
Hamed Yarmohammadi, Mansour Ziaei, Mohsen Poursadeghiyan, Mysam Moradi, Bahram Fathi, Hamed Biglari, Mohammad Hossein Ebrahimi

1Department of Occupational Health, Student research Committee, Kermanshah University of Medical Sciences, Kermanshah, Iran
2Department of Occupational Health, School of Public Health, Shiraz University of Medical Sciences, Shiraz, Iran
3Department of Ergonomics, School of Rehabilitation, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
4Department of Environmental Health Engineering, School of Public Health, Gonabad University of Medical Sciences, Gonabad, Iran
5Occupational and Environmental Health Research Center, Shahroud University of Medical Sciences, Shahroud, Iran

Abstract: Work-related musculoskeletal disorders are the most common ailments and hazards in occupational settings. The purpose of this study was the evaluation and occupational risk assessment of manual load carrying among auto mechanics using KIM Method in Kermanshah City in 2015. This cross-sectional research was conducted on 99 auto mechanics in Kermanshah City. Prior to the study, the prevalence of musculoskeletal disorders was investigated by the nordic body map questionnaire. And occupational risk assessment was studied by applying the Key Indicator Method for Manual Handling Operations (KIM-MHO). The obtained data was later analyzed by SPSS 16.

Key words: Eeronomics risk, KIM, repairman, Posture, MSDs

INTRODUCTION

Work-related Musculoskeletal Disorders (WMSDs) usually constitute one of the major portions of job related ailments. The prevalence of such ailments diminishes the power and quality of work and might increase the medical costs of the workers and increases working days lost (Barkhordari et al., 2011). WMSDs are the principal factors to cause work-related disability (Merlino et al., 2003; Farhadi et al., 2014). According to the report of national institute of occupational health and safety of America: WMSDs have second grade in comparison to other illnesses in terms of importance, frequency and possibility of advance, according to findings from the previous studies 4 million workers are suffering from WMSDs in Europe (Ghasemkhani et al., 2007). The impairments of WMSDs are more connected to the job tasks with more manual load carrying and is one of the important job problem in such a way that 19.1% of job injury due to heavy duties (Habibi et al., 2011). According to the results from the previous research conducted in Iran, the considerable prevalence of WMSDs is mainly associated with the high repetitive motions of manual load carrying tasks (Kivi and Mattila, 1991). Various risk factors are involved in the occurrence of these disorders among which are biomechanical factors such as awkward postures, excessive force, lifting heavy loads, work with repetitive movements, static work and continuous rotation; environmental factors (e.g., temperature), individual factors (e.g., gender, age and BMI) and psychological and organizational factors like high demand for production, little control and lack of social support (Kalte et al., 2014; Eskandari et al., 2011).

Manual load carrying is one of the reasons that redound to the development of WMSDs (Poornajaf et al., 2016). Manual load carrying is a usual work activity. It usually includes lifting, carrying, moving, pushing and pulling and almost always entails manual energy. WMSDs
caused by manual load carrying may lead to physical disorders and imposes stress and strain in girdle, shoulders and arms. Such disorders might then result inconstant and prolonged pain and disability (Mohammadi et al., 2012). They can also affect workers’ operations and cause financial losses for the person who is injured. Very causes of backache is non-specific (Mokhtarinia et al., 2012). Based on the results from the studies in this field, effective application of ergonomic intervention smay diminish the frequency and intensity of impairments (Mohammadi et al., 2012). In general, plenty of work related factors are to cause muscular skeletal disorders but one of the important factors is unsuitable or awkward working postures that should assessed it more details (Mokhtarinia et al., 2012).

Within the previous decade several studies have been conducted on the prevalence of WMSDs and analysis of ergonomic conditions of workers in construction, mine and similar industries, etc., in Iran, yet no such study exists on working conditions of auto mechanics (Rahimifard et al., 2010). The main purpose of this research is then to evaluate the occupational risk factors of manual load carrying by using Key Indicator Method for Manual Handling Operations (KIM-MHO) method on auto mechanics in Kermanshah City in Iran.

**MATERIALS AND METHODS**

The objective of the present study was the assessment of risks associated with occupational manual load carrying by KIM-MHO with a cross-sectional descriptive study on auto mechanics who live in Kermanshah City in 2015. All the subjects were informed about the purpose of this research and their consents were obtained. Then, we determine the level of occupational risk and the allowable load by using KIM. The prevalence of musculoskeletal disorders and demographic and occupational characteristic of the auto mechanics were recorded as well.

Four different parameters assessed during the application of KIM-MHO were physical stress for carrying the load (mass, hand grips with load and repeated displacement), the time of carrying the load and the status of the worker’s body. Also, this method is applied for evaluation and assessment of the prevalence of WMSDs with an approved reliability and validity. The study population (auto mechanics in Kermanshah City) had at least has 2 years experiences in their job.

**Sample size:** In order to estimate the number of samples required, based on the results from the study by Eskandari et al. (2012) that the marked prevalence of WMSDs is associated with the task of exchanging the tires 92.8% and by considering 5% for the first type error, the sample size was determined to be 100 persons. The subjects were also selected from the available for individuals and the obtained data was then analyzed by SPSS 16.

