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Musculoskeletal Disorders and Working Conditions Among Iranian Nursing Personnel

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This study investigated the prevalence of musculoskeletal disorders (MSDs) and associations with organizational, physical and psychosocial working conditions among 520 nursing personnel in Tehran, Iran. The results of the cross-sectional study on aids and different educational levels of nurses showed that the participants experienced 88% of MSDs in at least one body region during the past 12 months. The 3 most prevalent body regions were the low back (65.3%), knee (56.2%) and neck (49.8%). The participants reported inflexible work schedule, poor quality of devices for transferring patients, overexertion and job dissatisfaction. Physical and psychosocial exposure revealed an elevated odds ratio (95% confidence interval) of MSDs. The results showed a combination of high physical and psychosocial work demands along with low control over the work which increased work-related stress and enhanced the risk of MSDs. This study findings could help to understand work-related MSDs among nursing personnel in a developing country where the work situation and sociocultural context differ from other countries.

musculoskeletal disorders physical working conditions psychosocial working conditions
nurse Iran

1. BACKGROUND

Musculoskeletal disorders (MSDs) are the most commonly registered causes of disability pensions, long-term sick leave and occupational disorders in developed and developing countries [1, 2]. Contributory factors usually include workplace activities such as strenuous action, manual handling, lifting, repetitive tasks and job stress [3]. MSDs occur in some professions including nursing three or four times more often than in the general population [1]. MSDs and sick leave could lead to

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staff shortage, which is one of the major global challenges in nursing [4, 5]. MSDs among home healthcare workers and nurses are mainly caused by repeated manual patient lifting and handling activities [6]. Studies on the relationship between nurses' working conditions and MSDs focused on these physical and ergonomic conditions [7, 8, 9]. However, according to recent occupational health studies, contributory factors for disorders include all workplace demands [10, 11]. High physical workload and lack of control over work could lead to a stimulation of stress hormones, which then results in pathological symptoms and illnesses [12, 13].

Current studies on the work situation in nursing are based on the dominant work-related psychosocial models, and on a wide range of interpersonal relationships and the interaction between physical and psychosocial working conditions and MSDs [3, 11, 14, 15]. Nursing is considered as physically and psychologically demanding, and as a risk factor for MSDs [7, 8, 16]. Many Iranian studies on working conditions in nursing indicate a difficult situation for nurses'. Nurses usually have high workloads because of staff shortage. Most nurses are also dissatisfied with inflexible work schedule, shift work and low salary [17, 18]. Nursing is a female-dominated job and women are usually the primary caregivers of family members [19]. However, female workers in traditional societies such as Iran might face more demanding family roles because family means not only parents and children but also the extended family, and even neighbours and friends [6]. Moreover, household duties are the wife's role and the husband is responsible for the outside of home; thus, inflexible shift work creates a negative image and would be a challenge for nurses [17, 20]. Different aspects of the work situation and its relation to nurses' health and the traditional women's role expectations are not respected.

Choobineh, Rajaeefard and Neghab [2] and Choobineh, Movahed, Tabatabaie, et al. [16] evaluated the association between work factors and MSDs among Iranian nurses. Choobineh, et al. [2] found that physical, but not psychosocial, demands were associated with MSDs. Choobineh, et al. [16] found that an association between both physical and psychosocial demands and musculoskeletal pain was limited to nurses who worked in operating rooms. Mehrdad, Dennerlein and Haghighat reported a high prevalence of self-reported musculoskeletal symptoms which were associated with psychosocial factors among nurses in a large hospital in Tehran; physical factors were not included in their study [22].

There are not many studies on relationships between organizational, physical and psychosocial working conditions and MSDs among nurses in developing countries including Iran. Therefore, the aim of this study was to explore the prevalence of MSDs and associations with organizational, physical and psychosocial working conditions among Iranian nursing personnel working at 10 university hospitals in Tehran.

2. METHOD

2.1. Participants

A cross-sectional study was conducted in 10 university hospitals (i.e., general hospitals with many wards) affiliated to the Ministry of Health in Tehran, Iran. The participants were the nursing personnel of these hospitals who fulfilled the inclusion criteria and were full-time employees with at least one-year work experience. The participants (606) were randomly selected from the employment lists of the hospitals and invited to participate. Of the 606 questionnaires, 554 were returned (response rate: 92%). The participants with a history of severe disease, serious life events/stress were excluded (n = 34). A total of 520 questionnaires were analysed.

