PREVALENCE AND RISK FACTORS OF MUSCULOSKELETAL DISORDERS AMONG WORKERS OF THE ASSEMBLE PARTS OF THE FACTORY BATTERY

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Abstract: Introduction: Musculoskeletal disorders are the most common occupational injuries and constitute a huge global health problem with substantial economic and human cost as well as negative impact on the quality of life. The aim of this study was to determine the prevalence of musculoskeletal disorders among the workers of the montage part of a factory.
Materials and methods: In this descriptive cross-sectional study performed in 2013, 138 workers aged between 20 and 46 years from the montage part of a battery construction company filled out the NORDIC questionnaire. Also, for the assessing physical posture during work RULA method were applied and filled out by researcher.
Results: Our results show that the majority of the recruited population suffer from upper back (%30.4) and neck pain (%26.1) and lower back pain(%18.1) then by knee pain (%11.6) respectively. Also results of RULA method analyzing showed that risk level score for 31.2, 53.1 and 15.6% of all postures were 4, 3 and 2 respectively.
Conclusions: The prevalence of MSDs in the worker was high. Most of postures are needed to be corrected because of high score in RULA method.

Keywords: Musculoskeletal Disorders؛ Prevalence؛ Battery industry؛ NORDICK questionnaire ؛RULA

1. INTRODUCTION

Musculoskeletal Disorders (MSDs) are defined as an injury or disorder to nerves or organs, tendons and joints, cartilage and between vertebra disks.[1]. MSDs are among common reasons of work-related injuries and disability in industrial and specially, developing countries [2-3 & 4] when these disorders happen because of job or the persons job has a role in it, they are called work-related Musculoskeletal Disorders; however, in general MSDS are multi-reason disorders. [5,6,10,11].

According to the estimation of international job organization, MSDs have the highest contribution in economical loss (40%) among other injuries and work related diseases. [7]

There are a lot of factors for MSDs, but one of the most important factors of MSDS, is awkward postures. Correcting these postures reduces MSDs. Studies a bout the effect of unsuitable postures and appearance of MSDs have shown that awkward postures are among the most important factors in MSDs. [8,9]

Accordingly, MSDs are of great importance in occurrence of MSDs in work environments, with which Ergonomists around the world encounter. [12]
These MSDs start with feeling of boredom and pain and goes on towards the severity of problem. Restriction in moving organs, and reduction of muscle powers are among symptoms of this disorder. [13]

II. STATEMENT OF PROBLEM AND PURPOSE OF STUDY

Each job has its own dangers and risk factors, the battery production industry is not an exception of this rule, and the employees in this industry are subject to MSDs. In this industry, there are a lot of risk factors which can lead to MSDs including static body condition for long hours, repetitive movements tolerating force and carrying load. The occurrence of MSDs in this situation is most likely to happen. According to the above and considering the importance of health of workers in this industry and similar industries, this study was conducted to investigate the symptoms of MSDs among the workers of battery assembly section and finally to use these results in prevention of musculoskeletal injuries.

III. METHODOLOGY

Participants:
The present research was a cross-sectional, descriptive, analytical and quasi-experimental study. The participants were 138 workers who were working at battery production manufacture, ranging between 21 to 46 years old. They were chosen randomly.
The participants were the workers of battery industry, the workers of assembly-line, the workers with at least one year of experience in this job who had diploma (to fill in checklists and questionnaires) and those who consented to take part in this study. All of the participants were ensured about the confidentiality of the data; they all signed a consent

form. The criteria of dropping out of this study was the existence of unrelated musculoskeletal problems which were not caused by their jobs, being higher than 50 in age, and having disorders due to accidents. At the onset of the study, the purpose of this study was explained to the participants and they were given the questionnaire about demographic information.

Research instruments:

The instruments included

a) Nordick Questionnaire to determine the amount of MSD symptoms.
b) RULA method to assess postures.

