

Evaluation of Musculoskeletal Disorders among computer Users in Isfahan

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ABSTRACT

Along with widespread use of computers, work-related musculoskeletal disorders (MSDs) have become the most prevalent ergonomic problems in computer users. With evaluating musculoskeletal disorders among Computer Users can intervene a action to reduce musculoskeletal disorders carried out. The aim of the present study was to Assessment of Musculoskeletal Disorders among Computer Users in Isfahan University with Rapid Office Strain Assessment (ROSA) method and Nordic questionnaire. This cross-sectional study was conducted on 96 computer users in Isfahan university. The data were analyzed using correlation and line regression by test spss 20. and descriptive statistics and Anova test.

Data collection tool was Nordic questionnaire and Rapid Office Strain Assessment method checklist. The results of Nordic questionnaire showed that prevalence of musculoskeletal disorders in computer users were in the shoulder (62.1%), neck (54.9%) and back (53.1%) respectively more than in other parts of the body. Based on the level of risk of ROSA were 19 individuals in an area of low risk, 50 individual area of notification and 27 individual in the area hazard and need for ergonomics interventions. Musculoskeletal disorders prevalence were in women more than men. Also Anova test showed that there is a direct and significant correlation between age and work experience with a final score ROSA ($p < 0.001$). The study result showed that the prevalence of MSDs among computer users of Isfahan universities is pretty high and must ergonomic interventions such as computer workstation redesign, users educate about ergonomic principles computer with work, reduced working hours in computers with work, and elbows should be kept close to the body with the angle between 90 and 120 degrees to reduce musculoskeletal disorders carried out.

Key words: Musculoskeletal Disorders, Computer User, Rapid Office Strain Assessment ,Nordic Questionnaire

INTRODUCTION

The amount of computer user has dramatically increased in the past 20 years. In 2000, 60% of workers were required to use a computer as part of their job duties, with 80% of those workers reporting that they used a computer on a daily basis. Musculoskeletal disorders associated with occupational computer use are primarily linked to the upper limbs. Some studies have shown that most computer users are likely to experience musculoskeletal discomforts different areas of the body can be affected during or after working with computers, especially neck, shoulder, back, hands and wrists. These disorders can lead to permanent disabilities as employees and symptoms such as pain, numbness, tingling and loss of work time and reduce production costs and increase compensation for work contains [1]. Increasing use of computer is with pain, tingling

and numbness in the neck, shoulder, elbow and wrist. Musculoskeletal disorders, muscle disorders, tendons, peripheral nerves, joints, bones, ligaments and blood vessels are the result of repetitive motion, unsuitable posture and over exertion forces occur over time or are a result of the immediate or stroke acute [2]. The worldwide trend is for people to use computers for longer periods daily, due to increased computer based tasks at work as well as increased computer-based leisure activities. Static posture associated with computer work has been identified as a major occupational risk factor [3]. Hazardous postures, such as wrist extension or radial or ulnar deviation can be directly attributable to the use of improper office equipment and equipment setup. Various ergonomic exposures working with computers can cause musculoskeletal diseases in different parts of the body including shoulders, neck, wrist and back [4].

Musculoskeletal disorders in addition to ergonomic exposures to other factors such as age, gender, work experience, and fitness depends on individual sensitivity [5-6]. In a study by Evans and et al who were studied musculoskeletal disorders in computer users found that 65 percent of participants in the study have complained of neck and shoulder pain. In this study with control variables posture significant correlation between shoulder pain and neck posture and work stations with hours of computer use wasn't found [7]. Tornqvist and et al that to investigation different areas of the body musculoskeletal disorders in computer users, private companies and government office to the conclusion that individuals that 3 or more days per week working with computers increased incidence of musculoskeletal disorders of the neck and upper body. Also, 75% of computer users have occasionally suffered from back pain, neck and shoulder were 20 - 25% had experienced musculoskeletal pain every day [8]. Occupational risk factors are high in computer users and long-term continuous work with computer and work sitting and static mode can be considered as a risk factor for the development of musculoskeletal disorders. Occupational risk factors are high in computer users and the aim of the present study was to Assessment of Musculoskeletal Disorders among Computer Users Isfahan University with Rapid Office Strain Assessment (ROSA) method and Nordic questionnaire.

