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Musculoskeletal Disorders Risk Level among Workers of Jahrom University of Medical Science: an Ergonomic Assessment

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Abstract

Musculoskeletal disorders (MSDs) are among the most common occupational injuries that can arise from various risk factors. This cross-sectional descriptive study was conducted on 100 staff workers of the Jahrom University of Medical Science through Demographic Questionnaire, Nordic Musculoskeletal Disorders Questionnaire (NMQ) and Rapid Office Strain Assessment (ROSA) method. Prevalence of MSDs in the neck, shoulder, wrist, upper back, lower back, and one or both thighs were 24, 25, 4, 8, 24 and 11 percent, respectively. Given the high prevalence of MSDs among staff workers of the Jahrom University of Medical Science, it seems to be necessary to perform educational interventions to prevent skeletal and muscular

Introduction:

Worldwide the musculoskeletal disorders (MSDs) are among the most common work-related diseases. MSDs are defined as injuries to (or disorders of) muscles, nerves, tendons, joints, cartilage, and intervertebral discs and are one of the most prevalent causes of occupational injuries and disability in industrialized countries and mainly in developing countries (Choobineh *et al.*, 2007a,b; 2009). Prevention and control of work-related MSDs are crucial because they are very prevalent and most of the compensation paid to the workforce is related to these disorders. Hence, many researchers and research institutes have directed their studies on evaluating these disorders. According to the Occupational Safety and Health (OSH) Association, in general, ergonomics is trying to prevent this type of work-related complication. The World Health Organization (WHO) has introduced the 2000s as a decade of MSDs prevention. Various studies have shown that MSDs are the reason for more than half of days off work (Bridger, 2003). These disorders occur in the vertebral column, upper and lower organs, and causes some symptoms such as discomfort, pain, fatigue, swelling, dryness, sensory impairment, frisson, limitation of motion and reduced motor control (Choobineh, 2004). These disorders are often multifactorial (Smith *et al.*, 2006). Physical (Gerr *et al.*, 2014), psychological, social and organizational (Kangar *et al.*, 2006) and individual (Osborne *et al.*, 2013) factors have been identified as the risk factors for the occurrence of work-related MSDs. Failure to pay attention to ergonomic issues often led to an

increase in daily occupational incidents and diseases. One of the important goals of ergonomics and ergonomic processes is to designing work practices and relevant activities for individuals based on their abilities and limitations. Inadequate knowledge for standard working conditions and incorrect use of muscles during sitting, standing, various bending positions, and while lifting and carrying goods as well as failure to perform preventive and corrective physical exercises can all have a negative effect on the musculoskeletal structure of the body, resulting in defect(s) in the organs (David *et al.*, 2008). Keshtkaran & Daniali (2008) evaluated ergonomic disorders in 75 personnel of medical records departments and found 414 musculoskeletal disorders in the various organs of the studied participants, 37 of which resulted in days off work.

Motamedi *et al.* (2015) studied the risk level among 138 workers of a battery construction company in Isfahan (Isfahan, Iran) by data collection through Nordic and Demographic questionnaires. Their results showed that most workers suffer from pain at the upper back (30.4%), neck (26.1%), lower back (18.1%) and knee (11.6%). MSDs are work-related disorders that leads to mental disorders, stress, and fatigue. And preventing them is one of the most important challenges ergonomists are facing. The purpose of this paper was to ergonomically assess MSDs risk level among workers of the Jahrom University of Medical Science.

Material and methods:

This cross-sectional descriptive study was conducted in 2018 on staff workers of the Jahrom University of Medical

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Science by using a random sampling method. The questionnaires were distributed among the participants. Three questionnaires were used as a data gathering tool:

- 1) Demographic Questionnaire (including information on age, gender, education, job, etc.)
- 2) Nordic Musculoskeletal Disorders Questionnaire (NMQ)
- 3) Rapid Office Strain Assessment (ROSA) method

NMQ were used to analyze the prevalence of musculoskeletal disorders symptoms. It was developed in by Kuorinka *et al.* (1987). The questionnaire has two sections: section-1, contains demographic queries (a general questionnaire of 40 forced-choice items) and section-2, additional questions for determining the prevalence of musculoskeletal disorders. Content validity and reliability of the questionnaire were assessed by the faculty members of the university (Choobineh, 2004).

