



Prevalence of Work-related Musculoskeletal Symptoms among Iranian Workforce and Job Groups

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ABSTRACT

Background: Musculoskeletal disorders (MSDs) are known to cause occupational injuries. This study aimed to collate the existed relevant data and develop a general feature of MSDs problem among Iranian workforce.

Methods: In this study, we used the raw data related to 8004 employees from 20 Iranian industrial settings distributed throughout the country. In all studies, participants were selected based on simple random sampling method, and the data were collected using demographic characteristics and Nordic MSDs questionnaires.

Results: The most prevalent MSDs symptoms were reported in the lower back (48.9%), shoulders (45.9%), neck (44.2%), upper back (43.8%), and knees (43.8%). Prevalence rates of MSDs at least in one body region were found to be the highest (90.3%) among health-care workers. Prevalence rates of MSDs symptoms in all body regions were higher among workers with dynamic activities as compared to those of workers with static activities.

Conclusions: MSDs symptoms were common among the study population. Health-care provider and workers with dynamic activities had the highest rate of MSDs. These results merit attention in planning and implementing ergonomics interventional program in Iranian industrial settings.

Keywords: Injury, musculoskeletal system, occupational, risk factor, workplace

INTRODUCTION

Musculoskeletal disorders (MSDs) are identified as work-related diseases from the time of Ramazzini in the 18th century who described classical cases of such injuries in his book.^[1] MSDs have had increasing trend around the world during the past decades. They cause work-related

disability in workers with notable financial outcomes due to direct and indirect (i.e., restricted or lost working days) costs.^[2] The economic loss of such disorders influences both individuals and organizations.^[3] They are a global occupational ergonomics issue distributed in both industrialized and industrially developing countries.^[4] In industrially developing countries, injuries in the workplace are very important problems.^[4] Inappropriate working conditions and lack of an efficient occupational injury prevention program in these countries have resulted in

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high rates of MSDs among working groups.^[5] Coury has pointed out that in spite of the fact that work-related MSDs (WMSDs) have had increasing trend in developing countries; research for WMSDs prevention seems insufficient.^[6]

Musculoskeletal symptoms risk factors are work activities such as awkward and static postures, handling materials manually, repetitive movements^[7] as well as individual, psychosocial, and organizational factors which known as important predictive variables.^[8-13]

WMSDs prevention in the workplace requires identification of major individual and occupational risk factors associated with symptoms and elimination of the contributing factors from the working environment.^[14] In Iran, regarding to the technologies and work practices commonly utilized in industries, employees are exposed to varieties of musculoskeletal risk factors such as manual heavy load handling, awkward working postures, improper workstation design, and lack of adequate work-rest cycle. In this situation, high rate of musculoskeletal symptoms occurrence is expected among the workforce.

To improve workers' health and reduce economic loss due to WMSDs in Iranian industries, employees' exposure to musculoskeletal injuries risk factors should be eliminated. Some separate studies have so far been conducted in different Iranian industries and job groups to determine musculoskeletal symptoms prevalence and to determine main factors related to symptoms of MSDs. In the present study, we aimed to collate the existed relevant data and develop a general feature of MSDs problem among Iranian workforce and job groups. It is believed that the result of this project can provide an appropriate base for identification of high-risk occupations and their prioritization for implementing ergonomics interventional programs in the Iranian workplace.

METHODS

In this study, we used the raw data of our previous studies conducted in diverse Iranian industrial settings [Table 1]. Collectively, the data related to 8004 employees with at least 1 year of job tenure from 20 Iranian industries distributed throughout the country were analyzed. In all studies, participants were selected based on simple random sampling method. In all studies, the data-gathering tool was the same and consisted of an anonymous self-administered questionnaire with the two following parts:

- Personal details including gender, age, weight, height, job tenure, daily working time (hours), marital status, type of job activities (static and/or dynamic), and working schedule
- The general Nordic Questionnaire of Musculoskeletal symptoms (NMQ) to examine reported cases of MSDs among the study population.^[32] The Persian

version of NMQ validity and reliability was examined by Choobineh *et al.*^[10] Reported MSDs symptoms were limited to the past 12 months.

