

Emerging chronic non-communicable diseases in rural communities of Northern Ethiopia: evidence using population-based verbal autopsy method in Kilite Awlaelo surveillance site

Berhe Weldearegawi,^{1*} Yemane Ashebir,¹ Ejigu Gebeye,¹ Tesfay Gebregziabher,¹ Mekonnen Yohannes,² Seid Mussa,³ Haftu Berhe⁴ and Zerihun Abebe⁵

¹Department of Public Health, ²Department of Microbiology, ³Department of statistics, ⁴Department of Nursing and ⁵Department of Medicine, Mekelle University, P.O. Box 1871, Mekelle, Ethiopia

*Corresponding author. Department of Public Health, Mekelle University, P.O. Box 1871, Mekelle, Ethiopia. Tel: 251(0)914763969; E-mail: berheph@gmail.com

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Introduction In countries where most deaths are outside health institutions and medical certification of death is absent, verbal autopsy (VA) method is used to estimate population level causes of death.

Methods VA data were collected by trained lay interviewers for 409 deaths in the surveillance site. Two physicians independently assigned cause of death using the International Classification of Diseases manual.

Results In general, infectious and parasitic diseases accounted for 35.9% of death, external causes 15.9%, diseases of the circulatory system 13.4% and perinatal causes 12.5% of total deaths. Mortalities attributed to maternal causes and malnutrition were low, 0.2 and 1.5%, respectively. Causes of death varied by age category. About 22.1, 12.6 and 8.4% of all deaths of under 5-year-old children were due to bacterial sepsis of the newborn, acute lower respiratory infections such as neonatal pneumonia and prematurity including respiratory distress, respectively. For 5–15-year-old children, accidental drowning and submersion, accounting for 34.4% of all deaths in this age category, and accidental fall, accounting for 18.8%, were leading causes of death. Among 15–49-year-old adults, HIV/AIDS (16.3%) and tuberculosis (12.8%) were commonest causes of death, whereas tuberculosis and cerebrovascular diseases were major killers of those aged 50 years and above.

Conclusion In the rural district, mortality due to chronic non-communicable diseases was very high. The observed magnitude of death from chronic non-communicable disease is unlikely to be unique to this district. Thus, formulation of chronic disease prevention and control strategies is recommended.

Keywords Verbal autopsy, physician review, non-communicable diseases, HDSS, Ethiopia

KEY MESSAGES

- Most deaths were outside health institutions.
- Highest proportion of deaths was among under 5-year-old children and people aged 60 years and above, whereas the lowest proportion was in the age group of 5–9 years.
- Proportion of deaths from non-communicable diseases and accidents was very high.

Introduction

When programmes to improve health are in place, they need to be based on accurate morbidity and mortality statistics of the target population (Quigley *et al.* 1996; Mathers *et al.* 2005). Especially, information about who dies of what is critical to formulating effective planning, implementing and evaluating healthcare programmes (Quigley *et al.* 1996; Fottrell and Byass 2010).

In developed countries, data on disease-specific mortality are readily available from vital events registration (Gajalakshmi and Peto 2004). On the other hand, in most developing countries, where 80% of the global deaths occur, registration of vital events is not practised. Therefore, estimation of cause of death in developing countries is more difficult, as most deaths are neither attended by health professionals nor medically certified (Ronsmans *et al.* 1998; Gajalakshmi and Peto 2004; Lulu and Berhena 2005; Dongre *et al.* 2008; Fottrell and Byass 2010). Therefore, three quarters of the world's population remains outside any systematic mortality surveillance (Fottrell and Byass 2010).

In countries where registration of vital events is non-existent and the proportion of people who die at home without medical care is high, an indirect method called verbal autopsy (VA) has been adopted to identify causes of death (Lulu and Berhena 2005; Setel *et al.* 2006; Dongre *et al.* 2008; Fottrell and Byass 2010; Morris *et al.* 2010; Abbas *et al.* 2011). Today, VA remains the best available approach in communities where most deaths occur at home and is used in 35 sites primarily in Africa and Asia (Quigley *et al.* 1996; Fottrell and Byass 2010; Abbas *et al.* 2011).

