



Daily visual display terminal use and musculoskeletal disorders among Iranian bank tellers

Omid Giahi¹, Jamshid Khoubi¹, Abdullah Barkhordari², Ebrahim Darvishi¹, Mehrzad Ebrahemzadih¹

1 Kurdistan Environmental Health Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran

2 Department of Occupational Health, School of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Original Article

Abstract

Visual display terminals (VDTs) as one of the most important and useful equipment are used in offices and workplaces that may be created some health hazards, including work-related musculoskeletal disorders (WMSDs). The aims of this study were to (i) investigate the prevalence of WMSDs among Iranian bank tellers and (ii) to examine the demographic and work-related characteristics associated with that prevalence rate. In this cross-sectional study, 382 bank tellers who regularly working at VDTs stations were interviewed. The demographic, work characteristics and musculoskeletal disorders (MSDs) data were collected using specific questionnaire and standardized Nordic self-reporting Musculoskeletal Questionnaire. Hence, data analyses were carried out using IBM SPSS for Windows. As a result, 70.2% of participants reported the musculoskeletal problems within 12 past months in at least one of the body regions. The most prevalence was reported in the neck (37.4%) and low back (36.6%) regions, and the elbows (8.3%), and thighs (12.3%) were regions that reported with the least prevalence rate. Mean duration of daily VDT (DVDT) work in 268 subjects with musculoskeletal symptoms was 6.2 h (SD = ±2.2) and in other 114 subjects without symptoms, it was 5.5 h (SD = ± 2.3). There was a positive significant relationship between DVDT work hours with reported musculoskeletal problems (P = 0.005). In conclusion, WMSDs in bank tellers happened in high rate (70.2%) and the most complain reported in neck and low back regions. The most consistently identified risk factor was a duration of DVDT use and inadequate break times.

KEYWORDS: Daily Visual Display Terminal, Musculoskeletal Disorders, Occupational Health, Bank Tellers

Date of submission: 20 Nov 2013, **Date of acceptance:** 30 Dec 2013

Citation: Giahi O, Khoubi J, Barkhordari A, Darvishi E, Ebrahemzadih M. **Daily visual display terminal use and musculoskeletal disorders among Iranian bank tellers.** J Adv Environ Health Res 2014; 2(1): 1-6.

Introduction

Computers as one of the most important and useful visual displays are used in almost all offices and workplaces, and their use is growing.¹ Different sectors, including banks, government offices, private entities, autonomous institutions, etc. have computerized their data systems for easier and faster flow of information. Therefore, the increased use of computers in the modern

office setting has raised concern related to its potential health hazards. One of the most complaints in visual display terminals (VDTs) workers is work-related musculoskeletal disorders (WMSDs),² which account for approximately one-third of all work absenteeism.^{3,4}

In other words, the introduction of VDTs has changed the nature of work and so raised the prevalence of WMSDs among workers in offices; as some studies mentioned that the prevalence of WMSDs is closely associated with the VDT use.⁵ Numerous cross-sectional studies of VDT users have reported a prevalence of 10-76.5% of

Corresponding Author:

Jamshid Khoubi

Email: jamshidkhoubi@muk.ac.ir

musculoskeletal symptoms in the neck/shoulder region among visual display units (VDU) users.⁶⁻¹⁰ Some previous studies evaluated the prevalence of musculoskeletal disorders (MSDs) among Iranian workers with VDT stations.^{11,12} Mirmohammadi et al. reported that the prevalence of MSDs among VDT users in their study period of 12 months were 46.5%, 20.3%, 5.1%, 12.4%, and 57.6% in neck, shoulder, elbow, wrist, and low back areas, respectively.¹¹

Bank working is one of the major occupations with the potential MSDs hazard.⁵ Repetitive tasks and awkward postures are known as work-related ergonomic factors while age, gender and psychological characters are known as worker-related risk factors of MSDs among these workers.¹³⁻¹⁷ However, there are some controversial discussions about the causes and extent of the problem as well as the work-related reasons and the hazards leading to the symptoms, especially at VDT workstations.¹⁸ Furthermore, according to the results of several systematic reviews, there are limited evidence for an association between computer work and some of the studied MSDs.¹⁹

Hence, the aims of this study were to (i) investigate the prevalence of work-related MSDs among Iranian bank tellers and compare the findings with other studies and (ii) to examine the demographic and work-related characteristics associated with the prevalence rate.

