2008-5435/14/63-78-84
INTERNATIONAL JOURNAL OF OCCUPATIONAL HYGIENE

IJOH 8: 78-84, 2016

ORIGINAL ARTICLE

Work-Related Musculoskeletal Disorders among Administrative Employees of Kerman University of Medical Sciences

FARZAN MADADIZADEH[1,2], LEILA VALI[3], TOURAJ HARATI KHALILABAD[4*], MOHAMAD EZATI ASAR[5]

[1]*Noncommunicable Diseases Research Center, Fasa University of Medical Sciences, Fasa, Iran;*
[2]*PhD Student of Biostatistics, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran;*
[3]*Assistant Professor, Environmental Health Engineering Research Center, Kerman University of Medical Sciences, Kerman, Iran;*
[4]*PhD Student of Health Economics, Department of Management and Medical Information Sciences, Iran University of Medical Sciences, Tehran, Iran;*
[5]*PhD Student of Health Policy, Department of Management and Medical Information Sciences, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.*

Received October 22, 2015; Revised December 27, 2015; Accepted March 25, 2016

This paper is available on-line at *http://ijoh.tums.ac.ir*

ABSTRACT

Background: This study examined the factors affecting on musculoskeletal disorders and its frequency among administrative employees of Kerman University of Medical Sciences in 2015.

Materials and Method: This cross-sectional study conducted among 300 employees (94% response rate) from different Department of Kerman University of Medical Sciences, Kerman, Iran. The data were collected by standard Nordic questionnaire. We used the binary logistic regression in spss v.16 software to calculate odds ratios and confidence intervals, and chi-square and t tests to investigate the relationship between variables.

Results: The highest disorders were in the lower back (41%), shoulder (28%) and the lowest were to the elbow and forearm (5%). Among the different Departments, Health Department Staff (92.7%) and Food and Drug (92.5%) had the highest rate and Research Department had the least amount of disorders (70%). Among the variables, only age and body mass index were significantly associated with the prevalence of musculoskeletal disorders ($P<0.05$). The chances of developing musculoskeletal symptoms in people 22-29 years old compared to those older than 46 years, was 74% lower (OR=0.26 and P=0.03). Besides, chance for the Support staff Department to Research staff Department was 6 times higher (OR=5.96 and P=0.01).

Conclusion: Providing the necessary training courses about appropriate working postures and about consequences of weight gain can reduce the prevalence of these disorders. So according to the limitations of resources and as well as to preventing and reducing the prevalence of disorders, priority and focus should be on the employees Department of Health and Department of Food and Drug.

KEYWORDS: *Musculoskeletal disorders, Employees, Workplace, Nordic questionnaire*

**** Corresponding Author: Touraj Harati Khalilabad***
Email: *toorajharati@gmail.com*

INTRODUCTION

The World Health Organization (WHO) has defined health as a state of complete physical, mental, psychological, and social well-being [1]. Besides, the set of harms that occur as a result of various factors in different regions of the human body leading to reduced health and ability to do things are referred to as musculoskeletal disorders (MSDs) [2]. Musculoskeletal disorders can also occur due to injuries to joints and bones [3]. On the other hand, increasing advancement of science and technology not only has accelerated works and productivity but also led to sedentary lifestyle and musculoskeletal disorders which can be the main grounds for the incidence of musculoskeletal disorders in the workplace; for example, office employees can be affected with such disorders due to improper sit at computers and long-term activities [4].

In terms of individual effects; MSDs in an office employee can lead to limited ability and efficiency, lowered self-esteem, weak group communication, absenteeism in the workplace, poor-quality work, and consequently job loss [5-8]. In organizational terms, such disorders can impose heavy costs for treatment and training of new personnel for administrative offices and governments. For instance, annual estimate of direct and indirect costs of MSDs and their consequences in the United States in 2007 are almost 250 million dollars equivalent to the costs incurred by cancer in this country [9-10] and about 34 million dollars equal to 5% of Gross Domestic Product (GDP) in Australia for the 2000-01 financial year [11]. Although there are not exact figures available in this respect in Iran as a developing country, enormous costs are undoubtedly spent to treat such disorders every year. Furthermore, the study of MSDs in factory workers in China showed a high incidence of MSDs in female workers than male ones [12]. According to the reports released by the Chinese Ministry of Health, factors affecting health are encountered by 16 million companies now which is equivalent to more than 200 million workers exposed to the risk of MSDs [13].