VA data are generated through retrospective questioning of the caretaker for the deceased in surveys or in demographic surveillance systems (Ronsmans *et al.* 1998; Lulu and Berhena 2005).

To derive probable causes of death from VA data any of four methods of interpretation—physician review without algorithmic diagnostic criteria, physician review using algorithm, computer algorithms and more recently, probabilistic approaches—can be used (Dongre *et al.* 2008; Fottrell and Byass 2010).

The validity of cause of death ascertained using VA is affected by various methodological and conceptual factors like, design and content of questionnaire, timing of interview, skill of interviewers, respondents identified and approach used to derive probable cause of death from VA data (Quigley *et al.* 1996; Fottrell and Byass 2010). Several studies showed that VA can be used to generate reasonable population level estimates of causes of death (Khademi *et al.* 2010; Araya *et al.* 2012), while some other studies are less supportive of it (Anker 1997). Studies reported that the validity and reliability of VA varies for

varying causes of death and age groups. Reliability and validity estimation from a cohort study in Iran reported an overall validity above 81% and reliability above 75% (Khademi *et al.* 2010). Some other validation studies from Ghana and Tanzania reported that VA underestimated the proportion of stillbirths and overestimated maternal deaths. However, for deaths at the age of 5 and above its sensitivity may range from 10 to 95% (Setel *et al.* 2006; Edmond *et al.* 2008). In general, the VA method is recommended to obtain a population-level estimate of causes of deaths in the absence of a medical recording system (Dongre *et al.* 2008; Edmond *et al.* 2008).

Ethiopia is the second most populous country in Africa, with an 86 million population, the majority (84%) living in rural areas. The population age pyramid has remained quite young with 44% under 15 years, and only 3% of the total population is more than 65 years old (FMoH 2010). Despite improvements in recent decades, the Ethiopian population still faces high morbidity and mortality rates. Life expectancy of males and females is 49.7 years and 52.4 years, respectively, while the infant mortality and Under 5 mortality rates are 59 and 88 per 1000 live births, respectively. Although the maternal mortality rate has declined to 590/100 000 live births, it is still among the world's highest (CSA 2006, 2011; MoH 2012). Health service utilization is very poor with total outpatient utilization of government health facilities ~0.25 visits per person per year. Thus, due to poor access to health services and low health-seeking behaviour most morbidities and mortalities are out of health facilities and remain undocumented. As a result, there is a deficiency of mortality data at both health facility and community level.

Therefore, this study was conducted to identify causes of death using the physician review VA approach at the Kilite Awlaelo health and demographic surveillance site (KA-HDSS).

Methods

The study was conducted in 10 selected kebeles, where the KA-HDSS is implementing the longitudinal study since 2009. A total population of 68 495 (35 237 female and 33 258 male) living in 15 000 households are included under this surveillance. The centre for KA-HDSS is 835 km north of Addis Ababa. A selected kebele that is included in the longitudinal follow up represents lowest administrative unit in Ethiopia with an average population of 5000. The surveillance population had lower mortality, crude death rate of 4.2 per 1000 mid-year population, lower than the national 8.2. Fertility levels are also low, with total fertility rate of 4.5 lower than the national 4.8.

In the HDSS, all vital events, such as pregnancy outcome, death, in-migration, out-migration, internal move, relationship

change are continually recorded. For every death in the surveillance population, high school complete trained interviewers pay visit to household of the deceased and collect VA data. Respondents were adult relatives who were caregiver during the terminal illness, but mothers were interviewed if the deceased were children. Standardized VA questionnaire was adapted from World Health Organization (WHO) and the International Network of field sites with continuous Demographic Evaluation of Populations and Their Health in developing countries (INDEPTH). Separate, structured VA questionnaires, containing open and closed ended questions, were used for the three age groups: neonates, post-neonate and children (29 days to 15 years) and adults (>15 years) (WHO 2010). Data were collected after the end of local mourning (45–55 days) using paper format which takes 110 min on average to complete.

