Evaluation of Musculoskeletal Disorders in Household Appliances Manufacturing Company

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ABSTRACT

Work-related musculoskeletal disorders are the most prevalent work-related disorders and injuries and being the main cause of disability. This study was conducted to assessment of the prevalence of musculoskeletal disorders in worker company household appliances production. Posture analysis was evaluated by OWAS method and prevalence of musculoskeletal disorders by Nordic questionnaire. With evaluating musculoskeletal disorders among company household appliances production can intervention action to reduce musculoskeletal disorders was carried out. This cross-sectional study was performed on 100 workers of the appliance manufacturing industry. These Individuals were included 15 persons from foam injection workshop, 17 persons from molding workshop, 17 operators of presses, 17 persons from packaging, 17 person from cutting unit and 17 operators of rivet. The Nordic questionnaire was completed by Individuals for the organs of arm, back, leg and wrist and Posture analysis was performed by OWAS method. The data were analyzed using Spss software version 18 and descriptive statistics and Anova test. Nordic questionnaire results revealed that highest disorders were observed in the arm (25%), back (22%) and leg (21%). Also Anova test showed that was observed a significant correlation respectively between age and work experience with the prevalence of musculoskeletal disorders ($p<0.02$) ($p<0.01$). The results showed based on the level of risk OWAS for each job respectively, the highest level of risk associated with foam injection unit, packaging and cutting unit (risk level 4) and the lowest level of risk associated with molding workshop unit (risk level 2).The results of this study showed that household appliances Manufacturing workers due to the nature of their jobs are at risk of musculoskeletal disorders and Ergonomic interventions to do such as workstation redesign, reduced working hours, cycle of rest-work development.

Keywords: Musculoskeletal Disorders, Company Household Appliances Production, OWAS Method

INTRODUCTION

Work-related musculoskeletal disorders are the most prevalent work-related disorders and injuries and being the main cause of disability. Despite increasing of mechanization, many occupational activities and work tasks are done by workers which can lead to musculoskeletal disorders. It is the main cause of absence from the work, loss of working hours [1, 2]. based on the analysis of the exposure to musculoskeletal disorders in the EU countries, stated that occurrence of tiring and painful body positions mainly concerns persons within the age of 40-50 and over 62% of employees is exposed for at least 25% of the working time to performance of repeatable motions of arms and hands [3] Musculoskeletal disorders, muscle disorders, tendons, peripheral nerves, joints, bones, ligaments and blood vessels are the result of repetitive motion, unsuitable posture and over exertion forces occur over time or are a result of the immediate or stroke acute [4]. Musculoskeletal disorders (MSDs) are an important public health problem in both developed and developing countries, with substantial impact on quality of life and a substantial economic burden in compensation costs, lost wages and productivity [5] Descriptive studies on MSDs among industrial populations have focused on workers that experience chronic pain and are on long-term paid sick leave due to temporary or permanent disability. Increasing knowledge about active workers who exhibit MSDs symptoms provide the opportunity to assess potential risk factors and to implement control measures. [6] Etemadinezhad *et al.* in a study investigated the prevalence of musculoskeletal disorders by method OWAS among Workers Tobacco Factory have concluded the highest prevalence of musculoskeletal disorders was in the region back and shoulder [7] Musculoskeletal disorders associated with work usually causes involvement back, neck, leg and upper extremities. These disorders are the most common occupational