Research studies have been also conducted in Iran in order to obtain an estimate of the incidence of MSDs and their related factors in different jobs [14-15]; however, few studies have shed light on the prevalence of such disorders and their relevant factors in administrative employees of universities.

The main purpose of the present study was to examine the prevalence rate of MSDs and their related risk factors in the administrative employees of Kerman University of Medical Sciences as one of the major medical universities in Iran. It should be noted that no studies had been conducted in such a context; therefore, it was a good choice for the present study.

MATERIALS AND METHODS

The present descriptive-analytic study was conducted in a cross-sectional design among administrative employees of Kerman University of Medical Sciences in 2015. Three hundred employees were recruited in this study and 18 administrative employees affected with disorders unrelated to workplace factors were excluded to enhance the accuracy of the study results.

The study was approved by Ethics Committee of the university (1394-358).

Inclusion criteria for eligibility of employees to include in study were 22-50 years old age, 3-21 years duration of employment, had only one job, had no prior history of disease, major surgery, bone fracture, rheumatic or musculoskeletal disorders.

Data were collected by the standard version of Nordic questionnaire [16], the validity and reliability of this questionnaire were investigated and approved in the Persian language [4,15]. Validity approved by experts and reliability assessment showed that ICC and Cronbach's alpha were 0.63 and 0.78 respectively. Data were analyzed by the SPSS software version 16 (Chicago, IL, USA). After descriptive statistics, for investigate relationship between variables we used two independent samples t tests and chi-square and multivariate logistic regression in the univariate and multivariate case, respectively. All tests were adopted at the significant level of $P<0.05$.

RESULTS

Two hundred eighty-two employees of Kerman University of Medical Sciences were included. A total population study, male, single, normal body mass index, upper levels education and right hand employees accounted for 35.5 % (100/282), 22%(62/282), 54.3%(153/282), 30.9%(87/282) and 94%(265/282); respectively. The mean± standard deviation employee's age, work experience was 38.87±7.93years old, 14.8±6.6 years; respectively (see Table 1).

The frequency of the MSDs in each of the nine regions of the body were calculated among the participants based their workplaces (Service locations). The highest prevalence of disorders in the employees of different Deputy Vice-Chancellors included types of backaches and the lowest rates were related to pains in forearms, elbows, bottom, and thighs (Table 2).

As it is shown in Table 2, comparison of the rates of disorders in each of the nine regions of the body in employees of different workplaces was conducted by Chi-Square test and the results revealed a significant difference in the prevalence

Published online: June 16, 2016

of pains in hips\thighs (P=0.001), shoulders (0.01), and neck (P=0.0001) in different working environments. Nevertheless, the pains in other regions of the body in various workplaces were almost the same (P>0.05).

Moreover; logistic regression analysis was used to evaluate the effects of demographic variables on the incidence of musculoskeletal disorders and to calculate odds ratios and their interpretations. Calculations for a variety of disorders in nine regions of the body required univariate and multivariate logistic regression analysis, but there was no possibility of reporting results in a research paper format; therefore, the individuals were divided generally into two groups: individuals affected with such disorders (at least in one of the nine regions) over the past 12 months and those without any disorders. So that in the past 12 months, 92.7% employees of Vice-Chancellor for Health, 85% of Vice-Chancellor for Treatment, 85% of the Educational Deputy, 87.5% of the Student Assistant Deputy, 92.5% of the Food and Drug Deputy, 82.9% of the Supportive Deputy and 70% employees of the Research Deputy at least in one of the nine regions of their bodies had disorders. Besides, in total 85.1% of employees had disorders. As shown in Table 2, difference between overall prevalence in deputies was not statistically significant (P=0.08). The highest incidence of disorders were in the Health Deputy equal to 92.7% and the Food and Drug Deputy equal to 92.5%, the lowest disorder was in the Research Deputy equal to 70% (Table 2).