Nordick standard questionnaire (NMQ): In order to determine the amount of musculoskeletal disorders, a questionnaire developed by korinka et.al. in 1987 in professional health institute in Scandinavia was used. This questionnaire is known as Nordic questionnaire. [14]: This questionnaire had two sections. In the first part demographic information about age, height, level of education, marital status, regular exercise using narcotics, experiencing injuries and left-handed or right handedness the second part contained information to identify the amount of MSD in different organs of body. This section had questions about pain in different organs during the last 12 months, 7 last days and questions about whether pain in last 12 months had prevented them to go to work or not. [15-16]

In order to assess the danger of occurrence of musculoskeletal problems and according to the classification of jobs and the static or dynamic nature of work condition, the RULA method was used. RULA is a paper-pen observation which has a guideline. This method is among the best methods of quick assessment of the danger of musculoskeletal disorders in upper organs of body especially in static work conditions. The guideline form will be completed according to the body posture while working. In this method numbers or letters are used for coding and scoring of body organs like neck, back, shoulder, elbow, wrist, thigh, knee and ankle. The gained score shows the level of risk. [18]

The gathered data were coded in the SPSS software (statistical package for social sciences) version 21.

IV. RESULTS AND FINDINGS

The results of the Nordick questionnaire showed that MSDs are common in upper parts of back, neck and knee. The results of RULA in the assembly department showed that among the 12 assessed postures, 16.66% of them were ranked as second, 58.33% as third and 25% as fourth.

a) Demographic features: Table 1 shows the demographic features of the workers working at the assembly department. As it can be seen, the mean score of the male participants' age was 29 years, that is young people with a mean amount of 5.5 working experience.

Diagram 1: Demographic information of the participants

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Standard deviation	Max	Min	Mean	Variable
4.64	46	21	29.43	age
12.89	160	52	75.7	Weight (kg)
5.95	190	162	176.7	Height (cm)
	216	0	66	Working experience (month)

b) The amount of MSDS: This amount is shown in diagrams 2,3 and 4. As it is clear, in diagram 2 the disorders which the workers of assembly line have experienced during last 12 months are depicted. These include feeling pain and discomfort. The upper part of back, neck, the lower part of back and knee had the highest range of MSDS. In diagram 3 the MSDs which had prevented the workers to go to work during last 12 months are shown. Right knee and neck had the highest range in this regard. Diagram 4 shows MSDs among the workers of assembly department during the last 7 days. Again the highest amount belonged to right knee, thigh joint and left knee similarly ranked the next.

Diagram 2: The amount of MSDS in the form of pain, senselessness and discomfort during the last 12 months among the workers at assembly line.

