

The Prevalence Rate of Work-Related Musculoskeletal Disorders Among Iranian Female Workers

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Background: The risk of work-related musculoskeletal disorders (WMSDs) in female workers is high. Despite the increasing trend in women's work force in recent decades, there is no comprehensive survey on WMSDs in Iranian female workers population.

Objectives: The objectives of the present study were to investigate the period prevalence rate of WMSDs in different body regions of Iranian female workers and determine major contributing factors associated with WMSDs in this population.

Patients and Methods: In this study, we used the raw data of our previous studies conducted in diverse Iranian workplace settings. Collectively, the data related to 2934 female employees from 15 Iranian workplace settings distributed throughout the country were analyzed. Data gathering tool consisted of 2 parts including: a) personal details and b) the General Nordic Questionnaire of Musculoskeletal symptoms (NMQ). Data were analyzed using statistical tests including Chi-square and multiple logistic regressions.

Results: The results of NMQ showed that symptoms of musculoskeletal disorders (MSDs) in lower back (51.8%), shoulders (51.5%) and wrists/hands (46.2%) were the most prevalent problem among the studied female workers. The results of multiple logistic regression showed a significant association between the prevalence of musculoskeletal disorders in different body regions with age, job tenure, daily working hours, type of activity (static and/or dynamic), working schedule (shift or day working) and marital status.

Conclusions: Lower back, shoulders, and wrists/hands complaints were highly prevalent among studied female workers. Age, job tenure, daily working hours, type of activity, working schedule (shift or day working) and marital status were found to be associated with WMSDs among Iranian female workers.

Keywords: Prevalence; Female; Musculoskeletal Disorders; Worker

1. Background

Work-related musculoskeletal disorders (WMSDs) are widespread in the world, with substantial individual and socio-economic impacts (1, 2). Some factors such as biomechanical, organizational and individual characteristics could be known as possible factors affecting these disorders (3). The chance of developing MSDs varies by demographic factors (e.g. age and gender), sociological and genetic factors. Other risk factors for MSDs are obesity, smoking, muscle contraction and conditions of workplace (4).

One of the considered factors for the WMSDs in other literatures of ergonomic and epidemiology would be gender (5). According to the previous studies despite similarity of the work procedures, severity and prevalence rate of WMSDs varies by gender (6).

In some studies it was noted that female work force had WMSDs problems about two to five times more than male work force (7). It was also considered that in various parts of body, gender is significantly related to the development of the MSDs symptoms (e.g. shoulders, wrists/hands, lower back, knees and ankles/feet) such

that chance of MSDs occurrence among female workers was higher than the male workers with odds ratio ranging from 1.62 to 2.35 (8, 9).

In the United States the prevalence of chronic joint symptoms among female workers in 2001 was 37.3% (10). In a large population-based study in the Netherlands, 79.3% of the women employed in industrial settings reported one or more musculoskeletal complaints in the past year (11). The one-year prevalence of self-reported spinal pain (including lower back, upper back and neck) in a sample of 35 to 45 years old Swedish residents was 69.5% for female work force (12). The prevalence of MSDs during the past 12 month among French female workers was 83.9% with 95% confidence interval of [82.0 - 85.7] (13). Generally, in the European countries, the highest and the lowest prevalence rates of WMSDs among female workers were related to German (70%) and Bulgarian (40%) women, respectively (14). In the Southeast Asia, the highest prevalence rate of WMSDs symptoms among female employees was reported among Vietnamese, Thai, and Filipino women (15).

The results of majority of studies have indicated that the prevalence rate of WMSDs in female workers is higher than that of the male population. In Iran, many independent studies were conducted on WMSDs among work force including male and female populations in different industries. However, there is not a comprehensive survey on WMSDs among the population of female workers.

2. Objectives

The objectives of the present study are to investigate the prevalence rate of WMSDs in different body regions of Iranian female workers and determine major contributing factors associated with WMSDs in this population.

3. Patients and Methods

In this cross-sectional study, we used the raw data of our previous studies which were conducted from 2005 to 2013 in diverse Iranian workplace settings. Collectively, we analyzed the data related to 2934 female employees from 15 Iranian workplace settings including petrochemical companies, generator manufacturing companies, textile industries, communication industries, bank tellers, sewing industries, surgery staff, hospital nurses, operating room nurses and office workers distributed throughout the country. In all studies, subjects were selected based on simple random sampling method. In these studies, all employees with at least one year of job tenure participated and workers with background diseases or accidents affecting the musculoskeletal system were excluded from the study. In all studies, the data gathering tool was identical and consisted of an anonymous self-administered questionnaire with the following 2 sections:

(a) Personal characteristics including age, weight, height, job tenure, daily working hours, marital status, type of job activity i.e. static work including prolonged state of muscular contraction and dynamic work which is characterized by a rhythmic alternation of contraction and extension, tension and relaxation (16) and working schedule (day or shift working).

