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Risk Assessment of MusculoSkeletal Disorders among workers of a housekeeping service company in Kerman, Iran.

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ABSTRACT

Aim: Ergonomic risk factors play an important role in prevalence of Work-related MusculoSkeletal Disorders (WMSDs). Due to housewives' different tasks at home, they seem to be exposed to different safety and health risk factors. The aim of the present study is assessment of risk and WMSDs prevalence in housekeeping job.

Method and Materials: In this study, first, the task and subtask of housekeeping job were analyzed by Hierarchical Task Analysis (HTA) method. Then the postures of 100 housewives were assessed by Rapid Entire Body Assessment (REBA) method and finally, the prevalence of WMSDs was investigated using the Nordic Questionnaire (NQ).

Findings: The REBA score for housewives in three tasks of dusting (worst posture), hovering and floor squeegeeing (longest posture) was 8 (high), 2, and 2 (low), respectively. The highest prevalence of WMSDs was reported in the lower back and neck. Significant relationship was observed between Low Back Pain (LBP) and stand-sit activity.

Conclusion: This study showed high prevalence of WMSDs symptoms in study population, especially in their lower back and neck. In addition, it was indicated that the working conditions of housewives need to be improved. It is recommended to train individuals to identify ergonomic risk factors and use proper ergonomic principles and procedures to prevent WRMSDs in housework.

Keywords: Housekeeping, Work-related MusculoSkeletal Disorders, Rapid Entire Body Assessment, Nordic Questionnaire, Hierarchical Task Analysis.

Introduction

Work-related MusculoSkeletal Disorders (WMSDs) are among the biggest occupational health problems in industrialized and developing countries [1]. According to research, despite the increasing of mechanized and automated processes, WMSDs are the main cause of lost work time, increased costs, and labor injuries [2], and it is one of the most important issues facing ergonomists around the world [3]. According to research, forty percent of employees' compensation is related to the WMSDs [1]. According to the international labour organization (ILO) about 160 million work-related diseases occur each year, of which WMSDs form a major part of it [4]. According to the national institute for occupational safety and health (NIOSH), work-related musculoskeletal disorders are the second most national importance diseases - in terms of prevalence, severity, and prevention- after occupational respiratory diseases [5]. Studies have shown that more than half of absences in the workplace are due to WMSDs [6]. Musculoskeletal disorders economically are so costly. In terms of prevalence, pain and suffering, these disorders are ranked first, which among of them, back pain is in the first rank [7].

In the Scandinavia countries, the cost of such disorders is estimated at 3 to 5 percent of Gross Domestic Product (GDP) [8]. WMSDs are one of the most common causes of disability

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and work-related injuries [9, 10]. By definition, musculoskeletal disorders are the muscles, tendons, peripheral nerves, joints, bones, ligaments, and blood vessels disorders that either result from repetitive stress over time or result from an immediate or acute trauma [1]. These disorders occur as a result of the cumulative destruction of musculoskeletal tissues during months and years of exposure to workplace biomechanical and psychosocial stressors [1]. Work Musculoskeletal Disorders occur in the spine, upper and lower limbs [11]. These disorders may occur gradually over a long period of time due to long-term exposure to the causative agents, or they may occur suddenly due to a large impact on a part of the musculoskeletal system. When workplace and work environment contribute to the prevalence of them, musculoskeletal disorders are considered WMSDs [12]. One of the most important factors in the occurrence of these multi factorial injuries is the body poor posture (undesirable posture) at work [1]. Working in inappropriate work situations, sitting or standing for long periods of time, lifting and moving objects repeatedly, and exerting excessive force are other causes of these disorders [13]. These risk factors are exacerbated by some organizational characteristics such as improper work rest cycle, working at high speed, long duration of work, unfamiliar tasks and lack of variety in work [14].