The participants belonged to two groups: nurses and health care assistants. There are three levels of nurses in Iran: registered nurse, auxiliary nurse and technician. A registered nurse must complete a 4-year bachelor degree at a university. A registered nurse performs task based on the dominant functional approach in a hospital such as wound care, monitoring vital signs, accompanying physicians when visiting patients and carrying out doctors' orders. An auxiliary nurse completes a 3-year vocational training programme, which

does not require a high school diploma. An auxiliary nurse works under the direction and professional guidance of a registered nurse and performs practical nursing tasks. There are no differences between an auxiliary nurse and a registered nurse in terms of practical duties but a registered nurse is involved in writing nursing notes about patients and administrative duties. A technician completes a 2-year university programme and then works as an operating room nurse and assists the surgeon or accompanies the patient in all phases of surgical procedure [16, 18]. Health care assistants are employed at hospitals but are not considered as nurses. They do not take training courses in nursing and as untrained staff they perform procedures such as patient transportation and preparation of equipment.

Data were collected for 2 weeks in each hospital. The first author of this study delivered questionnaires to each ward and was present during the data collection. The participants were informed about the protocol of the study both orally and in writing. A week later, the participants received a reminder notice to maximize the response rate. The head nurses also controlled the participants. The same procedure was performed in each hospital. The data were collected between April and November 2008. Eight employees were not available during this period. Thus, questionnaires were distributed among 598 employees. The participants completed 554 questionnaires.

2.2. Questionnaire

The self-administered questionnaire contained three domains: demographic information, working conditions and MSDs. It was adapted in terms of cross-cultural translation into Persian, validity and reliability [22].

The demographic information domain contained items on background information. These items were from the Nurse Early Exit Study (NEXT study) questionnaire. The NEXT Study, which was conducted among nurses working in 10 European countries, focused on central aspects of nurses' working environment, individual resources and also premature departure from the nursing profession [23, 24].

The working conditions domain contained three parts: organizational factors (working hours and shift, and type of ward), and physical/ergonomic and psychosocial working conditions. The physical working condition part included two multiple choice questions and a 3-point scale. The first two questions were on the operating quality of devices for transferring patients such as stretcher and wheel chair. The third question was related to participation in any training course on the use of devices for transferring patients over the work experience. The other three items helped to quantify physical tasks including lifting and transferring patient, and bending and standing position. Each item had a 4-point scale (1–4), where higher scores indicated higher exposure. The final score for each participant was then computed (according to formula [(mean score of physical items × 5)/4] × 20) to obtain a score between 0 and 100 [25].

Items on psychosocial working conditions were from the Copenhagen Psychosocial Questionnaire (COPSOQ I), developed as a valid and reliable comprehensive tool for assessing psychosocial working environment; it has been used in many work-related health studies among different job group and health care workers [26, 27]. Six subscales of the COPSOQ I questionnaire were chosen to measure psychosocial working conditions. In this study, a combination of two subscales of "quantitative demands" and "emotional demands" were considered as the "work demands" factor. "Role clarity" and "quality of leadership" were combined and considered as the "leadership" factor. Further, "influence at work" and "job satisfaction" were included in the psychosocial part of the study questionnaire. The items on psychosocial working conditions had five response options, scores ranged from 0 to 100. The direction of the scores followed the label of the scale [26, 28].

The MSDs domain contained items from the Nordic musculoskeletal questionnaire, which measures ache, pain and discomfort experienced in nine body regions (neck, shoulder, elbows, wrists/hands, upper back, low back, hips/thighs, knees and ankles/feet) during the past 12 months and during the past week [29]. The validity and

reliability of the questionnaire had been investigated and approved in the Persian version [30].

2.3. Ethics

The Ministry of Health in Tehran approved the study. Managers and nursing administrators of the participating hospitals gave their permission for the study. The participants were informed about the protocol of the study before they gave their consent. The participants were able to withdraw from the study at any time. All participants answered the questionnaires anonymously.