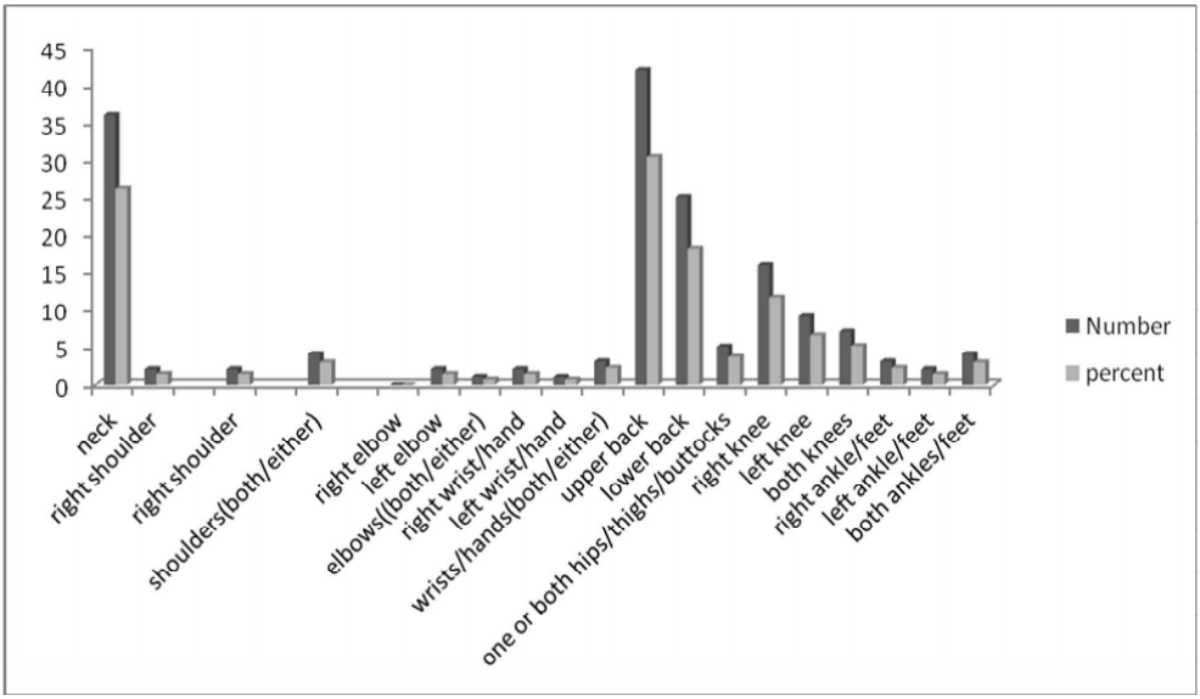


Diagram 3: The amount of MSDS in a way that blocked daily life during the last 12 months.