Around the world, many people and workforce are exposed to WMSDs caused by adverse posture [13-19]. One of these groups are housewives who suffer from long-term problems due to their poor ergonomic condition at work. Housewives face many ergonomic risk factors while on duty, one of the most important of which is ergonomic risk factors such as improper posture [20]. Hachesu et al. conducted a study on cleaners. The results showed that the highest prevalence was related to the waist, ankle and knee, respectively. There was no significant difference between the mean of age and work experience of people with musculoskeletal disorders compared with people without musculoskeletal disorders. The REBA posture assessment showed that many employees were in poor body posture while on duty [21]. In another study, Jafari Nodoushan et al. conducted a study on WMSDs and related factors on housewives. The results showed that the most prevalent musculoskeletal disorders in the housewives were in the lumbar, knee, and neck respectively. The prevalence of WMSDs in some areas of the body increased because of an increase in the number of children, declining in welfare, and the use of assistive devices at home [22]. A researcher conducted a study on Vietnamese housewives. In this study, a number of housewives in Vietnam were studied to assess WMSDs. The results showed that the elbows and wrists are the most used organs in all housekeeping activities. It was found out that all individuals suffered from neck and back pain [23].

Because poor posture at work is one of the most important risk factors for musculoskeletal disorders, in many methods of assessing the risk of WMSDs, postural analysis is considered as the basis of the assessment [21]. Among the postural analysis methods, REBA method can be mentioned, which allows the assessment of a wide range of risk factors for musculoskeletal disorders. Hierarchical Task Analysis (HTA) in ergonomics is used to identify ergonomic problems in each tasks in the workplace. The aim of the HTA is to identify the various activities and subtask that form the job [24]. Since the ergonomic condition of housewives has not been extensively studied in their tasks and subtasks, in this study, the physical postures of housewives were investigated by observational method using REBA technique. Also, the prevalence

of musculoskeletal symptoms was assessed using the NQ. The aim of this study was to assess the risk of WMSDs in housewives in Kerman province.

Method and Materials

The present study is a descriptive study that was performed on workers of a service company in Kerman province, Iran. There were 100 workers whose who were working in a service company and so all their housewives were studied.

Data collection tools in this study were NQ and REBA. First, according to the questions, HTA analysis was performed for their job duties. The purpose of the HTA was to identify the various activities and tasks that made up the job. HTA specifies the hierarchy of operations required to achieve the goal. HTA breaks down the job task into a set of goals, operations, and plans. It is at the top of the plan pyramid and each plan is divided into a set of goals, and finally a set of operations that must be performed to reach the goal [24, 25]. Based on the HTA, in this study, most of the housewives confirmed that the task of dusting caused them to take the worst physical posture and hoovering and floor squeegeeing task had the longest period posture. In this study, REBA method was used to determine the level of risk of the worst job posture. The REBA method is an accepted method that is used due to its' ease of use, analysis of a wide range of different postures, high sensitivity, reliability and validity [26]. In the REBA method, the organs of the body are classified into two groups, A and B. Group A includes the trunk, neck, and legs, creating a combined 60 postures, and group B includes the arms, forearms, and wrists, which create a combined 36 postures. The method of scoring the postures of each group and their combined effect is done using the relevant tables. The point for applying force is added to the combined score of group A and the score for coupling of the hand with the load is added to the combined score of group B. Finally, using the relevant table, the scores A and B are combined and the score C is determined, then the activity score obtained from another Table is added to the C score to obtain the final score. Then the level of risk and priority of corrective actions are determined. For these housewives, the task of dusting, which was the worst posture, and the task of hoovering and floor squeegeeing, which was the longest period posture, were chosen. Mentioned postures were assessed to determine the level of risk. Finally, in this study, the NQ was used to determine the prevalence of WMSDs among housewives [27]. This questionnaire includes demographic factors such as age, sex, weight, height, right or left hand, and the prevalence of MSDs in 9 areas of the body, including the neck, shoulders, elbows, wrists, back, waist, Hips and thighs, knees and the ankle. This questionnaire was completed by the housewives. First the study's goals were fully explained to the individuals and then the questionnaires were completed with the individuals' complete satisfaction.