Interviewers were residents of surveillance villages, who at least completed high school education, were permanently recruited and conducted the VA interview for the two years period. They were trained on VA tools, interviewing techniques, indigenous terminologies, concepts of illnesses and their manifestations. Besides, they were provided with refreshment training every 6 months, on the top of monthly discussions about their experiences.

Reviewer physicians were trained on applying International Classification of Diseases (ICD-10) and standardization procedures across other HDSS sites, using ICD-10 training Module 3. Two physicians (blinded for the review) independently reviewed the completed VA questionnaires to assign cause of death using ICD-10 manual. Agreement between the two physician diagnoses was checked by the members of the surveillance team. When there were disagreements in diagnosis, a third physician was assigned to review the case and final diagnosis was assigned based on the agreement between the third and any of the two physicians. If the three physicians assigned different diagnosis, the case was labelled as undecided. For classification of causes of death, the ICD-10 classification in the WHO-global burden of diseases was used (WHO 2008).

The current report is based on VA for deaths from September 2009 to 2011. Data entry cleaning and analysis were made using SPSS version 16.0 statistical package. This surveillance has been ethically approved by the Ethiopian Science and Technology Agency with identification number—IERC 0030. Informed consent was taken for every interview and information was kept confidential.

Results

About 86.7% of the surveillance population was from rural areas, depending on seasonal farming. The surveillance population was young, with 38% being under 15 years of age and 4.4% were 60 years and above. VA review was made for a total of 409 deceased, for all deaths during the entire period except two refusals to be interviewed. Of the total deceased, 226 (55.3%) were males and 183 (44.7%) were females. Among the deceased, 379 (92.7%) were from rural parts of the study district and most deaths, 366 (89.5%) took outside health institutions. More than two thirds, 209 (68.5) of the deceased had no formal schooling and 180 (60%) of them rely on

farming. The mean age \pm SD at death was 42 ± 3 years (Table 1).

Reviewers agreed for 387 (94.6%) of total VA cases reviewed, while their diagnosis disagreed for 22 (5.4%) cases. For ~339 (83%) of cases, cause of death was assigned by the first two reviewers, whereas 70 (17%) required a third reviewer. There was almost equal agreement on the cause of death assigned for both sexes, whereas the disagreement level varied for varying age category. Fifty percent of the disagreements were in two age groups, under 5 years (23%) and 80 years and above (27%). The first leading causes of death were infectious and parasitic diseases accounting for 35.9% of total deaths, followed by external causes of death (15.9%), disease of circulatory system (13.4%) and perinatal causes of death (12.5%). Accidental fall (4.9%) and accidental drowning and submersion (4.6%) were commonest causes under the external causes of death, while the contribution of transport accidents was 1%. Among disease of circulatory system, cerebrovascular diseases (7.3%) and ischaemic heart disease (2.7%) were commonest causes of death. Bacterial sepsis of newborn was also the main perinatal cause of death accounting for 5.6% of total deaths. Maternal death (0.1%) and death from malaria (3.2) were relatively low (Table 2).

In general, chronic diseases accounted for 28.6% of total deaths, diseases of circulatory system and neoplasms being the

Table 1 Sociodemographic characteristics of deceased individuals, KA-HDSS, Ethiopia, 2009–11

Variable	Category	Total N (%)
Age in years	0–5	96 (23.5)
	5–9	13 (3.2)
	9–19	29 (7.1)
	19–29	30 (7.3)
	29–39	27 (6.6)
	39–49	17 (4.2)
	49–59	23 (5.6)
	59–69	32 (7.8)
	69–79	57 (13.9)
	79+	85 (20.7)
Educational status for age ≥ 7 years ($n=305$)	No formal schooling	209 (68.5)
	Primary	69 (22.6)
	Secondary and above	27 (8.8)
Marital status for age 10+ years ($n=300$)	Married	125 (41.7)
	Unknown	69 (23.0)
	Dissolved	54 (18.0)
	Single	52 (17.3)
Occupation (age 10+)	Farming	180 (60.0)
	No work	36 (12)
	Student	30 (10)
	Daily labourer	22 (7.3)
	All other	22 (7.3)
	Employed	10 (3.3)
Place of death	Home (work place)	366 (89.5)
	Health institution	43 (10.5)