Materials and Methods

This cross-sectional survey was carried out during April 2010 to Jun 2012 in bank tellers in Sanandaj, Iran. Subjects included 382 tellers regularly working in the banks with VDTs. For participant's selection, a list of all banks and their branches were taken from Provincial Headquarters of banks, and 76 banks were selected randomly, then from every branch offices, five participants were selected randomly. Inclusion criteria were included: ages between 20 and 55 years, employed for at least 3 months or more in the current job (VDTs) and worked for at

least 1 h/day for at least 5 days a week.

The following participants were excluded because of not meeting the entrance criteria: those who were not tellers, shift workers, those with more than 13 days off in a month, who had an injury such as disorders caused by unwanted events (e.g., falling down, accidents, etc.) or illnesses like diabetes and finally those who were not willing to cooperate in the study.

The study was explained for the employees and those willing to participate were enrolled, and their informed consent was obtained. The demographic information, Work characteristics such as VDT work experience and duration of daily work with VDTs were collected using specific questionnaires. MSDs data were gathered using standardized different studies, including Persian medium have approved the reliability and validity of the Nordic self-reporting Musculoskeletal Questionnaire.^{20,21} This questionnaire deals with the incidence of MSDs during the previous 7 days and recent 12 months as well as their severity and body parts.

After data collection, normality of data was tested by one-sample Kolmogorov-Smirnov. Normally distributed data were analyzed using Student's independent t-tests. Non-normal distributed data were analyzed by chi-square and Mantel-Haenszel tests. The latest test was used to control the effect of confounding factors. All analyses were carried out using IBM SPSS Statistics for Windows (version 20.0, SPSS Inc., Chicago, IL, USA).

Results and Discussion

Of 400 subjects included in the study, 382 completed the questionnaire with the high response rate of 95.5%, which suggested that the tellers were very interested in the subject and the validity and reliability of the questionnaire was approved.

According to the results, 268 (70.2%) participants reported the musculoskeletal problems within 12 past months in at least one of the body regions. The final study group was comprised of 302 males (79.1%) and 80 females

Table 1. Association between some demographic characteristics and musculoskeletal problems among Sanandaj bank tellers (n = 382)

Variables	Musculoskeletal problems		Total (%)	P
	Reported	Not reported		
Gender				
Female	57	23	80 (20.9)	0.400
Male	211	91	302 (79.1)	
Age	255 $\mu = 37.4 \pm 6.8$	127 $\mu = 37.1 \pm 7.5$	382	0.700
Body mass index (BMI)	25.8 ± 3.0	25.4 ± 2.6	382	0.300
Smoking				
Yes	29	19	48 (12.6)	0.080
No	239	95	334 (87.4)	
Duration of employment (year)				
> 5	78	43	121 (31.7)	0.100
5-10	113	36	149 (39)	
10-20	77	35	112 (29.3)	
Working hours/day	8.4 ± 0.9	8.2 ± 1.0	382	0.080
Daily VDT use (h)	6.2 ± 2.2	5.5 ± 2.3	382	0.005*

* Statistically significant; VDT: Visual display terminal

(20.9%) with mean ages of 38.5 ± 6.9 and 32.6 ± 5.3 years, respectively. t-test analysis showed that there was no significant relationship between age and MSDs ($P > 0.05$).

