

Original Article

Investigation of Upper Limb Disorders and its Relationship with Physical Working Requirements among metallic industry Workers

Ehsanollah Habibi¹, Zahra Asaadi², Jamshid Khobi³, Abdullah Barkhordari⁴, Karim Fard Zarei⁵,
Mohsen Karchani^{5,6}, Javad Vatani⁶

¹. Department of Occupational Health Eng., School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

². M.sc in Occupational Health & Safety, Mashhad University of Medical Sciences, Mashhad, Iran

³. Department of Occupational Health, Health School, Kurdistan University of Medical Sciences, Sanandaj, Iran

⁴. Department of Occupational Health, Health School of Damgan ,Semnan University of Medical Sciences, Semnan, Iran

⁵. Department of Occupational Health, Health School, Ilam University of Medical Sciences, Ilam, Iran

⁶. PhD student, Dept of occupational Health, Tehran University of Medical Science, International Campus (TUMS.IC), Tehran, Iran

a.barkhordari2007@gmail.com

Abstract:

Introduction: Musculoskeletal disorders, premature tiredness caused by work and so on are arisen from different requirements of every job. According to the statistics provided by the World Health Organization (WHO), the most important cause of the loss of working time is the prevalence of musculoskeletal disorders in work environments.

Method: A cross sectional study with randomized sampling was conducted to determine the relationship between the physical work requirements and upper limbs disorders such as shoulders, wrist, elbow, and hand. data was gathered by using of a questionnaire consist of demographic data and TMW (Tools for Modified Work) for physical work requirement and Maastricht Upper Extremity Questionnaire for upper limbs musculoskeletal disorders.

Results: Results showed that there was significant relationship between musculoskeletal disorder and the physical work requirements. In other words musculoskeletal disorders in all upper limb have been increased by deficiency in providing the physical work requirement

Conclusion: This study confirmed that physical work requirement has a crucial role in musculoskeletal disorder especially in upper limbs. And it is essential to give full attention to provide standard requirements for workers.

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1. Introduction

Nowadays, there are myriads of workshops, small to large, in the field of industry. According to the statistics provided by the World Health Organization, about %58 of the world older-than-ten persons spend one third of their time in these places, while only 5-10 percents of workers in the developing countries have access to occupational health services (1, 2). Musculoskeletal disorders are the second most important health problems among workers, and are considered as the main cause of lost of working time, increase in costs, and damages to the human labor force (1, 2). This indicates the high importance of the musculoskeletal disorders in work environments. These disorders happen in any industrial work, and physical work requirements are one of the factors effective in prevalence of such disorders, which treat those who have not enough physical power more than others (1, 3). According to the results of the previous studies, despite the wide spread of mechanized and automated procedures, musculoskeletal disorders arisen from work are the major cause of lost of working time, increase in costs, and

damages to the human labor force (4, 5, and 6). Musculoskeletal disorders emerge in the spinal column, upper limb and lower limb. These disorders may have been caused by long-term exposure to their causing factors, gradually and during a long procedure, or they may have been caused suddenly by a forceful shock on some part of the musculoskeletal system (1, 7, 8, 9, and 10). Physical requirements of work were evaluated in a group of workers. Through comparing the workers who did not display any musculoskeletal symptom with those workers who showed these symptoms, the effects of the physical requirements of work were investigated after controlling factors such as emotional requirements, wrong method and the amount of work, violence, and social supports on the job (11). According to a study performed by Moor et al. in Canada in 1992, musculoskeletal disorders, with an annual cost of \$17.8 million, are placed after cardiovascular diseases, which cause \$19.7 million annual losses (4).

Meeting physical requirements of a work is necessary to perform it. These physical requirements may cause musculoskeletal disorders by hurting some parts of body, specially waist, shoulders, neck, elbow, hand, and wrist (12). In this study, physical requirements of workers employed in metal industries, which include cutting and reforming of metals and also general workshops of metal industries, have been investigated and examined for any possible relationship with musculoskeletal disorders of the upper limb.

2. Material and Methods

This research was a Cross sectional study. Sample included workers in the workshops of metallic products in Isfahan, a city in the west of Iran. The sample was selected through sampling with the simple random method. The sample population was calculated using the below equation, and it was calculated to be 169:

$$n = \frac{NZ^2P(1-P)}{(N-1)d^2 + Z^2(1-P)}$$

N: Total number of the workers employed in the workshops of metallic products in Isfahan.

Z: 95% confidence interval coefficient, which is equal to 1.96

P: An estimation of the relative frequency of musculoskeletal disorders among workers, which was taken equal to 0.5 due to their diversity in order to get the highest sample volume.

D: The degree of precision, which is taken equal to 0.05.

In this study, the upper limb disorders were detected using Maastricht Upper Extremity Questionnaire (MUEQ). After that, for each worker, the evaluation for the physical requirement of the work, considering organs one by one (neck, shoulder, arm, hand, and wrist), was filled out using Tools for Modified Work (TMW) method and the physical requirements of the considered job was estimated. Then the collected data were entered to SPSS software and in order to examine the relationship between disorders of the upper limb with physical requirements of work among workers. The SPSS version 11.5 (SPSS Inc. Chicago, Illinois, U.S) and X2 statistical test was used for data analysis.