Rapid Office Strain Assessment (ROSA) method was designed to develop previous evaluation methods, and aimed at further focusing on users of administrative activities. This is a type of a high-speed paper-and-pencil test useful to determine the number of ergonomic risk factors. It also provides a report to redesign and optimize the environment. This method has high validity and reliability in evaluating ergonomic risk factors in the office environment of working with computers. The evaluation was performed in three steps. After completing each section and determining values in the seat, monitor and telephone, the score of the mouse and keyboard were specified in the final score tables. The final score was in between 0 and 10. Values between 3 and 5 represented the alert level, whereas values greater than 5 mean the necessity for intervention measures (Ferasati *et al.*, 2014). Data were analyzed using IBM SPSS Statistics 21.0, and descriptive (Frequency, Percentage, SD and Mean) and inferential (Independent t-test and One-Way ANOVA) statistical tests at $p < 0.05$.

Results:

Demographic results are represented in the pie diagrams below:

Figure-1: Presenting Percentage frequency of the participants; a) Gender, b) Age group, c) Working experiences, d) ROSA Scores

Independent T-test was used to measure the relationship between age and the ROSA score. One-Way ANOVA was used to measure the relationship between gender and seniority with the ROSA score. A significant correlation was observed in all three variables (Table-1).

Table 5. The relationship between demographic specifications and the ROSA score.

Parameters	Range	Mean	SD	Test value	P-value
Age (years)	>30	0.000	0.000	17.50	0.001
	30-40	0.5745	0.49977		
	<40	0.8600	0.35051		
Gender	Female	0.8929	0.31497	2.69	0.000
	Male	0.6250	0.48752		
Work Experience (years)	>10	0.000	0.000	0.07	0.000
	10-20	0.8545	0.35581		
	<20	1.0000	0.0000		

Results has been given in Table-2, after examining the pain, MSDs prevalence in various body parts of the participants during the study period.

Table-2. MSDs prevalence according to the NMQ questionnaire

NMQ	Pain assessment		Days off work during the past 12 months	
	Freq.	%	Freq.	%
Painless/days off work	4	4	65	65
Neck	24	24	3	3
Shoulder	25	25	5	5
Wrist	4	4	0	0
Upper back	8	8	0	0
Lower back	24	24	24	24
One or both thighs	11	11	3	3
Total	100	100		

Discussion:

The results of our study showed significant MSDs prevalence in staff workers of Jahrom University of Medical Sciences. Total 96% of the participants have experienced pain and discomfort in one of their musculoskeletal areas at least once in the past 12 months. Earlier more or less similar types of findings were reported by Motamedi *et al.* (2016), Aghanasab *et al.* (2012), Rahimian *et al.* (2014), Jamshidi *et al.* (2013), Zarei *et al.* (2016), Esfandiari *et al.* (2018); Halvani *et al.* (2014). The highest MSDs prevalence was found in the shoulder than neck and lower back, respectively. This result is close to the report of Zarei *et al.* (2014) where they reported the highest incidence of pain in the backbone, back and knees whereas Ali-Akbari *et al.* (2018) reported the highest MSDs prevalence in the backbone, shoulders, back, and neck. Il-beygi *et al.* (2015) aimed to study the physical posture targetting the dental portion where the most pain was reported in the neck and shoulders, respectively. Zamani *et al.* (2014) applied the REBA method to assess ergonomically the risk of MSDs in midwives where they found the most MSDs prevalence was in the back, buttocks, knee, and backbone. Sartang *et al.*

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(2015) used the ROSA method to evaluate MSDs in computer users and found that the prevalence of these disorders was more in the shoulder, neck, and back, respectively. Lengvist *et al.* (1995) examined MSDs in the bank staff and found that MSDs were more common in the shoulder and neck, which are consistent with our findings. Setzo *et al.* (2005) evaluated MSDs in administrative staff where they found the MSDs prevalence in shoulder and neck in employees working with computers was higher than those were working in other sectors. These results are also supporting our findings. Indeed, failure to match the height of the working table with the chair, the mismatch between the seat with the thighs length and not-reaching the foot to the ground, which causes pressure to the thighs and pain feeling, are among the causes of MSDs prevalence in the neck and shoulders of these users. The chair's back area is also not fitted to the user's back, and in the long term use causes symptoms of discomfort and pain. Thus, the project requires more corrective measures and attention. The high incidence of back disorders can be due to prolonged sitting, inappropriate work stations, and inappropriate conditions in these work environments (Aghanasab *et al.*, 2012). Ortiz-hernandez *et al.* (2003) investigated the risk of MSDs in staff working with computers and found that use of the mouse, long-term work in sitting state, inappropriate working conditions, and mental factors are among the risk factors for increasing MSDs prevalence. In this study, a significant relationship was found between the ROSA method, age, gender, and seniority. Ghanbary-Sartang & Habibi (2015) also found a meaningful positive relationship between gender, age, seniority and the final score of ROSA method ($p < 0.001$). Holmstrom & Engholm (2003) assessed MSDs and found that there was a significant positive correlation between age and seniority with increasing MSDs. Their results are in line with our findings. Gerr *et al.* (2002; 2004) assessed MSDs prevalence in upper body organs in computer users and found a positive correlation between age and seniority and the MSDs prevalence. Our result is strengthening these findings.

