

## Original Article

**Prevalence of Work-related Musculoskeletal Disorders and Associated Risk Factors among Nurses in a Public Hospital**\*Seyedtaghi Mirmohammadi<sup>1</sup>, Jamshid Yazdani<sup>2</sup>

1- Department of Occupational Health, Health Sciences Research Center, School of Health, Mazandaran University of Medical Sciences, Sari, Iran

2- Department of Biostatistics, Health Sciences Research Center, School of Health, Mazandaran University of Medical Sciences, Sari, Iran

\*seyedtaghim@gmail.com

(Received: 27 Apr 2014; Revised: 1 Jul 2014; Accepted: 18 Sep 2014)

**Abstract**

**Background and purpose:** Work-related musculoskeletal disorders (WMSDs) are a group of painful disorders of muscles, tendons, and nerves. Carpal tunnel syndrome, tendonitis, thoracic outlet syndrome, and tension neck syndrome are examples. Almost all work requires the use of the arms and hands, therefore, most WMSD affect the hands, wrists, elbows, neck, and shoulders. The aim of the current study was to assess the prevalence of WMSDs among hospital nurses in working time.

**Materials and Methods:** All of nurses during the period of 12 months in 10 body regions were evaluated in the workplaces by checklist data sheet assessment using the nordic musculoskeletal questionnaire (NMQ). A cross-sectional study was performed through 2013 using by questionnaire and nurses who experienced WMSDs for at least 1 day during the past 12 months were included in the study.

**Results:** WMSDs were seen mostly in the neck (28.2%), knees (18.2%) and upper back (17.3%). A significant relationship was seen between sex of participants ( $P < 0.05$ ) and WMSDs, and there was a positive correlation between sex of subjects and WMSDs problem in the neck ( $P < 0.05$ ). Body mass index was correlated to musculoskeletal disorders problems ( $P < 0.05$ ).

**Conclusion:** In general, subjects with patients handling/transferring had significantly higher prevalence of symptoms in most body regions than those with light physical workloads. The female nurses are more tendency to involve and occurrence of WMSDs compared to male staffs.

[\*Mirmohammadi S, Yazdani J. Prevalence of Work-related Musculoskeletal Disorders and Associated Risk Factors among Nurses in a Public Hospital. *IJHS* 2014; 2(3): 55-61] <http://jhs.mazums.ac.ir>

**Key words:** Work-related Musculoskeletal Disorders, Nurse, Workplaces, Nordic Musculoskeletal Questionnaire

## 1. Introduction

Work-related musculoskeletal disorders (WMSDs) include a variety of degenerative and inflammatory conditions that affects on muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels with pain or discomfort (1, 2). Epidemiological surveys of WMSDs disorders have been carried out among general populations and nurses in different countries (1-7) WMSDs are defined as musculoskeletal disorders that results from a work-related event (3, 8). WMSDs are general among health care workers, with the nursing population that constitutes about 33% of the hospital workforce at mainly high risk and reported for 60% of the reported occupational injuries (4-6). There is a lake of conviction related to the accurate cause of increased prevalence of WMSDs in nurses who working in hospitals. The most frequently reported risk factor for WMSDs is heavy physical workload such as lifting, awkward posture, and whole body vibration (9-11). Lifestyle is also encountered as a risk factor of WMSD (9, 12, 13) inadequacy of physical exercise (9), and short sleep time 14 are common factors to increase the risk of low back pain (LBP) (14). An association between WMSDs and psycho-social factors has also been reported (9, 15, 16).

WMSDs are stated to affect significantly on the quality-of-life (1), cause lost work time or working absenteeism, increase work restriction, changing to another job (7-9), with a considerable compensation and losses on the individual, the organization and the family and society (9-13).

Social surveys illustrate that many Iranian nurses have changed their professional job to a comfort job (such as officer, secretary and teacher) this has been associated with WMSDs among nurses (17-19). Because nurses are already at risk for musculoskeletal disorders, a diminution in professional nursing staff and other changes in nursing care delivery are likely to lead to even higher rates

of these disorders (20). Although a number of researchers have stated the prevalence of WMSDs among nurses in the developed countries (5-7, 15, 21). This study assessed 12 months period and point prevalence of WMSDs; the associated job risk factors and the coping strategies toward reducing the risk for development of WMSDs among nurses from selected in a big hospital in Sari, Iran.