3. Results

The subjects were all male with average age of 33.6 years (from 20 to 50 years) and the average length of employment period was 7.35 years. Frequency and classification of physical requirement around to neck were summarized in table one there is a significant relationship between Physical requirement to neck and frequency of musculoskeletal disorders (P-value =0.03). Frequency and classification of physical requirement around to shoulders were summarized in table there is a significant relationship between Physical requirement to neck and frequency of musculoskeletal disorders (P-value =0.04). Frequency and classification of physical requirement around wrist and elbow were summarized in table one and four there is a negative significant relationship between Physical requirement to wrist and elbow and frequency of musculoskeletal disorders (P-value =0.03). Frequency and classification of physical requirement around to hand was summarized in table one there is a significant relationship between Physical requirement to hand and frequency of musculoskeletal disorders (P-value =0.03).

4. Discussions

In this study, result showed that there is a significant relationship between physical requirement and neck musculoskeletal disorder. These results are consistent with the results provided by Trinkhoff (10). In his work, 1163 nurses were investigated and the results showed that the measured physical requirement has been significantly accompanied by disorders around neck, shoulders, and waist (10).

Likewise, in a study performed by L. Karlqvist, 234 women and 953 men among ambulance and emergency personnel were randomly selected and studied using self-reporting questionnaire (3).

Table 1. Frequency and classification of physical requirement around neck, shoulders, elbows, wrist and hand

		Physical requirement to neck		Total
		No or low physical requirement	Medium or high physical requirement	
musculoskeletal disorders	Yes	19(32%)	40(68%)	59
	No	81(73%)	29(27%)	110
	Total	100(59%)	69(41%)	169
		Physical requirement to shoulders		Total
		No or low physical requirement	Medium and high physical requirement	
musculoskeletal disorders	Yes	20 (14%)	119(86%)	139
	No	9(30%)	21(70%)	30
	Total	29	140	169
		Physical requirement to elbows		Total
		No or low physical requirement	Medium and high physical requirement	
musculoskeletal disorders	Yes	131(85%)	23(15%)	154
	No	4(27%)	11(73%)	15
	Total	135	34	169
		Physical requirement to wrist		Total
		No or low physical requirement	Medium and high physical requirement	
musculoskeletal disorders	Yes	87(60%)	58(40%)	145
	No	9(37%)	15(63%)	24
	Total	96	73	169
		Physical requirement to hand		Total
		No or low physical requirement	Medium and high physical requirement	
musculoskeletal disorders	Yes	14(31%)	31(69%)	45
	No	91(73%)	33(27%)	124
	Total	105	64	169

In that study, factors related to the work and its physical requirements were investigated, and the results showed that the physical requirements of persons are related to work limitations which are caused by musculoskeletal disorders in the neck area (3). In addition, the relationship between physical requirements of work

with musculoskeletal disorders of shoulder among the studied workers showed that the relationship was significant. According to Table 1, among all of the studied workers (169 persons), 139 persons have had musculoskeletal disorders, out of which 119 persons have had medium and high physical requirements and 20 persons have had low or no physical requirements. These results are consistent with the results of a study performed by other research (7, 10, 11, and 13). According to the Fredriksson, 1663 English and Spanish workers were studied, and the frequency of neck and shoulder disorders were determined to be %10.7 and %9.5, respectively. In addition, there has been a significant relationship between physical requirements of work and the prevalence of these disorders (7).

Relationship between physical requirements of work with musculoskeletal disorders of elbow among the studied workers was examined too. Results indicated that there is a significant relationship between these two parameters. According to Table 1, among all of the studied workers, 154 persons have had musculoskeletal disorders around elbow, out of which 23 persons have had medium and high physical requirements and 131 persons have had low or no physical requirements (3, 10).

Relationship between physical requirements of work with musculoskeletal disorders of wrist among the studied workers showed that there is a significant relationship between these two parameters. These results are consistent with the results reported by Mr. Hansson. His study showed that limited physical requirement among hospital workers had significantly increased with higher prevalence of wrist disorders (8). Relationship between physical requirements of work with musculoskeletal disorders in hand showed that there is a significant relationship between these two parameters. According to Table 1, among all of the studied workers, 45 persons have had musculoskeletal disorders, out of which 31 persons have had medium and high physical requirements and 14 persons have had low or no physical requirements in hands. These results are consistent with the results reported by Hansson (8). In his study, 95 women who had been performing repetitive works were investigated. Results showed that the prevalence of disorders in hand, wrist, neck, and shoulder have a significant relationship with physical load of work and physical requirement of work (1, 14).

5. Conclusion

This study confirmed that physical work requirement is a one of the most important factors that is related to musculoskeletal disorder especially in upper limbs. And employer should provide standard requirements in order to prevention of musculoskeletal disorder in workers.

Corresponding Author:

Abdullah Barkhordari
Department of occupational health,
School of health, Semnan University of Medical Sciences,
Semnan, Iran
E-mail: a.barkhordari2007@gmail.com

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