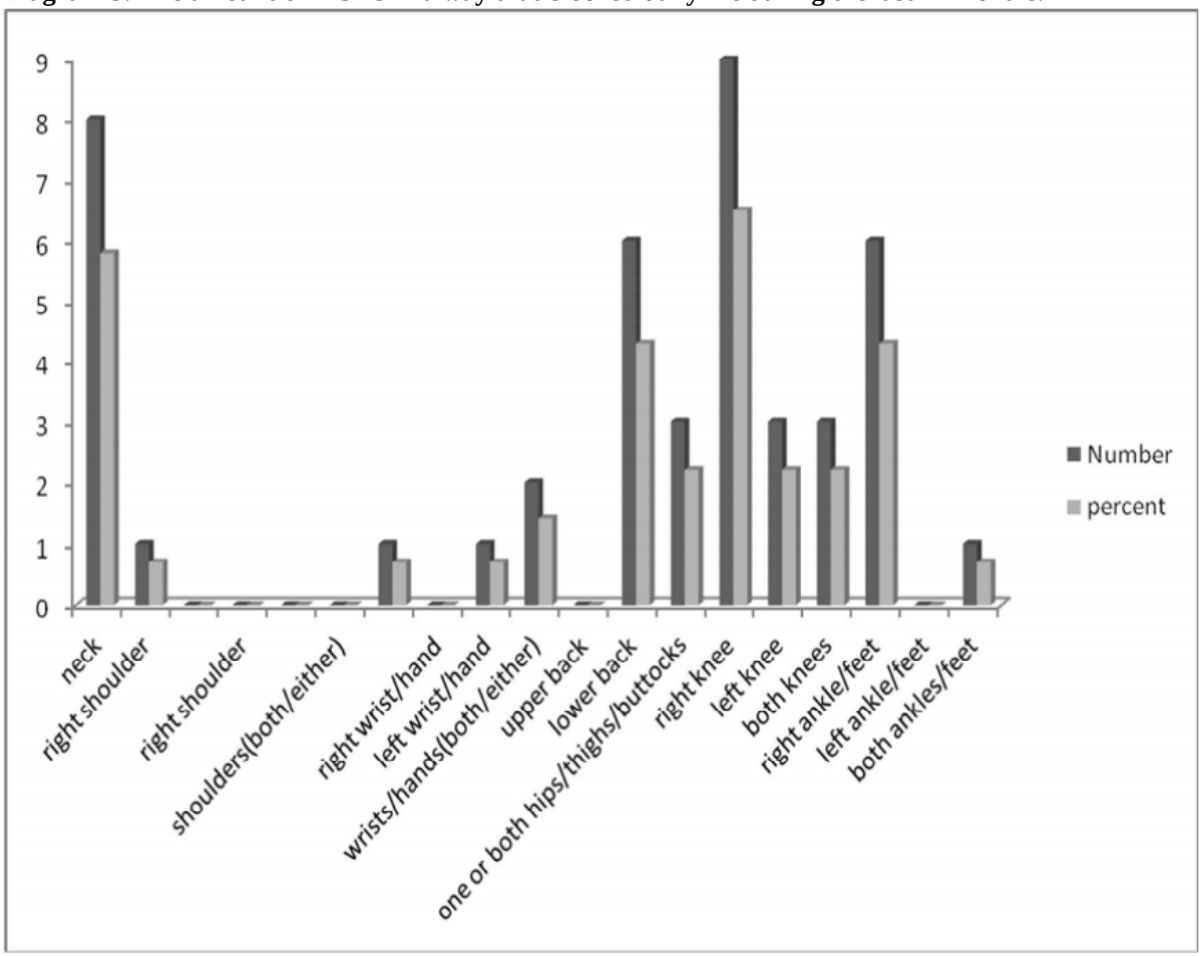
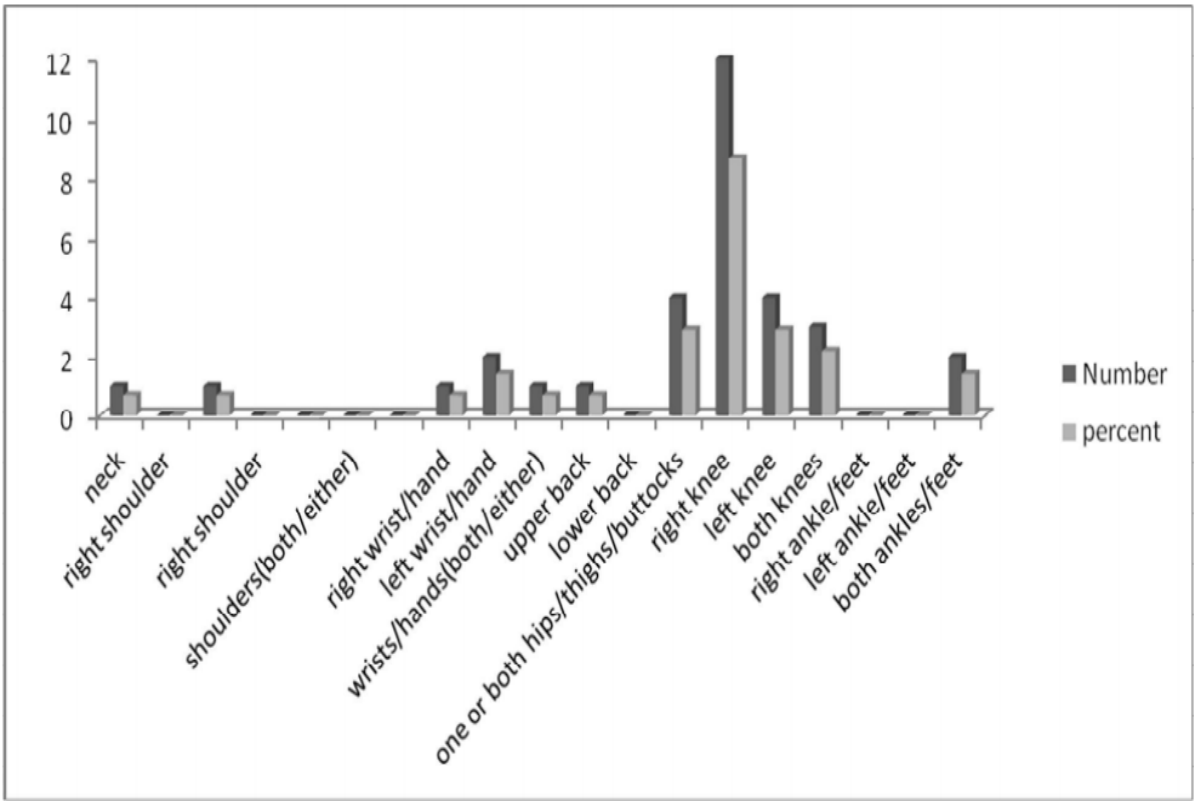