Table 1. Basic characteristics among administrative employees of Kerman university of medical sciences (N=282)

Characteristics	Levels	Frequency	%
Gender	Male	100	35.5
	Female	182	64.5
Age group (yr)	22-29 years	36	12.8
	30 -37 years	99	35.1
	38 – 45 years	76	27.0
	≥46 years	71	25.2
Education level	≤ Bachelor	195	69.1
	Masters & Ph.D	87	30.9
Service location	Vice-Chancellor for Health	41	14.5
	Vice-Chancellor for Treatment	40	14.2
	Vice-Chancellor for Education	40	14.2
	Vice-Chancellor for Cultural and Student Affairs	40	14.2
	Vice-Chancellor for Food and Drug	40	14.2
	Vice-Chancellor for Development & Resource Management Affairs	41	14.5
	Vice-Chancellor for Research	40	14.2
Type handwriting	Right-handed	265	94.0
	Left-handed	17	6.0
Marital Status	Single	62	22.0
	Married	220	78.0
Duration of employment	≤5	66	23.4
	6-12 years	58	20.6
	13 -19 years	68	24.1
	20≥	90	31.9
BMI (kg/m^2)	Underweight <18.5	26	9.2
	Normal weight 18.5–24.9	153	54.3
	Overweight 25–29.9	94	33.3
	Obesity ≥30	9	3.2

Table 2. Number (%) of MSD of different body parts by different parts

Service location	Frequency	Knees	Hips/ thighs	Low back	Upper back	Wrist/ hands	Elbow/ forearm	Shoulder	Neck	Ankles/feet	Total
A	41	9(22.0)	3(7.3)	14(34.1)	5(12.2)	7(17.1)	2(4.9)	6(16.4)	5(12.2)	7(17.1)	38(92.7)
B	40	8(20.0)	1(2.5)	13(32.5)	6(1.5)	7(17.5)	1(2.5)	3(7.5)	2(5.0)	2(5.0)	34(85.0)
C	40	13(32.5)	5(12.5)	16(40.0)	6(1.5)	8(20.0)	1(2.5)	2(5.0)	4(10.0)	8(20.0)	34(85.0)
D	40	14(35.0)	2(5.0)	16(40.0)	8(20.0)	11(27.5)	2(5.0)	4(10.0)	5(12.5)	6(15.0)	35(87.5)
E	40	11(27.5)	1(2.5)	14(35.0)	9(22.5)	8(20.0)	2(5.0)	5(12.5)	2(5.0)	4(10.0)	37(92.5)
F	41	17(41.5)	10(24.4)	24(58.5)	10(24.4)	14(34.1)	5(12.5)	13(31.7)	10(24.4)	11(26.8)	34(82.9)
G	40	8(20.0)	10(25.0)	19(47.5)	11(27.5)	10(25.0)	2(5.0)	8(20.0)	15(37.5)	4(10.0)	28(70)
*P-value	…..	0.22	0.001	0.20	0.56	0.52	0.64	0.01	0.0001	0.15	0.08
Total	282	80(28.0)	32(11.0)	11.6(41.0)	55(19.0)	65(23.0)	15(5.0)	41(14.5)	43(15.2)	42(14.8)	240(85.1)

Chi square test P-value

A: Vice-Chancellor for Health; B: Vice-Chancellor for Treatment; C: Vice-Chancellor for Education; D: Vice-Chancellor for Cultural and Student Affairs; E: Vice-Chancellor for Food And Drug; F: Vice-Chancellor for Development & Resource Management Affairs; G: Vice-Chancellor for Research

Published online: June 16, 2016

We have used univariate and multivariate logistic regression for study the musculoskeletal disorders related risk factors in the administrative employees of Kerman University of Medical Sciences, Iran (Table 3). For using the logistic regression we considered overall binary variable including two levels as had MSDs or not. The prevalence of MSDs had no relationship with gender, education, marital status, work experience and hand writing (P>0.05). The relationship between age and the prevalence of MSDs was also significant in univariate and multivariate models so that the risk of MSDs in individuals aged 22-29 yr was 74% lower than that in people over 46 yr old (OR=0.26, P=0.03). The relationship between people's workplace and the prevalence of MSDs was significant in multivariate model so that the risk of MSDs in the Supportive Deputy's employees was 6-times higher than the Research Deputy's employees (OR=5.96, P=0.01). The relationship between the prevalence of MSDs and levels of body mass index was significant so that the risk of MSDs in the overweight were nearly 2.5 times higher than the normal weight (OR=2.48, P=0.01).