The most prevalence of work-related musculoskeletal symptoms reported in the neck [143 (37.4%)] and low back regions [140 (36.6%)]. This prevalence was not significant between males and females ($P > 0.05$). Furthermore, the results showed that the elbows and thighs were the regions with the least prevalence rate of 32 (8.3%) and 47 (12.3%), respectively. Table 1 demonstrates the association between some demographic variables and reported musculoskeletal problems in the Sanandaj bank tellers.

Mean duration of daily VDT (DVDT) work in 268 subjects with musculoskeletal symptoms was 6.2 h (SD = ± 2.2) and in other 114 subjects, without symptoms, it was 5.5 h (SD = 2.3). There was a positive significant relationship between daily VDT work hours with reported musculoskeletal problems ($P = 0.005$). Table 2 presents the prevalence of WMSDS symptoms in the various body regions of the tellers during the last 12 months. As table 2 demonstrates, the most commonly affected regions among the tellers

were neck (37.4%) and low back (36.6%). Prevalence at a low back region was related to marital status and working hours at home.

Table 2. Musculoskeletal symptoms in various body regions during the 12 months before their including in the study (n = 382)

Body regions	Number	(%)
Neck	143	37.4
Shoulders	123	31.0
Elbows	32	8.3
Wrists/hands	79	20.7
Upper back	114	29.8
Lower back	140	36.6
Thighs	47	12.3
Knees	99	25.9
Legs/feet	55	14.4

Work experience data demonstrated that 59.7% of the participants worked for 10 years or more 10 or more in banking operations, and 86.1% worked for 8 or more than hours per day. Furthermore, duration of DVDT use showed that 63.9% of respondents worked for 6 h or more, and 29.3% tellers worked for 8 h or more with VDTs. Approximately, 8.2% of subjects were having rest breaks of 5 min/h, which indicates that there are no reinforcement breaks in the actual workplace.

Working in the bank, and any activity related to it is a stressful occupation. Several studies have been conducted in MSDs in office workers in Iran,^{11,12} but the assessment of these symptoms among bank tellers, which are important users of the visual display terminals, have not been examined, yet. The 95% of participation rate suggested that the tellers were very interested in the subject. According to the results of several systematic reviews, there is limited evidence for a relationship between computer work and MSDs.¹⁹ Based on our data, the prevalence of musculoskeletal problems was high in bank tellers. It was recognized that there are multiple stressors in bank workers such as; repetitive computer based tasks, awkward and continuous postures, insufficient break times and some other factors.

According to the research, there was no significant relationship between age and musculoskeletal problems prevalence rates since all the subjects were relatively young tellers; the mean age was approximately 37 years old, and most of them were employees with <10 years' experience (70.7%). Similarly, the prevalence of MSDs in all body regions between males and females was not significant ($P > 0.05$), except wrist/hand. The prevalence of MSDs in the recent organ was 26% and 23% in females and males, respectively. The relationship between the incidence and gender was significant ($P = 0.03$). In a similar study, carried out by Klussmann, et al., association between gender and having symptoms in hand/wrist or elbow/forearm was not significant; however, this relation about neck and shoulders was significant.¹⁸

This study demonstrated that the association between MSDs prevalence and cigarette smoking was not significant ($P = 0.08$). This result was compatible with several previous studies in which sports and smoking habits had no significant effects on symptoms in anybody region.¹⁸

Our study revealed that compared to other organs, the prevalence of symptoms in neck, lower back, and shoulders was higher during the

previous year (37.4%, 36.6%, and 31.0%, respectively), which may be due to changes in the workstation during time. Initially, workstations were designed with ergonomic consideration, but the changes caused by the users make the stations non-ergonomic. For example, the monitor that is too lower than the eye level of the user is a risk factor for increased discomforts in the shoulders and the lower back.²² Furthermore, lack of adequate rest periods increases the problems.^{23,24} This finding is similar to the Aydeniz and Gürsoy which conducted in Turkey. They compared 100 bank workers with extensive computer use with 65 office workers with < 2 h/day of computer use. They founded that the extensive computer users had more positive clinical tests for diagnoses in the shoulder-neck, as well as in the elbow and wrist.²⁵ Other related studies have shown increased risk in neck and shoulders caused by duration of awkward,^{18,26} static and fixed sedentary posture at work.²⁷