Findings

In this study, 100 housewives who were living in Kerman province were studied. The age range of participants was between 20 and 58 years. About 58% (N=58) of the participants were in the age range of 20 to 35 years, which indicates that the study population were young. About 70% (N=70) of the participants were married and 30% (N=30) were single. Around 64% (N=64) of the participants did not work outside of working hours and 36% (N=36) had working outside of working hours. The type of work activity of the participants was 73% (N=70), 21% (N=21) and 6% (N=6) for both standing/sitting activities, permanent sitting and permanent standing, respectively. About

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79% (N= 79) and 21% (N=21) of participants had daily working hours of 8 and 10 hours or more, respectively. Furthermore, the findings of this study showed just 28% (N=28) of the participants had sports activities. Table 1 shows the highest prevalence of WMSDs in housewives in the last 7 days and 12 months. Table 2 shows the disorders that have forced the participants to rest, reduce their work activities, leaving their workplace during the last 12 months.

According to Table 2, the highest and lowest percent of these disorders were related to the back 31% (N=31) and elbows 2% (N=2), respectively.

Table 3 shows REBA final score, level of risk and priority of correct actions in the worst posture among participants According to this Table, the level of risk and corrective action is specified for the worst and the longest work postures, which were the task of dusting, hoovering and floor squeegeeing, respectively.

According to this Table, people who perform the task of dusting had REBA score of 8 with a high risk level and people who perform the task of hoovering and floor squeegeeing had a REBA score of 2, with lower risk level.

Table 1) Distribution of work related musculoskeletal disorders in different parts of participants' body (N=100)

Different parts of body		Elbow N(%)	Hips and thighs N(%)	Ankle N(%)	Wrist N(%)	Knee N(%)	Upper back N(%)	Shoulder N(%)	Neck N(%)	Lower back N(%)
Musculoskeletal disorders symptoms	Last 12 months	1(1)	5(5)	7(7)	10(10)	11(11)	12(12)	14(14)	18(18)	22(22)
	Last 7 days	1(1)	6(6)	6(6)	7(7)	12(12)	13(13)	15(15)	19(19)	21(21)

Table 2) Distribution of work related musculoskeletal disorders that caused work place leaving or limited activity during last 12 months.

Body member	Elbow N(%)	Hips and thighs N(%)	Ankle N(%)	Wrist N(%)	Knee N(%)	Upper back N(%)	Shoulder N(%)	Neck N(%)	Lower back N(%)
Musculoskeletal disorders symptoms	2(2)	3(3)	4(4)	6(6)	11(11)	11(11)	13(13)	19(19)	31(31)

Table 3) REBA final score, level of risk and priority of corrective actions in the worst posture

Tasks	REBA score	Risk Level	Priority level of corrective action	Necessity of corrective action
Dusting	8	High	3	Necessary (as soon as possible)
Hoovering	2	Low	1	Maybe necessary
Floor squeegeeing	2	Low	1	Maybe necessary

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Discussion

In this study, first, the task and subtask of housekeeping job were analyzed by HTA method. Then the posture of housewives was assessed by REBA method and finally, the prevalence of WMSDs was investigated using the NQ. According to the results of the present study, the highest and lowest prevalence of WMSDs were related to the lower back and elbow areas, respectively. A study conducted by Dshettar et al. The highest prevalence of WMSDs in women was in the lower back [28]. In another study conducted in Ethiopia on people who were in charge of cleaning, the results showed that the most musculoskeletal disorders symptoms were in the lower back [29], and also in the study of Palak Chheda et al. In 2020, the highest prevalence was in the lower back and knees [30]. The results of these three studies were completely agreed with the results of the present study. However, in disagreement with the result of the present study, in 2020 Nabeela Nazish et al. conducted a study on housewives and showed that the highest prevalence is in the shoulder [20]. According to the studies mentioned above, it seems that despite the difference in the prevalence of most disorders in different parts of the body, in general, housewives have more problems about WMSDs in the lower back, knees, and neck than other organs, which shows the importance of the corrective measures in the mentioned organs. Among the causes of musculoskeletal disorders and injuries in the upper and lower parts of housewives , the factors such as cleaning surfaces below waist height in completely adverse postures, inappropriate designs (such as lack of space, working at less than knee height, working at a height higher than the elbow), lack of access to equipment to help move heavy objects, lifting heavy objects alone, applying too much pressure for dewatering the cleaning cloth for cleaning the surface, performing repetitive movements and rotating the waist while performing the tasks were important . As can be seen in the present study, musculoskeletal disorders prevalence is highest in the lower back, which can be due to adverse posture, heavy handling and standing for a long period time in the working shift. This means that paying attention to the risk factors for disorders related to these areas and eliminating them in the workplace can be an effective measure to improve working conditions and prevent these disorders, and any prevention should focus on controlling risk factors related to these areas [21].