Conclusively, the high prevalence of MSDs among staff workers of the Jahrom University of Medical Science, it seems to be necessary to perform educational interventions to prevent skeletal and muscular changes. Implementing ergonomic interventions in the work environment is therefore necessary.

The following corrective measures are recommended to mitigate MSDs prevalence in the studied population:

- Performing relaxation movements at defined intervals based on work-rest cycle (75 minutes work, 10 minutes exercise and rest)
- Creating diversity in employee duties and reducing their hours of work

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References:

- Aghanasab, M., Ghalenoei, M., Kouhnavard, B. & Ahmadi Panah, V. (2017): The relationship between musculoskeletal disorders and workstation conditions among academic and nonacademic staffs in school of public health, Qazvin University of Medical Sciences in 2012. *J. Health*, 8(1):35-44.
- Aliakbari, R., Vahedian-Shahroodi, M., Tehrani, H., Esmaeili, H. & Hokmabadi, R. (2018): Dentists' ergonomic assessment by RULA method and its relationship with musculoskeletal disorders. *J. Dental Med.*, 31(1):42-48.
- Bergqvist, U., Wolgast, E., Nilsson, B. & Voss, M. (1995): Musculoskeletal disorders among visual display terminal workers: individual, ergonomic, and work organizational factors. *Ergonomics*, 38(4):763-776.
- Bridger, R.S. (2003): **Introduction to Ergonomics**. 2nd ed. Pub. by: Taylor & Francis, USA. P. 234.
- Choobineh, A.R. (2004): **Posture assessment methods in occupational ergonomics**. 3rd ed. Pub. by: Fanavarin Publications, Hamadan, Iran. P. 193. [Persian]
- Choobineh, A.R., Hosseini, M., Lahmi, M., Khani Jazani, R. & Shahnava, H. (2007): Musculoskeletal problems In Iranian hand-woven carpet industry: Guidelines for workstation design. *Appl. Ergonom.*, 38(5):617-624. [Persian]
- Choobineh, A.R., Tabatabaei, S.H. & Behzadi, M. (2009): Musculoskeletal problems among workers of an Iranian sugar-producing factory. *J. Occup. Saf. Ergon.*, 15(4):419-427.
- Choobineh, A.R., Tabatabaei, S.H., Tozihian, M. & Ghadami, F. (2007): Musculoskeletal problems among workers of an Iranian communication company. *Indian J. Occup. Environ. Med.*, 11(1):32-36. [Persian].
- David, G., Woods, V., Li, G., & Buckle, P. (2008): The development of the quick exposure check (QEC) for assessing exposure to risk factors for work-related musculoskeletal disorders. *Appl. Ergon.*, 39(1):57-69.
- Esfandiari, N., Samaei, S.E. & Amrollahi, M. (2018): The prevalence of musculoskeletal disorders and ergonomic risk factors in Repairmen: a case study in a steel industry. *Health Develop. J.*, 7(1):49-59.
- Ferasati, F., Sohrabi, M. & Jalilian, M. (2014): Evaluation of WMSDs in VDT users with Rapid office strain assessment (ROSA) method. *J. Ergon.*, 1(3):65-74.
- Gerr, F., Fethke, N.B., Anton, D., Merlino, L., Rosecrance, J., Marcus, M. & Jones, M.P. (2014): A prospective study of musculoskeletal outcomes among manufacturing workers: II. effects of psychosocial stress and work organization factors. *Hum. Factors*, 56(1):178-190.
- Gerr, F., Marcus, M., Ensor, C., Kleinbaum, D., Cohen, S., Edwards, A., Gentry, E., Ortiz, D.J. & Monteilh, C. (2002): A prospective study of computer users: I. Study design and incidence of musculoskeletal symptoms and disorders. *Am. J. Ind. Med.*, 41(4):221-235.
- Gerr, F., Marcus, M. & Monteilh, C. (2004): Epidemiology of musculoskeletal disorders among computer Users: lesson