2.4. Data Analysis

In this study, the prevalence rate of MSDs was the occurrence of pain/discomfort in at least one out of nine body regions during the past 12 months and during the past week. A past week period was chosen to reduce recall bias [31, 32]. Descriptive statistics, differences in exposure (background data and working conditions) to MSDs were analysed with the χ^2 test ($p < .05$). According to the original questionnaire and similar studies, physical and psychosocial scales were dichotomized into two categories (under and over the median value): adverse and nonadverse exposure variables [28, 33]; the same was done for the physical scale. The logistic regression analysis evaluated the association between exposure and outcome variables. The odds ratio (*OR*) with 95% confidence interval (CI) calculated pain levels during the past week in the three most prevalent body regions (neck, low back and knee). Firstly, the logistic regression analyses were adjusted for age and gender for each exposure variable (model I); then all exposure variables were included in the multiple logistic regression analyses (model II). SPSS version 18 was used for data analyses.

3. RESULTS

About 69% of the participants had overtime work (*M* 57 (*SD* 17) h/week) and 81% of the participants had shift work. The results showed that 88% of the participants reported MSDs in at least one body region during the past 12 months. The three body regions where pain was prevalent (during two time periods: the past 12 months and the past week, respectively) were: low back (65.3%, 39.8%), knee (56.2%, 35.2%) and neck (49.8%, 27%).

Table 1 shows the relationship between demographic data and MSDs in three body regions (neck, low back and knee) during the past week. There were no significant gender differerences in MSDs in the low back and knee but there were significant diffrences in MSDs in neck (females 28.9% and males 18.7%). Neck pain was also reported by the participants who worked longer during the week (35.5%). There were no significant relationship between MSDs and different wards and shifts.

Most participants reported low efficiency of manual devices for transferring patients and also lack of training. Physical and psychosocial demands were rated as high, and influence at work, leadership and job satisfaction were reported as poor (Table 2).

Neck pain was associated with heavy lifting and transferring patients, bending/maintaining an uncomfortable posture, poor job satisfaction and leadership. Low-back pain was associated with heavy lifting and transferring patients, prolonged standing position, bending/maintaining an uncomfortable posture, high work demand, poor job satisfaction and poor influence at work. Knee pain was associated with prolonged standing position and poor job satisfaction.

Table 3 shows *OR* (95% CI) for neck, low-back and knee pain during the past week. In the logistic regression analyses (model I), most variables had an increased *OR* for neck and low-back pain, but prolonged standing position had an increased *OR* for knee pain only. According to the multiple logistic regression analyses (model II), bending/maintaining an uncomfortable posture and poor job satisfaction had an elevated *OR* for neck pain (*OR* 1.86, 95% CI [1.07–3.23] and *OR* 2.34 (95% CI [1.48–3.71], respectively). Poor job satisfaction also had an elevated *OR* for low-back pain (*OR* 2.53, 95% CI [1.68–3.81]). Prolonged standing position had *OR* 7.38 (95% CI [1.68–32.40]) for knee pain.

TABLE 1. Demographics Data and Association With MSDs Past Week (*N* = 520)

Variable	*N* (%)	Neck (%)	*p*	Low Back (%)	*p*	Knee (%)	*p*
Gender							
male	107 (20.6)	18.7	.02*	35.5	.18	31.8	.24
female	413 (79.4)	28.9		40.9		36.1	
Age							
<30	146 (28.7)	26.2		43.2		31.5	
30–39	193 (38.0)	27.1	.98	41.5	.47	37.7	.47
≥40	169 (33.3)	27.1		36.7		37.3	
Work experience							
1–10	258 (49.6)	27.2		40.7		31.4	
11–20	170 (32.7)	26.3	.98	40.6	.82	35.9	.07
21–30	92 (17.7)	26.4		37.0		44.6	
Work shift							
morning shift	100 (19.4)	26.8		39.0		40.0	
circulatory shift	290 (56.3)	27.0	.12	38.3	.34	33.1	.43
night shift	70 (13.6)	18.8		37.1		32.9	
other	55 (10.7)	38.2		50.9		41.8	
Job title							
registered nurse	393 (75.6)	27.8		42.0		37.4	
technicians	52 (10.0)	30.8	.17	40.4	.15	30.8	.28
auxiliary nurses	31 (6.0)	10.0		25.8		29.0	
aides	44 (8.5)	25.0		29.5		25	
Department							
surgical ward	94 (19.0)	33.3		48.9		36.2	
medical ward	93 (18.8)	28.6		40.9		33.3	
critical ward	105 (21.2)	30.5	.36	34.3	.37	27.6	.56
operation room	117 (23.6)	25.0		36.8		35.9	
other	86 (17.4)	22.1		39.5		40.7	
Working hours/week							
44[a]	160 (31.0)	28.8		41.0		39.6	
45–64	237 (46.0)	23.3	.04*	42.1	.74	33.6	.72
>65	107 (23.0)	35.5		42.6		35.8	

Notes. MSDs = musculoskeletal disorders, * = significant χ^2 test ($p < .05$), a = ordinary working hours.