In this study, the duration of work at VDT stations for all body regions was recognized the most consistent risk factor ($P = 0.005$). We found that 63.9% and 29.3% of tellers worked for 6 and 8 h/day with VDTs stations, respectively. This long uninterrupted exposure may cause the incidence problems arise. In another study, 2000 clerical workers were studied, in Thailand. It was found that there is a significant correlation between daily work hours and MSDs in head and neck regions ($P < 0.001$).²⁸

In order to prevent MSDs in bank tellers or those with similar occupations that have to work continuously with VDT stations, we recommend the followings: (1) Having sufficient breaks, (2) respecting the housekeeping and avoiding the disarray, (3) redesigning workstations without consideration of ergonomic principals, and (4) using customer waiting systems for workload control.

Conclusion

WMSDs in bank tellers happened in high rate (70.2%) and the most complains were reported

in neck and low back regions. The most consistent risk factor recognized was the duration of DVDT use and inadequate break times. Regarding to the lack of research and its inconsistency, we suggested further studies to be implemented for demonstration of MSDs risk factors among bank tellers.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgements

The authors are grateful for funding this research with project No. 92/109 provided by Kurdistan University of Medical Sciences.

References

1. Yoshioka E, Saijo Y, Fukui T, Kawaharada M, Kishi R. Association between duration of daily visual display terminal work and insomnia among local government clerks in Japan. *Am J Ind Med* 2008; 51(2): 148-56.
2. Singh S, Wadhwa J. Impact of computer workstation design on health of the users. *J Hum Ecol* 2006; 20(3): 165-70.
3. Woods V, Hastings S, Buckle PP, Haslam R. Ergonomics of using a mouse or other non-keyboard input device. London, UK: Health and Safety Executive; 2002. p. 511-8.
4. Werner RA, Franzblau A, Gell N, Ulin SS, Armstrong TJ. Predictors of upper extremity discomfort: a longitudinal study of industrial and clerical workers. *J Occup Rehabil* 2005; 15(1): 27-35.
5. Yun MH, Lee YG, Eoh HJ, Lim SH. Results of a survey on the awareness and severity assessment of upper-limb work-related musculoskeletal disorders among female bank tellers in Korea. *International Journal of Industrial Ergonomics* 2001; 27(5): 347-57.
6. Jensen C, Finsen L, Sogaard K, Christensen H. Musculoskeletal symptoms and duration of computer and mouse use. *International Journal of Industrial Ergonomics* 2002; 30(4-5): 265-75.
7. Karlqvist LK, Hagberg M, Koster M, Wenemark M, Nell R. Musculoskeletal symptoms among computer-assisted design (CAD) operators and evaluation of a self-assessment questionnaire. *Int J Occup Environ Health* 1996; 2(3): 185-94.
8. Bergqvist U, Wolgast E, Nilsson B, Voss M. Musculoskeletal disorders among visual display terminal workers: individual, ergonomic, and work organizational factors. *Ergonomics* 1995; 38(4): 763-76.
9. Bernard B, Sauter S, Fine L, Petersen M, Hales T. Job task and psychosocial risk factors for work-related musculoskeletal disorders among newspaper employees. *Scand J Work Environ Health* 1994; 20(6): 417-26.
10. Talwar R, Kapoor R, Puri K, Bansal K, Singh S. A study of visual and musculoskeletal health disorders among computer professionals in NCR Delhi. *Indian J Community Med* 2009; 34(4): 326-8.
11. Mirmohammadi S, Mehrparvar A, Soleimani H, Lotfi M, Akbari H, Heidari N. Musculoskeletal disorders among video display terminal (VDT) workers comparing with other office workers. *Iran Occup Health* 2010; 7(2): 11-4. [In Persian].
12. Jafari Nodoushan R, Halvani G, Vatani Shooa J, Vatani shooa J. Survey of musculoskeletal disorders among bank staff in Yazd. *Occup Med* 2011; 3(1): 1-7. [In Persian].
13. Bruce PB. Musculoskeletal disorders and workplace factors [Online]. [cited 1997 Jul]; Available from: <http://www.cdc.gov/niosh/pdfs/97-141.pdf>
14. Linton SJ, Kamwendo K. Risk factors in the psychosocial work environment for neck and shoulder pain in secretaries. *J Occup Med* 1989; 31(7): 609-13.
15. Putz-Anderson V, Bernard BP. Musculoskeletal disorders and workplace factors. Washington, DC: National Institute for Occupational Safety and Health; 1997.
16. Choobineh A, Rajaeefard A, Neghab M. Association between perceived demands and musculoskeletal disorders among hospital nurses of Shiraz University of Medical Sciences: a questionnaire survey. *Int J Occup Saf Ergon* 2006; 12(4): 409-16.
17. Choobineh A, Movahed M, Tabatabaie SH, Kumashiro M. Perceived demands and musculoskeletal disorders in operating room nurses of Shiraz city hospitals. *Ind Health* 2010; 48(1): 74-84.
18. Klussmann A, Gebhardt H, Liebers F, Rieger MA. Musculoskeletal symptoms of the upper extremities and the neck: a cross-sectional study on prevalence and symptom-predicting factors at visual display terminal (VDT) workstations. *BMC Musculoskelet Disord* 2008; 9: 96.
19. Waersted M, Hanvold TN, Veiersted KB. Computer work and musculoskeletal disorders of the neck and upper extremity: a systematic review. *BMC Musculoskelet Disord* 2010; 11: 79.
20. Baron S, Hales T, Hurrell J. Evaluation of symptom surveys for occupational musculoskeletal disorders. *Am J Ind Med* 1996; 29(6): 609-17.
21. Choobineh A, Lahmi M, Shahnavaz H, Jazani RK, Hosseini M. Musculoskeletal symptoms as related to ergonomic factors in Iranian hand-woven carpet industry and general guidelines for workstation design. *Int J Occup Saf Ergon* 2004; 10(2): 157-68.