Table 3. Factors associated with work-related injuries over the past 12 months in the current work among 282 workers

Factor	Levels	Frequency	Prevalence (%)	Crude OR(CI)	*P*	Adjusted OR(CI)	*P*
Gender	Female	182	0.87	1	….	1	….
	Male	100	0.80	0.55(0.28-1.06)	0.07	0.49(0.23-0.78)	0.06
Age group (yr)	22-29 years	36	0.77	0.26(0.18-0.58)	0.03	0.06(0.01-0.12)	0.01
	30-37 years	99	0.78	0.28(0.10-0.48)	0.01	0.10(0.01-0.40)	0.02
	38-45 years	76	0.89	0.64(0.20-1.07)	0.46	0.30(0.07-0.47)	0.09
	≥46 years	71	0.92	1	….	1	….
Education level	≤ Bachelor	195	0.86	1.46(0.94-1.89)	0.27	1.16(0.52-2.62)	0.71
	Masters & PhD	87	0.81	1	….	1	….
Service location	A	41	0.93	5.42(4.39-6.06)	0.01	6.99(4.51-9.32)	0.01
	B	40	0.85	2.41(1.81-3.29)	0.11	2.66(1.78-3.03)	0.12
	C	40	0.85	2.43(1.78-3.25)	0.12	2.33(1.68-3.21)	0.17
	D	40	0.87	3.00(1.94-3.52)	0.06	3.67(2.02-4.53)	0.04
	E	40	0.92	5.28(4.36-5.93)	0.01	5.96(4.40-6.27)	0.01
	F	41	0.83	2.08(1.72-2.99)	0.17	1.63(0.49-2.39)	0.42
	G	40	0.70	1	….	1	….
Handwriting type	Right-handed	265	0.85	1.83(0.56 –2.93)	0.30	1.49(1.36-2.08)	0.57
	Left-handed	17	0.76	1	….	1	….
Marital status	Married	220	0.88	2.28(1.12 – 4.62)	0.02	1.39(0.83-2.24)	0.51
	Single	62	0.76	1	….	1	….
Duration of employment	≤5	66	0.82	1	….	1	….
	6-12 years	58	0.74	0.64(0.57-1.02)	0.30	0.42(0.12-0.68)	0.16
	13-19 years	68	0.93	2.80(1.93-3.40)	0.07	1.76(1.57-1.86)	0.75
	20≥	90	0.89	1.78(0.71-2.50)	0.22	1.04(0.95-1.23)	0.65
BMI (kg/m^2)	Underweight	26	0.73	0.58(0.22-1.05)	0.27	0.46(0.15-1.03)	0.16
	Normal weight	153	0.82	1	….	1	….
	Overweight	94	0.93	2.66(1.11-3.59)	0.01	2.48(1.96-3.23)	0.01
	Obesity	9	0.88	1.71(1.31-2.40)	0.35	1.82(1.09-3.71)	0.47

A: Vice-Chancellor for Health; B: Vice-Chancellor for Treatment; C: Vice-Chancellor for Education; D: Vice-Chancellor for Cultural And Student Affairs;
E: Vice-Chancellor for Food And Drug; F: Vice-Chancellor for Development & Resource Management Affairs; G: Vice-Chancellor for Research

DISCUSSION

According to the report released by the WHO, MSDs have been taken into account as the most significant health-threatening factors imposing irreparable economic and social costs on different countries every year [17]. The incidence of such disorders in advanced societies is expanding and requires more attention by relevant authorities [3]. The results of the present study revealed that the bulk of personnel (nearly 85%) have been at least affected with one of the MSDs in the nine regions of the body over the past year. The highest prevalence was reported in the back region (41%) which could be due to lack of observing ergonomic principles while sitting or existence of non-standard administrative equipment.