4. DISCUSSION

The participants reported MSDs in nine body regions during two time periods: the past 12 months and the past week. The results of the study show a high prevalence of MSDs (88%) in at least one body region during the past 12 months, which is similar to studies among Asian nurses in China and Turkey [34, 35], and studies in developed countries such as the United States [8] and Australia [19]. Two recent Iranian studies also showed similar results [16, 21]. The participants reported low back, knee and neck as the three most prevalent body regions during the past 12 months. The prevalence rate of MSDs in at least one body region was higher than statistics for the general population [36] and the industrial working environment in Iran [37].

Most participants reported a deficiency and low quality of manual devices for transferring patients (stretcher and wheel chair) and also lack of education. Other factors related to MSDs were heavy manual handling and transferring patients, standing positions for a prolonged time and uncomfortable postures. High physical workload as exposure of MSDs was described in most occu-

TABLE 2. Average Values (Range: 0–100) of Physical and Psychosocial Exposure and Association With MSDs During Past Week (*N* = 520)

Variable	*M* (*SD*)	Neck (%)	*p*	Low Back (%)	*p*	Knee (%)	*p*
Physical exposure							
Lifting and transferring patients	67.16 (22.11)						
heavy		30.8	.02*	43.8	.02*	35.9	.41
light		21.8		34.5		34.5	
Standing position	83.08 (16.73)						
prolonged		27.2	.41	41.1	.02*	37.2	.001**
not prolonged		23.3		20.0		6.7	
Bending/uncomfortable posture	72.34 (20.77)						
yes		32.6	.001**	44.3	.01*	36.7	.23
no		18.8		34.1		33.2	
Psychosocial exposure							
Work demand	60.93 (12.99)						
high work demand		29.7	.66	44.3	.01*	36.4	.31
no high work demand		23.4		34.3		33.9	
Job satisfaction	29.66 (17.75)						
poor job satisfaction		36.2	.001**	52.3	.001**	39.7	.05*
job satisfaction		19.5		29.7		32.2	
Influence at work	37.00 (24.38)						
poor influence at work		30.2	.08	44.9	.04*	34.3	.49
influence at work		24.2		36.6		35.9	
Leadership	53.19 (12.49)						
poor leadership		30.7	.03*	43.4	.12	38.1	.21
no poor leadership		23.0		37.8		34.3	

Notes. MSDs = musculoskeletal disorders, * $p < .05$, ** $p < .01$.

TABLE 3. *OR* (95% CI) for Neck, Low-Back and Knee Pain During Past Week

Variable	Model	Neck	Low-Back	Knee
Physical exposure				
heavy lifting and transferring patient	I	1.70 [1.12–2.59]	1.47 [1.01–2.13]	1.08 [0.74–1.57]
	II	1.12 [0.66–1.91]	1.11 [0.70–1.77]	0.84 [0.53–1.34]
prolonged standing position	I	1.12 [0.46–2.71]	2.64 [1.05–6.62]	8.23 [1.93–35.10]
	II	0.94 [0.32–2.78]	1.91 [0.71–5.14]	7.38 [1.68–32.40]*
bending/uncomfortable posture	I	2.20 [1.42–3.41]	1.47 [1.01–2.12]	1.21 [0.83–1.77]
	II	1.86 [1.07–3.23]*	1.18 [0.73–1.88]	1.10 [0.68–1.75]
Psychosocial exposure				
high work demand	I	1.38 [0.92–2.07]	1.56 [1.08–2.24]	1.19 [0.82–1.72]
	II	1.01 [0.64–1.61]	1.15 [0.76–1.73]	1.35 [0.72–1.65]
poor job satisfaction	I	2.67 [1.77–4.08]	2.60 [1.79–3.76]	1.41 [0.97–2.05]
	II	2.34 [1.48–3.71]*	2.53 [1.68–3.81]*	1.34 [0.89–2.02]
poor influence at work	I	1.20 [0.79–1.81]	1.29 [0.89–1.87]	1.03 [0.71–1.50]
	II	1.00 [0.64–1.60]	1.11 [0.74–1.66]	1.00 [0.67–1.49]
poor leadership	I	1.50 [0.99–2.24]	1.28 [0.89–1.84]	1.20 [0.83–1.74]
	II	1.16 [0.74–1.80]	1.04 [0.70–1.54]	1.05 [0.71–1.56]

Notes. OR = odds ratio, CI = confidence interval, * = significant *OR* (95% CI).

pational health studies among nurses [8, 16]. Nursing is physically demanding in terms of lifting and transferring tasks, uncomfortable postures and, thus, related to musculoskeletal disabilities [8, 16].

