient?

1. Accidental spillage by self
2. Accidental spillage by another
3. Accidental dipping in the hot liquid by self
4. Accidental dipping in the hot liquid by another
5. Intentional
6. Other → specify:……..

Q64. Please give a short description of how the incident happened.

……

Ask the following 3 questions (Q65-Q67)) only if the burn is a due to <u>contact with a hot object</u>

Q65. Contact with what hot object caused the burn?.....

Q66. What caused contact between the hot object and the skin?

1. Accidental by self
2. Accidental by another
3. Intentional
4. Inflicted by other
4. Other →specify:……

Q67. Please give a short description of how the incident happened.

……

Ask the following 7 questions (Q68-Q75)) only if the burn is caused by flame

Q68. What device was responsible for the fire? '……..

Q69. What material was responsible for the fire?

1. Kerosene
2. Benzene
3. Gasolene
4. Gas
5, Wood
6. Explosive/Gunpowder
7. Fireworks
8. Other 6 → specify: ……

Q70. What was caused ignition of the fire? ……

Q70clothes. Were clothes ignited?

1. Yes 2. No

Q71. What caused contact between the flame and the person?

1. Accidental by self
2. Accidental by another
3. Intentional
4. Inflicted by other
5. Other →specify:……

Q72. If it is an open fire, where did the fire happen?

1. Not open fire ***Go to Q72***
2. At home
3. At workplace
4. Outdoors

Q73. Where you enclosed and overwhelmed by smoke?

1. Yes
2 No → ***Go to Q72***

Q74. How long were you enclosed and overwhelmed by smoke *(in minutes)*?.....

Q75. Pleas give a short description of how the incident happened.

……

Ask the following 4 questions (Q76-Q79)) only if the burn is caused by ingestion or contact with chemical corrosives

Q76. What is the type of the corrosion injury?

1. External (contact with external parts of the body)

2. Internal (ingestion of the material)

Q77. Which material was responsible for the burn? ……..

Q78. What caused contact with the corrosive?

1. Accidental spillage by self
2. Accidental spillage by another
3. Accidental dipping in the corrosive material by self
4. Accidental dipping in the corrosive material by another
5. Accidental ingestion
6. Intentional
6. Other → specify:……..

Q79. Please give a short description of how the incident happened.

……

Ask the following 4 questions (Q80-83)) only if the burn is caused by electrical current

Q80. What device was responsible for the burn?.....

Q80. How did the contact with the body happen?

1. Accidental by self
2. Accidental by another
3. Faulty device/electricity source
4. Intentional
5. Other-infilcted
6. Other → specify: ……..

Q82. Which part of the body first came contact with the electricity? .....

Q83. Give a short description of how the incident happened.

……

Ask the following questions (Q84)) only if the burn is caused by lightening

Q84. Give a short description of how the incident happened.

……

Ask the following questions (Q84)) only if the burn is caused by lightening

Q84E. Give a short description of how the incident happened.

……

Ask the following questions (Q84)) only if the burn is caused by lightening

Q84O. Give a short description of how the incident happened.

……

The following questions are for every one

Q85. How much time lapsed between burn event and arrival in hospital? *(write in minutes and hours)*

……

Q85d. Delay in days (if one day or more):…..

Q85I. Hospital days if admitted before this hospital:……..

Q86. What did you do for the burn at home?

1. Nothing
2. Cooling with water
3. Application of tooth paste/ tomato etc. → specify……..
4. Application of medical ointment
5. Other → specify: ……

Q87. What happened to the patient?

1. Treated and sent away without follow up
2. Treated and sent away with follow up in the Emergency Hospital out patient
3. Treated and sent away with follow up in the health centre
4. Admitted (*eligible for admitted patients' module and quality of life Q)*

3. Referred to Emergency Hospital (in case of primary health centres)

Q88. Does the patient have any other diseases for which he/she is under treatment and/or supervision?
1. Yes → specify:…….. 2. No

This part of the interview with the patient is completed. If the patient is a child of 0-5 years, go to child module (QC) and then complete the table below for all patients.

Take the answers of the following questions from the records

Q89.Burn area	Q90.second degree	Q91Third degree	Q91b.Mixed	Q92.Total
1. Head				
2. Neck				
3. Anterior trunk				
4. Posterior trunk				
5. Rt. Buttock				
6. Lt. buttock				
7. Genitalia				
8. Rt. upper arm				
9. Lt. upper arm				
10. Rt. lower arm				
11. Lt. lower arm				
12. Rt. Hand				
13. Lt. hand				
14. Rt. Thigh				
15. Lt. thigh				
16. Rt. Leg				
17. Lt. leg				
18. Rt. Foot				
19. Lt. foot				

Q93 Total percentage of burn: ……
Q94. Total percentage of third degree: ……

Module for Children 0-5 Years of Age (QC)

This module is complementary to the general module BQ1 and must be administered immediately after that module only to children aged 0-5 complete years.

Q1. Interview Number ***(copy it from BQ1)***:……

Unique Patient ID No.:

QC2. Where was the child delivered?
1. Home
2. Hospital/health facility

QC3. Is the child currently going to nursery or kindergarten?
1. Yes 2.No

QC4. Has the child ever gone to nursery or kindergarten?
1. Yes 2.No

QC5. What is the order of the child in the family? ……

QC7. Is the child living with his/her mother?
1. Yes 2.No

QC8. Does the child have an elder sister who sometimes takes care of him/her?
1. Yes 2. No

QC9. Who usually takes care of the child?
1. Mother
2. Sister
3. Other → specify:……

QC10. If the child is not with the mother (mother out or busy at home), who takes care of the child?
1. Father
2. Sibling
3. Grandparent
4. No one
5. Others → specify:……

		never or rarely(0)	Some-times (1)	Often (2)	very often(3)
QC12	Does the child fidget with hands or feet or squirms in seat?				
QC13	Does the child run about or climb excessively in situations in which it is inappropriate Does not seem to listen when spoken to directly?				
QC14	Is the child "on the go" or often acts as if "driven by a motor"?				

QC19. How often can this child reach out to the place where you keep matches, cigarette lighters, cooker lighters?
1. Never
2. Sometimes
3. Often
4. Very often

QC20. When you cook and work near fire, how often are you aware of the danger of burning?
1. Never

2. Sometimes
3. Often
4. Very often

QC21. Does the child have history of seizures?
1. Yes 2.N

QC22. Does the child have any severe mental health problem (mental retardation, learning disorders)?
1. Yes → specify …….. 2. No

QC23. Does the child have difficulty in walking (if child still younger than awaking age tick NA)?
1. Yes 2.No 3.Not walking yet

Q24. Does the child have difficulty in hearing?
1. Yes 2.No

Q25. Does the child have difficulty in seeing?
1. Yes 2.No

Module for admitted patients (QA)

Data to be extracted from file at discharge

This module is complementary to the general module BQ1 and must be filled for all patients who are admitted to hospital at day of discharge from the patients file.

Unique Patient ID No.:

QA0. File Number:……..
QA1. Date of admission (dd/mm/yy): …../……/……
QA2. Date of discharge/death (dd/mm/yy): …../……/……
QA2Type of discharge:
1. Death 2. Improvement 3. Transfer 4. Against advice
QA3 Length of stay in hospital in days:(auto)
Q A3 weight…… QA3hb1 .....QA3hb2..... QA3prot.....
QA3Sugar ……. QA3Urea ……. QA3Crea ……. QA3Sod…….
QA4 Inhalation injury
1. Yes 2.No
QA5. Non-surgical treatment given:
QA5a Number of pints of IV fluids:
QA5b. Number of pints of Blood:
QA5c. Number of days on Antibiotics:
QA5d. Number of days on non-narcotic analgesics
QA5e. Number of days on narcotic analgesics
QA4h. Other:
QA6. Surgical Interventions(e.g. debriedment, skin graft, amputation etc.)
1.
2.
3.
4,
QA7. How many times was the patient operated under general Anesthesia? ……
QA9. Complications (e.g. wound infection, septicemia, renal failure etc.)
1.
2.
3,
4.
QA10. Wound culture done?
1. Yes 2. No
QA11. Results of wound culture
0. Negative
1. Positive → pathogen(s):……. …….
QA12. Did the patient die?
1. Yes 2. No → ***Go to Q15***
QA13. Immediate cause of death?.....
QA14. Other causes mentioned: ……..
QA15. Any long lasting effects(e.g. movement limitation, amputations, scars, blindness etc.)
1.
2.
3.
4,

Appendix 1b. The Burns Questionnaire (in Kurdish)

Sulaymaniyah Burns Study
Burn Questionnaire-BQ1: For all burns patients

تویژینەوەی سووتاوی لە سلێمانی: پرسنامەی BQ1 بۆ هەموو نەخۆشەکان

پێش ئەوەی دەست بە چاوپێکەوتنەکە بکەی پرسیاری ١-٥ وەڵام بدەرەوە

پ١. ناوی نەخۆشخانە یا بنکەی تەندروستی:.....

Unique Patient ID No.:

پ٢. ناوی پرسکار: .....

پ٣. رۆژی چاوپێکەوتن (رۆژ/مانگ/ساڵ): ____/__ /____

پ٤. ژمارەی چاوپێکەوتن:.....

پ٥. چاوپێکەوتن لەگەڵ کێدایە؟

١. نەخۆش
٢. دایکی نەخۆش
٣. باوکی نەخۆش
٤. خەڵکی تر، تکایە دیاریی بکە:.....

پ٦. رەگەزی نەخۆش ***(ئەگەر منداڵیکی بچووك بوو پرسیلر بکە)*** ١.نێر ٢.مێ

پ٧. بەرواری لەدایك بوون: (رۆژ/مانگ/ساڵ): ____/__ /____ یا پ ٨. تەمەن: .....

پ٩. ئیشی نەخۆش

١. کارمەندی حکومەت، دیاریی بکە:.....
٢. کەرتی تایبەت، دیاریی بکە:.....
٣. خانەنشین
٤. بێکار
٥. جووتیار
٦. ژنی ماڵەوە
٧. منداڵ، خوێندکار، کچی ماڵ >> ***بچۆ بۆ پ ١٤***
٨. هی تر، تکایە دیاریی بکە: .....

پ١٠. باری خێزانی نەخۆش

١. سەڵت >> ***بچۆ بۆ پ ١٤***
٢. هاوسەری هەیە
٣. تەڵاق
٤. جیابووەتەوە
٥. هاوسەری نەماوە

پ١١ ئیشی هاوسەری نەخۆش

١. کارمەندی حکومەت، دیاریی بکە:.....
٢. کەرتی تایبەت، دیاریی بکە:.....
٣. خانەنشین
٤. بێکار
٥. جووتیار
٦. هی تر، تکایە دیاریی بکە: .....

پ١٢. ئایا هاوسەری نەخۆشەکە خوێندەواریی هەیە؟ بەڵێ ١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ٢٠*

پ١٣. بەرزترین پلەی خوێندنی هاوسەری نەخۆش؟

١. سەرەتایی
٢. ناوەندی
٣. ئامادەیی
٤. خوێندنی باڵا

>> ***ئێستا بچۆ بۆ پرسیاری ٢٠***

پ١٤. ئیشی باوکی نەخۆش؟

١. کارمەندی حکومەت، دیاریی بکە:.....
٢. کەرتی تایبەت، دیاریی بکە:.....
٣. خانەنشین
٤. بێکار
٥. جووتیار
٦. هی تر، تکایە دیاریی بکە: .....

پ١٥. ئیشی دایکی نەخۆش؟

١. کارمەندی حکومەت، دیاریی بکە:.....
٢. کەرتی تایبەت، دیاریی بکە:.....
٣. خانەنشین
٤. ژنی ماڵەوە
٥. هی تر، تکایە دیاریی بکە: .....

پ١٦. ئایا دایکی نەخۆش خوێندەواریی هەیە؟ ١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ١٨*

پ١٧. بەرزترین پلەی خوێندنی دایکی نەخۆش؟

١. سەرەتایی ٢. ناوەندی ٣. ئامادەیی ٤. خوێندنی باڵا

پ١٨. ئایا باوکی نەخۆش خوێندەواریی هەیە؟ ١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ٢٠*

پ١٩. بەرزترین پلەی خوێندنی باوکی نەخۆش؟

١. سەرەتایی ٢. ناوەندی ٣. ئامادەیی ٤. خوێندنی باڵا

پ٢٠. ئایا نەخۆشەکە خوێندەواریی هەیە؟ ١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ٢٢*

پ٢١. بەرزترین پلەی خوێندنی نەخۆش؟

١. سەرەتایی ٢. ناوەندی ٣. ئامادەیی ٤. خوێندنی باڵا

پ٢٢. ماڵتان لە کوێ یە؟

١. ناو سلێمانی >> گەرەکی: .....

٢. دەرەوەی سلێمانی >> شاری:..... گوندی: .....

پ٢٣. ژمارەی ئەندامەکانی خێزانەکەتان چەندن کە پێکەوە دەژین؟ ..... پ٢٤. چەند کەسیان تەمەنیان لە شەش ساڵ کەمترە؟ .....