**RESULTS AND DISCUSSION**

The study population included 99 auto mechanics of whom 15.2% were single and 84.8% were married. Of all the subjects, 15.2% wore glasses but 84.8% were not glasses wearers. The 37.4% of the subjects had elementary education, 36.4% had pre high school degree and 26.3% of them had managed to finish high school and had high school diploma (Table 1).

The 38.4% of the subjects wore soft shoes. The 35/4% of them bout soft and stiff shoes. The 62/3% of them had soft shoes.

In terms of exercised and sport activities, 31.3% of the subjects regularly performed such activities while 68.7% of the auto mechanics were smokers but 63.6% of them did not smoke (Table 2-4).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Average</th>
<th>SD</th>
<th>Least</th>
<th>Most</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>37/24</td>
<td>10/96</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>Work antecedent</td>
<td>16/06</td>
<td>9/6</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>BMI</td>
<td>23/93</td>
<td>2/85</td>
<td>17/3</td>
<td>31/22</td>
</tr>
<tr>
<td>Work hour</td>
<td>8/6</td>
<td>1/9</td>
<td>3</td>
<td>14</td>
</tr>
</tbody>
</table>

**Table 1: Demographic characteristing of participant**

**Table 2: The prevalence of WMSDs among studied auto mechanics based on the results from the questionnaire survey (body map)**

<table>
<thead>
<tr>
<th>Organs</th>
<th>Without the pain (frequency)</th>
<th>Low</th>
<th>Medium</th>
<th>Intense</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hand</td>
<td>76/8 (76)</td>
<td>10/1 (10)</td>
<td>12/1 (12)</td>
<td>8/1 (8)</td>
<td>4/1 (4)</td>
</tr>
<tr>
<td>Right knee</td>
<td>52/6 (52)</td>
<td>12/1 (12)</td>
<td>28/3 (28)</td>
<td>6/1 (6)</td>
<td>1/1 (1)</td>
</tr>
<tr>
<td>Right leg</td>
<td>76/7 (76)</td>
<td>9/1 (9)</td>
<td>10/1 (10)</td>
<td>3/3 (3)</td>
<td>1/1 (1)</td>
</tr>
<tr>
<td>Right ankle</td>
<td>70/7 (70)</td>
<td>11/1 (11)</td>
<td>12/1 (12)</td>
<td>5/1 (5)</td>
<td>1/1 (1)</td>
</tr>
<tr>
<td>Back</td>
<td>36/4 (36)</td>
<td>5/1 (5)</td>
<td>25/3 (25)</td>
<td>24/2 (24)</td>
<td>9/1 (9)</td>
</tr>
<tr>
<td>Left shoulder</td>
<td>75/8 (75)</td>
<td>11/1 (11)</td>
<td>9/1 (9)</td>
<td>4/4 (4)</td>
<td>-</td>
</tr>
<tr>
<td>Left elbow</td>
<td>91/9 (91)</td>
<td>3/3 (3)</td>
<td>4/4 (4)</td>
<td>1/1 (1)</td>
<td>-</td>
</tr>
<tr>
<td>Left elbow and forearm</td>
<td>67/7 (67)</td>
<td>15/2 (15)</td>
<td>12/1 (12)</td>
<td>3/3 (3)</td>
<td>2/2 (2)</td>
</tr>
</tbody>
</table>

**Table 3: The prevalence of WMSDs among studied auto mechanics based on the results from the questionnaire survey (body map)**
The results showed that the prevalence of WMSDs among the participants of this study is considerably high; almost every individual subject is complaining at least about painful areas in their body. The result from our study corresponds with the result presented by Eskandari in one of the automobile industry in Tehran and the most people suffer of the pain in their anatomic areas (Eskandari et al., 2012). Based on the Eskandari’s study and other colleagues most of the pain was in neck, shoulders, girdle and back areas in muscular skeletal disorder correlate and in correlate with Eskandari’s studies (2011). According to the case study conducted on hospital employees in Italy, there is a significant and direct relationship between backache and manual handling. Based on the results from the results of our research, the high prevalence of the back pain approves such causal relationship. Niosh in 1997 discovered that there is a relationship between working conditions and girdle, shoulder and neck disorders which is identical to our finding in this study where the high prevalence of disorders has social and economic consequences (Panjali1 et al., 2013). As in United States about 1 million persons leave their work due WMSDs and according to obtained result and high scores of occupational risk in KIM and excessive pain among subjects who participated in this research and for prevention of such disorders, we can do several controlling and engineering measures could be taken to reduce various (like the weight of cargo, time, working conditions) and we can change the level of risk to an acceptable level. Some of these actions are: peoples in struction, high adjustable work surface, increasing the number of workers, minimizing working time, use of the appropriate instrumentation for lifting loads, coordination between worker and jobs are significant in terms of weight and anthropometry.

CONCLUSION

According to the findings, most of the pain complaints were related to back and girdle. There is a significant inverse relationship between KIM-MHO and the shoulder and right leg pain along with the left elbow and left leg. There is also a statistically significant inverse relationship between KIM-MHO and right forearm and right elbow, right wrist, right leg, left hip, left metatarsus and left leg pain and had a significant direct relationship with back organ. The results showed that a work-related musculoskeletal disorder has high risk and prevalence in this career.

ACKNOWLEDGEMENT

We thank heartily the people who helped us in concluding this research study.

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