MATERIALS AND METHODS

This cross-sectional study was conducted on 96 computer users. The number of individual to participate in the study was considered according to the formula below:

$$n=(z)^2(s^2)/d^2$$

Z_{95%} confidence level is 1.96

S =1 on the basis of similar studies

d =0.2

Data collection tools were standard questionnaire NMQ (Standard Nordic questionnaires) and Rapid Office Strain Assessment (ROSA) checklist. Beginning Nordic questionnaire to determine the prevalence of musculoskeletal disorders in during the past 12 months was completed and then demographic variables of gender, age and experience work were recorded and finally completed checklist of rapid office strain assessment. Rapid office strain assessment method is based on standard EN-ISO 9241, 1997 is edited. ROSA method is a method observation that can identify ergonomic risk factors and has good reliability for the assessment of

musculoskeletal disorders. This method involves three main steps that include, score determine in sections of chairs, monitor, telephone, mouse, keyboard and Duration of use scores in a day. According to the score obtained in this section and put them in the table final, ROSA final score is determined. Final score ROSA is between 0 to 10 that score of 0 to 3 is low risk rate, 3 to 5 score is area notification and score more than 5 is need ergonomic intervention [9]. standard Nordic questionnaires used to evaluate qualitatively musculoskeletal disorders of the neck, shoulders, back, back, elbow, wrist, hand, thigh, knee and foot [10]. This questionnaire is very useful for assessing musculoskeletal problems in epidemiological studies. Inclusion criteria were at least one year of experience working and computer use for at least 3 hours a day [4]. Also Exclusion criteria were an unwillingness to cooperate in completing the questionnaire [8]. Data analysis was performed with SPSS (version 20) and descriptive statistics and Anova test. Also the value of P<0.05 was considered statistically significant. This study was performed after getting permission from the Ethic Committee in Medicine.

RESULTS

In this study, 52 males and 44 females participated. Highest and lowest age participants in this study were between 43 and 27 years. Demographic characteristics age and experience work are given in Table 1.

Table 1.demographic characteristics age and experience work by gender

Variable	Classification	mean (SD)	Minimum-maximum
Age	male	35(9.4)	28-43
	female	29(3.8)	27-34
Experience work	male	21(6.8)	13-26
	female	9(3.8)	2-11

In Table 2, the prevalence of musculoskeletal disorders in different organs by the Nordic questionnaire showed given in the last 12 months. According to the Table 2, most of musculoskeletal disorders are respectively in the shoulder, neck and back. Also the prevalence of musculoskeletal disorders in total by Nordic questionnaire for women 56.8 and men 43.2 percent.

Posture evaluation by rapid office strain assessment method showed that 19 person (19.1%) in the low risk level and score lower than 3, 50 person (51.8%) in notification area score 3 to 5 and 27 person (28.1%) in area the need for ergonomics intervention score more than 5. Also final average score rapid

office strain assessment method was (4.93) that in the area are warning and caution.

Table 2. prevalence of musculoskeletal disorders in different organs by the Nordic questionnaire in the last 12 month

Variable	Number	Percent
Neck	61	54.9
Shoulder	67	62.1
Elbow	48	43.2
Hand and Wrist	39	31.5
Thoracic	54	48.6
Back	59	53.1
Thigh	24	21.6
Knee	44	39.6
Foot	21	18.9

In Table 3 the results rapidly office strain assessment methods by gender, work experience and age is given.

According to Table 3, ANOVA test showed a significant difference between the scores obtained from ROSA and sex. So that musculoskeletal disorders prevalence was in women more than men. Also ANOVA test showed a significant relationship between the obtained score from ROSA with experience work and age. So that musculoskeletal disorders prevalence increased with increasing experience work and age variables. Score obtained from ROSA and score obtained from Nordic questionnaire showed that computer users are at risk of musculoskeletal disorders.