## 2. Materials and Methods

The study was carried out in Imam Hospital, in Sari. The design of this study was a cross-sectional study using a questionnaire to investigate the prevalence of WMSDs and to identify risk factors among a representative sample of nurses. A random sampling of subjects was carried out and using a confidence level of 95% the sample size for cross-sectional study.

The survey of the occupational health disorders among nursing practice section tool was a modification of the standardized nordic questionnaire (15, 16) and consisted of questions referring to nine body areas. These are 3 upper limb segments (Shoulders, elbows, wrists/hands/thumb), 3 lower limb segments (Hips/thighs, knees, ankles/feet), and 3 trunk segments (Neck, upper back and lower back). A total of 110 subjects by the nordic musculoskeletal questionnaire (NMQ) questionnaires were assessed in different hospital wards on working time; however, 100% (110) of the questionnaires was used in the data analyses.

Many individual questions were included in the questionnaire NMQ having mainly binary or multiple choice answers and divided into the three sections. The first section included nurse's personal details (e.g., age, gender, and smoking habits), and the last section included questions related to WMSDs history. The questionnaire required approximately 10 min to complete. Investigations were conducted in the workplaces (hospital wards). Data were

summarized using the descriptive statistics of mean, standard deviation and percentages. Pearson's chi-square analysis was used to determine the association of prevalence of investigated musculoskeletal symptoms with personal characteristics and job risk factors. The data analyses were carried out using SPSS for Windows (version 20, SPSS Inc., Chicago, IL, USA) and the level was set at 0.05.

The sample size was selected from all nurses (n = 200) by the following statistical formula:

$$n = \frac{NZ_{\frac{1-\alpha}{2}}^2 p(1-p)}{d^2(N-1) + Z_{\frac{1-\alpha}{2}}^2 p(1-p)}$$

By  $d = 0.04$ ,  $p = 0.13$ ,  $N = 200$ ,  $Z_{1-\alpha/2} = 1.96$ , the sample size calculated 120 (n = 120).

### 3. Results

Table 1 shows the descriptive individual health parameters evaluation for studied hospital healthcare staffs and nurses.

The descriptive analysis results showed that 66.4% female and 33.6% man participated in the study as subjects (n = 110), they divided into three groups, nurse (n = 61), health care staff (n = 30) and trainees students (n = 19). The subjects worked at different wards of a big public hospital (such as neonatal intensive care unit, intensive care unit and general surgery, emergency, magnetic resonance imaging and sonography and radiology, internal surgery, kidney, psychosurgery, women, hematology, orthopedic and medical laboratory). As shown in table 2, the current study results showed that the WMSDs can affect on nurses, health care staffs and trainees' as a disease risk factor student in the hospital, and it caused the working out absence percentage and tend to the high rate of prevalence. The working out absence percentage was high in knees region of all groups of participants and it might depend to working whole shift in a standing position in a hospital ward, or they had less time to break.

**Table 1.** Individual descriptive statistical analysis for studied cases

Gender	N	Minimum	Maximum	Mean	SD
Female					
Age	73	22.00	50.00	36.2055	7.52027
BMI	73	16.16	36.05	26.3235	4.33993
Height	73	142.00	190.00	164.8767	10.27530
Weight	73	42.00	110.00	71.7123	14.28211
Male					
Age	37	23.00	49.00	33.0000	8.18196
BMI	37	17.58	34.93	25.6938	4.22534
Height	37	150.00	185.00	163.7297	7.99183
Weight	37	45.00	100.00	69.0405	13.35123

BMI: Body mass index, SD: Standard deviation

**Table 2.** Prevalence of WMSDs problem for body region on last year with absence (%)

Body region	Frequency	Percent	Valid percent	Cumulative percent (%)
Neck	3	2.7	2.7	99.1
Shoulder	1	0.9	0.9	100.0
Elbow	1	0.9	0.9	100.0
Wrist/Hand	2	1.8	1.8	100.0
Upper back	2	1.8	1.8	100.0
Lower back	7	6.4	6.4	100.0
Hips/Buttock	1	0.9	0.9	100.0
Knees	27	24.5	24.5	100.0

WMSDs: Work-related musculoskeletal disorders

Based on the result of the statistical analysis of the present study by chi-square, there was a significant relationship between the subject's body mass index (BMI) and prevalence of WMSDs ( $P < 0.005$ ), it might be related to body weight of studied subjects.