پ٢٧. ئاستی ئابووریی خێزانەکەت لە چ رادەیەکدا دادەنێی؟

١. خراپ ٢. مامناوەندی ٣. باش ٤. زۆرباش

پ٢٨. لە خانووی خۆتاندا ئەژین یا لە کرێدا؟

١. خانووی خۆمان ٢. کرێ ٣. جۆری تر، دیاریی بکە: .....

پ٣٠. خانووەکە لەچی دروست کراوە؟

١. کۆنکرێت ٢. قوڕ ٣. هی تر، دیاریی بکە :.....

پ٣١ چەند ژوورتان هەیە (ژووری نووستن و دانیشتن و نان خواردن و مەتبەخ حساب بکە)؟: .....

پ٣٤. کام لەم شتانەی خوارەوە بەکاردێنن بۆ چێشت لێنان؟ (ئەتوانی زیارتر لە یەکیک هەڵبژێری)

١. تەباخی غاز ٣. تەباخی کارەبا، هیتەر ٥. پەرەمێز/ سێپا

٢. تەباخی نەوت ٤. زۆپا ٦. ئاگردان

پ٣٦. کام لەم شتانەی خوارەوە بەکاردێنی بۆ گەرمکردنی ماڵەکە؟ (ئەتوانی زیاتر لە یەکێک هەڵبژێری)

١. سپلیت یا ئەیر کۆندیشن ٣. زۆپای غاز ٥. زۆپای دار

٢. زۆپای نەوت ٤. زۆپا و هیتەری کارەبا ٦. مقەڵی

پ٣٧. کام لەم شتانەی خوارەوە بەکاردێنی بۆ گەرمکردنی ئاوی حەمام؟ (ئەتوانی زیارتر لە یەکیک هەڵبژێری)

١. بۆیلەر

٢. ئیلەمێنتی کارەبا

٣. پەرەمێز

٤. تەباخی نەوت *بچۆ بۆ پرسیاری ٣٩*

٥. تووڵ و دار

پ٣٨. (ئەگەر بۆیلەر بەکاردێنی) ئایا ئەزانی پلەی گەرمای بۆیلەرەکەتان لەسەر چەندە؟ ١. بەڵێ ٢. نەخێر

پ٣٩. ئایا موەلیدەی خۆتان هەیە لە ماڵەوە؟ ١. بەڵێ ٢. نەخێر

پ٤٠. سەیارەتان هەیە؟ ١. بەڵێ ٢. نەخێر

پ٤١. لە ماڵەوە بەنزین هەڵدەگرن؟ ١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ٤٣*

پ٤٢. لە چیدا بەنزین هەڵ دەگرن لە ماڵەوە؟

١. دەبەی پلاستیک ٢. جێریکانی ئاسن ٣. بەرمیل ٤. شتی تر، دیاریی بکە.....

پ٤٣. لە ماڵەوە حەریقتان هەیە (بوتڵی ئاگر کوژاندنەوە) ١. بەڵێ ٢. نەخێر

پ٤٤. لە ماڵەوە دەزگای ئینزاری ئاگرتان هەیە ١. بەڵێ ٢. نەخێر

پ٤٥. عادەتەن کام لەم شتانە بەکاردێنن بۆ چا دروست کردن؟

١. کتری و قۆری
٢. سەماوەر و قۆری
٣. کتری کارەبایی
٤. شتی تر، دیاریی بکە:.....

پ٤٩. لەم خێزانەدا کەسی تر پێشتر سووتاوە؟ ١. بەڵێ ٢. نەخێر

پ٥٠. ئەم نەخۆشە چەند جاری تر پێشتر سووتاوە؟.....

پ٥١. ئەم سووتاوییەی ئێستا کەی رووی دا؟ (رۆژ/مانگ/ساڵ): ____/__ /____

پ٥٣. سەعات چەند سووتانەکە رووی دا؟ سەعات و دەقە بنووسە: .....

پ٥٤. سووتانەکە لە کوێ رووی دا؟

١. لە ماڵ
٢. لە سەر ئیش
٣. لە قوتابخانە، ڕەوزە، حەزانە
٤. لە دەرەوە(کۆڵان، سەرجادە ..)

بچۆ بۆ پرسیاری ٥٦

پ٥٥. لە ماڵەوە لە کوێ رووی دا؟

١. مەتبەخ
٢. ژووری دانیشتن و هۆڵ
٣. ژووری نووستن
٤. حەمام
٥. حەوشەو هەیوان
٦. مەخزەن و گەنجینە
٧. هی تر، دیاریی بکە:.....

پ٥٦. سووتانەکە چۆن رووی دا؟

١. حادیسە بوو خەتای خۆی بوو
٢. حادیسە بوو خەتای یەکێکی تر بوو
٣. خۆی بەدەستی ئەنقەست
٤. یەکێکی تر بەدەستی ئەنقەست
٥. هی تر، دیاریی بکە :.....

پ٥٧. کە سووتانەکە رووی دا ئەو کەسە بەتەنیا بوو؟ ١. بەڵێ ٢. نەخێر

پ ٥٨. قوماشی جلەکانی چی بوو کاتی سووتان؟ ١. نایلۆن و مادەی دەسکرد ٢. لۆکەو خوری

پ٥٩. چ دەزگایەك بووە هۆی سووتان؟

١. تەباخی غاز
٢. تەباخی نەوت
٣. تەباخی کارەبا
٤. زۆپای غاز
٥. زۆپای نەوت
٦. بۆیلەر
٧. هیتەری کارەبا
٨. ئوتو
٩. پەرەمێز
١٠. زۆپای دار
١١. شقارتە
١٢. ئاگری کراوە
١٣. هی تر، دیاریی بکە: .....

پ٦٠. چ مادەیەك بووە هۆی سووتانەکە؟

١. گڕی راستەوخۆ >> بچۆ بۆ پرسیاری ٦٨
٢. بەرکەوتنی شتێکی گەرم >> بچۆ بۆ پرسیاری ٦٥
٣. ئاوی گەرم
٤. چای گەرم
٥. ڕۆنی گەرم
٦. شیری گەرم
٧. خواردنی گەرم
٨. هەڵمی گەرم
٩. شلەی تری گەرم، تکایە دیاریی بکە:.....

>> بچۆ بۆ پرسیاری ٦١

١٠. مادەی کیمیایی سووتێنەر >> بچۆ بۆ پرسیاری ٧٦

١١. کارەبا >> بچۆ بۆ پرسیاری ٨٠

١٢. هەوەرتریشقە >> بچۆ بۆ پرسیاری٨٤

١٣. تەقینەوە >> بچۆ بۆ پرسیاری ٨٤ ب

١٤. هی تر،تکایە دیاریی بکە:..... .....>> بچۆ بۆ پرسیاری ٨٤ج

ئەم ٤ پرسیارە (٦١-٦٤) تەنیا بۆ ئەو سووتانەیە کە بەهۆی ئاوو هەڵم و شلەمەنی گەرمەوە رووی دابێ

پ٦١. چ شلەیەك بووە هۆی سووتانەکە؟ .....

پ٦٢. ئەو شلەیەی بووە هۆی سووتان لە چ جۆرە قاپێکدا بوو؟

١. پیاڵەو پەرداخ ٣. قاپ و قاچاخی چێشت ٥. بەلووعە

٢. کتری و قۆری ٤. شتومەکی حەمام ٦. هی تر، دیاریی بکە: .....

پ٦٣. چ شتێك بووە هۆی ئەوەی شلە گەرمەکە بەر نەخۆشەکە بکەوێ؟

١. بە سودفە خۆی رژاندی ٥. بە ئەنقەستی خۆی بوو

٢. بە سودفە یەکێکی تر رژاندی ٦. بە ئەنقەتسی یەکێکی تر بوو

٣. بە سودفە خۆی کەوتە ناوی ٧. هی تر،دیاریی بکە:.....

٤. بە سودفە یەکێکی تر خستیە ناو شلە گەرمەکەوە

پ٦٤. تکایە بە کورتی باسێکی چۆنێنی رووداوەکە بکە: .....

.....

>> *بچۆ بۆ پرسیاری ٨٥*

ئەم ٣ پرسیارە (٦٥-٦٧) تەنیا بۆ ئەو سووتانەیە کە بەهۆی بەرکەوتنی شتی گەرمەوە رووی دابێ

پ٦٥. بەرکەوتنی چ شتیك بووە هۆی سووتان؟.....

پ٦٦. چ شتێك بووە هۆی ئەوەی ئەو شتە گەرمەت بەرکەوێ؟

١. بە سودفە خەتای خۆی بوو ٤. بە ئەنقەتسی کەسێکی تر بوو

٢. بە سودفە خەتای کەسێکی تر بوو ٥. هی تر، دیاریی بکە :.....

٣. بە ئەنقەستی خۆی بوو

پ٦٧. تکایە بە کورتی باسێکی چۆنێنی رووداوەکە بکە: .....

.....

>> *بچۆ بۆ پرسیاری ٨٥*

ئەم ٧ پرسیارە (٦٨-٧٤)تەنیا بۆ ئەو سووتانەیە کە بەهۆی گڕی ئاگرەوە رووی دابێ

پ٦٨. چ دەزگایەك بووە هۆی سووتان؟.....

پ٦٩. چ مادەیەك بووە هۆی سووتان؟

١. نەوت ٤. غاز ٧. تەرەقە و ئەلعاب ناری

٢. بەنزین ٥. دار ٨. هی تر، دیاریی بکە :.....

٣. گازۆیل ٦. تەقەمەنی و باروت

پ٧٠.چ شتێك بوو بەهۆی داگیرسانی ئاگرەکە؟ .....

پ٧١.چ شتێك بووە هۆی بەرکەوتنی گڕی ئاگرەکە؟

١. بە سودفە خەتای خۆی بوو ٣. بە ئەنقەستی خۆی بوو ٥. هی تر، دیاریی بکە:

٢. بە سودفە خەتای کەسێکی تر ٤. بە ئەنقەتسی کەسێکی تر بوو .....

پ۷۲. ئەگەر ئاگرێکی کراوە بووە، ئاگرەکە لە کوێدا رووی دابوو؟

.1 ئاگری کراوە نەبوو .2 لە ماڵەوە ٣. لە شوێنی ئیش ٤. لە دەرەوە

پ۷۳. ئایا لە ناو ئاگراەکەدا مایتەوە لە شوێنێکی داخراودا؟ ١. بەڵێ ٢. نەخێر

پ۷٤. ماوەی چەند لە ناو ئاگرەکەدا مایتەوە؟.(بە دەقە بینووسە).....

پ۷۵. تکایە بە کورتی باسێکی چۆنێنی رووداوەکە بکە: .....

.....

<< *بچۆ بۆ پرسیاری ۸۵*

ئەم ٤ پرسیارە (۷٦-۷۹) بکە ئەگەر سووتانەکە بەهۆی خواردنەوە یا بەرکەوتنی مادەی کیمیایی سووتینەرەوە رووی داوە؟

پ۷٦. جۆری برینە سووتێنەرەکە چییە؟

١. بەرکەوتنی مادەی کیمیایی لەگەڵ بەشی دەرەوەی لەش

٢. بەرکەوتن لەگەڵ ناوەوەی لەش (خواردنەوەی مادەکە)

پ۷۷. چ مادەیەك بووە هۆی سووتانەکە؟.....

پ۷۸. چ شتێك بووە هۆی بەرکەوتنی مادە سووتێنەرەکە؟

١. بە سودفە خۆی رژاندی ۵. بە هەڵە خواردیەوە

٢. بە سودفە یەکێکی تر رژاندی ٦. بە ئەنقەستی خۆی بوو

٣. بە سودفە خۆی کەوتە ناوی ۷. بە ئەنقەتسی یەکێکی تر بوو

٤. بە سودفە یەکێکی تر خستیە ناو شلە گەرمەکەوە ۸. هی تر، دیاریی بکە:.....

پ۷۹. تکایە بە کورتی باسێکی چۆنێنی رووداوەکە بکە: .....

.....

.....

<< *بچۆ بۆ پرسیاری ۸۵*

ئەم ٤ پرسیارە (۸۰-۸۳) بکە ئەگەر سووتانەکە بەهۆی کارەباوە رووی داوە؟

پ۸۰. چ دەزگایەك بووە هۆی سووتانەکە؟.....

پ۸۱. چ شتێك بووە هۆی بەرکەوتنی کارەباکە؟

١. بە سودفە خۆی ٤. بە ئەنقەستی خۆی بوو

٢. بە سودفە کەسێکی تر ۵. بە ئەنقەتسی یەکێکی تر بوو

٣. دەزگاکە یا کارەباکە خراپ بوو ٦. هی تر، دیاریی بکە: .....

پ۸۲. کارەباکە بەر چ بە شێکی لەش کەوت؟ .....

پ۸۳. تکایە بە کورتی باسێکی چۆنێتی رووداوەکە بکە:.....