In similar studies only the impact of few risk factors were evaluated, but in our study more risk factors, including BMI, Service location have been evaluated. Also, we have created new binery response variable (overally had MSDs, had no MSDs) for the logistic regression analysis. On the other hand, a few studies in Iran have investigated the effect of different workplace on MSDs of Administrative Employees of University of Medical Sciences.

The present study is one of the first studies on the effect of different service location of Administrative Employees on the prevalence of their MSDs. We did not find any other study in the literature that evaluated the effect of different service location of Administrative Employees on the prevalence of their MSDs. However, a limited number of studies have been done on the effect of

workplace and have provided different results.

Table 2 showed that the highest incidence of pains occurred in hips and thighs in the Supportive and the Research Deputies and the least amount of pains were reported in the Curative and the Food and Drug deputies. The reasons behind differences in prevalence could be the result of variety of employees' tasks in the Supportive and the Research Deputies and also due to physical inactivity and prolonged sitting on chairs in office environments. Most shoulder pains were related to employees working in the Supportive deputy and the lowest prevalence was reported in Vice-Chancellor for Treatment. The highest incidence of neck pains was in the Research Deputy and the lowest rate was detected in the Curative and the Food and Drug deputies. It can be argued that employees in the Research Deputy sat long hours in front of computers due to their duties and this could be a factor for pains in their neck [14]. In other regions of body, the incidence of MSDs in the workplace had no different rates. In general; if the disorder was defined as experiencing at least one musculoskeletal disorder in the past year, the position of different Deputy Vice-Chancellors in order of highest to lowest was the Health Deputy (92.7%), the Food and Drug deputy (92.5%), the Research Deputy (87.5%), the Curative and the Educational deputies (85%), in the Supportive deputy (82.9%) and the Research Deputy (70%). Although the prevalence of each disorder was reported high in all Deputy Vice-Chancellors, final column of table 2 showed overally the differences in the prevalence of at least one disorder in different Deputy Vice-Chancellors were not statistically significant (P=0.08).

Most disorders in various Deputy Vice-Chancellors were of types of backaches and the least pains were related to forearms, elbows, bottom, and thighs which were in line with the results of previous studies such as the one by Khosroabadi et al. in the employees of Sabzevar University of Medical sciences [12,15,18-19]. Backaches were also as the most important pain factor in jobs in the literature in a way that their prevalence was reported by 40%, 62%, 64%, respectively in different studies [14,20-21]. The prevalence of MSDs in different regions of the body in various jobs was different [22].

According to Table 3, results of logistic regression analysis also indicated no significant difference in the incidence of MSDs in men and women. This results of the present study were consistent with the findings of previous studies such as the investigation by Valipour et al. among the personnel in Ahvaz University of Medical Sciences and other similar research studies [15,23-24]. No significant effect of gender on the incidence of disorders was to some extent due to being exposed to risk factors of workplace for both genders [25]. Although the prevalence of disorders in employees with bachelor's degrees and lower was higher than other groups, the difference was not statistically significant (Table 3). This issue was also confirmed by the related literature [4,15].

Furthermore; there was no significant relationship between working experience and incidence of disorders while several studies had examined the relationship between working experience and such MSDs and obtained conflicting results about the rising or falling impact of disorders on working experience [18,24,26]. Moreover, a significant relationship was found between the prevalence of body mass index (BMI) and prevalence of disorders in this study. The results were consistent with the findings of the research study by Trinkof et al [27]. in a sample of nurses. A significant relationship observed between MSDs and BMI means that the people who were overweight (BMI=25-29.5) had 2.5 times greater chance than normal individuals (BMI=18.5-24.5) to be affected with MSDs in the organs of the body. These findings also confirmed the results of other similar studies [27-28]. Although no significant relationship was found between this index and the prevalence of disorders in some other investigations [14,29-30].

There was also a significant and direct relationship between age and incidence of MSDs so that the incidence of such disorders was more evident as age increased (22-29 years v.s≥46 years OR=0.06, P=0.01; 30 -37 years v.s≥46 years OR=0.1, P=0.02). The findings of similar studies also confirmed our results [15,31-32]. Aging leads to reduced strength and decreases mobility and consequently the prevalence of disorders [24,33-34], but in the meantime there are conflicting results; for example, no significant relationship was found between age and incidence of MSDs in the nursing personnel according to the results of other studies [14-15].