Table 3 shows a significant correlation was seen between sex of subjects and neck pain problems' of nurses, health care staffs and trainees' student of different, as well. This correlation was seen in female employees ( $P < 0.05$ ).

Based on tables 4 and 5 illustrates that, the sex of subjects is an important and significant factor to appear of neck pain problem among female nurses, health care staffs and trainees' student; it seems that the prevalence of neck

pain in the working time depends on morphology and physiology of female assessed employees. A strong significant correlation was seen between the sex of three groups of subjects and LBP in last year and last week ( $P < 0.05$ ), also it showed a straight relationship for work out absence in last year.

Furthermore, tables 6-8 show a strong correlation between knees and ankles/feet problem in last year and last week work experience for nurses, health care staffs and trainees' students. These results indicated that, working at the above mentioned workstation causes musculoskeletal disorders in the neck, low back, knees and ankles/feet regions. Regarding to the prevalence of the disorders in other regions of the body and workgroups no significant relevance was observed.

**Table 3.** Statistical relationship between WMSDs problems and sex of subjects

	Neck condition on last year		Total
	Without Pain	With Pain	
Sex of subjects			
Female count (%)	47 (64.4)	26 (35.6)	73 (100)
Male count (%)	32 (86.5)	5 (13.5)	37 (100)
Total			
Count	79 (71.8)	31 (28.2)	110 (100)

WMSDs: Work-related musculoskeletal disorders

**Table 4.** Correlation between Sex of subjects and neck pain

	Value	df	Asymptotic significant (2-sided)	Exact significant (2-sided)	Exact significant (1-sided)	Point probability
Pearson chi-square	5.927 <sup>a</sup>	1	0.015	0.024	0.011	
Continuity correction <sup>b</sup>	4.885	1	0.027			
Likelihood ratio	6.447	1	0.011	0.015	0.011	
Fisher's exact test				0.015	0.011	
Linear-by-linear association	5.873 <sup>c</sup>	1	0.015	0.024	0.011	0.009
Number of valid cases	110					

df: Degrees of freedom

**Table 5.** The result of neck pain problem correlation and sex of subjects

Body region	Value	df	Asymptotic significant (2-sided)	Exact significant (2-sided)
Pearson chi-square	5.927 <sup>a</sup>	1	0.015	0.024
Continuity correction <sup>b</sup>	4.885	1	0.027	
Likelihood ratio	6.447	1	0.011	0.015
Fisher's exact test				0.015
Linear-by-linear association	5.873 <sup>c</sup>	1	0.015	0.024
Number of valid cases	110			

df: Degrees of freedom

#### 4. Discussion

This study shows that working in the hospital can cause most musculoskeletal disorders among nurses and health care staffs. Lifting and transferring of patients were strongly associated with pain in the neck, low back and knees' of subjects in the past 12 months and last week. Comparison of this finding with those of other surveys in musculoskeletal epidemiology is difficult. Most of them do not evaluate whole body region, a standardized case description is rarely used despite being recommended (13). Based on the present study results, patient handling (transfers and repositioning) increased the prevalence of WMSDs of the neck, low back and knees. This finding was consistent with a cross-sectional analysis of the similar studies which carried out in other countries (14-19, 22). Differences between the health care tasks in different hospitals in terms of WMSDs risk are difficult to evaluation because the nature

of work and health care staffs' morphology is different. This study shows there is a need for providing lifting device and using during the transfer of a patient for prevention purpose. Based on the other studies, the motivation of health care staffs to make use of lifting devices was strongly associated with decreasing of WMSDs prevalence percentage during the transfer and repositioning of the patient (23). This finding illustrate that it demand to make a planning or managing for encourage of nurses to use ergonomics lifting devices when required by making sure that enough lifting devices are obtainable in amount to patients on the ward (21, 22). The current study finding is comparable to another research was carried out by Koppelaar et al. reported that among health hospital care staffs (n = 876) who worked on transfers and repositioning section, one-third of them showed WMSDs in past 1 year of their work history (20).