.....

<< *بچۆ بۆ پرسیاری ۸۵*

پ۸٤. (هەورەتریشقە)تکایە بە کورتی باسێکی چۆنێنی رووداوەکە بکە: .....

.....

<< *بچۆ بۆ پرسیاری ۸۵*

پ۸٤ب. (تەقینەوە)تکایە بە کورتی باسێکی چۆنێنی رووداوەکە بکە .....

.....

پ۸۵ج. تکایە (هی تر)بە کورتی باسێکی چۆنێنی رووداوەکە بکە

.....

.....

پ٨٥. لە سووتانەوە تا گەیشتنە نەخۆشخانە چەندی پێ چوو؟.(بە سەعات و دەقە بینووسە).....

پ٨٦. لە ماڵەوە چیتان بۆ چارەی سووتاوییەکە کرد؟

١. هیچ

٢. فێنك کردنەوە بە ئاو

٣. بەکارهێنانی مەرهەمی پزیشکی

٤. بەکارهێنانی شتی دەرمانی ددان شتی کوردەواری، تکایە دیاریی بکە:.....

پ٨٧. نەخۆشەکە چی لێ بەسەرهات لە نەخۆشخانە؟

١. چارەسەر کراو نێردرایەوە و پێویستی بە سەردانی تر نیە

٢. چارەسەر کراو نێردرایەوە بەڵام پێویستی بە سەردانی دووبارە هەیە

٣. داخڵی نەخۆشخانە کرا (پرسنامەی داخڵ و چۆنایەتی ژیان)

٤. نێردرا بۆ سەنتەری سووتاوی (ئەگەر نەخۆش لە بنکەیی تەندروستی بینراوە)

پ٨٨. ئایا نەخۆشەکە هیچ نەخۆشییەکی تری هەیە کە دەرمانی بۆ وەربگرێ یا لە ژێر چاودێریدا بێت بە هۆیەوە؟

١. بەڵێ، تکایە دیاریی بکە:..... ٢. نەخێر

ئەم بەشەی چاوپێکەوتن تەواو بوو. ئەگەر نەخۆشەکە منداڵی ٠-٥ ساڵە پرسنامەی منداڵی بۆ پڕبکەرەوە (QC) و پاشان ئەم خشتەیەی خوارەوە پڕبکەرەوە بۆ هەموو نەخۆشەکان. وەڵامی ئەم خشتەیە لە تۆماری نەخۆشەکەوە وەربگرە.

پ ٨٩. شوێن سووتاوی	پ٩٠. پلە ٢	پ٩١.پلە ٣	پ٩١b. مکس	پ٩٢. کۆ
١. سەر				
٢. مل				
٣. پیشەوەی قەد (سك و سنگ)				
٤. پشتەوەی قەد				
٥. سمت ٢★				
٦. جەنیتاڵیا				
٧. باسك ٢★				
٨. قۆڵ ٢ ★				
٩. دەست ٢★				
١٠. ران ٢★				
١١. لاق ٢★				
١٢. پێ ٢ ★				
پ٩٣. ڕێژەی گشتیی سووتاوی:				
پ٩٤. ڕێژەی گشتیی سووتاوی پلە ٣:.....				

Module for Children 0-5 Years of Age (QC)

پرسنامەی منداڵانی ٠- ٥ ساڵ

ئەم بەشە تەواوکەری پرسنامەی سەرکییە و پێویستە یەکسەر دوای ئەو پرسنامەیە بۆ هەموو ئەو منداڵانە تەواوبکرێ کە تەمەنیان ٠-٥ ساڵە.

Unique Patient ID No.:

پ١. ژمارەی چاوپێکەوتن (لە بەشی سەرەکییەوە وەری بگرە):.....

پ٢. ئەم منداڵە لە کوێ لەدایك بووە؟

١. لە ماڵەوە ٢. لە نەخۆشخانە یا هەر دامەزرامەیەکی تەندروستی

پ٣. ئایا ئەم منداڵە ئێستا دەچێ بۆ ڕەوزە یا حەزانە؟ ١. بەڵێ ٢. نەخێر

پ٤. ئایا ئەم منداڵە پێشتر چووە بۆ ڕەوزە یا حەزانە؟ ١. بەڵێ ٢. نەخێر

پ٥. ئەم منداڵە چەندەم منداڵە لە خێزانەکەدا؟ .....

پ٧. ئایا ئەم منداڵە لەگەڵ دایکی دەژی؟ ١. بەڵێ ٢. نەخێر

پ٨. ئایا ئەم منداڵە خوشکی لەخۆی گەورەتری هەیە جار جار وریایی بکات؟ ١.. بەڵێ ٢. نەخێر

پ٩. بە شێوەیەکی گشتی کێ زیاتر وریایی ئەم منداڵە دەکات؟

١. دایکی ٢. خوشکی ٣.کەسێکی تر، دیاریی بکە: .....

پ١٠. ئەگەر کاتێك دایکی لەماڵ نەبێ یا مەشغوڵ بێ، کێ وریایی منداڵەکە دەکات؟

١. باوك ٤. هیچ کەس

٢. خوشك و برا ٥. کەسێکی تر، دیاریی بکە: .....

٣. دایە گەورە و بابە گەورە

	تا چ ڕادەیەك ئەم منداڵە وایە؟	قەت وانیە یا بەدەگمەن وایە	جارجار وایە	زۆرجار وایە	زۆربەی کات وایە
پ١٢	ئەم منداڵە دایم دەست پەل دەکوتێ لەسەر کورسیش بێ هەر لە جووڵە جووڵ ناوەستێ				
پ١٣	ئەم منداڵە زیاد لە پێویست دەجووڵێ و بە شوێنی وادا سەردەکەوێ و دەڕوا لەبار نیە بۆی؟				
پ١٤	ئەم منداڵە وەکوو جیوەی تێکرابێ بەردەوام لە جووڵەدایە؟				

پ١٩. تا چ ڕادەیەك منداڵەکەت دەستی دەگات بە شقارتە و چەرخ و چەرخی غاز داگیرساندن لە ماڵەوە؟

١. هەرگیز ٢. جاربە جار ٣. زۆرجار ٤. زۆربەی کات

پ٢٠. کاتێ نزیك ئاگریت یا خەریکی چێشت لێ نانی تا چ رادەیەك خەتەری سووتان لە خەیاڵتدایە؟

١. قەت لە خەیاڵمدا نیە ٢.جارجار لە خەیاڵمدایە ٣.زۆرجار لە خەیاڵمدایە ٤.زۆربەی کات لە خەیاڵمدایە

پ٢١. ئایا ئەم منداڵە ڤێ ی لەگەڵدایە؟ ١. بەڵێ ٢. نەخێر

پ٢٢. ئایا ئەم منداڵە هیچ کێشەیەکی گەورەی هەیە لەرووی عەقڵەوە وەك تەخەلوڤێ عەقڵی و کێشەی فێر نەبوون؟

١. بەڵێ ، دیاریی بکە: ..... ٢. نەخێر

پ٢٣. ئایا ئەم منداڵە کێشەی هەیە لە رۆیشتندا؟ ١. بەڵێ ٢. نەخێر ٣. هێشتا پێی نەگرتووە

پ٢٤. ئایا ئەم منداڵە کێشەی هەیە لە بیستندا؟ ١. بەڵێ ٢. نەخێر

پ٢٥. ئایا ئەم منداڵە کێشەی هەیە لە بینیندا؟ ١. بەڵێ ٢. نەخێ

Module for admitted patients (QA)

پرسنامەی نەخۆشی داخڵ کراو

Unique Patient ID No.:

QA0 . ژمارەی فایل: .....

QA1. رۆژی داخڵ بوون (رۆژ/ مانگ/ ساڵ): ____/____/____

QA2. رۆژی دەرچوون لە نەخۆشخانە: (رۆژ/ مانگ/ ساڵ): ____/____/____

QA2جۆری دەرچوون: ١.مردن ٢.باشبوون ٣.احالە ٤.لەسەربەرپرسیاری خۆیان

A3 b Weight…… QA3hb1 .....QA3hb2..... QA3prot..... QA3Sugar ……. QA3Urea …….
QA3Crea ……. QA3Sod……. QA3K…….

QA4. بریندارییەکەڵ هەڵمژین ١. هە یە ٢.نیە

QA5. چارەسەری غەیری نەشتەرگەری کە بۆ نەخۆش کراوە:

QA5a. قەوارەی موغەزی کە وەری گرتووە بە لیتر:..... QA5b. قەوارەی خوێن کە وەری گرتووە بە لیتر:.....

QA5c. ژمارەی رۆژ لەسەر ئەنتی بایۆتیك بووە: ..... QA5d. ژمارەی رۆژ کە لەسەر دەرمانی ئازاربەری نابێهۆشکەبووە: .....

QA5e. ژمارەی رۆژ کە لەسەر دەرمانی ئازاربەری بێهۆشکەر بووە:..... QA5f. هی تر: .....

QA6. چارەسەری نەشتەرگەری کە بۆی کراوە:

١- .....

٢- .....

٣- .....

a. .....

QA7. چەند جار نەخۆش لەژێر بەنجی گشتیدا نەشتەرگەری بۆکراوە؟.....

QA9. ئەو ئالۆزکارییانەی رووبان داوە (وەك هەوکرنی برین و سێپتیسیمیا، نوشوستی گورچیلە هند.)

٤- .....

٥- .....

٦- .....

٧- .....

QA10. ئایا زەرعی برین کراوە بۆ هەو کرن؟

١. بەڵێ ٢. نەخێر > بچۆ بۆ پرسیاری ١٢

QA11. ئەنجامی زەرعی برین:

١. نێگەتیف پۆزەنیف: میکرۆبەکان: .....

QA12. ئایا نەخۆش کۆچی دوایی کرد؟

١. بەڵێ ٢. نەخێر > بچۆ بۆ پرسیاری ١٢

QA13. هۆی راستەوخۆی مردن: .....

QA14. هۆیەکانی تری مردن: .....

QA14کاتی مردن:.....

QA15. ئاسەواری دریژخایەن کە لە نەخۆشدا مابێتەوە: وەك برینەوە، سکاری بەرجەستە، نابیانیی، سنووردارکردنی جوولەی جومگە هتد.

١- .....

٢- .....

٣- .....

٤- .....

Appendix 2. The Quality of Life Questionnaire (Kurdish BSHS)

Sulaymaniyah Burns Study
Quality of Life Questionnaire (*Kurdish BSHS*)

For each of the following questions please select only one answer:

QL1. How much difficulty do you have eating with a spoon?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL2. How much difficulty do you have tying shoelaces, bows?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL3. How much difficulty do you have unlocking a door with a key?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL4. How much difficulty do you have bathing independently?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL5. How much difficulty do you have dressing by yourself?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL6. How much difficulty do you have getting into and out of a chair?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL7. How much difficulty do you have going to the toilet without help?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL8. How much difficulty do you have doing the kind of activities you used to do before?
1. Extreme 2. Quite a bit 3. Moderate 4. A little bit 5. None

QL9. Generally how much has the burn affected your ability to work?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL10. How much has the burn affected the work you used to do?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL11. Because of the burn, how much does being out in the sun bother you?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL12. Because of the burn, how much pain and discomfort do you have?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL13. Because of the burn, how much pain and discomfort do you have?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL14. How much does taking care of your skin bother you?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL15. How much does following all those instructions to take care of your burn bother you?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL16. How much do you feel that your burn is unattractive to others?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL17. How much, because of the burn, does your general appearance bother you?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL18. How much does the appearance of your scars bother you?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL19. How much are you troubled by feelings of loneliness?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL20. How much do you often feel sad or blue?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL21. How much do you sometimes think that you have an emotional problem?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL22. How much you do you feel like wanting to avoid your friends?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL23. How much do you feel like avoiding visiting people?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL24. How much do you think that your injury has put you further away from your family?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

QL25. How much unhappy do you feel about the way your family acts around you?
1. Extremely 2. Quite a bit 3. Moderately 4. A little bit 5. None

Appendix 2b. The Quality of Life Questionnaire (in Kurdish)

Quality of Life Questionnaire (Kurdish BSHS)

توێژینەوەی سووتاوی لە سلێمانی

پرسنامەی چۆنایەتی ژیان (*Kurdish BSHS*)

پ١:. رۆژی چاوپێکەوتن(رۆژ/ مانگ/ ساڵ): ____/____/____ پ٢. ژمارەی فایل: .....