In all studies, each participant received the questionnaire in person in her/his workplace.

Data analysis

Statistical analyses were performed using Statistical Package for Social Sciences 16 (SPSS Inc, Chicago, IL, USA). T-test, Mann-Whitney U-test, and Chi-square test were used to assess univariate associations between independent variables and reported musculoskeletal symptoms.

RESULTS

Table 2 shows personal characteristics of the participants.

The results of NMQ showed that lower back (48.9%), shoulders (45.9%), neck (44.2%), upper back (43.8%), and knees (43.8%) symptoms had high prevalence among the participants [Table 3].

Table 4 presents prevalence rates of MSDs symptoms in different body regions based on the type of industry. As displayed in this table, prevalence rates of MSDs at least in one body region are the highest among health-care workers (90.3%), followed by manufacturing (86.9%), hand-weaving (79.7%), office (74.7%), and petrochemical workers (61.5%), respectively. As shown, the prevalence rates of MSDs symptoms in the neck (56.6%) and wrists/hands (46.7%) regions are higher among office workers as compared to those of workers in other industries. The prevalence rates of lower back (57.9%), shoulders (56.1%), and knees (54.8%) symptoms are higher among health-care workers as compared to those of other employees. Furthermore, the prevalence rates of MSDs symptoms in the upper back (56.9%), legs/feet (54.1%), thighs (50.7%), and elbows (48.8%) regions are higher among manufacturing workers than those of other workers.

Table 5 demonstrates prevalence rates of MSDs symptoms in different body regions based on type of activity (i.e., static and dynamic). As shown, the prevalence rates of MSDs symptoms in all body regions are higher among workers with dynamic activities as compared to those of other workers (workers with static activities).

DISCUSSION

The study population was relatively young with mean (standard deviation [SD]) age and mean (SD) job tenure of 33.53 (9.06) and 9.90 (7.41) years, respectively. The majority of the participants were male (53.6%) and married (61.3%).

The results obtained from NMQ revealed that musculoskeletal symptoms were common in the studied

Table 1: Studies on musculoskeletal disorders among Iranian workers in different industries