Table 2 Verbal autopsy based causes of death by sex in KA-HDSS, 2009–11

Underlying cause of death	VA code	Male	Female	Total
Infectious and parasitic diseases (VA-01.01–VA.01.99)		67 (16.4)	80 (19.6)	147 (35.9)
Tuberculosis	VA-01.03	20 (4.9)	29 (7.1)	49 (12)
Intestinal infectious diseases (VA-01.01, VA-01.02 and VA-01.99)		18 (4.4)	10 (2.4)	28 (6.8)
Acute lower respiratory infections (including pneumonia and acute bronchitis)	VA-01.13	12 (2.9)	9 (2.2)	21 (5.1)
HIV/AIDS	VA-01.09	4 (1.0)	15 (3.7)	19 (4.6)
Meningitis	VA-01.11	8 (2.0)	6 (1.5)	14 (3.4)
Malaria	VA-01.10	4 (1.0)	9 (2.2)	13 (3.2)
Others [viral hepatitis (VA-01.08) and measles (VA-01.07)]		1 (0.2)	2 (0.5)	3 (0.7)
External causes of death (VA-11.01–VA-11.97)		43 (10.5)	22 (5.4)	65 (15.9)
Accidental fall	VA-11.03	13 (3.2)	7 (1.7)	20 (4.9)
Accidental drowning and submersion	VA-11.04	12 (2.9)	7 (1.7)	19 (4.6)
Other accidents [accident unspecified (VA-11.97), war deaths (VA-11.13) and exposure to force of nature (VA-11.07)]		5 (1.2)	2 (0.5)	7 (1.7)
Intentional self-harm	VA-11.10	5 (1.2)	1 (0.2)	6 (1.5)
Exposure to smoke, fire and flames (VA-11.05) and contact with venomous animals and plants (VA-11.06)		3 (0.7)	2 (0.5)	5 (1.2)
Transport accidents (VA-11.01 and VA-11.02)	VA-11.01	2 (0.5)	2 (0.5)	4 (1.0)
Assault	VA-11.11	3 (0.7)	1 (0.2)	4 (1.0)
Diseases of the circulatory system (VA-04)		29 (7.1)	26 (6.4)	55 (13.4)
Cerebrovascular disease	VA-04.03	17 (4.2)	13 (3.2)	30 (7.3)
Ischaemic heart disease	VA-04.02	5 (1.2)	6 (1.5)	11 (2.7)
Congestive heart failure	VA-04.05	4 (1.0)	5 (1.2)	9 (2.2)
Others [rheumatic heart diseases (VA-04.04) and hypertension (VA-04.01)]		3 (0.7)	2 (0.5)	5 (1.2)
Perinatal causes of death (VA-10)		32 (7.8)	19 (4.6)	51 (12.5)
Bacterial sepsis of newborn	VA-10.08	10 (2.4)	13 (3.2)	23 (5.6)
Prematurity (including respiratory distress)	VA-10.02	6 (1.5)	2 (0.5)	8 (2.0)
Stillbirths	VA-10.97	6 (1.5)	1 (0.2)	7 (1.7)
Birth asphyxia and perinatal respiratory disorders	VA-10.05	5 (1.2)	0 (0)	5 (1.2)
Congenital malformations of the nervous system	VA-10.09	3 (0.7)	2 (0.5)	5 (1.2)
Other diseases of perinatal period and neonatal pneumonia (VA-10.06)	VA-10.99	2 (0.5)	1 (0.2)	3 (0.7)
Malignant neoplasm of various organs (VA-02.02–VA-02.99)		11 (2.7)	7 (1.7)	18 (4.4)
Nutritional and endocrine disorders		7 (1.7)	6 (1.5)	13 (3.2)
Diabetes mellitus	VA-03.03	5 (1.2)	2 (0.5)	7 (1.7)
Severe malnutrition (VA-03.02) and nutritional anaemia	VA-03.01	2 (0.5)	4 (1.0)	6 (1.5)
Gastrointestinal disorders: VA-06		9 (2.2)	4 (1.0)	13 (3.2)
Gastric and duodenal ulcer (VA-06.01), intestinal obstruction (VA-06.03) and acute abdomen (VA-06.06)		5 (1.2)	3 (0.7)	8 (2.0)
Chronic liver disease	VA-06.02	4 (1.0)	1 (0.2)	5 (1.2)
Mental and nervous system disorders (VA-08.01, VA-08.02 and VA-08.96)		8 (2.0)	4 (1.0)	12 (2.9)
Renal failure (VA-07.01) and other renal disorders (VA-07.98)	VA-07.01	4 (1)	3 (0.7)	7 (1.7)
Respiratory disorders [chronic lung disease (VA-05.01) and asthma (VA-05.02)]		4 (1)	1 (0.2)	5 (1.2)
Other direct maternal causes, unspecified	VA-09.99	–	1 (0.2)	1 (0.2)
Undecided		12 (2.9)	10 (2.4)	22 (5.4)
Total		226 (55.3)	183 (44.7)	409 (100)