بۆ هەر یەکە لەم پرسیارانەی خوارەوە تکایە تەنیا یەک وەڵام هەڵبژێرە

١. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ بە کەوچك نان بخۆیت؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٢. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ قەیتانی پێڵاو ببەستی یا گرێ لێ بدەیت؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٣. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ دەرگایەکی داخراو بە کلیل بکەیتەوە؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٤. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ خۆت بشۆیت؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٥. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ خۆت بگۆڕیت؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٦. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ لەسەر کورسییەك دانیشی و هەستی؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٧. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ بە بێ یارمەتیی کەس بچیت بۆ تەوالێت؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٨. **تا چ رادەیەك بەلاتەوە زەحمەتە ئەگەر بتەوێ ئەو ئیشوکارانە بکەیت کە ئەوسا دەتکرد؟**

١. ئەوپەڕی زەحمەتە ٢. زۆر زەحمەتە ٣. نە کەم نە زۆر ٤.تۆزێك زەحمەتە ٥. هیچ زەحمەت نیە

٩. **بە شێوەیەکی گشتی سووتاویەکەت تا چ رادەیەك تەئسیری لە توانای ئیش کردنت کردووە؟**

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٠. **سووتاوییەکەت تا چ رادەیەك کاری لەو ئیشە کردووە کە پێش سووتان هەتبوو؟**

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١١. **بە هۆی سووتاوییەکەوە تا چ رادەیەك بەر هەتاو نارەحەتت ئەکات؟**

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٢. بەهۆی سووتاوییەکەوە هەوای گەرم تا چ رادەیەك نارەحەتت ئەکات؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٣. بەهۆی سووتاوییەکەوە تا چ رادەیەك ئازار رو نارەحەتیت هەیە؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٤. چاودێری کردنی پێستت تا چ رادەیەك مایەی عەزیەتە بۆت؟.

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٥. تاچ رادەیەك جێبەجێکردنی هەموو ئەو رێنماییانەی پێت وتراوە مایەی عەزیەتە بۆت ؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٦. تا چ رادەیەك هەست ئەکەیت سووتاوییەکەت بەلای خەڵکەوە جوان نیە؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٧. تا چ رادەیەك نارەحەتیت لە شکڵی خۆت؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٨. تا چ رادەیەك نارەحەتیت لە شێوەی قەتماغەی سووتاوییەکە؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

١٩. تا چ رادەیەك هەستی تەنیایی نارەحەتت ئەکا؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

٢٠. تا چ رادەیەك هەست بە خەفەت و دڵتەنگی ئەکەیت؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

٢١.تا چ رادەیەك هەست دەکەیت کێشەت هەبێ لە رووی دەروونیەوە؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

٢٢. تا چ رادەیەك حەز دەکەی خۆت لە هاوڕێکانت دوور بگریت؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

٢٣. تا چ رادەیەك حەزدەکەی خۆت لە سەردانی خەڵك دوور بگریت؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

٢٤. ئەم سووتاوییە تا چ رادەیەك لە کەسوکار دووری خستوویتەوە؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

٢٥. تا چ رادەیەك نامورتاحی لە شێوەی هەلسوکەوتی کەسوکارت لە گەڵت؟

١. ئێجگار زۆر ٢. زۆر ٣. نە کەم نە زۆر ٤.تۆزێك ٥. هیچ

Appendix 3. Euroqol EQ-5D

Euroqol EQ-5D (in Kurdish)

بە نیشانەکردنی یەك خانە لە هەر یەکە لەو کۆمەڵانەی خوارەوەدا، تکایە نیشانی بدە کام قسەیان بە باشترین شێوە باری تەندروستی ئەمڕۆی تۆ دەردەبڕێت.

لە هەر کۆمەڵەیەکدا یەك خانە زیاتر نیشانە مەکە.

١. جوولّە

- **من هیچ کێشەم نیە لە گەڕان و هاتوچۆدا** ☐
- **من هەندێ کێشەم هەیە لە گەڕان و هاتوچۆدا** ☐
- **من لەناو جێدا کەوتووم** ☐

٢. خۆ چاودێری کردن

- **من هیچ کێشەم نیە لەوەدا بتوانم چاودێریی خۆم بکەم** ☐
- **من هەندێ کێشەم هەیە لە خۆشتن و خۆگۆڕیندا** ☐
- **من توانای ئەوەم نیە خۆم بشۆم یا خۆم بگۆڕم** ☐

٣. ئیشوکاری رۆژانە (وەك ئیش، خوێندن، ئیشی ناومالّ، چالاکی ناو خێزان و و سەرگەرمی)

- **من هیچ کێشەم نیە لە ئەنجامدانی ئیشوکاری رۆژانەدا** ☐
- **من هەندێ کێشەم هەیە لە ئەنجامدانی ئیشوکاری رۆژانەدا** ☐
- **من توانای ئەوەم نیە ئیشوکاری رۆژانەم ئەنجام بدەم** ☐

٤. ئازار و نارەحەتی

- **من هیچ ئازار و نارەحەتیم نیە** ☐
- **من هەندێ ئازار و نارەحەتیم هەیە** ☐
- **من ئازار و نارەحەتییەکی ئێجگار زۆرم هەیە** ☐

٥. دلّەراوکێ و خەمۆکی

- **من قەلەق و خەمبار نیم** ☐
- **من تارادەیەك قەلەق و خەمبارم** ☐
- **من ئیجگار زۆر قەلەق و خەمبارم** ☐

سوپاس بۆ هاوکاریت

Appendix 4. The study logbook

Sulaymaniyah Burns Study: Study logbook

SN	Date	Name	OPD No.	File No.	Unique No.	Admission records	Case?	Notes
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University of Nottingham, School of Community Health Sciences
University of Sulaimani, Department of Community Medicine

Title of Project:
Epidemiology of burns and the outcome of management in Sulaimaniyah, Iraq: a prospective study
(Causes of burns and the results of treatment in Sulaymaniyah)

Name of Investigators:
Dr Nasih Othman, PhD student. Student, Chief Investigator
Dr Denise Kendrick, Reader, School of Community Health Science: First Supervisor
Dr Ahmed Al-Windi, Associate Professor, Department of Community Medicine, University of Sulaimani, Iraq: Second Supervisor

Study Participant Information Sheet (Admitted Patients)

You have been invited to take part in a research study. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information and ask us if there is anything that is not clear or if you would like more information. If you decide to take part you may keep this leaflet. Thank you for reading this.

What is the research about?
This research is done to study burns in Sulaimaniyah to find out how burns happen. This will help us plan how to prevent burns in the future.

How is the research done?
This study will last two years during which we want to collect information on all persons who have had a burn. We will try to interview all patients or the care-takers of patients (in case of children). In addition we will collect information on a sample of 224 children who are admitted to hospital for other diseases so that we can compare them with children who have had a burn.

Do you have to participate?
We are here with you because we intend to ask every person who is affected with a burn during the period of the study; we want to collect information on all persons who have had a burn during one year period.

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw from the study at any time without giving a reason.

What happens if you decide to take part?
If you decide to participate then we will ask you to take part in an interview.

1. We will interview you on the day of admission. The interview will last around half an hour. During this interview we will ask questions about you (your child), your family, your housing condition, as well as questions about the burn and how it happened. We will not do any tests or examinations and you will not be subject to any harm or inconvenience apart from the time taken for the interview. If you agree to take part, you will still be free to refuse to answer any questions you don't want to answer.
2. We will also contact the doctor who treated you and have a look at your hospital file to take some information we need about your condition and the treatment you received during your stay in hospital.
3. We will give you a questionnaire on day of discharge to fill in which asks some questions about your condition and how you feel about it. Filling the questionnaire will take around 10 minutes.
4. We will contact you 3 months after discharge during your follow up visits and give you the same questionnaire to fill in again. We want you to do this a second time because we would like to know how is your condition and how do you feel about it.

What happens to the information you provide?
All information we collect during this study will remain confidential and will be strictly used for the purpose of the study. The information will be kept with the study group. Your name and the name of your child will not be recorded on the answer sheet and the information will not be linked to your names.

What will happen to the results of the study?
The results of the study will be shared with the University of Sulaimani and the Department of Health. The results may be published in scientific journals. Summary of the findings will also be published in the Kurdish newspapers so that people become aware of it.

Who is doing the study?
The study is a PhD project done in collaboration with the College of Medicine in the University of Sulaimani, School of Community Health Sciences of the University of Nottingham and the Department of Health in Sulaimaniyah.

Who has reviewed the study?
This study has been reviewed and approved by the University of Nottingham Medical School Ethics Committee to make sure that it is appropriate and it doesn't harm the interests of people who participate in it.

Contact for Further Information
If you have any questions or concerns please don't hesitate to contact the chief investigator, Dr Nasih Othman at the Emergency Hospital, Tel 07701451633.

Please note that you will be given a **consent form** with this information sheet. Please read the consent form and sign it if you agree to take part in the study. Thank your very much for taking part in our study.

University of Nottingham, School of Community Health Sciences
University of Sulaimani, Department of Community Medicine

Title of Project:
Epidemiology of burns and the outcome of management in Sulaymaniyah, Iraq: a prospective study
(Causes of burns and the results of treatment in Sulaymaniyah)

Name of Investigators:
Dr Nasih Othman, PhD student. Student, Chief Investigator
Dr Denise Kendrick, Reader, School of Community Health Science: First Supervisor
Dr Ahmed Al-Windi, Associate Professor, Department of Community Medicine, University of Sulaimani, Iraq: Second Supervisor

Study Participant Information Sheet (Outpatients)

You have been invited to take part in a research study. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information and ask us if there is anything that is not clear or if you would like more information. If you decide to take part you may keep this leaflet. Thank you for reading this.

What is the research about?
This research is done to study burns in Sulaimaniyah to find out how burns happen. This will help us plan how to prevent burns in the future.

How is the research done?
This study will last two years during which we want to collect information on all persons who have had a burn. We will try to interview all patients or the care-takers of patients (in case of children). In addition we will collect information on a sample of 224 children who are admitted to hospital for other diseases so that we can compare them with children who have had a burn.

Do you have to participate?
We are here with you because we intend to ask every person who is affected with a burn during the period of the study; we want to collect information on all persons who have had a burn during one year period.

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw from the study at any time without giving a reason.

What happens if you decide to take part?
If you decide to participate, we will ask you to take part in an interview. The interview will last around half an hour. During this interview we will ask questions

about you (your child), your family, your housing condition, as well as questions about the burn and how it happened. We don't do any tests or examinations and you will not be subject to any harm or inconvenience apart from the time we take for the interview. If you agree to take part, you will still be free to refuse to answer any of the questions that you don't want to.

We will also contact the doctor who treated you and the hospital register to take some information about the burn.

What happens to the information you provide?
All information we collect during this study will remain confidential and will be strictly used for the purpose of the study. The information will be kept with the study group. Your name and the name of your child will not be recorded on the answer sheet and the information will not be linked to your names.

What will happen to the results of the study?
The results of the study will be shared with the University of Sulaimani and the Department of Health. The results may be published in scientific journals. Summary of the findings will also be published in the Kurdish newspapers so that people become aware of it.

Who is doing the study?
The study is a PhD project done in collaboration with the College of Medicine in the University of Sulaimani, School of Community Health Sciences of the University of Nottingham and the Department of Health in Sulaimaniyah.

Who has reviewed the study?
This study has been reviewed and approved by the University of Nottingham Medical School Ethics Committee to make sure that it is appropriate and it doesn't harm the interests of people who participate in it.

Contact for Further Information
If you have any questions or concerns please don't hesitate to contact the chief investigator, Dr Nasih Othman at the Emergency Hospital, Tel 07701451633.

Please note that you will be given a **consent form** with this information sheet. Please read the consent form and sign it if you agree to take part in the study.

Thank your very much for taking part in our study.

University of Nottingham, School of Community Health Sciences
University of Sulaimani, Department of Community Medicine

Title of Project:
Epidemiology of burns and the outcome of management in Sulaymaniyah, Iraq: a prospective study
(Causes of burns and the results of treatment in Sulaymaniyah)

Name of Investigators:
Dr Nasih Othman, PhD student. Student, Chief Investigator
Dr Denise Kendrick, Reader, School of Community Health Science: First Supervisor
Dr Ahmed Al-Windi, Associate Professor, Department of Community Medicine, University of Sulaimani, Iraq: Second Supervisor

Study Participant Information Sheet (Controls)

You have been invited to take part in a research study. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information and ask us if there is anything that is not clear or if you would like more information. If you decide to take part you may keep this leaflet. Thank you for reading this.

What is the research about?
This research is done to study burns in Sulaimaniyah to find out how burns happen. This will help us plan how to prevent burns in the future.

How is the research done?
This study will last two years during which we want to collect information on all persons who have had a burn. We will try to interview all patients or the care-takers of patients (in case of children). In addition we will collect information on a sample of 224 children who are admitted to hospital for other diseases so that we can compare them with children who have had a burn.

Do you have to participate?
We are here with you because we intend to ask every person who is affected with a burn during the period of the study; we want to collect information on all persons who have had a burn during one year period.

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw from the study at any time without giving a reason.

What happens if you decide to take part?
If you decide to participate then we will ask you to take part in an interview. The interview will last around half an hour. In this interview we will ask questions about

your child, your family and your housing condition. We don't do any tests or examinations on the child and you will not be subject to any harm or inconvenience apart from the time we take for the interview. If you agree to take part, you will still be free to refuse to answer any of the questions that you don't want to.