CONCLUSION

Incidence of MSDs was reported high in the administrative employees of Kerman University of Medical Sciences, Iran. Therefore, it required special attention by relevant authorities and health officials and policy makers were suggested to reduce the incidence of these problems by taking into account the factors affecting such disorders in the present study and provide necessary training to university personnel on observing ergonomic principles in the workplace as well as supplying standard office equipment which all lead to a reduction in spending by the Ministry of Health in Iran and improve operational efficiency at universities.

ACKNOELEDGEMNET

The authors would like to express their

gratitude to the authorities at Kerman University of Medical Sciences for their financial supports for this article with Registration number 94/358. The authors declare that there is no conflict of interests.

REFERENCES

1. Purine A, Aleksejuniene J, Petrauskiene J, BalciunieneI, Janulyte V. Self-reported occupationalhealth issues among Lithuanian dentists. *Ind Health* 2008; 46: 369–74.
2. Ahmadi Motemael F, Abdolsamadi H, Roshanaei Gh, Jalilian S. The prevalence of musculoskeletal disorders in general dentistry in Hamadan. *J Hamedan Univ Med Sci* 2011;19(3):61-66.
3. Australian Safety and Compensation Council. *Work -Related Musculoskeletal Disease in Austeralia*. Safe Work Australia. 2006
4. Gorgi Z, Asadolahi Z, Ghafarian A, Rezaeian M. Prevalence of musculoskeletal disorders in employees of Medical Sciences University of Rafsanjan. *J Rafsanjan Univ of Med Sci* 2014; 12(12):991-1002.
5. Choobineh AR, Rahimi fard H, Jahangiri M, Mahmood khani S. Musculoskeletal injuries and their associated risk factors in office work places. *Iran Occupat Health* 2012; 8(4):70–80.
6. Ladou J. *Current Occupational and environmental medicine*. 4th ed, mcgraww-hill education, Published Online: June 18, 2014.
7. Summers K, Jinnett K, Bevan S. Musculoskeletal Disorders, Workforce Health and Productivity in the United States.The center for workforced health and performance, Lancaster university, 2015.
8. Yu W, Yu I TS, Wang X, Li Z, Wan S, Qiu H, Lin H, Xie S, Sun T. Effectiveness of participatory training forprevention of musculoskeletal disorders: arandomized controlled trial. *Int Arch Occup Environ Health* 2012; 86(4): 431-440.
9. Leigh, J. P. Economic burden of occupational injury and illness in the United States. *Milbank Q* 2011; 89(4): 728–772.
10. R.Marucci-Wellman H, K. Courtney T, L. Corns H, Sorock G, S.Webster B, Wasiak R,Y. Ian Noy, Matz S, B. Leamon T. The direct cost burden of 13 years of disabling workplace injuries in the U.S. (1998–2010): Findings from the Liberty Mutual Workplace Safety Index. *J Safety Res* 2015; Volume 55: 53–62.
11. Safe Work Australia, *The Cost of Work-related Injury and Illness for Australian Employers*. Workers and the Community: 2008–09, Canberra, 2012.
12. Wenzhou Y, Ignatius T.S. Y, Zhimin L, Xiaorong W, Trevor S, Hui L, Sabrina W, Hong Q, Shaohua X. Work-related injuries and musculoskeletal disorders among factory workers in a major city of China. *Accid Anal Prev* 2012; 48(1) : 457– 463.
13. Chinese Ministry of Health. *Occupational Health Report in China*, 2009 Availableat:http://www.moh.gov.cn/publicfiles/business/htmlfiles/mohwsjdj/s5854/200909/42688.htm (accessed on 17.12.2009).
14. Taghinejad H,Azadi A, Suhrabi Z, Sayedinia M . Musculoskeletal Disorders and Their Related Risk Factors Among Iranian Nurses. *Biotechnology and Health Sciences* 2016; 3(1):12-31.
15. Valipour Noroozi M, Hajibabaei M, Saki A,Zakieh Memari Z. Prevalence of Musculoskeletal Disorders Among Office Workers. *Jundishapur J Health Sci* 2015; 7(1): 21-32.
16. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, Jørgensen K. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied Ergonomics* 1987; 18(3):233-7.
17. WHO. *Shaping the future*. World Health Organization report, 2003
18. Khosroabadi A, Razavi M, Fallahi M, Akaberi A. Prevalence of musculoskeletal disorders in theHealth workers-medical of Sabzevar University ofMedical Sciences in 2007. *Quarterly J Sabzevar Uni Med Sci* 2010; 17(3): 218-23.
19. Aminian O, Pouryaghoub Gh, Shanbeh M. One year study of musculoskeletal disorders and their relation to occupational stress among office workers: a brief report. *J Tehran Uni of Med Sci* 2012 ; 70(3): 194-9.
20. Eltayeb SM, Staal JB, Hassan AA, Awad SS, de Bie RA. Complaints of the arm, neck and shoulder among computer office workers in Sudan: a prevalence study with validation of an Arabic risk factors questionnaire. *Environ Health* 2008 ;27(7): 33-43.
21. Barzideh M, Choobineh AR, Tabatabaee HR. Job stress dimensions and their relationship to musculoskeletal disorders in Iranian nurses. *Work* 2014;47(4):423–9.
22. Ardakani E, Haerian ArdaKani A, Karbasi MA, Dehghan Kh. Evaluation of musculoskeletal disorders in Yazd dentists. *J Dental School Tehran Univ of Med Sci* 2004;17(4):52-60.
23. Yip YB. New low back pain in nurses: work activities work stress and sedentary lifestyle. *J Adv Nurs* 2004; 46:430- 440.
24. Ahmadi Motemael F, Abodolsamadi H, Roshanaei Gh, Jalilian S.The prevalence of musculoskeletal disorders among dentists in the city of Hamedan. *J Hamadan Univ Med Sci* 2013;19(3):22-31.
25. Hooftman WE, Beek AJ van der, Bongers PM, van Mechelen W. Gender differences in self-