Number	Title	Industry	Year of study	Sample size	Publication
1	The Survey of Prevalence Rate among Workers of Main Office of Shiraz University of Medical Sciences ^[15]	Office workers	2005	177	7 th National Iranian Students Seminar
2	Musculoskeletal disorders among bank computer operators ^[16]	Bank employees	2005	287	Iran Occupational Health
3	Musculoskeletal Problems among Surgery Staffs in Hospitals of Shiraz University of Medical Sciences ^[17]	Surgery staff	2006	200	1 st International Conference on Ergonomics in Iran
4	Association between perceived demands and musculoskeletal disorders among hospital nurses of Shiraz University of Medical Sciences: A questionnaire survey ^[18]	Hospital nurses	2005	641	The International Journal of Occupational Safety and Ergonomics
5	Musculoskeletal problems in Iranian hand-woven carpet industry: Guidelines for workstation design ^[19]	Weaving industry	2007	1439	Applied Ergonomics
6	Musculoskeletal problems among workers of an Iranian communication company ^[20]	Communication industry	2007	193	Indian Journal of Occupational and Environmental Medicine
7	Musculoskeletal problems among workers of an Iranian rubber factory ^[21]	Rubber industry	2007	454	Journal of Occupational Health
8	Musculoskeletal Problems among Workers of Industries of Sepidan City ^[22]	Small scale industries	2007	611	11 th Annual Research Congress of Iran's Medical Sciences Students
9	Musculoskeletal Disorders in Sewing Workers ^[23]	Sewing industry	2008	233	1 st International Conference on Ergonomics in Iran
10	Musculoskeletal Problems among Jewelry Workers ^[24]	Jewelry industry	2008	230	1 st International Conference on Ergonomics in Iran
11	Musculoskeletal symptoms among workers of metal structure manufacturing industry in Shiraz, 2005 ^[25]	Metal structure manufacturing industry	2009	156	Iranian Journal of Epidemiology
12	Perceived demands and musculoskeletal symptoms among employees of an Iranian petrochemical industry ^[26]	Petrochemical industry	2007	928	International Journal of Industrial Ergonomics
13	Musculoskeletal problems among workers of an Iranian sugar-producing factory ^[27]	Sugar-producing industry	2007	116	The International Journal of Occupational Safety and Ergonomics
14	Perceived demands and musculoskeletal disorders in operating room nurses of Shiraz city hospitals ^[13]	Operating room nurses	2007	375	Industrial Health
15	Musculoskeletal risk assessment in small furniture manufacturing workshops ^[28]	Furniture industry	2008-2009	411	The International Journal of Occupational Safety and Ergonomics
16	Ergonomic assessment of musculoskeletal disorders risk level among workers of Tabriz petrochemical company	A petrochemical company	2012	439	Unpublished data
17	Ergonomic assessment of musculoskeletal disorders risk level among workers of a petrochemical company ^[29]	A petrochemical company	2013	327	Iran Occupational Health
18	Prevalence of musculoskeletal symptoms and assessment of working conditions in an Iranian petrochemical industry ^[30]	A petrochemical company	2013	290	Journal of Health Sciences and Surveillance System
19	Ergonomic workplace assessment and survey of musculoskeletal injuries in a generator manufacturing company ^[31]	Generator manufacturing company	2013	319	Journal of Health System Research
20	Ergonomic assessment of musculoskeletal disorders risk level among workers of Mahshahr petrochemical special economic zone	Petrochemical special economic zone	2013	178	Unpublished data

individuals. Symptoms in the lower back, shoulders, neck, upper back, and knees were prevalent problems in the participants. In the European Union, the average proportion of individuals reporting MSDs as their most serious work-related health problem was 54%, the lowest and the highest proportion were in Bulgaria (37%) and in Germany (75%), respectively (2012). Based on

Farioli *et al.* study conducted among 43,816 European employees in 34 countries, the prevalence rate of MSDs in the back region ranged from 25.7% in Ireland to 63.8% in Portugal and prevalence rates of neck/upper limb symptoms ranged from 26.6% in Ireland to 67.7% in Finland.^[33] The report of Health and Safety Executive on MSDs in Great Britain in 2014 revealed that back pain

Table 2: Some personal details of the studied workers (n=8004)

Variable	Amount
Age (years)	
Mean±SD	33.53 (9.06)
Minimum-maximum	13-74
Weight (kg)	
Mean±SD	71.62 (12.84)
Minimum-maximum	37-135
Height (cm)	
Mean±SD	171.33 (8.79)
Minimum-maximum	120-200
BMI* (kg/m ²)	
Mean±SD	24.35 (3.61)
Minimum-maximum	10.71-47.92
Job tenure (years)	
Mean±SD	10.90 (7.60)
Minimum-maximum	1-40
Working h/day (h)	
Mean±SD	8.15 (2.02)
Minimum-maximum	6-16
Sex (%)	
Female	3154 (39.40)
Male	4850 (60.42)
Marital status (%)	
Single	3098 (38.70)
Married	4906 (61.30)
Type of industry (%)	
Office workers	1619 (20.23)
Petrochemical industry (operational workers)	1168 (14.60)
Hand-weaving industry	1439 (17.98)
Health-care providing industry	1216 (15.19)
Manufacturing industries [†] (operational workers)	2562 (32.00)
Type of activity (%)	
Static	4266 (53.98)
Dynamic	3738 (46.02)
Working schedule (%)	
Shift working	2817 (35.19)
Day working	5187 (64.81)