What happens to the information you provide?
All information we collect during this study will remain confidential and will be strictly used for the purpose of the study. The information will be kept with the study group. Your name and the name of your child will not be recorded on the answer sheet and the information will not be linked to your names.

What will happen to the results of the study?
The results of the study will be shared with the University of Sulaimani and the Department of Health. The results may be published in scientific journals. Summary of the findings will also be published in the Kurdish newspapers so that people become aware of it.

Who is doing the study?
The study is a PhD project done in collaboration with the College of Medicine in the University of Sulaimani, School of Community Health Sciences of the University of Nottingham and the Department of Health in Sulaimaniyah.

Who has reviewed the study?
This study has been reviewed and approved by the University of Nottingham Medical School Ethics Committee to make sure that it is appropriate and it doesn't harm the interests of people who participate in it.

Contact for Further Information
If you have any questions or concerns please don't hesitate to contact the chief investigator, Dr Nasih Othman at the Emergency Hospital, Tel 07701451633.

Please note that you will be given a **consent form** with this information sheet. Please read the consent form and sign it if you agree to take part in the study.

Thank your very much for taking part in our study.

زانکۆی سلێمانی، کۆلێژی پزیشکی

زانکۆی نۆتینگهام، کۆلێژی زانستەکانی تەندروستیی کۆمەڵ

ناونیشانی پرۆژە: پەتاناسیی سووتاوی و دەرەنجامی چارەسەری لە سلێمانی : تۆژینەوەیەکی بەرەوپێش (هۆیەکانی سووتاوی و ئەنجامەکانی چارەسەرکردنی)

ناوی توێژەرەکان:

١. د. ناصح فاتح عوسمان، قوتابی دوکتۆرا، توێژەری سەرەکی

٢. د. دێنیس کێندریك، پسپۆڕی تەندروستیی بەرایی: سەرپەرشتیاری یەکەم

٣. د. ئەحمەد وەندی، پرۆفیسۆری یاریدەدەر: سەرپەرشتیاری دووەم

زانیاری بۆ بەشدارانی توێژینەوەکە (نەخۆشی داخلّکراو)

تۆ داوات لێ کراوە بەشداری بکەی لەم توێژینەوەیەدا. پێش ئەوەی بریار بدەی بەشداری بکەی گرنگە بزانی ئەم توێژینەوەیە چییەو بە چی مەبەستێك ئەنجام دەدرێ. تکایە ئەم زانیارییانە بخوێنەرەوە و هەر شتێکی پوون نەبوو بەلاتەوە یان زانیاریی زیاترت ویست، پرسیار بکە. سوپاس بۆ بەشداری کردنت.

توێژینەوەکە دەربارەی چییە؟

ئامانجی ئەم توێژینەوەیە لێکۆڵینەوەی سووتاوییە لە سلێمانی بۆ ئەوەی بزانین سووتان چۆن و بۆچی روو ئەدات. ئەمەش یارمەتیمان ئەدا لە داهاتوودا پلان دابنێین بۆ پێشگیری کردن لە سووتان.

توێژینەوەکە چۆن دەکرێ؟

توێژینەوەکە نزیکەی دوو ساڵ دەخایەنێ و لەو ماوەیەدا زانیاری کۆدەکەینەوە لەسەر هەموو ئەو نەخۆشانەی تووشی سووتاوی دەبن. هەوڵ دەدەین چاوپێکەوتن لەگەڵ هەموو نەخۆشەکان یا بەخێوەکەرانیان بکەین (ئەگەر منداڵ بن). هەروەها زانیاری لە کۆمەڵێك (٢٢٤) منداڵ وەردەگرین کە داخڵی نەخۆشخانە کراون لەبەر هۆی تر بۆئەوەی بەراوردیان بکەین لەگەڵ منداڵە سووتاوەکاندا.

پێویستە بەشداری بکەی یان نا؟

ئێمە هاتووینەتە لات چونکە ئەمانەوێ چاوپێکەوتن لەگەڵ هەموو ئەو کەسانە بکەین کە لەماوەی توێژینەوەکەدا تووشی سووتان بوون و زانیاری لەهەمووان کۆبکەینەوە. بەشداری کردنت خزمەت بە تێگەیشتن لە باری تەندروستیی کوردستان دەکات. بەهەرحاڵ بەشداری کردن بەدەست خۆتە. ئەگەر بریار بدەی بەشداری بکەی ئەم زانیارییانەت دەدەینێ لەگەڵ فۆرمێکی ڕەزامەندیدا. ئەگەر بەشداریش بکەی هەرکاتێ بتەوێ ئەتوانی پاشەکشە بکەی.

ئەگەر بەشداری بکەی چی دەبێ؟

ئەگەر ڕازی بی بە بەشداری کردن ئەوا ڕووبەڕوو هەندێ پرسیارت لێ دەکەین. لە چاوپێکەوتندا:

١. لەکاتی داخڵ بوونداً چاوپێکەوتنت لەگەڵ دەکەین کە نزیکەی نیو کاتژمێر دەخایەنێ. لەم چاوپێکەوتنەدا پرسیارت لێ دەکەین سەبارەت بە خۆت (یا منداڵەکەت) و خێزان و مالّ و چۆنێتی ڕوودانی سووتانەکە. ئەم شتانە

هەموو بە پرسیارو وەڵام دەکرێ و هیچ فەحس و پشکنینێکت بۆ ناکەین. ئەم چاوپێکەوتنە بێجگە لەو کاتەی لێت دەگرێ هیچ نارەحەتییەکت بۆ دروست ناکات. هەر پرسیارێکیش نەتەوێ وەڵامی بدەیتەوە، ئازادی.

٢. قسە لەگەڵ پزیشکی خۆت دەکەین و هەندێ زانیاریش لە فایلی نەخۆشییەکەتەوە وەردەگرین سەبارەت بە سووتانەکەو ئەو چارەسەرەی لە نەخۆشخانە وەرت گرتووە.

٣. رۆژی دەرچوون فۆرمێکت دەدەینێ پڕی بکەیتەوە کە هەندێ پرسیاری تێدایە دەربارەی حاڵەتەکەت و هەست کردنی خۆت دەربارەی. پڕکردنەوەی ئەم پرسنامەیە رەنگە دە دەقیقەیەکی پێ بچێ.

٤. سێ تا چوار مانگ پاش دەرچوون لەکاتی سەرداندا پەیوەندیت پێوەدەکەین و هەمان فۆرمت دەدەنێ تا دیسان پڕی بکەیتەوە چونکە ئەمانەوێ بزانین حاڵەتەکەت و هەستت دەربارەی ئەوکاتە چۆنە.

ئەو زانیارییانەی لێت وەردەگرین چییان لێ دێ؟

هەموو ئەو زانیارییانەی لەم ماوەیەدا کۆی دەکەینەوە بە شێوەیەکی نهێنی دەمێنێتەوە و تەنیا بۆ مەبەستی توێژینەوەکە بەکاردەهێنرێ و لای دەستەی توێژینەوەکە دەبێ. ناوی خۆت و منداڵەکەت لەسەر فۆرمەکە تۆمارناکرێ (ئەگەر بتەوێ) و زانیاریەکان کە داخڵی کۆمپیوتەر دەکرێن و دواتر بەکاردێن ناویان لەسەر نابێ.

ئەنجامی توێژینەوەکە چی لێ دێ؟

نوسخەی ئەنجامی ئەم توێژینەوەیە دەدرێت بە فەرمانگەی تەندروستی و زانکۆی سلێمانی. رەنگە ئەنجامەکان لە گۆڤارە زانستییەکاندا بڵاوبکرێنەوە. کورتەی ئەنجامەکان لە رۆژنامە کوردییەکانیشدا بڵاودەکرێنەوە بۆئەوەی خەڵک ئاگادار بن.

کێ توێژینەوەکە دەکات؟

ئەم توێژینەوەیە پرۆژەیەکی دکتۆرایە بەهاوکاری زانکۆی سلێمانی و فەرمانگەی تەندروستیی سلێمانی و زانکۆی نۆتینگهام.

کێ بەم توێژینەوەیەدا چووەتەوە؟

ئەم توێژینەوەیە لەلایەن کۆمیتەی ئەخلاقیی کۆلێژی پزیشکیی زانکۆی نۆتینگهامەوە پێداچوونەوەی بۆ کراوە بۆ دڵنیا بوون لەوەی شتێکی گونجاوە و هیچ زیانێك بە بەرژەوەندیی ئەو کەسانە ناگەینێ کە بەشداریی تێدا دەکەن. هەروەها کۆلێژی پزیشکی زانکۆی سلێمانی و فەرمانگەی تەندروستیش لێی ئاگادارن.

پەیوەندی

ئەگەر هەر پرسیارێکت هەیە تکایە پەیوەندی بکە بە د. ناصح قەرەداخی لە سەنتەری سووتاوی، مۆبایل: ٠٧٧٠١٤٥١٦٣٣

تکایە ئەو فۆرمی رەزامەندییەی پێت دەدرێ بیخوێنەرەوە و ئەگەر ئامادەی بەشداری بکەی ئیمزای بکە و بیدەرەوە بە توێژەرەکە.

زۆر سوپاس بۆ بەشداری کردنت لە توێژینەوەکەدا

زانکۆی سلێمانی، کۆلێژی پزیشکی
زانکۆی نۆتینگهام، کۆلێژی زانستەکانی تەندروستیی کۆمەڵ

ناونیشانی پرۆژە: پەتاناسیی سووتاوی و دەرەنجامی چارەسەری لە سلێمانی : تۆژینەوەیەکی بەرەوپێش (هۆیەکانی سووتاوی و ئەنجامەکانی چارەسەرکردنی)

ناوی توێژەرەکان:

١. د. ناصح فاتح عوسمان، قوتابی دوکتۆرا، توێژەری سەرەکی
٢. د. دێنیس کێندریك، پسپۆڕی تەندروستیی بەرایی: سەرپەرشتیاری یەکەم
٣. د. ئەحمەد وەندی، پرۆفیسۆری یاریدەدەر: سەرپەرشتیاری دووەم

زانیاری بۆ بەشدارانی توێژینەوەکە (سەرپێیی)

تۆ داوات لێ کراوە بەشداری بکەی لەم توێژینەوەیەدا. پێش ئەوەی بریار بدەی بەشداری بکەی گرنگە بزانی ئەم توێژینەوەیە چییەو بە چی مەبەستێك ئەنجام دەدرێ. تکایە ئەم زانیارییانە بخوێنەرەوە و هەر شتێکی ڕوون نەبوو بەلاتەوە یان زانیاریی زیاترت ویست، پرسیار بکە. سوپاس بۆ بەشداری کردنت.

توێژینەوەکە دەربارەی چییە؟

ئامانجی ئەم توێژینەوەیە لێکۆڵینەوەی سووتاوییە لە سلێمانی بۆ ئەوەی بزانین سووتان چۆن و بۆچی ڕوو ئەدات. ئەمەش یارمەتیمان ئەدا لە داهاتوودا پلان دابنێین بۆ پێشگیری کردن لە سووتان.

توێژینەوەکە چۆن دەکرێ؟

توێژینەوەکە نزیکەی دوو ساڵ دەخایەنێ و لەو ماوەیەدا زانیاری کۆدەکەینەوە لەسەر هەموو ئەو نەخۆشانەی تووشی سووتاوی دەبن. هەوڵ دەدەین چاوپێکەوتن لەگەڵ هەموو نەخۆشەکان یا بەخێوەکەرانیان بکەین (ئەگەر منداڵ بن). هەروەها زانیاری لە کۆمەڵێك (٢٢٤) منداڵ وەردەگرین کە داخڵی نەخۆشخانە کراون لەبەر هۆی تر بۆئەوەی بەراوردیان بکەین لەگەڵ منداڵە سووتاوەکاندا.

پێویستە بەشداری بکەی یان نا؟

ئێمە هاتووینەتە لات چونکە ئەمانەوێ چاوپێکەوتن لەگەڵ هەموو ئەو کەسانە بکەین کە لەماوەی توێژینەوەکەدا تووشی سووتان بوون و زانیاری لەهەمووان کۆبکەینەوە. بەشداری کردنت خزمەت بە تێگەیشتن لە باری تەندروستیی کوردستان دەکات. بەهەرحاڵ بەشداری کردن بەدەست خۆتە. ئەگەر بریار بدەی بەشداری بکەی ئەم زانیارییانەت دەدەینێ لەگەڵ فۆرمێکی ڕەزامەندیدا. ئەگەر بەشداریش بکەی هەرکاتێ بتەوێ ئەتوانی پاشەکشە بکەی.

