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Prevalence of Musculoskeletal Disorders in Employees of Iran Khodro

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Introduction: Musculoskeletal disorders depend on a variety of factors such as inappropriate body posture; heavy lifting; repetitive actions; and mental, physical, and organizational risk factors. The component manufacturing industry is one of the industries in which direct involvement of the worker in the production process is unavoidable. The present study was carried out with the aim of surveying the prevalence rate of musculoskeletal disorders and assessing the upper limb conditions in employees of a component manufacturing company affiliated to Iran Khodro.

Methods and Materials: This descriptive-analytical study was performed on 50 employees selected from 5 sections in 2016. In this study, Nordic questionnaire was used to determine the prevalence rate of musculoskeletal disorders and then to evaluate the incidence of musculoskeletal disorders.

Results: The results of this study showed that the highest prevalence rates of musculoskeletal disorders in employees of component manufacturing industry during the last 12 months were 58.69, 52.17, and 41.28% in waistline, neck, and wrists, respectively.

Conclusion: Considering the high prevalence rate of musculoskeletal disorders in some of the employees in this industry, it is necessary to consider ergonomic issues, optimize workstations, use the mechanical methods for lifting and moving loads, design the standing-sitting work stations, contract with sports halls, gives overtime work, and design and construct ergonomic chairs.

Keywords: Musculoskeletal disorders, Nordic questionnaire, Component manufacturing industry

Introduction

Musculoskeletal disorders are one of the most important occupational health issues in today's world. Studies have shown that the prevalence rate of musculoskeletal discomfort is significant in various occupations (Smith, Leggat, & Speare, 2009). The American National Institute for Occupational Safety and Health (NIOSH) has identified musculoskeletal disorders as a group of conditions that involve nerves, tendons, muscles, and supporting structures such as intervertebral discs.

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The cause of half of the workplace complications is related to musculoskeletal disorders. The US National Institute for Occupational Safety and Health has categorized illnesses and work-related complications based on their importance in terms of prevalence, severity, and prevention and reported that after an illness, the respiratory tract infects the musculoskeletal system at the second stage. Musculoskeletal disorders constitute 7% of all diseases in the community, among which 14% of the patients refer to physicians, constituting 19% of hospital admissions (Kurinka et al., 1987). In the United States, WMSDs have reduced the work time in over 600,000 people and increased cost between $ 54-45 million (Mostaghaci et al., 2012; Spallek et al., 2010).

Various risk factors are involved in the onset of this disease. These factors can be divided into biomechanical, environmental, psychological, organizational, and individual factors (Choobineh, 2007; Choobineh et al., 2007). Biomechanical factors

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include undesirable body posture, force, lifting, carrying heavy loads, tasks accompanied by repeated movements and work. The undesirable effects of bad body posture in the workplace are considered as the most important line-of-stemming factors (Maul, Laubli, & Krueger, 2003; Sen, 1984). In Figure 1, examples of adverse body postures that can cause injuries and musculoskeletal disorders are shown.

Fig. 1. Some of the body physical status of workers during work in the manufacturing departments of Iran Khodro Manufacturing Co.

Studies have shown that the prevalence rate of musculoskeletal disorders varies among different occupations. A study by Smith et al. On nurses at the Shizazaohang hospitalal in China showed that the rate of muscular skeletal problems were 70% (Smith et al, 2004). A study conducted by Neg in India in spring 2010 on women weavers showed that the prevalence rate of musculoskeletal disorders in this community was 79% (Neg et al, 2010). The results of a study among computer users in Germany reported the prevalence rate of musculoskeletal diseases as 62% (Spallek et al., 2010). In the study of workers in the sugar factory in Shiraz, the highest incidence of pain symptoms was observed in the waist (54.3%) and shoulder (48.3%) (Mostaghaci et al., 2010).

The manufacturing process in the manufacturing industry requires various work activities. From the human engineering principles point of view, workers are at risk for musculoskeletal disorders. Work in the manufacturing sectors is difficult and difficult to maintain. While in cutting parts, the cutting line constantly requires duplicating movements. The purpose of this study was to evaluate the incidence of musculoskeletal disorders among workers performing various activities in the industry.