**Table 6.** The result of low back problem correlation and sex of subjects

Body region	Value	df	Asymptotic significant (2-sided)	Exact significant (2-sided)
Pearson chi-square	10.114 <sup>a</sup>	1	0.001	0.002
Continuity correction <sup>p</sup>	8.801	1	0.003	
Likelihood ratio	11.097	1	0.001	0.001
Fisher's exact test				0.001
Linear-by-linear association	10.022 <sup>c</sup>	1	0.002	0.002
Number of valid cases	110			

a: 0 cells (0%) have an expected count of less than 5. The minimum expected count is 10.43; b: Computed only for a 2x2 table; c: The standardized statistic is -2.423

**Table 7.** The result of knees problem correlation and sex of subjects

Body region	Value	df	Asymptotic significant (2-sided)	Exact significant (2-sided)
Pearson chi-square	5.679 <sup>a</sup>	1	0.017	0.019
Continuity correction <sup>p</sup>	4.616	1	0.032	
Likelihood ratio	6.283	1	0.012	0.019
Fisher's exact test				0.019
Linear-by-linear association	5.627 <sup>c</sup>	1	0.018	0.019
Number of valid cases	110			

a: 0 cells (0%) have an expected count of less than 5. The minimum expected count is 10.43; b: Computed only for a 2x2 table; c: The standardized statistic is -2.423

**Table 8.** The result of ankles/feet problem correlation and sex of subjects

Body region	Value	df	Asymptotic significant (2-sided)	Exact significant (2-sided)
Pearson chi-square	14.739 <sup>a</sup>	1	0.000	0.000
Continuity correction <sup>p</sup>	12.896	1	0.000	
Likelihood ratio	21.833	1	0.000	0.000
Fisher's exact test				0.000
Linear-by-linear association	14.605 <sup>c</sup>	1	0.000	0.000
Number of valid cases	110			

a: 0 cells (0%) have an expected count of less than 5. The minimum expected count is 10.43; b: Computed only for a 2x2 table; c: The standardized statistic is -2.423

The finding of the present survey is consistent with same study result was conducted by researchers among nurses and health care staffs in the general hospital (23). They reported that 21.7% of assessed subjects by NMQ showed disorders on different body region in last 12 months, neck, shoulder, low back and hand are the main body region that appeared symptoms of WMSDs problem and there was a significant correlation between work experience and WMSDs problem. (21) Other studies results are compatible with the current study finding, they stated that, based on the obtained results all of nurses who worked in a private hospital are exposed to WMSDs and this job is a high WMSDs risk task and it need to more attention for prevention or controlling of the disorders before happening (18-19, 24).

These results illustrated that female nurses and health care staffs are more tendency to involve and occurrence of WMSDs compare to male staffs. This study demonstrated that encouraging and providing of ergonomics lifting devices for transfers and repositioning are more effective to control or prevention of WMSDs among nurses and health care staffs. A periodic educational program as well as back school practice can play a main role in the prevention and reduce the musculoskeletal disorders resulted.

### Acknowledgement

The authors appreciate health sciences research center, Mazandaran University of Medical Sciences for financial support of the current study.