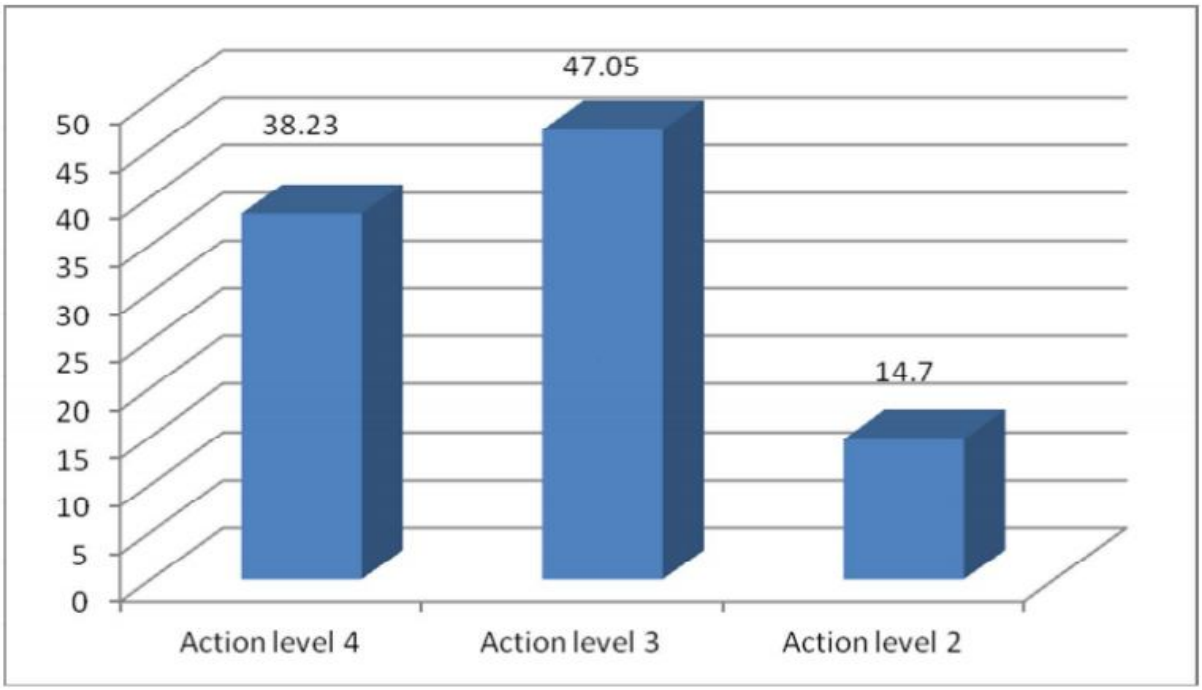