In consistent with the results, there was no significant relationship between aging and the prevalence of WMSDs in studied individuals, which has been mentioned in many studies [13, 31]. In this study, there was no significant relationship between increasing work experience and reducing the prevalence of WMSDs, so that, in some cases, younger people showed a higher prevalence of disorders and in others, more experienced people showed a higher prevalence of disorders, but in this case there were contradiction results. However, in some studies it was shown that with increasing work experience, the prevalence of these disorders increases significantly [32, 33]. However, Aminian et al. reported in a study that with increasing work experience, the prevalence of WMSDs decreases among people, which can be attributed to the reduction of occupational stress due to the increased work experience [34]. However, in consistent with these results of the present study, Rezaei et al. stated that no significant difference was observed between the prevalence of WMSDs with age and work experience, this may be due to the fact that most of the samples were young, that the poor body posture at work and other variables have not yet had such an effect

on individuals [21]. Based on the results of REBA postural analysis in this job, the task of dusting in this study, has the highest level of risk. According to the results of the consistent and inconsistent studies, housewives are exposed to many ergonomic risks due to excessive physical activity, which leads to the prevalence of musculoskeletal disorders in the lower back, neck, knees and shoulders, and it is necessary that, this kind of job be studied from an ergonomic point of view to prevent WMSDs. Although in the past, indoor activities were mostly related to women, but today if men have free time, it is better to help their wives with housework activities

1) Always work in neutral postures, 2) keep everything in easy reach, 3) work at proper height, 4) reduce excessive force, 5) reduce excessive motion, 6) for every 45 minutes of work, be sure to rest for 10 minutes, 7) learn how to do it right, 8) before starting work, encourage the housekeepers to wear comfortable shoes, 9) when cleaning the table or any other surface that has a low height, instead of bending and turning your back, do the work in a sitting position so that reduce the distance and eliminate the curvature of the waist, 10) do not buy heavy vacuum cleaners due to reduce the force resulting from lift and move it and reduce stress on the shoulders and back, 11) when buying a vacuum cleaner, pay special attention to the ergonomics of the vacuum cleaner handle, 12) in order to reduce the time of hoovering and easy transportation, use industrial vacuum cleaners, 13) minimize fatigue and static load, 14) to clean the toilet, to reduce curvature and filth spray on the face, use brushes with long handles, 15) minimize pressure points, 16) use long-handled cleaning tools, 17)provide clearance, 18) move, exercise and stretch. Difficult access to individuals, limited numbers of participants and limitations due to covid-19, can be listed as the limitations of the current study.

Conclusion

This study showed an increase in the prevalence of musculoskeletal disorders (WMSDs) in the study population, especially in the lower back and neck areas. In addition, it was indicated that the working conditions of the housewife need to be improved. Training the individuals to identify risk factors and use proper ergonomic principles and procedures is recommended.

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Author Contribution: MJSh analyses and interpret the data. FS reviews the literature and designed the study and wrote the first draft of the manuscript. OA supervised all stages the study. All authors read the manuscript and approved it.

Conflict of Interests: The authors declare that there is no conflict of interest for this study.

Ethical Permission: All principals of ethics were considered in study. Participants were satisfied to be studied This study was approved by Student Research Committee of TMU.

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