diseases and injuries and they are the major causes of disabilities in the workers. Morken *et al.* in a cross sectional study investigated the prevalence of musculoskeletal disorders and its relationship with the physical activities in the work time and break in the staff of the Royal Navy in Norway. Based on the obtained results, the most prevalent muscular disorder is back pain with the prevalence of 15%, shoulder with the prevalence of more than 12% and the neck with the prevalence of more than 11% [8, 9] Musculoskeletal Disorders (MSDs) that lead to important health problems and the depletion of social resources are the most common drawbacks affecting the working population [10] Robert *et al.*, in a study investigated the musculoskeletal disorders among the plastic plant staff. The results indicated that 28.4% of the employees need to change in the situation of body and revise workstation for preventing of appearing the musculoskeletal disorders as soon as possible or immediately [4] OWAS (Ovako Working Posture Analyzing System) method which was designed by Finish occupational health and safety in 1992 and is used for assess posture in workplaces [11] Occupational risk factors are high in household appliances Manufacturing Company and the aim of the present study was to Evaluation of musculoskeletal disorders by OWAS method and Nordic questionnaire in company household appliances production.

MATERIALS AND METHODS

This cross-sectional study was performed on 100 workers of company household appliances production. The study population was included, 15 persons from foam injection workshop, 17 persons from molding workshop, 17 operators of press, 17 persons from packaging, 17 person from cutting unit and 17 operator of rivet. Inclusion criteria were at least one year of experience working. Also Exclusion criteria were unwillingness to cooperate in completing the questionnaire. Data collection tools were standard questionnaire NMQ (Standard Nordic questionnaires).This questionnaire is useful for assessing musculoskeletal problems in epidemiological studies [12] and OWAS method [11]. Beginning Nordic questionnaire to determine the prevalence of musculoskeletal disorders in during the past 12 months was completed and then demographic variables of age, height and experience work were recorded and finally Posture analysis performs by OWAS method. The Nordic questionnaire was completed by persons for the organs of arm, back, leg and wrist and was recorded. OWAS method is a method observation that can identify ergonomic risk factors arms, back, leg and force exertion and has good reliability for the assessment of musculoskeletal disorders. Final score OWAS is between 1 to 4(no injury=1 risk level, probably injury=2 risk level, injury =3 risk level and high injury in 4 risk level). Data analysis was done with SPSS (version 18) and descriptive statistics and Anova test. Also the value of $P<0.05$ was considered statistically significant. This study was performed after getting permission from the Ethic Committee in Medicine.

RESULTS

The study was carried out on 100 workers. Highest and lowest age participants in this study were between 45 and 26 years. Demographic characteristics age and experience work is given in Table 1.

Table 1: Demographic characteristics age, Height (cm) and experience work

Variable	mean (SD)	Minimum-Maximum
Age	34.7(6.4)	26-45
Experience work	9.8(4.1)	11-1
Height(cm)	179(5.3)	170-184

In Table 2, the prevalence of musculoskeletal disorders in different organs by the Nordic questionnaire showed given in the last 12 months. According to the Table 2, most of musculoskeletal disorders are respectively in the arm (25 percent) in Operator press, back (22 percent) in cutting unit, leg (21 percent) in foam injection and wrist (20 percent) in packaging.

Also ANOVA test showed a significant relationship between the obtained score from OWAS method with experience work and age. So that musculoskeletal disorders of prevalence and OWAS risk level increased with increasing experience work ($p<0.01$) and age ($p<0.02$) variables. Score obtained from OWAS method and percent obtained from Nordic questionnaire showed that workers company household appliances productions are at high risk of musculoskeletal disorders.

Force exertion rate for any job showed of in Table 3. Force less than 10kg with code 1, force 10 to 20kg with code 2, force more than 20kg with code 3 in Table 3 is shown.

he results showed based on the level of risk OWAS for each job respectively, the highest level of risk associated cutting unit (risk level 4) and the lowest level of risk associated with molding workshop unit (risk level 2) in Table 4 is shown.