(b) The general Nordic musculoskeletal questionnaire (NMQ) was used to examine reported MSDs symptoms during the last 12 months prior to the study and determine period prevalence of MSDs among the studied subjects (17). The validity and reliability of the Persian version of NMQ had been perused in Choobineh et al. (18) study.

3.1. Data Analysis

Statistical analyses were done by SPSS (version. 16). Univariate Chi-square test was used for assessing the association between independent variables and MSDs symptoms. Multiple logistic regression analysis (step-wise) was used for each outcome retaining the variables in the models to adjust for potential confounding. In the regression analysis, if the P-value of univariate test for assessing the association between the variable and MSDs

symptoms was ≤ 0.25 , the variable was included in the regression model of that region (19).

4. Results

Table 1 shows some personal characteristics of the female workers studied. Mean of age and job tenure of participants were 31.47 ± 9.09 SD and 8.24 ± 7.30 SD years, respectively. Most of the subjects were married (60.5%) and employed as day workers (75.7%).

The results of NMQ showed that lower back pain (51.8%), shoulder ache (51.5%) and wrists/hands aches (46.2%) were the most prevalent symptoms among the studied female work force (Table 2).

Table 1. Personal Details of the Female Workers Studied (n = 2934)^a

Variable	Values
Age, y	31.47 ± 9.09 (13 - 70)
Weight, kg	63.10 ± 10.91 (37 - 97)
Height, cm	165.18 ± 8.82 (120 - 198)
BMI, Kg/m ²	23.13 ± 3.51 (10.71 - 45.14)
Job tenure, y	8.24 ± 7.30 (1 - 35)
Working hours per day, h	8.46 ± 2.19 (6 - 16)
Marital status	
Single	1159 (39.5)
Married	1775 (60.5)
Working schedule	
Shift working	713 (24.3)
Day working	2221 (75.7)

^a The values are presented as Mean ± SD (Min - Max) or No. (%).

Table 2. Frequency of Reported Musculoskeletal Symptoms in Different Body Regions Among the Studied Female Workers During the Last 12 Months Prior to the Study (n = 2934)^a

Body region	Number of Subjects With Symptoms
Neck	1222 (42.3)
Shoulders	1498 (51.5)
Elbows	767 (26.5)
Wrists/Hands	1344 (46.2)
Upper back	1261 (43.7)
Lower back	1493 (51.8)
Thighs	627 (21.9)
Knees	1236 (42.7)
Feet and ankles	1033 (35.7)

^a The values are presented as No. (%).

Table 3 shows significant factors on MSDs for various regions of the body. For the initial selection of potential risk factors for musculoskeletal complaints univariate test (Chi-Square) were used at significance level of $P \leq 0.25$. Then, all independent variables that revealed significant associations were included in the multivariate logistic regression model. Age, job tenure, working hours per day, marital status, working schedule and type of activity were the main variables retained in the regression models with odds ratios generally greater than 1.27. This indicates that among all variables included in the regression model, the foregoing variables have significant association with reported symptoms in different body regions.

Table 3. Models Indicating Factors Influencing Msds in Different Body Regions of Iranian Female Workers (n = 2934)^a

Body Region	Variables Retained in The Model		P-Value
	OR	95% CI	
Neck			
Age	1.77	1.40 - 2.23	< 0.001
Shoulders			
Age	1.38	1.17 - 1.62	< 0.001
Working hours per day	1.27	1.06 - 1.52	0.007
Type of activity	1.41	1.17 - 1.69	< 0.001
Elbows			
Age	2.02	1.68 - 2.43	< 0.001
Type of activity	3.24	2.70 - 3.24	< 0.001
Wrists/hands			
Age	1.61	1.37 - 1.89	< 0.001
Type of activity	1.82	1.54 - 2.15	< 0.001
Upper back			
Working schedule	1.51	1.27 - 1.80	< 0.001
Lower back			
Job tenure	1.41	1.12 - 1.76	0.003
Marital status	1.27	1.02 - 1.59	0.033
Thighs			
Age	1.82	1.50 - 2.62	< 0.001
Type of activity	2.16	1.78 - 2.62	< 0.001
Knees			
Age	2.27	1.77 - 2.90	< 0.001
Working hours per day	1.33	1.06 - 1.66	0.013
Working schedule	1.27	1.02 - 1.59	0.031
Ankles/feet			
Age	1.88	1.58 - 2.24	< 0.001
Type of activity	3.74	3.14 - 4.46	< 0.001

^a Abbreviations: OR, odds ratio; CI, confidence interval.

