

Evaluation of Occupational Risk Assessment of Manual Load Carrying Using KIM Method on Auto Mechanics in Kermanshah City in 2015

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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 risks 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 them did not do any sport or exercise at all. The 36.4% of the auto mechanics were smokers but 63.6% of them did not smoke (Table 2-4).

Table 1: Demographic characteristing of participant

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

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

Amount of the pain					
Organs	Without the pain (frequency)				
	Low	Medium	Intense	Max.	
Neck	61/6 (61)	-	21/2 (21)	8/1 (8)	4 (4)
Right shoulder	67/7 (67)	-	16/16/2	4 (4)	2 (2)
Right elbow and forearm	84/9 (84)	9/1 (9)	6/1 (6)	8/1 (8)	1 (1)
Right wrist	57/6 (57)	19/2 (19)	19/2 (19)	3 (3)	1 (1)
Right hand	76/8 (76)	10/1 (10)	12/1 (12)	10/1 (10)	1 (1)
Hip	84/9 (84)	8/1 (8)	6/1 (6)	7/1 (7)	2 (2)
Right knee	52/6 (52)	12/1 (12)	28/3 (28)	6/1 (6)	1 (1)
Right leg	76/7 (76)	9/1 (9)	10/1 (10)	3 (3)	1 (1)
Right ankle	70/7 (70)	11/1 (11)	12/1 (120)	5/1 (5)	1 (1)
Back	36/4 (36)	5/1 (5)	25/3 (25)	24/2 (24)	9/1 (9)
Left shoulder	75/8 (75)	11/1 (11)	9/1 (9)	4 (4)	-
Left elbow and forearm	91/9 (91)	3 (3)	4 (4)	1 (1)	-
Left wrist	67/7 (67)	15/2 (15)	12/1 (12)	3 (3)	2 (2)
Left hand	81/8 (81)	9/1 (9)	8/1 (8)	1 (1)	-
Girdle	36/4 (36)	7/1 (7)	24/2 (24)	28/3 (28)	4 (4)
Left knee	57/6 (57)	9/1 (9)	26/3 (26)	6/1 (6)	1 (1)

Left leg	78/7 (78)	8/1 (8)	9/1 (9)	3 (3)	1 (1)
Left ankle	72/8 (72)	9/1 (9)	12/1 (12)	5/1 (5)	1 (1)

Table 3: The means and standard deviations of WMSDs risk

Risk	Average	SD	Least	Most
KIM-HHC	28/93	23/73	0	132
KIM-PP	3/43	4/59	0	24
KIM-MHP	32/23	13/71	6	80

Table 4: The result of Sperman's test

Organs	KIM-HHC	KIM-MHP
Right shoulder	-	-0/020
Right elbow and forearm	-0/009	-0/018
Right wrist	0/032	-
Right hand	-	-(0/029)
Hip	-0/020	-
Right leg	-0/007	-0/005
Back	(0/020)	-
Left elbow and forearm	-	-0/001
Left leg	-0/010	-0/001
Left ankle	-(0/042)	-

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 findings 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 (Panjajiri *et al.*, 2013). As in United States about 1 million persons leave their work due to WMSDs and according to the 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, cargo time, working conditions) and we can change the level of risk to an acceptable level. Some of these actions are: people in instruction, 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.

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REFERENCES

- Barkhordari, A., S. Poorabdian, J. Khoobi and M. Karchan, 2011. The study of changes in the serial peak flowmetry test in the workers of car painting workshops in Isfahan. *Sci. J. Kurdistan Uni. Med. Sci.*, 15: Pe73-Pe80.
- Eskandari, D., A. Ghahri, A. Gholamie, M.M. Kashani and S.G.A. Mousavi, 2011. Prevalence of musculoskeletal disorders and work-related risk factors among the employees of an automobile factory in Tehran during 2009-10. *Feyz J. Kashan Univ. Med. Sci.*, 14: 539-545.
- Eskandari, D., N. Norizadeh, H. Saadati, S. Mohammadpour and A. Gholami, 2012. The prevalence of musculoskeletal disorders and occupational risk factors in Kashan SAIPA Automobile Industry workers by Key Indicator Method (KIM). *J. Health Saf. Work*, 2: 27-36.
- Farhadi, R., L. Omid, S. Balabandi, S. Barzegar and A.M. Abbasi, 2014. Investigation of musculoskeletal disorders and its relevant factors using Quick Exposure Check (QEC) method among seymareh hydropower plant workers. *J. Res. Health Soc. Develop. Health Promotion Res. Center*, 4: 714-720.
- Ghasemkhani, M., K. Azam and S. Aten, 2007. Evaluation of ergonomic postures of assembling unit workers by rapid upper limb assessment. *Hakim Res. J.*, 10: 28-33.
- Habibi, E., S. Gharib, M. Shakerian and A. Hasanzadeh, 2011. The prevalence of musculoskeletal disorders and analyzing the ergonomic status of workers involved manually carrying goods in the dairy

- industry. *J. Health Syst. Res.*, 6: 649-657.
- Kalte, H.O., M. Ziaei, H. Najafi, A. Karami and A. Akbarzadeh *et al.*, 2014. Use of the finnish method to quantify the ergonomic properties in an office environment among the workplaces in an Electricity Distribution Company in West Tehran Province. *Electron. Physician*, 6: 779-785.
- Kivi, P. and M. Mattila, 1991. Analysis and improvement of work postures in the building industry: Application of the computerised OWAS method. *Appl. Ergon.*, 22: 43-48.
- Merlino, L.A., J.C. Rosecrance, D. Anton and T.M. Cook, 2003. Symptoms of musculoskeletal disorders among apprentice construction workers. *Applied Occup. Environ. Hyg.*, 18: 57-64.
- Mohammadi, S., H.R. Mokhtarinia, F. Tabatabaee and R. Nejatbakhsh, 2012. Surveying ergonomic factors of backpack in Tehranian Primary School children. *Razi J. Med. Sci.*, 19: 1-11.
- Mokhtarinia, H., M. Sanjari and M. Parnianpour, 2012. The effect of fatigue on postural stability during repetitive trunk bending motion in healthy and chronic non-specific low back pain subjects. *J. Res. Rehabil. Sci.*, 1: 719-727.
- Panjali, Z., S. Zakerian, R. Abedinlo and E. Rezaee, 2013. Assessment of manual material handling using Iranian MMH regulations and comparison with NIOSH equation and MAC method in one of the metal casting industries in Tehran, 2011. *J. Health Saf. Work*, 3: 27-34.
- Poornajaf, A., L. Omid, I. Khodadadi, N.N. Rahim and A. Rahmani *et al.*, 2016. Backpack and related health problems among school students. *Payesh*, 15: 79-85.
- Rahimifard, H., N.N. Hashemi, A.R. Choobineh, H.R. Haidari, and H. Tabatabaei, 2010. Assessment of risk factors and prevalence of musculoskeletal disorders in raw furniture preparation workshops of the furniture industry. *J. School Public Health Inst. Public Health Res.*, 8: 53-68.