reported physical and psychosocial exposures in jobs with both female and male workers. *J Occup Environ Med* 2005; 47:244-252.
26. Mirmohammadi J, Mehrparvar A, Akbari H, Hafezi R. *Ergonomics in the Office Environment and Computer Work*. 2nd edition, Farzaneh Book, Tehran, Iran, 2009.
27. Trinkoff AM, Lipscomb JA, Geiger-Brown J, Storr CL, Brady BA. Perceived physical demands and reported musculoskeletal problems in registered nurses.*Am J Prev Med* 2003; 24(3): 270–5.
28. Leboeuf-Yde C. Body weight and low back pain.Asystematic literature review of 56 journal articles reporting on 65 epidemiologic studies. *Spine (Phila Pa 1976)* 2000; 25(2): 226–37.
29. Feyzi V, Hasheminejad N, Jafariroodbandi As, Zolala F, Asadi A. Relationship between Hand Grip Strength and Functional Disability of the Elderly Living in Nursing Homes in Kerman, Southeastern Iran. *Int J Occup Hyg* 2016; 8(1):39-44.
30. Attarchi M, Raeisi S,Namvar M, Golabadi M. Association between shift working and musculoskeletal symptoms among nursing personnel. *Iran J Nurs Midwifery Res* 2014;19(3):309–14.
31. Mosavifard A, Zarei F. Evaluating the prevalence of Muscular and Skeletal Disorders and postural analysis of office employees in karaj university of medical sciences by using RULA method and Ergo Intelligence – UEA software and Nordic questionnaire. *J of Alborz Univ of Med Sci* 2013: 2(4): 245-250.
32. Rahimabadi S, Khanjani N, Mardi H. The Prevalence of Musculoskeletal Disorders and their Related Factors in Workers of a Dairy Factory, Nishabur, Iran. *J Health Develop* 2012; 1(2): 121–9.
33. Kjellberg K, Lagerström M, Hagberg M. Work technique of nurses in patient transfer tasks and associations with personal factors. *Scand J Work Environ Health* 2003; 29: 468-477.
34. Samaei S, Hasheminejad N, Zolala F. Evaluation Of Risk Factors Influencing Low Back Pain In Patient Transfer Tasks. *Int J Occup Hyg* 2015; 7(2):76-82.

Published online: June 16, 2016