*Body mass index; [†]Including furniture, rubber, metal, cloth, sugar, and jewelry.
SD=Standard deviation

among studied workers was in the priority, followed by upper and lower limbs disorders. Interestingly, this report declared that prevalence rate of WMSDs had decreasing trend in 2013/2014 as compared to 2001/2002.^[34] Kim and Nakata pointed out that in Korean and Japanese workers, the most reported WMSDs were related to the neck, shoulder, and upper limb regions.^[35]

The results of the present study showed that the prevalence of MSDs symptoms at least in one body region among health-care workers had the highest rate in comparison to the workers of other industrial

Table 3: Frequency of reported musculoskeletal symptoms in different body regions among workers during the last 12 months (n=8004)

Body region	MSDs symptoms, n (%)
Neck	3362 (42)
Shoulders	3674 (45.9)
Elbows	2425 (30.3)
Wrists/hands	3290 (41.1)
Upper back	3506 (43.8)
Lower back	3914 (48.9)
Thighs	2289 (28.6)
Knees	3506 (43.8)
Legs/feet	2945 (36.8)
Any region	6491 (81.1)

MSDs=Musculoskeletal disorders

settings, while in the European countries, the most WMSDs occurrence was reported in construction industry.^[36]

The results of the present study revealed that prevalence rates of MSDs symptoms among office workers in the neck and wrists/hands were higher than those of other employees. In some other studies, namely, Zungu and Ndaba,^[37] Choobineh *et al.*,^[31] and Tomqvist *et al.*,^[38] similar results were reported.

The result of this study showed that prevalence rate of MSDs symptoms in the lower back, shoulders, and knees among health-care staff was higher than those of employees from other industries. This finding is in line with the results of other studies indicating that workers in the health-care industry are at higher risk of suffering from occupational MSDs.^[39,40] Risk factors including patient transfer, extra force exertion, awkward and static posture, prolonged standing position, high mental workload, and working in shift schedule have been reported to be probable causes of the high prevalence of MSDs in this industry.^[41]

Upper back, legs/feet, thighs, and elbows had high prevalence rate of MSDs among operational workers in manufacturing industries. Schierhout *et al.* in their study on manufacturing industry in South Africa pointed out that the low back, neck/shoulder, and forearm/wrist regions had high rate of symptoms.^[42]

Prevalence rate of MSDs symptoms in all body regions was higher among workers with dynamic jobs (in dynamic jobs, mobility of workers is high, such as welders, mine workers, and so on) as compared to that of workers with static jobs (in static jobs, mobility of workers is low, such as office workers, bank employees, and so on). This finding indicated that eliminating MSDs risk factors among workers with dynamic jobs had high priority. It seems that risk factors such as lifting of heavy loads, repetitive movements, standing position for long period

Table 4: Prevalence rate of musculoskeletal disorders symptoms in different body regions based on the type of industry (n=8004)

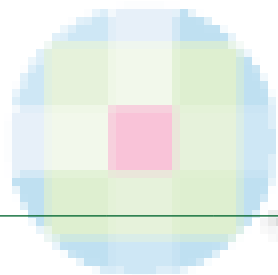
Body region	Office workers (n=1619), n (%)	Petrochemical industry (operational workers) (n=1168), n (%)	Hand-weaving industry (n=1439), n (%)	Health-care providing industry (n=1216), n (%)	Manufacturing industries (operational workers) (n=2562), n (%)	P*
Neck	916 (56.6)	296 (25.3)	507 (35.2)	529 (43.5)	1145 (44.7)	<0.001
Shoulders	618 (38.2)	277 (23.7)	688 (47.8)	682 (56.1)	1396 (54.5)	<0.001
Elbows	243 (15.0)	121 (10.4)	276 (19.2)	499 (41.0)	1250 (48.8)	<0.001
Wrists/hands	756 (46.7)	230 (19.7)	550 (38.2)	356 (29.3)	1089 (42.5)	<0.001
Upper back	635 (39.2)	252 (21.6)	543 (37.7)	601 (49.4)	1458 (56.9)	<0.001
Lower back	722 (44.6)	384 (32.9)	650 (45.2)	704 (57.9)	1440 (56.2)	<0.001
Thighs	236 (14.6)	137 (11.7)	230 (16.0)	370 (30.4)	1299 (50.7)	<0.001
Knees	557 (34.4)	384 (32.9)	498 (34.6)	666 (54.8)	1394 (54.4)	<0.001
Legs/feet	390 (24.1)	183 (15.7)	341 (23.7)	638 (52.5)	1386 (54.1)	<0.001
Any region	1209 (74.7)	718 (61.5)	1147 (79.7)	1098 (90.3)	2226 (86.9)	<0.001