ئەگەر بەشداری بکەی چی دەبێ؟

ئەگەر ڕازی بی بە بەشداری کردن ئەوا ڕووبەڕوو هەندێ پرسیارت لێ دەکەین. لە چاوپێکەوتنێکدا. چاوپێکەوتنەکە نزیکەی نیو سەعات دەخایەنێ کە تیایدا پرسیارت لێ دەکەین سەبارەت بە خۆت (یا منداڵەکەت) و خێزان و ماڵ و

چۆنێتی رووداني سووتانەکە. ئەم شتانە هەموو بە پرسیارو وەڵام دەکرێ و هیچ فەحس و پشکنینێکت بۆ ناکەین. ئەم چاوپێکەوتنە بێجگە لەو کاتەی لێت دەگڕێ هیچ نارەحەتییەکت بۆ دروست ناکات. هەر پرسیارێکیش نەتەوێ وەڵامی بدەیتەوە، ئازادی. هەروەها پەیوەندی دەکەین بە پزیشکەکەت و تۆماری نەخۆشخانەوە بۆ وەرگرتنی هەندێ زانیاری دەربارەی سووتانەکە.

ئەو زانیارییانەی لێت وەردەگرین چییان لێ دێ؟

هەموو ئەو زانیارییانەی لەم ماوەیەدا کۆی دەکەینەوە بە شێوەیەکی نهێنی دەمێنێتەوە و تەنیا بۆ مەبەستی توێژینەوەکە بەکاردەهێنرێ و لای دەستەی توێژینەوەکە دەبێ. ناوی خۆت و منداڵەکەت لەسەر فۆرمەکە تۆمارناکرێ (ئەگەر بتەوێ) و زانیاریەکان کە داخڵی کۆمپیوتەر دەکرێن و دواتر بەکاردێن ناویان لەسەر نابێ.

ئەنجامی توێژنەوەکە چی لێ دێ؟

نوسخەی ئەنجامی ئەم توێژینەوەیە دەدرێت بە فەرمانگەی تەندروستی و زانکۆی سلێمانی. رەنگە ئەنجامەکان لە گۆڤارە زانستییەکاندا بڵاوبکرێنەوە. کورتەی ئەنجامەکان لە ڕۆژنامە کوردییەکانیشدا بڵاودەکرێنەوە بۆئەوەی خەڵك ئاگادار بن.

کێ توێژنەوەکە دەکات؟

ئەم توێژنەوەیە پرۆژەیەکی دکتۆرایە بەهاوکاری زانکۆی سلێمانی و فەرمانگەی تەندروستیی سلێمانی و زانکۆی نۆتینگهام.

کێ بەم توێژنەوەیەدا چووەتەوە؟

ئەم توێژینەوەیە لەلایەن کۆمیتەی ئەخلاقیی کۆلێژی پزیشکیی زانکۆی نۆتینگهامەوە پێداچوونەوەی بۆ کراوە بۆ دڵنیا بوون لەوەی شتێکی گونجاوە و هیچ زیانێك بە بەرژەوەندیی ئەو کەسانە ناگەینێ کە بەشداریی تێدا دەکەن. هەروەها کۆلێژی پزیشکی زانکۆی سلێمانی و فەرمانگەی تەندروستیش لێی ئاگادارن.

پەیوەندی

ئەگەر هەر پرسیارێکت هەیە تکایە پەیوەندی بکە بە د. ناصح قەرەداخی لە سەنتەری سووتاوی، مۆبایل: ٠٧٧٠١٤٥١٦٣٣

تکایە ئەو فۆرمی ڕەزامەندییەی پێت دەدرێ بیخوێنەرەوە و ئەگەر ئامادەی بەشداری بکەی ئیمزای بکە و بیدەرەوە بە توێژەرەکە.

زۆر سوپاس بۆ بەشداری کردنت لە توێژینەوەکەدا

زانکۆی سلێمانی، کۆلێژی پزیشکی
زانکۆی نۆتینگهام، کۆلێژی زانستەکانی تەندروستیی کۆمەڵ

ناونیشانی پرۆژە: پەتاناسیی سووتاوی و دەرەنجامی چارەسەری لە سلێمانی : توێژینەوەیەکی بەرەوپێش (هۆیەکانی سووتاوی و ئەنجامەکانی چارەسەرکردنی)

ناوی توێژەرەکان:

۱. د. ناصح فاتح عوسمان، قوتابی دوکتۆرا، توێژەری سەرەکی
۲. د. دێنیس کێندریك، پسپۆڕی تەندروستیی بەرایی: سەرپەرشتیاری یەکەم
۳. د. ئەحمەد وەندی، پرۆفیسۆری یاریدەدەر: سەرپەرشتیاری دووەم

زانیاری بۆ بەشدارانی توێژینەوەکە (کۆنترۆڵەکان)

تۆ داوات لێ کراوە بەشداری بکەی لەم توێژینەوەیەدا. پێش ئەوەی بریار بدەی بەشداری بکەی گرنگە بزانی ئەم توێژینەوەیە چییەو بە چی مەبەستێك ئەنجام دەدرێ. تکایە ئەم زانیارییانە بخوێنەرەوە و هەر شتێکی ڕوون نەبوو بەلاتەوە یان زانیاریی زیاترت ویست، پرسیار بکە. سوپاس بۆ بەشداری کردنت.

توێژینەوەکە دەربارەی چییە؟

ئامانجی ئەم توێژینەوەیە لێکۆڵینەوەی سووتاوییە لە سلێمانی بۆ ئەوەی بزانین سووتان چۆن و بۆچی ڕوو ئەدات. ئەمەش یارمەتیمان ئەدا لە داهاتوودا پلان دابنێین بۆ پێشگیری کردن لە سووتان.

توێژینەوەکە چۆن دەکرێ؟

توێژینەوەکە نزیکەی دوو ساڵ دەخایەنێ و لەو ماوەیەدا زانیاری کۆدەکەینەوە لەسەر هەموو ئەو نەخۆشانەی تووشی سووتاوی دەبن. هەوڵ دەدەین چاوپێکەوتن لەگەڵ هەموو نەخۆشەکان یا بەخێوەکەرانیان بکەین (ئەگەر منداڵ بن). هەروەها زانیاری لە کۆمەڵێك (۲۲٤) منداڵ وەردەگرین کە داخڵی نەخۆشخانە کراون لەبەر هۆی تر بۆئەوەی بەراوردیان بکەین لەگەڵ منداڵە سووتاوەکاندا.

پێویستە بەشداری بکەی یان نا؟

ئێمە هاتووینەتە لات چونکە ئەمانەوێ چاوپێکەوتن لەگەڵ هەموو ئەو کەسانە بکەین کە لەماوەی توێژینەوەکەدا تووشی سووتان بوون و زانیاری لەهەمووان کۆبکەینەوە. بەشداری کردنت خزمەت بە تێگەیشتن لە باری تەندروستیی کوردستان دەکات. بەهەرحاڵ بەشداری کردن بەدەست خۆتە. ئەگەر بریار بدەی بەشداری بکەی ئەم زانیارییانەت دەدەینێ لەگەڵ فۆرمێکی ڕەزامەندیدا. ئەگەر بەشداریش بکەی هەرکاتێ بتەوێ ئەتوانی پاشەکشە بکەی.

ئەگەر بەشداری بکەی چی دەبێ؟

ئەگەر ڕازی بی بە بەشداری کردن ئەوا ڕووبەڕوو هەندێ پرسیارت لێ دەکەین. لە چاوپێکەوتنێکدا. چاوپێکەوتنەکە نزیکەی نیو سەعات دەخایەنێ کە تیایدا پرسیارت لێ دەکەین دەربارەی منداڵەکەت و خێزان و بارودۆخی ماڵەوەتان.

ئەم شتانە هەموو بە پرسیارو وەڵام دەکرێ و هیچ فەحس و پشکنینێکت بۆ ناکەین. ئەم چاوپێکەوتنە بێجگە لەو کاتەی لێت دەگرێ هیچ نارەحەتییەکت بۆ دروست ناکات. هەر پرسیارێکیش نەتەوێ وەڵامی بدەیتەوە، ئازادی.

ئەو زانیارییانەی لێت وەردەگرین چییان لێ دێ؟

هەموو ئەو زانیارییانەی لەم ماوەیەدا کۆی دەکەینەوە بە شێوەیەکی نهێنی دەمێنێتەوە و تەنیا بۆ مەبەستی توێژینەوەکە بەکاردەهێنرێ و لای دەستەی توێژینەوەکە دەبێ. ناوی خۆت و منداڵەکەت لەسەر فۆرمەکە تۆمارناکرێ (ئەگەر بتەوێ) و زانیاریەکان کە داخڵی کۆمپیوتەر دەکرێن و دواتر بەکاردێن ناویان لەسەر نابێ.

ئەنجامی توێژینەوەکە چی لێ دێ؟

نوسخەی ئەنجامی ئەم توێژینەوەیە دەدرێت بە فەرمانگەی تەندروستی و زانکۆی سلێمانی. ڕەنگە ئەنجامەکان لە گۆڤارە زانستییەکاندا بڵاوبکرێنەوە. کورتەی ئەنجامەکان لە ڕۆژنامە کوردییەکانیشدا بڵاودەکرێنەوە بۆئەوەی خەڵک ئاگادار بن.

کێ توێژینەوەکە دەکات؟

ئەم توێژینەوەیە پرۆژەیەکی دکتۆرایە بەهاوکاری زانکۆی سلێمانی و فەرمانگەی تەندروستیی سلێمانی و زانکۆی نۆتینگهام.

کێ بەم توێژینەوەیەدا چووەتەوە؟

ئەم توێژینەوەیە لەلایەن کۆمیتەی ئەخلاقیی کۆلێژی پزیشکیی زانکۆی نۆتینگهامەوە پێداچوونەوەی بۆ کراوە بۆ دڵنیا بوون لەوەی شتێکی گونجاوە و هیچ زیانێك بە بەرژەوەندیی ئەو کەسانە ناگەینێ کە بەشداریی تێدا دەکەن. هەروەها کۆلێژی پزیشکی زانکۆی سلێمانی و فەرمانگەی تەندروستیش لێی ئاگادارن.

پەیوەندی

ئەگەر هەر پرسیارێکت هەیە تکایە پەیوەندی بکە بە د. ناصح قەرەداخی لە سەنتەری سووتاوی، مۆبایل: ٠٧٧٠١٤٥١٦٣٣

تکایە ئەو فۆرمی ڕەزامەندییەی پێت دەدرێ بیخوێنەرەوە و ئەگەر ئامادەی بەشداری بکەی ئیمزای بکە و بیدەرەوە بە توێژەرەکە.

زۆر سوپاس بۆ بەشداری کردنت لە توێژینەوەکەدا

Appendix 6. Opinion of The Medical School Research Ethic Committee

The University of Nottingham

Please quote ref no: **E/3/2007**

Faculty of Medicine and Health Sciences

Medical School Research Ethics Committee
Division of Therapeutics & Molecular Medicine
D Floor, South Block
Queen's Medical Centre
Nottingham
NG7 2UH

Tel: +44 (0) 115 8231063
Fax: +44 (0) 115 8231059

Direct line/e-mail
+44 (0) 115 8231063
Louise.Sabir@nottingham.ac.uk

Dr Nasih Othman
PhD Student
Division of Primary Care
Floor 13, Tower Building
University Park
Nottingham
NG7 2RD

20 March 2007

Dear Dr Othman

Ethics Reference No: E/3/2007 - *Please quote this number on all correspondence*
Study Title: Epidemiology of burns and the outcome of management in Sulaimaniyah, Iraq: a prospective study.
Lead Investigator: Dr Nasih Othman, PhD Student

Co Investigators: Dr Denise Kendrick, Reader in Primary Care - Supervisor, Community Health Sciences, Dr Ahmed Al-Windi, Associate Professor - Family Medicine - Supervisor, Community Medicine, University of Sulaimani , Iraq.

Thank you for submitting the above application which was considered at the Medical School Research Ethics Committee at its meeting on 15th March 2007. The following documents were reviewed:

- Covering E-mail dated 28/2/07
- Application form dated 28/2/07
- Study Protocol
- Burn questionnaire BQ1: for all burn patients
- Module (QC) for children 0-5 years of age
- Module (QA) for admitted patients
- Quality of Life questionnaire BQ3
- Burn questionnaire BQ2: for Controls
- Participant information sheet (out-patients)
- Participant information sheet (Admitted patients)
- Participant information sheet (Controls)

This interesting study falls outside the remit of this Committee because it involves patients (outside the UK) rather than healthy volunteers. However the Committee do appreciate the unusual circumstances and would like to make the following comments:

1. This study has been well thought out and does not present any serious ethical issues with regard to the subjects. The research question being asked is valid. The Welfare and dignity of the participants has been ensured and the standard of

information and consent is acceptable. The study is being conducted to the same high standards that we would expect in the UK.

2. Permission from the local Health Authorities is being sought in Sulaimaniyah, Iraq which is appropriate.

3. An ethical opinion, or informal view, could also be sought from a UK clinical research ethics committee, such as the Primary Care Ethics committee.

The Committee would like to wish you every success with your project.