### References

1. Brage S, Bjerkedal T. Musculoskeletal pain and smoking in Norway. *J Epidemiol Community Health* 1996; 50(2): 166-9.
2. Chen JC, Chang WR, Chang W, Christiani D. Occupational factors associated with low back pain in urban taxi drivers. *Occup Med (Lond)* 2005; 55(7): 535-40.
3. Khali MI, Rahman MM, Yasmin N, Ahsan GU, Faruquee MH. Musculoskeletal problems among truck drivers in selected areas of Dhaka City. *SUB J Public Health* 2009; 2: 22-8.
4. Funakoshi M, Tamura A, Taoda K, Tsujimura H, Nishiyama K. Risk factors for low back pain among taxi drivers in Japan. *Sangyo Eiseigaku Zasshi* 2003; 45(6): 235-47.
5. Krause N, Ragland DR, Greiner BA, Syme SL, Fisher JM. Psychosocial job factors associated with back and neck pain in public transit operators. *Scand J Work Environ Health* 1997; 23(3): 179-86.
6. Leino-Arjas P, Hanninen K, Puska P. Socioeconomic variation in back and joint pain in Finland. *Eur J Epidemiol* 1998; 14(1): 79-87.
7. Skov T, Borg V, Orhede E. Psychosocial and physical risk factors for musculoskeletal disorders of the neck, shoulders, and lower back in salespeople. *Occup Environ Med* 1996; 53(5): 351-6.
8. Munabi IG, Buwembo W, Kitara DL, Ochieng J, Mwaka ES. Musculoskeletal disorder risk factors among nursing professionals in low resource settings: a cross-sectional study in Uganda. *BMC Nurs* 2014; 13(1): 7.
9. Miranda H, Viikari-Juntura E, Punnett L, Riihimaki H. Occupational loading, health behavior and sleep disturbance as predictors of low-back pain. *Scand J Work Environ Health* 2008; 34(6): 411-9.
10. Gheldof EL, Vinck J, Vlaeyen JW, Hidding A, Crombez G. The differential role of pain, work characteristics and pain-related fear in explaining back pain and sick leave in occupational settings. *Pain* 2005; 113(1-2): 71-81.
11. Porter JM, Gyi DE. The prevalence of musculoskeletal troubles among car drivers. *Occup Med (Lond)* 2002; 52(1): 4-12.
12. Nagasu M, Sakai K, Ito A, Tomita S, Temmyo Y, Ueno M, et al. Prevalence and risk factors for low back pain among professional cooks working in school lunch services. *BMC Public Health* 2007; 7: 171.

13. Hoogendoorn WE, van Poppel MN, Bongers PM, Koes BW, Bouter LM. Systematic review of psychosocial factors at work and private life as risk factors for back pain. *Spine (Phila Pa 1976)* 2000; 25(16): 2114-25.
14. Reed LF, Battistutta D, Young J, Newman B. Prevalence and risk factors for foot and ankle musculoskeletal disorders experienced by nurses. *BMC Musculoskelet Disord* 2014; 15: 196.
15. Health and Safety Executive. Upper limb disorders in the workplace [Online]. [cited 2011]; Available from: URL:[http://www.hseni.gov.uk/upper\\_limb\\_disorders\\_in\\_the\\_workplace.pdf](http://www.hseni.gov.uk/upper_limb_disorders_in_the_workplace.pdf).
16. Hagberg M, Silverstein B, Wells R, Smith MJ, Hendrick HW, Carayon P, et al. *Work-related musculoskeletal disorders (WMSDs): A reference book for prevention*. 1<sup>st</sup> ed. London, UK: Taylor and Francis; 1995.
17. Smedley J, Egger P, Cooper C, Coggon D. Manual handling activities and risk of low back pain in nurses. *Occup Environ Med* 1995; 52(3): 160-3.
18. Retsas A, Pinikahana J. Manual handling practices and injuries among ICU nurses. *Aust J Adv Nurs* 1999; 17(1): 37-42.
19. Retsas A, Pinikahana J. Manual handling activities and injuries among nurses: an Australian hospital study. *J Adv Nurs* 2000; 31(4): 875-83.
20. Koppelaar E, Knibbe JJ, Miedema HS, Burdorf A. Determinants of implementation of primary preventive interventions on patient handling in healthcare: a systematic review. *Occup Environ Med* 2009; 66(6): 353-60.
21. Evanoff B, Wolf L, Aton E, Canos J, Collins J. Reduction in injury rates in nursing personnel through introduction of mechanical lifts in the workplace. *Am J Ind Med* 2003; 44(5): 451-7.
22. Dehdashti A. 0071 a structural equation modelling method to describe work environment risk factors and musculoskeletal symptoms among hospital nurses. *Occup Environ Med* 2014; 71(Suppl 1): A68.
23. Mehrparvar AH, Rnjbar S, Mostaqasi M, Salehi M. Risk assessment of musculoskeletal disorders by QEC method in a food production factory. *Occup Med* 2011; 3(2): 54-60. [In Persian]
24. Kulkarni S, Darsana NG. Musculoskeletal risk assessment among nurses in patient manual handling in hospital wards: A cross sectional study. *Cureus* 2013; 5(8): e137.