Methods and Materials

This descriptive-analytical research was carried out on 50 employees of the Iran Khodro manufacturing unit located in Khorasan Razavi in 1396. In the studied factory, various occupational groups were studied, including saloon workers, assemblies, quality control, cutting lines, and component manufacturing workers with a 95% confidence interval and a percentage error (d) of 0.01 using the following formula.

$$n = \frac{N \times \sigma^2 \times Z^2_{1-\frac{\alpha}{2}}}{(N-1) \times d^2 + \sigma^2 \times Z^2_{1-\frac{\alpha}{2}}}$$

The sample size was 50. These workers performed 8 hours or more than 10 hours a day with a high speed. They were required to produce different parts at the end of their working hours.

In this study, Nordic questionnaire was used to determine the symptoms of musculoskeletal disorders. Kurinka and his colleagues at the Scandinavian Institute of Occupational Health designed the Nordic questionnaire in 1987.

Before distributing the questionnaire, the questionnaire and the method of implementation were explained to the participants. The Nordic script consists of two parts: the first part targets participants' demographic information including age, work experience, education, smoking, and activity type. The second part analyzes the symptoms of pain in specific areas such as the waist, neck, shoulder, wrist, ankle, knee, elbow, hip, hip, and upper back. This questionnaire can also be used to measure the results of epidemiological studies in the field. Musculoskeletal disorders may be used, but they cannot be used for clinical diagnosis.

The Rapid Upper Limb Assessment (RULA) method was then used to evaluate the incidence of musculoskeletal disorders in the upper extremities. Mc Atramni and Kourlet invented RULA in 1993 to assess people according to their postures, muscles, and activities. RULA is based on the OWAS method

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so that it can be said that RULA is an evolved form of OWAS to assess the risk of musculoskeletal disorders in the upper extremities. The RULA method is sampled using the observation technique from the organs posture and body. In this method, the body organs are divided into Groups A and B, of which A includes the forearm, arm and wrist. The RULA is scored according to certain principles. High scores represent more muscular skeletal pressure.

Results

In this study, the all of studied populations were male. The results of this study showed that 86% of the subjects had pain and discomfort in one of the nine areas. Among 50 people participated in this study, 52.17% were in the age ranges of 30- 40 years old, 39.41% in the age ranges of 40-50 years, and 8.69% in the age range of more than 50 years old. The highest numbers of employees were in the manufacturing (38.9%) and quality control (21.63%) sectors. The largest numbers of employees (54.35%) were busy constantly in standing-permanent resident's condition.

The prevalence rate of musculoskeletal disorders in the last 12 months and 7 days is shown in Table 2, showing that the highest pain among the participants was observed in the waist (58.69%), neck (52.17%), and upper back (34.88%), respectively while the lowest incidence of pain was related to the left wrist area (10.85%). In addition, in the last 7 days, the highest and the lowest prevalence rate of musculoskeletal disorders were reported to be in the waist (50%) and the right elbow region (69.8%), respectively.

All of the participants were placed in the prior levels of corrective actions in Group 2 (90%) and 1 (10%), indicating that work environment of the staff is ergonomically appropriate (Table 3).

Table 1. Demographic information of the studied population (Iran Khodro dependent personnel, n = 50).

Variable	Condition
Age (year)	
30-40 years old	52.17%
40-50years old	39.41%
Over 50 years old	8.69%
Working hours (hours)	
8hours of work	60.87%
More than10hours	13.39%
Sports activity	
Yes	60.86%
No	39.14%
Job type	
Production	38.90%
Assembly	15.2%
Quality Control	21.63%
Line cutting	10.05%
Plotting	14.21%
Type of activity	
Permanent sitting	36.96%
Standing permanent	8.69%
Standing - permanent resident	54.35%

Table 2. The prevalence rate of musculoskeletal disorders in the last 12 months and 7 days.