5. Discussion

The findings of this study revealed high prevalence rates of WMSDs in different body regions among female workers in Iran. In this study, the highest prevalence rate of WMSDs symptoms, in descending order, was related to lower back, shoulders and wrists/hands, respectively. In the study of Strazdins and Bammer (20), it was reported that 81% of the studied population had some sorts of upper body MSDs symptoms. Also, the results of Strazdins and Bammer's study showed that upper body MSDs symptoms were more prevalent among female workers as compared to their male counterparts (20). The results of Lee et al. (15) study on southeastern Asian female workers showed that about 35% of the participants experienced some types of WMSDs during the year prior to the study. They also found that WMSDs were more prevalent among Vietnamese (57.1%), Thai (33.9%), and Filipino (25.8%) female workers. The low back MSDs symptoms were the most commonly reported problem among the Vietnamese and the Filipinos. The results of Linton et al. (12) study showed a high prevalence rate for WMSDs in the upper body regions of the studied female population. According to Clays et al. (21) one year prevalence rate of low back pain was 49.9% in female workers. The results of Farioli et al. (22) study on 43816 subjects from 34 European countries showed that prevalence rates of MSDs in back and neck/upper limbs among the studied female population were 48.4% and 48.1%, respectively. Generally, one year prevalence rate of WMSDs of the upper body regions in female workers were reported to range from 2 to 41% in different studies (23). Our results indicate that the prevalence rate of WMSDs in Iranian female workers is higher than those of female employees from other countries in our literature review.

Using multivariate regression model to evaluate risk factors for the MSDs showed that the type of activity (static and/or dynamic) was the strongest risk factor, odds Ratio (OR) ranging from 1.41 to 3.74, in shoulders, elbows, wrists/hands, thighs and ankles/feet regions where the risk of these disorders in female workers with dynamic jobs was higher than those with static activities. This finding is in line with the results of Choobineh et al. (9) study.

Age was found to be a significant factor for neck, shoulders, elbows, wrists/hands, thighs, knees and ankles/feet pain. The chance of developing WMSDs in these regions among subjects with age > 35 year was more than their younger counterparts with OR varying from 1.38 to 2.27. This result is in agreement with the findings of some other studies (9, 24). Job tenure and marital status were significant factors for lower back pain. The risk of lower back pain among female workers with job tenure > 10 years and married workers was higher as compared to those workers with job tenure ≤ 10 years and single workers with OR=1.41 and OR = 1.27, respectively. This is in accordance with the findings of other studies (9, 25, 26). Daily working hours was a significant factor for shoulder and knee problems. The chance of developing WMSDs symptoms in shoulders

and knees among female workers with more than 8 hours of daily work was higher than those with less than 8 hours (OR ranging from 1.27 to 1.33). This is in agreement with the results of the study of Alexopoulos et al. (27). Working schedule was a significant factor for upper back and knee pain with OR ranging from 1.27 to 1.51. The results revealed that in shift workers the chance of WMSDs occurrence in the foregoing body regions was higher than in day workers. This is in accordance with the findings of Choobineh et al. (8) study.

In all studied subjects, the perceived symptoms of WMSDs were investigated by the general Nordic questionnaire. The subjects' MSDs symptoms were not medically examined. Also, the subjects of the present study were relatively young and the majority of them were married and employed as day workers. These factors may lead to over and underestimation of the MSDs prevalence among the participants and need to be considered in the interpretation of the findings of the present study.

Lower back, shoulders and wrists/hands complaints were among the most prevalent problems in terms of WMSDs among the studied female workers. There was significant association between prevalence rate of WMSDs in different body regions and age, job tenure, daily working hours, type of activity, working schedule and marital status. These contributing factors should be taken into account when implementing any interventional program to prevent WMSDs among Iranian female subjects.

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Authors' Contributions

Alireza Choobineh: idea, data interpretation, article drafting, final approval of the article. Hadi Daneshmandi: data interpretation, article drafting, final approval of the article. Seyed Hamidreza Tabatabaee: data analysis and interpretation, article drafting, final approval of the article.

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