22. Fogleman M, Lewis RJ. Factors associated with self-reported musculoskeletal discomfort in video display terminal (VDT) users. *International Journal of Industrial Ergonomics* 2002; 29(6): 311-8.
23. Devereux JJ, Vlachonikolis IG, Buckle PW. Epidemiological study to investigate potential interaction between physical and psychosocial factors at work that may increase the risk of symptoms of musculoskeletal disorder of the neck and upper limb. *Occup Environ Med* 2002; 59(4): 269-77.
24. Bergqvist U, Wolgast E, Nilsson B, Voss M. The influence of VDT work on musculoskeletal disorders. *Ergonomics* 1995; 38(4): 754-62.
25. Aydeniz A, Gürsoy S. Upper extremity musculoskeletal disorders among computer users. *Turk J Med Sci* 2008; 38(3): 235-8.
26. Turhan N, Akat C, Akyuz M, Cakci A. Ergonomic risk factors for cumulative trauma disorders in VDU operators. *Int J Occup Saf Ergon* 2008; 14(4): 417-22.
27. Leino P, Magni G. Depressive and distress symptoms as predictors of low back pain, neck-shoulder pain, and other musculoskeletal morbidity: a 10-year follow-up of metal industry employees. *Pain* 1993; 53(1): 89-94.
28. Janwantanakul P, Pensri P, Jiamjarasrangsri W, Sinsongsook T. Associations between prevalence of self-reported musculoskeletal symptoms of the spine and biopsychosocial factors among office workers. *J Occup Health* 2009; 51(2): 114-22.