Different parts of the body according to Nordic questionnaire	The number of people who have had pain in the last 12 months (%)	The number of people with pain in 7 days (%)
Neck	26 (52.17)	17 (34.78)
Shoulder	20 (41.3)	15 (30.43)
Elbow	15 (32.6)	9 (19.55)
Wrist	20 (41.28)	18 (36.94)
Upper back	17 (34.78)	11 (23.19)
Waist	29 (58.69)	25 (50)
Butterflies	9 (19.56)	8 (17.39)
Knee	11 (23.91)	5 (10.86)
Ankle	13 (26.08)	9 (19.56)

Table 3. Results of the RULA method.

Score	Corrective Action Level	Prioritization of corrective actions	Number	Percent
1-2	1	Posture is acceptable if it has not been repeated for a long time or remains unresponsive.	5	10
3-4	2	There should be more detailed research on the posture and changes are likely to be needed.	45	90
5-6	3	Soon, changes and reforms, as well as more precise research, should take place	0	0
7 or above	4	Rapid changes should be made with more detailed research	0	0

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Discussion

This study showed that the highest and the lowest prevalence of the musculoskeletal disorders among participants in the last 12 months reported in Waist area 29 (58.69) and Butterflies 9 (19.59). In line with our study, in study of Hosseini et al, the highest prevalence of musculoskeletal disorders in the manufacturing workers reported in areas of the Wrist more than 80 %. In return, in study of October and et al, The lowest incidence was attributed to shoulder pain. (Ismail et al. 2009). Aghilinezhad's study in conducted on 1438 fold workers in Tehran in 2011 showed that the prevalence of pain symptoms was in the waist (63.8%) and neck (39.7%). The prevalence rate of musculoskeletal disorders reported in the last 12 months in different organs shows that the highest prevalence was in the lumbar region (Mirmohamadi et al, 2004; Mehrparvar et al, 2011). In a study by volunteers and colleagues who were involved in the automotive parts industry, 70.2% of the subjects had pain and discomfort in at least one area in the past 12 months. According to RULA in the present study, about 50% of the participants received score 7. In a similar study 38.6% of employees received score 7 (36.16 %,), 5 (36.17%), and 6 (17.02) respectively (Azizi et al 2013). In a study conducted on workers in a car manufacturing industry, it was shown that 81.2% of the study population had pain and discomfort in one of the nine areas of the body during the past year. Due the body's inappropriate condition; bending and twisting of the waist, hands, and wrists; repetitive movements; inappropriate height; the use of workers during the labor In this study, the highest incidence of musculoskeletal disorders was also reported in the lumbar region, the results of which are consistent with the present study. (Barkhordar et al 2012).

In general, in this study, it was observed that most of the tasks were conducted with cervical and lumbar bending. In this industry, the tasks were such that workers had to stand or sit for more than 30 minutes continuously, and since the workstations were irregular, short and tall workers were forced to use the same station, and this seems to be the cause of inappropriate conditions in the neck, shoulders, and wrists of workers.

Conclusion

Considering the nature of work in the component industry and many other industries in which the direct involvement of the worker in the production process is inevitable, and performing physical activities such as lifting and moving materials, doing repetitive work, and performing work in adverse postures is common. Considering the high prevalence of musculoskeletal disorders in some industrial occupations, it is necessary to address ergonomic issues by optimizing work stations and using mechanical methods for lifting and moving loads; designing work stations as standing, sitting, sloping workstations; designing and manufacturing the front of the production line presses and seats with short bases for working with press; contracting with gyms as overtime; using heel shoes; designing and constructing ergonomic chairs; establishing suitable work/rest cycles according to the work process in the occupational groups; planning and implementing ergonomic training courses with emphasis on lifting and carrying loads, reducing weight; improving load lifting conditions and ergonomic training. Observing ergonomic issues in load lifting is one of the most effective advices in this field that should be applied in this industry.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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Author contribution

FAB, SB and ADM: Study design and importation, data collection and analysis.

ZHS: Study implementation and data collection/ analysis.

AAA: Study implementation and data collection/ analysis.

All authors provided the first draft of the manuscript and confirmed it.

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