- learned from the role of posture and keyboard use. J. Electromyogr. Kinesiol., 14(1):25-31.
- Ghanbary-Sartang, A. & Habibi, H. (2015): Evaluation of musculoskeletal disorders to method rapid office strain assessment (ROSA) in computers users. J. Preven. Med., 2(1):47-54.
- Halvani, G., Fallah, H., Hokmabadi, R., Smaeili, S., Dabiri, R., Sanei, B. & Saberi, A. (2014): Ergonomic assessment of work related musculoskeletal disorders risk in furnace brickyard workers in Yazd. J. North Khorasan Univ. Med. Sci., 6(3):543-550.
- Holmström, E., & Engholm, G. (2003): Musculoskeletal disorders in relation to age and occupation in Swedish construction workers. Am. J. Ind. Med., 44(4):377-384.
- Ilbeigi, S., Biglar, A., Saghebjo, M. & Farzaneh, H. (2015): The investigation of relationship between work-related musculoskeletal disorders and level of physical activity and body posture of dentists in Mashhad city in 2012-2013. J. Torbat Heydariyeh Univ. Med. Sci., 2(4):31-37.
- Jamshidi, H.R., Daneshmandi, H. & Haghayegh, A. (2015): Survey prevalence of musculoskeletal disorders and risk assessment in paddy workers in Marvdasht in 2013. J. Neyshabur Univ Med Sci., 3(1):57-65.
- Kangar, L.H., Malekzadeh, S., Alizadeh, K., Shamshiri, B. & Zareei, S. (2006): The Prevalence of Musculoskeletal Causes of Disability Retirement among Air Force Personnel during 1371-1382. Ann. Mil. Health Sci Res., 4(4):813-818.
- Keshtkaran, A. & Daniali, A. (2007): Ergonomics disorders in the personnel of medical records department at training hospitals of Shiraz University of medical sciences. Health Inform. Manag., 4(1):61-69.
- Motamedi, M., Mokhtarinia, H., Oskoe, Zade R. & Rezasoltani P. (2016): Ergonomic assessment of musculoskeletal disorders' risk level among workers of a factory battery. Razi J. Med. Sci., 22(141):30-37.
- Ortiz-hernandez, L., Tamez-gonzalez, S., Martinez-alcantara, S. & Mendez, R. (2003): Computer use increase the Risk of musculoskeletal disorders among newspaper office workers. Archiv. Med. Res., 34(4):331-342.
- Osborne, A., Blake, C., Meredith, D., Kinsella, A., Phelan, J., McNamara, J. & Cunningham C. (2013): Work-related musculoskeletal disorders among Irish farm operators. Am. J. Ind. Med., 56(2):235-242.
- Smith, D.R., Mihashi, M., Adachi, Y., Koga, H. & Ishitake, T. (2006): A detailed analysis of musculoskeletal disorder risk factors among Japanese nurses. J. Saf. Res., 37(2):195-200.
- Szeto, G.P., Straker, L.M. & O'Sullivan, P.B. (2005): A comparison of symptomatic and asymptomatic office Workers performing monotonous keyboard work-1: neck and shoulder muscle recruitment Patterns. Manual Ther., 10(4):270-280.
- Rahimian, J.T., Choobineh, A., Dehghan N., Rahimian R.T., Kolahi, H., Abbasi, M. & Abbaszadeh, M. (2014): Ergonomic evaluation of exposure to musculoskeletal disorders risk factors in welders. J. Ergon., 1(3):18-26.
- Zamanian, Z., Salimian, Z., Daneshmandi, H. & AliMohammadi, Y. (2014): The Reba technique ergonomic assessment of musculoskeletal disorders risk level among midwives of shiraz state hospitals. J. Urmia Nurs. Midwifery Fac., 12(1):24-18.
- Zare, R., Khazraei, T., Choobineh, A.R., Daneshmandi, H. & Rahimian, T.J. & Rajabi, A.H. (2014): Assessment of the risk of musculoskeletal disorders using the quick exposure check technique among the workers of a shipbuilding company. Sadra Med. Sci. J., 4(2):399-406.
- Zarei, F., Mousavifard, S.A. & Ardestani, M. (2016): Assessment of musculoskeletal disorder prevalence and associated risk factors of A metal structure manufacturing company in Tehran. J. Environ. Health. Eng., 4(1):10-19.