Table 3. Results rapid office strain assessment (96 person)

Variable	Classification	Score of less than 3 percent	score 3 to 5 percent	Score more than 5 percent	Mean(SD)	P_value
Gender	male	21.3	59.6	19.1	4.9(2.8)	P <0.001
	female	27.8	30.4	41.8	5.9(1.7)	
	less than 5 year	51.9	34.4	13.7	3.9(0.7)	
Experience work	5 to 15 year	20.6	39.8	39.6	5.3(1.1)	P <0.001
	more than 15 year	8.6	13.4	78	6.9(1.9)	
	less than 30 year	40.6	38.4	21	3.7(0.9)	
Age	30 to 40 year	28.7	45.6	25.7	5.1(1.4)	P <0.001
	more than 40 year	18.8	30.3	50.9	6.7(2.1)	

Significant level: $p=0.05$

DISCUSSION

Today, using computers in office environments has increased dramatically. Computers and computer workstations (also called video display terminals-VDTs) have become increasingly common in both workplaces and private residences over the past 20 years. The aim of the present study was to the evaluation of musculoskeletal disorders in computer Users with Rapid Office Strain Assessment (ROSA) method. The present study has shown that computer users according to the type and nature of their jobs are at risk of musculoskeletal disorders. According to the results of the questionnaire Nordic highest prevalence of musculoskeletal disorders was in region shoulder (62.1), neck (54.9) and back (53.1).also results of this study showed that musculoskeletal disorders in computer users was high in region the shoulder, neck, wrist and back. Also in our study, musculoskeletal disorders prevalence were significantly higher among women. The reason for the high prevalence of musculoskeletal pain and symptoms can be related to the repeated activity in each region, high force exertion, long-term involvement of static works, high muscle activity, hypermobility of low back, inadequate rest breaks (recovery periods) between work periods, individuals' genetic susceptibility, poor nutrition, poor design of

tools and equipment working with the computer, awkward postures during work with computers, high frequency and repetition of tasks in short times. Bergqvist and et al in a study that paid to assessment musculoskeletal disorders in bank computer users to Concluded that most of musculoskeletal disorders was in region neck and shoulder, which are consistent with the findings of the present study [11]. Szeto and et al that to pay evaluate musculoskeletal disorders among office staff to conclude that musculoskeletal disorders prevalence in the region neck and shoulder individuals who worked with computers were more from other staff, which is consistent with the findings of the present study [12] according to the result of Rapid Office Strain Assessment method and the Nordic questionnaire at this study of musculoskeletal disorders is for women more than men. This is caused to the different physical and physiological body of women and in various studies is confirmed of gender as a risk factor for skeletal muscle disorders. So that the prevalence of musculoskeletal disorders in women than men reported. Also small size body and low muscle mass women are common causes was to more musculoskeletal disorders in women ratio to men [13-14]. In the study was found to with increasing age and work experience increased incidence of musculoskeletal disorders. Gerr and *et al.* that to assessment prevalence of musculoskeletal

disorders of the upper extremities of the body in the computer users to conclude that with age and work experience increases the prevalence of musculoskeletal disorders increased, which confirms the findings of the present study [3, 15]. Carolyn and et al that paid to evaluate musculoskeletal disorders in computer users to concluded that keyboard type, mouse, table and chairs and ergonomic work stations contributed to the reduction of musculoskeletal disorders and in those with the principles of non-ergonomic tools used were higher prevalence of musculoskeletal disorders [16]. Marcus and *et al.* performed a prospective epidemiological investigation of 632 computer users to evaluate associations between neck or shoulder pain with computer use variables (posture, work hours). Results they showed that the highest musculoskeletal disorders prevalence were related to shoulder, neck and lower back among men and women, which confirms the findings of the present study. Wu and *et al.* reported that the highest prevalence of work-related musculoskeletal disorders was related to the neck among office workers in China [17]. Mirzaei and *et al.* in their study found that non-neutral postures of the shoulder (flexion and abduction) have been found to be associated with musculoskeletal symptoms of the neck and upper limbs in computer user in this study, the most common musculoskeletal disorders was in the shoulder, which confirms the findings of the present study [18]

CONCLUSION

The result of study showed that the prevalence of MSDs among computer users of Isfahan universities is pretty high and Ergonomic interventions such as computer workstation redesign, users educate about ergonomic principles computer with work, reduced working hours computers with work, cycle of rest-work development, Use holders paper to minimize the pressure on the neck and back and reduce muscular and visual fatigue, posture hands, wrists, and forearms should be straight, in line and parallel to ground and elbows should be kept close to the body with the angle between 90 and 120 degrees .

ETHICAL ISSUES

Ethical issues such as plagiarism have been observed by the authors.

COMPETING INTERESTS

Authors declare that there is not any competing interest.

AUTHORS' CONTRIBUTIONS

Ghanbary Sartang was designer and conducted the study. professor Habibi was Corresponding author and advisor of the study.

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