commonest one (Table 3). Infectious and parasitic diseases accounted for comparable proportion death in females (19.6%) and males (16.4%). However, HIV/AIDS, malaria and tuberculosis caused higher number of deaths in females. On the other

hand, chronic diseases in general, accounted for 6% higher proportion of deaths in males than in females. There were slightly higher proportion of death from cerebrovascular diseases and malignant neoplasm among males, while deaths

Table 3 Verbal autopsy based broad causes of death in KA-HDSS, 2009–11

SN	Broad category of causes of death	N (%)
1	Infectious and parasitic diseases (VA-01.01–VA.01.99)	147 (35.9)
2	Non-communicable diseases: neoplasms (VA-02), diseases of circulatory system (VA-04), respiratory disorders (VA-05), gastrointestinal disorders (VA-06), renal disorders (VA-07), mental and nervous disorders (VA-08) and diabetes (VA-03.03)	117 (28.6)
3	External causes of death (VA-11.01–VA-11.97)	65 (15.9)
4	Perinatal causes of death (VA-10.02–VA-10.99)	51 (12.5)
5	Nutritional and endocrine disorders	6 (1.5)
6	Other direct maternal causes, unspecified	1 (0.2)
7	Undecided	22 (5.4)
	Total	409 (100)

from cardiovascular diseases were comparable in both sexes. Deaths from external causes of death and perinatal causes of death were twice more frequent in males than in females (Table 2).

Causes of death varied by age category. About 22.1, 12.6 and 8.4% of all deaths of under 5-year-old children were due to bacterial sepsis of newborn, acute lower respiratory infections such as neonatal pneumonia and prematurity including respiratory distress, respectively (Table 4). For 5–15-year-old children, accidental drowning and submersion accounting for 34.4% of all deaths in this age category, and accidental fall accounting for 18.8% were leading causes of death. Among 15–49-year-old adults, HIV/AIDS (16.3%) and tuberculosis (12.8%) were commonest causes of death, whereas tuberculosis and cerebrovascular diseases were major killers among 50 years and above (Table 5).

Discussion

This study identified community level causes of death using physician review VA approach. Nearly all deaths took place outside health institutions, either at home or workplace. This implies that, in the absence of vital registration of system, health institutions are providing mortality evidences for only 10% of total deaths. About a quarter of the total deaths occurred among under 5-year-old children, whereas the lowest proportion of deaths was in the age group of 5–9 years. This is also reflected in the mortality distribution of the general population, where mortality rate in under 5-year-old is 10.7/1000 person years, and 1.2/1000 person years in 5–9 years old. This increased vulnerability of children around the time of birth is a reflection of the lack socioeconomic status, access and utilization of healthcare services during childhood period.