Diagram 4: The amount of MSDS in the form of any problem during the last 7 days among the workers of assembly line



In table 2, the results of assessing the risk of MSDs of assembly line are shown using the RULA method. As it is clear, there is a need for quick correction in some activities such as putting plates on benches, pulling the metal palette which had plates using hand lift-truck and moving battery from the conveyor to the palette jack.

Diagram 5: The results of assessing postures of assembly line workers using RULA method



The reason for this problem may be awkward posture, carrying loads with hand, and working in a standing position during work-hours, which is seen in many work stations. This means removing the risk factors of these disorders can improve the working situation and prevent these disorders. Any kind of preventive program should focus on controlling risk factors of these organs. According to the assessments, the

following suggestions are offered to prevent the mentioned disorders:

1) Lowering the weight of hand-loads
2) Using mechanical methods to carry loads
3) Planning and executing Ergonomics courses with a focus on suitable working condition
4) Using Ergonomics seats at work
5) Providing the work-rest cycle according to the process and volume of work.

CONCLUSION

The results of RULA assessment showed that there is the potential of MSDS for the workers of assembly line. There fore, applying Ergonomics in the mentioned jobs is necessary and preventive program should focus on controlling risk-factors.

REFERENCES

[1]. Bureau of Labor Statistics, Department of Labor, U.S. Non-fatal occupational injuries and illnesses requiring days away from work. 2008. Available From: URL:http://www.bls.gov/news.release/pdf/osh2.pdf.

[2]. Choobineh, A.R. Tabatabaee, S. Behzadi, M.Musculoskeletal problems among workers of an Iranian sugar- producing factory. International Journal of Occupational Safety and Ergonomics (JOSE).2009; 15(4):419–27.

[3]. Choobineh A.R, Hosseini M, Lahmi M, Khani Jazani R, Shahnavaz H. Musculoskeletal problems In Iranian hand–woven carpet industry: Guidelines for workstation design. Applied Ergonomics. 2007;38:617–24.

[4]. Choobineh A.R, Tabatabaee S, Tozihian M,Ghadami F. Musculoskeletal problems among workers of an Iranian communication company.Indian Journal of Occupational and Environmental Medicine. 2007; 11(1):32–36.

[5]. Choobineh A, Tabatabaei SH, Tozihian M, Ghadami F. Musculoskeletal problems among workers of an Iranian communication company. Indian J Occup Environ Med. 2007; 11(1): 32-6.

[6]. Polanyi MFD, Cole DC, Beaton DE, Chung J, Wells R, Abdolell M, et al. Upper limb work-related musculoskeletal disorders among newspaper employers: Cross-sectional survey results. American Journal of Industrial Medicine. 1997; 32: 620-8.

[7]. Takala J, Niu S. Responses to the equity challenge in safety and health at work: improvement of working conditions in equitable bases, in 27th International Congress on Occupational Health 2003: Brazil.

[8]. Punnett L, Wegman DH. Work-related musculoskeletaldisorders: the epidemiologic evidence and the debate. Journal of Electromyography and Kinesiology. 2004;14:13-23.

[9]. Karwowski W, Marras WS. The occupational ergonomicshandbook: CRC Press; 1999.

[10]. Choobineh AR. Posture assessment methods in Occupational ergonomic. Hamedan: Fanavaran; 1383. [Persian]

[11]. Dillaton C, Sanders M. Diagnosis of work-related musculoskeletal disorders In:Krawowski W: International Encyclopedia of Ergonomics and Human Factors. London & NewYork: Taylor & Francis; 2001.

[12]. Genaidy AM, AL-Shedi A. and karwowski W.Postural stress analysis in industrial. Applied ergonomics, 1994; 25(2):77-87.

[13]. Hagberg M., Morgenstern H., Kelsh M. Impact of occupations and job tasks on the prevalence of carpal tunnel syndrome. Scand J Work Environ Health.1992; 18(6):337-45.

[14]. Korinka I, Jonsson B, Kilbom A, et al.Standardized nordic questionnaires for theanalysis of musculoskeletal symptoms. Applied Ergonomics, 1987; 25(2):77-87.

[15]. Choobineh A. The methods of posture analyses in jobergonomics. First ed. Hamadan: Fanavaran; 2004.[Persian]

[16]. Sadeghi Naeini H, Habibi E. The survey of relationshipbetween MSDs with Anthropometric indices in Isfahan Bus Company Drivers. Iran Occupational Health. 2009;6:6-14.

[17]. McAtamney L, Corlett EN. RULA: A survey method for the investigation of work-related upper limb disorders. Appl Ergon. 1993;24:91-9.

[18]. McAtamney L, Corlett E, Rula N. A survey method for the investigation of work-related upper limb disorders. Applied Ergonomics, 1993;24(2):91-9.

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