Many preventive programmes have been implemented to decrease problems with lifting and transferring patients with manual and mechanical devices [38]. There are several approaches to training health care workers on using the devices. The important issue is how to evaluate the results of training courses. Traditionally, decrease in MSDs was measured. However, a more relevant effect of training would be to evaluate skills in patient transferring technique among the participants in a training course based on nurses' skills and patients' evaluation of safety and comfort during transferring [39]. An on-the-job training course should be conducted to decrease the risks of lifting and transferring patient among health care workers in Iran.

The results of this study show that most nursing activities are still performed manually with traditional methods despite the use of modern diagnostic devices and advanced therapeutic techniques in Iranian hospitals [17, 40]. Thus, promoting within the hospital the use of modern devices for lifting and transferring patients might decrease musculoskeletal pain among employees. Intervention should also focus on the individual. Comfortable nursing shoes and compression hosiery provided by employers could also lead to a reduction in lower extremity discomfort for nurses.

This study found associations between psychosocial working conditions and MSDs, except for the associated physical factors like in previous studies [15, 21, 34]. One psychosocial subscale (poor job satisfaction) could cause an increase in the risk of both neck and low-back pain in the multiple regression model. A Taiwanese study indicated an increased risk of sick leave associated with low job satisfaction, low supervisor support and MSDs [31. According to Karasek and Theorell's demand–control–support model [13], poor job satisfaction as psychosocial exposure seems to reflect lack of an encouraging and supportive working environment, which might increase the risk of work stress and MSDs. The results of an interview study among Iranian nurses showed that the participants were dissatisfied with their inflexible work schedule, shift work and heavy workload [17].

This study also shows that neck pain was reported by the participants who worked over 44 h/week. Most Iranian nurses faced the unpredictability and irregularity of overtime work, but also experienced a high number of weekly working hours due to a shortage of nurses. There are not enough nurses for each patient due to financial cutbacks in the health care system; consequently, their request for control over their work and support are not respected by nursing managers [6, 42]. The most important interventions would be to improve organizational factors such as employing more nurses and to provide flexible working shifts adjusted to nurses' individual needs and their family demands.

In this cross-sectional study, prevalence of MSDs was measured during two time periods: the past 12 months and the past week. The accuracy of recall bias depends on the time interval between the event and the time of assessment; the longer the interval, the higher the probability of incorrect recalls [21, 32]. The past week time period was chosen to analyse the data to reduce the risk of recall bias.

4.1. Limitations

Sickness absence in Iran is permitted after presenting a medical certificate received from a doctor on the first day of absence only. If the absence lasts longer than 7 days, an expert medical board of the insurance organization confirms the diagnosis and decides about the sickness benefit (compensation) [43]. Therefore, nurses prefer short sick leave. Nurses often do not report their sickness because of nursing shortage. Moreover, the analysis was limited to nurses who were currently working; those who had left their jobs due to musculoskeletal symptoms or other reasons were excluded and a healthy worker effect might have occurred. The data may underestimate reported MSDs and the association between perceived demands and MSDs.

The participants at each hospital were randomly slected. There is a possibility that the exclusion of participants might have influenced the results.

5. CONCLUSION

The results of this study indicate a high prevalence rate of self-reported MSDs. Lack of satisfactory devices for transferring patient; training on transferring patient; physical/ergonomic, organizational and psychosocial exposure were associated with MSDs. Thus, the results of this study address the interaction of the physical, organizational and psychosocial work demands with MSDs among Iranian nursing personnel. The combination of low control over work and high work demands, where poor job satisfaction is the highest risk, increases work-related stress which enhances the risk of MSDs.

More nurses should be employed as a prerequisite for flexible working shifts adjusted to nurses' individual needs and their family demands. These activities, along with improving physical and psychosocial working conditions, could increase nurses' job satisfaction and work efficiency and would lead to increased quality of health care.

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