Table 2: Prevalence of musculoskeletal disorders in different organ arm, back and leg by the Nordic questionnaire in the last 12 month

Variable	Foam injection	Molding workshop	Operator press	Packaging	Cutting unit	Operator rivets
Arm	16%	13%	25%	18%	17%	11%
Back	14%	15%	11%	18%	22%	19%
Leg	21%	19%	6%	13%	21%	20%
Wrist	16%	18%	14%	20%	18%	14%

Table 3: Force exertion rate in any job

Job	Risk level
Foam injection	**3**
Molding workshop	**2**
Operator press	**1**
Packaging	**3**
Cutting unit	**3**
Operator rivet	**1**

Table 4: Final score OWAS risk level in any job

Job	Risk level	Percent
Foam injection	4	**12**
Molding workshop	2	**15**
Operator press	3	**10.3**
Packaging	4	**21**
Cutting unit	4	**22.1**
Operator rivet	3	**19.6**

Foam injection unit and press unit were shown in Fig. 1.

Fig. 1: A) foam injection unit and B) press unit

DISCUSSION

This study revealed that the prevalence of musculoskeletal disorders among workers is high. According to the results of the questionnaire Nordic highest prevalence of musculoskeletal disorders was in region arm (25 percent), back (22 percent) and leg (21 percent). Also, The results showed based the level of risk OWAS for each job respectively, the highest level of risk associated foam injection unit, packaging and cutting unit (risk level 4) and the lowest level of risk associated foam molding unit (risk level 2).According to Table 2 highest prevalence of musculoskeletal disorders was in arm (25%), back (22%) and leg (21%). Mostaghasi *et al.* in a study investigated the prevalence of musculoskeletal disorders on the 70 workers produce

company in 2011, showed result the prevalence of musculoskeletal disorders was back (12.8%), leg (8.7%) and arm (7.8%) were the most prevalent regions, and this finding is consistent with the findings of the present study [13] Faramarzi *et al.* in 2011 investigated the prevalence of musculoskeletal disorders by OWAS method, concluded that most of the posture risk level 2 and 4 [14]. In the study of KamaliNia *et al* that to investigated the prevalence of musculoskeletal disorders in telecommunication factories in Shiraz, the most prevalent was in back region with the prevalence of 67.9%, [15] Holmstrom *et al.* studied the evaluation of musculoskeletal disorders in the produce industry concluded between age and musculoskeletal disorders increases musculoskeletal disorders there is a significant correlation [16]. Boschman *et al.* that studied to assess musculoskeletal disorders in the manufacturing industry, concluded individual complaints of musculoskeletal disorders in organs wrist, arm and back was higher than other parts of the body [17]. Gilkey *et al.* that studied to evaluate musculoskeletal disorders in the carpenters by OWAS method, concluded the highest prevalence of musculoskeletal disorders was in the back and arm, which confirms the findings of the present study [18] Brown *et al.* that pay to evaluate musculoskeletal disorders by QEC method in small industries, show to result that most of musculoskeletal disorders was in the back and arm [19]. Hsien *et al*. that pay to analysis of Working Postures by OWAS Method concluded the highest prevalence of musculoskeletal disorders respectively was in the arm, back and leg [20]. Brandl *et al.* in a study investigated the analysis of working postures with OWAS in production of trailers company, showed result the prevalence of musculoskeletal disorders was back (62.7%) [21]. Choobineh *et al.* in 2013 investigated Musculo-skeletal injuries in a Generator Manufacturing Company, concluded that most the most prevalent was in neck and back region respectively with the prevalence of 67.9 percent and 47.2 percent [22].

CONCLUSION

The result of the study showed that the prevalence of MSDs among in company household appliances production is high and Ergonomic interventions such as workstation redesign, reduced working hours, cycle of rest-work development. Also The most important reason for the high prevalence of musculoskeletal disorders in a rivet unit and packaging can be undesirable postures neck, shoulder and wrist, hand and apply excessive force and using non-ergonomic tools.

ETHICAL ISSUES

Ethical issues such as plagiarism have been observed by the authors.

COMPETING INTERESTS

Authors declare that there is not any competing interest.

AUTHORS'CONTRIBUTIONS

Ghanbary Sartang and abbaspour were designer and conducted the study. professor Habibi was Corresponding author and advisor the study.

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