*Chi-square test

Table 5: Prevalence rate of musculoskeletal disorders symptoms in different body regions based on type of activity (n=8004)

Body region	Workers with static jobs (n=3980), n (%)	Workers with dynamic jobs (n=4024), n (%)	P*
Neck	1691 (42.5)	1859 (46.2)	0.001
Shoulders	1727 (43.4)	1960 (48.7)	<0.001
Elbows	700 (17.6)	1750 (43.5)	<0.001
Wrists/hands	1389 (34.9)	1915 (47.6)	<0.001
Upper back	1584 (39.8)	1936 (48.1)	<0.001
Lower back	1867 (46.9)	2052 (51.0)	<0.001
Thighs	700 (17.6)	1602 (39.8)	<0.001
Knees	1504 (37.8)	2012 (50.0)	<0.001
Legs/feet	1051 (26.4)	1899 (47.2)	<0.001
Any region	3112 (78.2)	3392 (84.3)	<0.001

*Chi-square test between the two groups



of time, and extra force exertion are causes of high prevalence rate of MSDs symptoms among workers with dynamic jobs.

Limitations

Regarding to the cross-sectional nature of the studies used in this paper and the method of self-report for data gathering, the results of the present study are to be cautiously interpreted. Self-report methodology has difficulty in remembering, deception, or denial. Furthermore, because the statistical analyses were limited to working employees, ones who had left their careers because of MSDs injuries might have been excluded from the study and healthy worker effect could occur. Thus, the symptoms prevalence rates may be underestimated.

We can somewhat generalize the results of our study to other places (such as office workplaces, petrochemical industry, hand-weaving industry, health-care providing industry, and manufacturing industries) that are more like to our study.

CONCLUSIONS

The findings of the present study revealed that symptoms from the musculoskeletal system were common among Iranian workers studied. The overwhelming percent of the individuals studied (81.1%) had some type of MSDs symptoms in the preceding 12 months. This indicates that the problem of MSDs among Iranian workers is an important issue and requires proper attention in national level.

The most symptoms were declared in the lower back, shoulders, neck, upper back, and knees. Hence, for improving conditions of workplace, risk factors of these regions should be considered with priority. Based on the results, from the viewpoint of type of industry, the highest prevalence rates of musculoskeletal symptoms were observed in health-care providing industry followed by manufacturing industries. It can, therefore, be pointed out that corrective ergonomics measures for eliminating or minimizing musculoskeletal injuries in national level should focus on these industries.

Furthermore, from the point of view of the type of activity, the prevalence rates of MSDs in all body regions were higher among workers with dynamic jobs as compared to those of workers with static jobs. It seems that risk factors such as lifting of heavy loads, repetitive movements, standing position for long period of time, and extra force exertion are causes of high prevalence rate of MSDs symptoms among workers with dynamic jobs.

Based on this finding, it could be concluded that reducing risk factors of MSDs in dynamic jobs should be considered with higher priority.

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Conflicts of interest

There are no conflicts of interest.

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