Yours sincerely

Dr David Turner
Chairman, Nottingham University Medical School Ethics Committee

Appendix 7. Approval of
The Ethics Committee of the College of Medicine, University of Sulaimani

Note: Signatures at the bottom of request letter are approval of members

Dr. Nasih Othman
PhD Student
School of Community Health Sciences
University of Nottingham

Ethics Committee
College of Medicine
University of Sulaimani

Date: 18 September 2007

Subject: Ethical approval

Dear honourable members,

I am a lecturer at the medical college of the University of Sulaimani currently doing a PhD degree in primary care epidemiology at the University of Nottingham, UK. My research is about epidemiology of burns in Sulaimaniyah (abstract attached). As a requirement of the study I have submitted the project protocol to the Ethics Committee of the Faculty of Medical and Surgical Sciences of the University of Nottingham and got the approval (copy attached).

Hereby I would also like to have the approval of this committee. With this request I am attaching an abstract of the project and the approval letter of the Nottingham ethics committee. The questionnaires, patient information sheets, consent forms and the detailed project protocol are all prepared in English (all) and Kurdish (except the project protocol). They would be made available should the committee wants to see them. These documents were part of the submission to the ethical approval in Nottingham.

Title of Project:
Epidemiology of burns and the outcome of management in Sulaimaniyah, Iraq: a prospective study

Names and Qualifications of Investigators:
1. Dr Nasih Othman, MBChB, MSc Epidemiology: PhD student, Chief Investigator
2. Dr Denise Kendrick, MD, PhD, Reader in Primary Care: First Supervisor
3. Dr Ahmad Al-Windi, MD, PhD Family Medicine, Associate Professor, Second Supervisor

Dr Nasih Othman
Chief investigator

Appendix 8. Approval of the Department of Health in Sulaymaniyah (English translation)

Kurdistan Region
The Minsitry of Helath

Department of Health in Sulaymaniyah
Personnel

Number: 9224
Date: 11/09/2007

To: the Burns and Plastic Surgery Centre
Subject: Cooperation

Reference to a letter from the College of Medicine, University of Sulaimani, number 7-22-1984 on 05/09/2007, it is kindly requested that you cooperate with Dr. Nasih Fatih Othman who is undertaking a research study in your hospital.

Dr. Sherko Abdullhah Rashid
General Director
07/09/2007
{Signed}

cc:

- College of Medicine, University of Sulaimani, your above-mentioned letter with respect
- The Teaching Hospital/ The Children's Hospital, the above mentioned purpose please
- Personnel-Parwin
- File

Appendix 8b. Approval of the Department of Health in Sulaymaniyah (Original in Kurdish)

هەرێمی کوردستان

وەزارەتی تەندروستی
فەرمانگەی تەندروستی سلێمانی
خـــــۆیەتی

ژمارە /
ڕۆژ / ١١ / ٩/ ٢٠٠٧
ڕۆژ / /گەلاوێژ٢٧٠٧

بـــــــۆ / سەنتەری سوتاوی و نەشتەرگەری جوانکاری
بابەت / هـــاوکـــاری

ئاماژە بە نوسراوی زانکۆی سلێمانی / ڕاگرایەتی کۆلێجی پزیشکی ژمارە ﴿ ١٩٨٤/٢٣/٧ ﴾ لە ٢٠٠٧/٩/٥ تکایە هاوکاری بەڕێز ﴿ د٠ ناصح فاتح عوسمان ﴾ بکەن بە نە نجام دانی توێژینەوە یەک لە نەخۆشخانەکەتان ٠

د٠ شێرکۆ عبدالله ڕشیـــــد
بەڕێـــوەبەری گشتـــی
٢٠٠٧/٩/ ١١

وێنەیەک بۆ//

- سەرۆکایەتی زانکۆی سلێمانی /ڕاگرایەتی کۆلێجی پزیشکی / نوسراوی سەردەوەتان / لە گەڵ ڕێزدا ٠
- نەخۆشخانەی فێرکاری / نەخۆشخانەی منداڵان بۆ هەمان مەبەستی سەردەوە تکایە ٠
- خوێەتی/ پروین
- د٠ تاییەت ٠
- د٠ خولاو ٠

Appendix 9. Study Participant Consent Form

University of Sulaimani, College of Medicine
University of Nottingham, School of Community Health Sciences

Title of Project:
Epidemiology of burns and the outcome of management in Sulaimaniyah, Iraq: a prospective study

(Causes of burns and the results of treatment in Sulaimaniyah)

Name of Investigators:
Dr Nasih Othman, PhD student. Student, Chief Investigator
Dr Denise Kendrick, Reader, School of Community Health Science: First Supervisor
Dr Ahmed Al-Windi, Associate Professor, Department of Community Medicine, University of Sulaimani, Iraq: Second Supervisor

Study Participant Consent Form

Please read this form and sign it once the above named or their designated representative has explained fully the aims and procedures of the study to you.

- I voluntarily agree to take part in this study.

- I confirm that I have been given a full explanation by the above named and that I have read and understand the information sheet given to me which is attached.

- I have been given the opportunity to ask questions and discuss the study with one of the above investigators or their deputies on all aspects of the study and have understood the advice and information given as a result.

- I agree to the above investigators contacting my doctor to make known my participation in the study where relevant.

- I authorise the investigators to disclose the results of my participation in the study but not my name.

- I understand that information about me recorded during the study will be kept in a secure database. If data is transferred to others it will be made anonymous. Data will be kept for 7 years after the results of this study have been published.

- I understand that I can ask for further instructions or explanations at any time.

- I understand that I am free to withdraw from the study at any time, without having to give a reason for withdrawing.

Name: ……

Address: ……..

Telephone number (if present): …….

Signature: ……. **Date:** ……

I confirm that I have fully explained the purpose of the study and what is involved to …… …..I have given the above named a copy of this form together with the information sheet.

Investigators Signature: …….. **Name**: ……

Study Volunteer Number: ……..

Appendix 9b. Study Participant Consent Form (in Kurdish)

زانکۆی سلێمانی، کۆلێژی پزیشکی

زانکۆی نۆتینگهام، کۆلێژی زانستەکانی تەندروستیی کۆمەڵ

ناونیشانی پرۆژە:

پەتاناسیی سووتاوی و دەرەنجامی چارەسەری لە سلێمانی : توێژینەوەیەکی بەرەوپێش (هۆیەکانی سووتاوی و ئەنجامەکانی چارەسەرکردنی)

ناوی توێژەرەکان:

٤. د. ناصح فاتح عوسمان، قوتابی دوکتۆرا، توێژەری سەرەکی

٥. د. دێنیس کێندریك، پسپۆری لە تەندروستیی بەرایی: سەرپەرشتیاری یەکەم

٦. د. ئەحمەد وەندی، پرۆفیسۆری یاریدەدەر: سەرپەرشتیاری دووەم

فۆرمی ڕەزامەندیی کەسانی بەشدار

تکایە پاش ئەوەی یەکێك لەو توێژەرانەی سەرەوە یا نوێنەرێکیان بە باشی ئامانجەکان و چۆنێتیی ئەنجامدانی توێژینەوەکەت بۆ باس دەکات، ئەم فۆرمە بخوێنەرەوە و ئیمزای بکە.

- من ئاڕەزوومەندانە ڕازیم بەوەی بەشداری بکەم لەم توێژینەوەیەدا.
- یەکێك لەو کەسانەی سەرەوە بە باشی باسی توێژینەوەکەی بۆ کردووم و خۆشم لاپەرەی زانیارییەکانم خوێندووەتەوە سەبارەت بە توێژینەوەکە کە لەگەڵ ئەم فۆرمەدایە.
- دەرفەتی ئەوەم پێ ڕاوە داوای ڕوون کردنەوە و پرسیار بکەم لە یەکێك لەوانەی سەرەوەی یا نوێنەرەکەیان سەبارەت بە هەرلایەنێکی توێژینەوەکە و ئەو ڕێنمایی و زانیارییانە تێگەیشتووم کە پێم وتراوە.
- ڕازیم بەوەی ئەم توێژەرانە پەیوەندیی بە پزیشکەکەمەوە بکەن سەبارەت بە بەشداری کردنم ئەگەر پێویستی کرد.
- ڕازیم توێژەرەکان ئەنجامەکانی بەشداری کردنم باس بکەن بەمەرجێ ناوی منی تێدا نەبێ.
- من وا تێگەیشتووم ئەو زانیارییانەی سەبارەت بەم من کۆدەکرێنەوە لەم توێژینەوەیەدا لە شوینێکی ئەمیندا دەپارێزرێن. ئەگەر ئەم زانیارییانە بدرێن بە هەرکەسێکی تر ئەوا ناوی منیان لێ لادەبرێ. زانیارییەکان تا ماوەی حەوت ساڵ پاش بڵاوکردنەوەی ئەنجامی ئەم زانیارییانە هەڵدەگیرێن.

- **من ئەتوانم هەر کاتێك داوای ڕێنمایی و ڕوونکرنەوەی زیاتر بکەم.**
- **من ئازادم لەوەی هەرکاتێك بمەوێ پاشەکشە بکەم بێ ئەوەی ناچار بم هۆیەکەی ڕوون بکەمەوە.**

ناوی بەشدار: .....

ناونیشان:..... .... **تەلەفۆن:**.....

ئیمزا:..... **بەروار:**.....

تێبینیی تۆێژەر:
تەئکیدی ئەوە دەکەم کە بەباشی ئامانجەکان و چۆنێتیی تۆێژینەوەکەم بۆ بەرێز .....
باس کردووە و کۆپییەکی ئەم فۆرمە و لاپەرەی زانیارییەکانم پێ داوە.

ناو و ئیمزای تۆێژەر:..... **ژمارەی**
بەشدار:.....

Appendix 10. The case-control questionnaire

Sulaimaniyah Burns Study

Burn Questionnaire (BQ2) For Controls

Fill in questions 1-4 before starting the interview with the patient/career

Q1. Name of Hospital/PHC:……..
Q2.: Name of Interviewer ……
Q3. Date of interview (ddmmyy): ___ / ___ / ___
Q4.:Interview No.:…….

Unique Patient ID No.:

Q5. Who is being interviewed?
1. Patient
2. Mother
3. Father
4. Other → specify:…….

Q6. Sex of the patient *(ask if a small child)*
1. Male
2. Female

Q7. Date of Birth *(ddmmyy):* ____ / ___ / ____ OR 8. Age: ……

Q14. Occupation of the father of the patient?
1. Civil servant → specify: ……
2. Private → specify: …….
3. Pensioner
4. Unemployed
5. Farmer
6. Other → specify: ……

Q15. Occupation of the mother of the patient?
1. Civil servant → specify: ……
2. Private → specify: ……
3. Pensioner
4. House wife
5. Other → specify: ……

Q16. Can the patient's mother read and write?
1. Yes
2. No ***Go to Q18***

Q17. What is the patient's mother's highest level of education?
1. Primary
2. Intermediate
3. Secondary
4. Higher educatio

Q18. Can the patient's father read and write?
1. Yes 2. No ***Go to Q20***

Q19. What is the patient's father's highest level of education?
1. Primary
2. Intermediate
3. Secondary
4. Higher education

Q23. How many persons are there in your household sharing the same kitchen? ……
Q24. How many of them are 0-5 years of age? ……..
Q27. How would you describe the living standard of the family?
1. Poor
2. Fair
3. Good
4. Very good

Q28. Do you live in your own house or other property?
1. Own house 2. Rented
3. Other → specify: ……..

Q30. What is the house made of?
1. Concrete 2. Mud 3. Other → specify: ……..

Q31. How many rooms are there in your house (counting sleeping room, living room, dining room and kitchen)? ……..

Q34. Which <u>one</u> of the following devices do you <u>usually</u> use for cooking?
1. Gas cooker
2. Kerosene cooker
3. Electric cooker
4. Kerosene stove
5. Sepa (tripod)
6. Agrdan (fireplace)

Q36. Which one(s) of the following devices do you use for heating the rooms?

1. Split/air conditioner
2. Kerosene stove
3. Gas stove
4. Electric heater
5. Wood stove
6. Coal stove

Q37. Which one of the following devices do you use for bathroom water boiling?

1. Boiler
2. Element dip
3. Primus
4. Kerosene stove
5. Wood fire (under barrel)

Go to Q 39

Q38. (If using Boiler) Do you know the temperature of your boiler?

1. Yes 2. No

Q39. Do you sometimes use a house generator for electricity?

1. Yes 2. No

Q40. Do you have a car?

1. Yes 2. No

Q41. Do you keep benzene at home?

1. Yes 2. No → ***Go to Q42***

Q42. How do you keep benzene at home?

1. in plastic containers
2. in metal jerry cans
3. in barrels
4. Other → specify: ….

Q43. Do you have a fire extinguisher cylinder at home?

1. Yes 2. No

Q44. Do you have a fire alarm installed at home?

1. Yes 2. No

Q45. Which of the following devices do you usually use for preparing tea?

1. Kettle and teapot
2. Samovar and teapot
3. Electric kettle
4. Other → specify: …….

Q49. Has any one else in the family sustained burn in the past?

1. Yes 2. No

QC2-QC25

QC2. Where was the child delivered?

1. Home
2. Hospital/health facility

QC3. Is the child currently going to nursery or kindergarten?