In general, more than one-third of total deaths were attributed to communicable diseases. Similar magnitude of deaths (33%) is reported from recent study on hospital deaths in Ethiopia (Misganaw *et al.* 2012). Among the communicable diseases, tuberculosis was the leading cause of death. Similar magnitude of deaths was also reported in recent study from Ethiopia (Misganaw *et al.* 2012). This magnitude of mortality from TB could be related to high incidence, low detection rate and low TB treatment success in Ethiopia (FMoH TB/HIV 2007;

Alebachew 2011, unpublished data) or related to HIV/AIDS co-infection.

Similar to other studies, death due to HIV/AIDS was likely to be an underestimate of the true proportion of deaths as families are unlikely to disclose their sero status due to fear of stigmatization. Moreover, cause of death might have been assigned to co-infections of HIV/AIDS which could further underestimate the actual proportion of deaths due to HIV/AIDS. However, even the current proportion of deaths from HIV/AIDS among rural women is public health problem which needs to be focus of effective prevention and control strategies (Joshi *et al.* 2006).

Contribution of non-communicable diseases to the overall mortality was only 7% less than that of communicable diseases. Current study on mortality pattern from hospital death certificate in Ethiopia showed that 31% of total 47 153 registered deaths were from chronic diseases (Misganaw *et al.* 2012).

Similar study from Andhra Pradesh district of India, however, came up with slightly higher reports, 32% (Joshi *et al.* 2006). Non-communicable diseases are classically thought to be common among sedentary urban population, experiencing change in lifestyle. Despite this, they were important causes of death in rural population who rely on labour intensive farming, and having no significant lifestyle change. In light of the growing burden and irreversible nature, non-communicable chronic diseases need to be a focus of prevention and control strategy, despite the existing Ethiopian health policy gives little emphasis to it (FMoH-HEP 2007).

The contribution of external causes of death, mainly accidents, to the total deaths were very high, and similar magnitude (12%) was reported from Ethiopia (Misganaw *et al.* 2012). Traffic accidents accounted ~1%, while the rest were attributable to accidents and injuries, such as fall, drowning and submersion, exposure to smoke, fire and flames. This high mortality from accidents and injuries highlights how unsafe the working and living settlements are. Being preventable in nature, accidents and injuries shall be a focus of social and healthcare programmes.

Causes of death have shown variation across varying age categories. Among under 5 children, childhood illness and conditions of neonatal period caused more than half of total deaths. Similar causes were reported as leading causes of under 5-year-old death in rural Andhra district of India (Joshi *et al.* 2006).

Table 4 Top 10 causes of death among children in KA-HDSS, Ethiopia, 2009–11

SN	Cause of death for age <5 years (total N=95)	N (%)
1	Bacterial sepsis of new-born	21 (22.1)
2	Acute lower respiratory infections including neonatal pneumonia	12 (12.6)
3	Prematurity including respiratory distress	8 (8.4)
4	Parasitic and intestinal infections (including diarrhoeal diseases)	8 (8.4)
5	Stillbirth	6 (6.3)
6	Meningitis	5 (5.3)
7	Nutritional anaemia and severe malnutrition	5 (5.3)
8	Birth asphyxia and perinatal respiratory disorders	5 (5.3)
9	Undetermined	5 (5.3)
10	Congenital malformation of nervous system	4 (4.2)
	Total	77 (81.1%)
	Cause of death for age 5–15 years (total N=32)	
1	Accidental drowning and submersion	11 (34.4)
2	Accidental fall	6 (18.8)
3	Tuberculosis	3 (9.4)
4	Exposure to force of nature	2 (6.3)
5	Others (malaria, contact with venomous animals and plants, unspecified infectious diseases and undetermined)	6 (18.8)
	Total	28 (87.5)

Table 5 Top 10 causes of death among adults in KA-HDSS, Ethiopia, 2009–11

SN	Causes of death for age 15–49 years (total N=86)	N (%)
1	HIV/AIDS	14 (16.3)
2	Tuberculosis	11 (12.8)
3	Intentional self-harm	6 (7)
4	Accidental drowning and submersion	5 (5.8)
5	Undetermined	5 (5.8)
6	Accidental fall	4 (4.7)
7	Malaria	3 (3.5)
8	Congestive heart failure	3 (3.5)
9	Chronic liver disease	3 (3.5)
10	Assault	3 (3.5)
	Total	57 (66.3)
	Causes of death for adults of 50 years and above (total N=196)	
1	Tuberculosis	33 (16.8)
2	Cerebrovascular diseases	30 (15.3)
3	Undetermined	11 (5.6)
4	Ischaemic heart disease	11 (5.6)
5	Intestinal and infectious diseases	10 (5.1)
6	Accidental fall	8 (4.1)
7	Acute lower respiratory infections (including neonatal pneumonia and acute bronchitis)	8 (4.1)
8	Malaria	8 (4.1)
9	Meningitis	7 (3.6)
10	Mental and nervous system disorders	7 (3.6)
	Total	133 (68)

Among 5–15-year-old children, the contribution of accidents was unacceptably high. This could be related to increasing availability of water wells at household level for irrigation purpose, which could be safe if protected from the reach of children. Thus, beside all efforts made to prevent and control childhood illness, much emphasis should be given to accidental injuries that are causing unparalleled mortality in this age group. HIV/AIDS and TB were leading cause of death among adults 15–49 years old, whereas tuberculosis and cerebrovascular diseases were commonest among 50 years and above. Similar distributions of deaths were also reported in other studies (Joshi *et al.* 2006). Physician review, the commonest method for interpretation of VA data, enables estimation of population level underlying causes of death with reasonable validity. Despite this, reliability is major problem with this approach. Another limitation with use of physician review approach is diagnosis may be affected by physician's prior knowledge of local epidemiology. It has been shown that physician reviewers will not readily code diseases not expected in certain demographic groups and geographic area. In some instances, physician reviewers show preference for highly specific diagnoses, tending to make an unsubstantiated selection of a single cause even if multiple causes are indicated; such nuanced interpretation introduces bias, particularly for less obvious causes of death (Fottrell and Byass 2010).

Conclusion

In conclusion, the study showed that the mean age at death was very low when compared with national life expectancy. Most deaths concentrated on the two extremes of age, under 5 and 79 years or above. Proportion of deaths accounted for by communicable diseases was modest, despite the contribution of tuberculosis and HIV/AIDS being high. Mortality due to accidents was high among 5–15-year-old children, whereas HIV/AIDS and cerebrovascular diseases were leading cause of death among 15–49 and 50 years or above old adults.

Deaths accounted for by non-communicable diseases in this rural community were high, with diseases of circulatory system and neoplasm being the major killers. Mortality attributed to accidents was also high, whereas mortality from maternal causes was low.

Recommendations

In Ethiopia, it is still thought that infectious diseases contribute for 85% of mortalities, while the actual estimate could be less. Therefore, nationally representative studies are recommended to reveal the actual burden. Mortality from chronic diseases was high, which demands formulation of chronic diseases prevention and control strategies. Moreover, periodic medical check ups could improve the prognosis. Newborn care shall also remain as core activities of the health system to minimize perinatal causes. Integrating occupational and safety education to the current health extension programme can also contribute to reduction of mortalities from accidents. In such rural communities, mortalities from TB and HIV/AIDS were high which calls for further advocacy and early screening practices.

Authors' contributions

B.W. and Y.A. designed the study, undertook field data collection, data analysis and prepared the draft manuscript. E.G. participated in field data collection, data cleaning, analysis and manuscript review. T.G., M.Y., S.M., H.B. and Z.A. contributed in the study design, manuscript review and approved the final version. B.W. accepts full responsibility for the work and the conduct of the study, had access to the data, and controlled the decision to publish. All authors have read and approved the final manuscript.

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