1. Yes 2.No

QC4. Has the child ever gone to nursery or kindergarten?

1. Yes 2.No

QC5. What is the order of the child in the family? ……

QC7. Is the child living with his/her mother?

1. Yes 2.No

QC8. Does the child have an elder sister who sometimes takes care of him/her?

1. Yes 2. No

QC9. Who usually takes care of the child?

1. Mother
2. Sister
3. Other → specify:……

QC10. If the child is not with the mother (mother out or busy at home), who takes care of the child?

1. Father
2. Sibling
3. Grandparent
4. No one
5. Others → specify:……

		never or rarely(0)	Some-times (1)	Often (2)	very often(3)
QC12	Does the child fidget with hands or feet or squirms in seat?				
QC13	Does the child run about or climb excessively in situations in which it is inappropriate Does not seem to listen when spoken to directly?				
QC14	Is the child "on the go" or often acts as if "driven by a motor"?				

QC19. How often can this child reach out to the place where you keep matches, cigarette lighters, cooker lighters?

1. Never
2. Sometimes
3. Often
4. Very often

QC20. When you cook and work near fire, how often are you aware of the danger of burning?

1. Never
2. Sometimes
3. Often
4. Very often

QC21. Does the child have history of seizures?

1. Yes 2.N

QC22. Does the child have any severe mental health problem (mental retardation, learning disorders)?

1. Yes → specify …….. 2. No

QC23. Does the child have difficulty in walking (if child still younger than awaking age tick NA)?

1. Yes 2.No 3.Not walking yet

Q24. Does the child have difficulty in hearing?

1. Yes 2.No

Q25. Does the child have difficulty in seeing?

1. Yes 2.No

Appendix 10b. The case-control questionnaire (in Kurdish)

Burn Questionnaire (BQ2) For Controls

تویژینەوەی سووتاوی لە سلێمانی: پرسنامەی BQ2 بۆ کۆنترۆڵەکان

پێش ئەوەی دەست بە چاوپێکەوتنەکە بکەی پرسیاری ١-٤ وەڵام بدەرەوە

پ١. ناوی نەخۆشخانە یا بنکەی تەندروستی:.....

پ٢. ناوی پرسکار: ..... Unique Patient ID No.:

پ٣. رۆژی چاوپێکەوتن (رۆژ/مانگ/ساڵ): ____/___ /____

پ٤. ژمارەی چاوپێکەوتن:.....

پ٥. چاوپێکەوتن لەگەڵ کێدایە؟

١. نەخۆش ٣. باوکی نەخۆش

٢. دایکی نەخۆش ٤. خەڵکی تر، تکایە دیاریی بکە:.....

پ٦. رەگەزی نەخۆش *(ئەگەر منداڵیکی بچووك بوو پرسیلر بکە)*

١. نێر ٢. مێ

ئێستا چاوپێکەوتنەکە دەست پێ بکە.

پ٧. بەرواری لەدایك بوون: (رۆژ/مانگ/ساڵ): ____/___ /____ یا پ ٨. تەمەن: .....

پ١٤. ئیشی باوکی نەخۆش؟

١. کارمەندی حکومەت، دیاریی بکە:..... ٤. بێکار

٢. کەرتی تایبەت، دیاریی بکە:..... ٥. جووتیار

٣. خانەنشین ٦. هی تر، تکایە دیاریی بکە: .....

پ١٥. ئیشی دایکی نەخۆش؟

١. کارمەندی حکومەت، دیاریی بکە:..... ٤. ژنی ماڵەوە

٢. کەرتی تایبەت، دیاریی بکە:..... ٥. هی تر، تکایە دیاریی بکە: .....

٣. خانەنشین

پ١٦. ئایا دایکی نەخۆش خوێندەواریی هەیە؟

١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ١٨*

پ١٧. بەرزترین پلەی خوێندنی دایکی نەخۆش؟

١. سەرەتایی ٢. ناوەندی ٣. ئامادەیی ٤. خوێندنی باڵا

پ١٨. ئایا باوکی نەخۆش خوێندەواریی هەیە؟

١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ٢٠*

پ١٩. بەرزترین پلەی خوێندنی باوکی نەخۆش؟

١. سەرەتایی ٢. ناوەندی ٣. ئامادەیی ٤. خوێندنی باڵا

پ٢٣. ژمارەی ئەندامەکانی خێزانەکەتان چەندن کە پێکەوە دەژین؟ .....

پ٢٤. چەند کەسیان تەمەنیان لە شەش ساڵ کەمترە؟ .....

پ٢٧. ئاستی ئابووریی خێزانەکەت لە چ رادەیەکدا دادەنێی؟

١. خراپ ٣. باش

٢. مامناوەندی ٤. زۆرباش

پ٢٨. له خانووی خۆتاندا ئەژین یا له کرێدا؟

١. خانووی خۆمان ٢.کرێ ٣.جۆری تر، دیاریی بکە: .....

پ٣٠. خانووەکە لەچی دروست کراوە؟

١. کۆنکرێت ٢. قوڕ ٣. هی تر، دیاریی بکە :.....

پ٣١ چەند ژوورتان هەیە (ژووری نووستن و دانیشتن و نان خواردن و مەتبەخ حساب بکە)؟: .....

پ٣٤. کام لەم شتانەی خوارەوە بەکاردێنن بۆ چێشت لێنان؟ (ئەتوانی زیارتر لە یەکیك هەڵبژێری)

١. تەباخی غاز ٣. تەباخی کارەبا، هیتەر ٥. پەرەمێز/ سێپا

٢. تەباخی نەوت ٤. زۆپا ٦. ئاگردان

پ٣٦. کام لەم شتانەی خوارەوە بەکاردێنی بۆ گەرمکردنی ماڵەکە؟ (ئەتوانی زیاتر لە یەکێك هەڵبژێری)

١. سپلیت یا ئەیر کۆندیشن ٣. زۆپای غاز ٥. زۆپای دار

٢. زۆپای نەوت ٤. زۆپا و هیتەری کارەبا ٦. مقەڵی

پ٣٧. کام لەم شتانەی خوارەوە بەکاردێنی بۆ گەرمکردنی ئاوی حەمام؟ (ئەتوانی زیارتر لە یەکیك هەڵبژێری)

١. بۆیلەر

٢. ئیلەمێنتی کارەبا

٣. پەرەمێز

٤. تەباخی نەوت } *بچۆ بۆ پرسیاری ٣٩*

٥. تووِن و دار

پ٣٨. (ئەگەر بۆیلەر بەکاردێنی) ئایا ئەزانی پلەی گەرمای بۆیلەرەکەتان لەسەر چەندە؟

١. بەڵێ ٢. نەخێر

پ٣٩. ئایا موەلیدەی خۆتان هەیە لە ماڵەوە؟

١. بەڵێ ٢. نەخێر

پ٤٠. سەیارەتان هەیە؟

١. بەڵێ ٢. نەخێر

پ٤١. لە ماڵەوە بەنزین هەڵدەگرن؟

١. بەڵێ ٢. نەخێر >> *بچۆ بۆ پرسیاری ٤٣*

پ٤٢. لە چیدا بەنزین هەڵ دەگرن لە ماڵەوە؟

١. دەبەی پلاستیك ٣. بەرمیل

٢. جێریکانی ئاسن ٤. شتی تر: دیاریی بکە :.....

پ٤٣. لە ماڵەوە حەریقتان هەیە (بوتڵی ئاگر کوژاندنەوە)

١. بەڵێ ٢. نەخێر

پ٤٤. لە ماڵەوە دەزگای ئینزاری ئاگرتان هەیە؟

١. بەڵێ ٢. نەخێر

پ٤٥. عادەتەن کام لەم شتانە بەکاردێنن بۆ چا دروست کردن؟

١. کتری و قۆری ٣. کتری کارەبایی

٢. سەماوەر و قۆری ٤. شتی تر، دیاریی بکە:.....

پ٤٩. لەم خێزانەدا کەسی تر پێشتر سووتاوە؟

١. بەڵێ ٢. نەخێر

پ٢. ئەم منداڵە لە کوێ لەدایك بووە؟

١. لە ماڵەوە ٢. لە نەخۆشخانە یا هەر دامەزرامەیەکی تەندروستی

پ٣. ئایا ئەم منداڵە ئێستا دەچێ بۆ ڕەوزە یا حەزانە؟ ١. بەڵێ ٢. نەخێر

پ٤. ئایا ئەم منداڵە پێشتر چووە بۆ ڕەوزە یا حەزانە؟ ١. بەڵێ ٢. نەخێر

پ٥. ئەم منداڵە چەندەم منداڵە لە خێزانەکەدا؟ .....

پ٧. ئایا ئەم منداڵە لەگەڵ دایکی دەژی؟ ١. بەڵێ ٢. نەخێر

پ٨. ئایا ئەم منداڵە خوشکی لەخۆی گەورەتری هەیە جار جار وریایی بکات؟ ١.. بەڵێ ٢. نەخێر

پ٩. بە شێوەیەکی گشتی کێ زیاتر وریایی ئەم منداڵە دەکات؟

١. دایکی ٢. خوشکی ٣. کەسێکی تر، دیاریی بکە: .....

پ١٠. ئەگەر کاتێك دایکی لەماڵ نەبێ یا مەشغوڵ بێ، کێ وریایی منداڵەکە دەکات؟

١. باوك ٤. هیچ کەس

٢. خوشك و برا ٥. کەسێکی تر، دیاریی بکە: .....

٣. دایە گەورە و بابە گەورە

	تا چ ڕادەیەك ئەم منداڵە وایە؟	قەت وانیە یا بەدەگمەن وایە	جارجار وایە	زۆرجار وایە	زۆربەی کات وایە
پ١٢	ئەم منداڵە دایم دەست پەل دەکوتێ لەسەر کورسیش بێ هەر لە جووڵە جووڵ ناوەستێ				
پ١٣	ئەم منداڵە زیاد لە پێویست دەجووڵێ و بە شوێنی وادا سەردەکەوێ و دەڕوا لەبار نیە بۆی؟				
پ14	ئەم منداڵە وەکوو جیوەی تێکرابێ بەردەوام لە حەرەکەدایە؟				

پ١٩. تا چ ڕادەیەك منداڵەکەت دەستی دەگات بە شقارتە و چەرخ و چەرخی غاز داگیرساندن لە ماڵەوە؟

١. هەرگیز ٢. جاربە جار ٣. زۆرجار ٤. زۆربەی کات

پ٢٠. کاتێ نزیك ئاگریت یا خەریکی چێشت لێ نانی تا چ ڕادەیەك خەتەری سووتان لە خەیاڵتدایە؟

١. قەت لە خەیاڵمدا نیە ٢.جارجار لە خەیاڵمدایە ٣.زۆرجار لە خەیاڵمدایە ٤.زۆربەی کات لە خەیاڵمدایە

پ٢١. ئایا ئەم منداڵە ڤ ی لەگەڵدایە؟

١. بەڵێ ٢. نەخێر

پ٢٢. ئایا ئەم منداڵە هیچ کێشەیەکی گەورەی هەیە لەرووی عەقڵەوە وەك تەخەلوق عەقڵی و کێشەی فێر نەبوون؟

١. بەڵێ ، دیاریی بکە: ..... ٢. نەخێر

پ٢٣. ئایا ئەم منداڵە کێشەی هەیە لە رۆیشتندا؟

١. بەڵێ ٢. نەخێر ٣. هێشتا پێی نەگرتووە

پ٢٤. ئایا ئەم منداڵە کێشەی هەیە لە بیستندا؟

١. بەڵێ ٢. نەخێر

پ٢٥. ئایا ئەم منداڵە کێشەی هەیە لە بینیندا؟

١. بەڵێ ٢. نەخێ

Appendix 11. Sample size calculation for the case-control study

$$n = \frac{\left[Z_{\alpha}\sqrt{(1+m)\bar{p}'(1-\bar{p}')} + Z_{\beta}\sqrt{p_1(1-p_1) + m\,p_0(1-p_0)}\right]^2}{(p_1 - p_0)^2}$$

$$\bar{p}' = \frac{p_1 + p_0 / m}{1 + 1/m}$$

$$p_1 = \frac{p_0 \psi}{1 + p_0(\psi - 1)}$$

$$n_c = \frac{n}{4}\left(1 + \sqrt{1\frac{2(m+1)}{n\,m\,|p_0 - p_1|}}\right)^2$$

Where *n* is the sample size (number of cases) before correction and *nc* is the sample size after continuity correction. In our case,

Expected proportion of control group children whose mothers have poor education, P0 = 0.60
Odds ratio= 1.9
Significance level (ά), two sided, of 0.05 where Zά will be 1.96
Power of 90% (1-β) where Z*β* will be 1.28
Probability of exposure in cases, P1 will be derived from the given formula
Number of controls subjects per case, *m*, =1

Substituting the above values in the equations above gives *n*= 234 and *nc*= 248

So the estimated number of cases needed is 248. An equal number of controls are needed