

Musculoskeletal Disorders Assessment and Posture Analysis by LUBA among Female Hairdressers in Tehran, 2015

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A-R-T-I-C-L-E-I-N-F-O

Article Notes:

Received: Sep.1, 2016

Received in revised form:

Nov.15, 2016

Accepted: Nov. 25, 2016

Available Online: Jan 1, 2017

Keywords:

LUBA

Body map

Hairdressers

Musculoskeletal disorders

Posture

Iran

A-B-S-T-R-A-C-T

Background & Aims of the Study: Musculoskeletal disorders (MSDs) are part of the main occupational diseases in the workplace. Occupations such as hairdressers are exposed to multiple risk factors of these problems. The study was conducted to assess MSDs and posture analysis among female hairdressers in Tehran, 2015.

Materials and Methods: In this cross-sectional research, 114 participants were studied. To collect data, demographic questionnaire, body map for assessment of MSDs and Postural Loading on the Upper Body Assessment (LUBA) method to evaluate postures was used. Also, data were analyzed by Mann-Whitney, Kruskal Wallis and Spearman correlation tests through SPSS-V20.

Results: The mean and standard deviation of age and experience of the participants were 5.34 ± 8.9 and 10 ± 8 years, respectively. In addition, they worked 9.8 hours per day on average. One hundred and thirteen (99.12%) persons have experienced the pain at least in one member of their musculoskeletal system. Most of hairdressers had reported leg, lower back, as well as neck and shoulder pain. According to the posture assessment, 94.2% of people experienced high risk of exposure to risk factors for MSDs.

Conclusion: Findings showed MSDs are high among barbers. Also, the work situations require immediate correction. Correction of workstations and tools design, work rest cycle and reduction in repetitive motions can help to improve working conditions.

Please cite this article as: Khandan M, Toranjian F, Koohpaei A. Musculoskeletal Disorders Assessment and Posture Analysis by LUBA among Female Hairdressers in Tehran, 2015. Arch HygSci 2017;6(1):26-31.

Background

Musculoskeletal disorders (MSDs) are one of the most common causes of occupational injuries and disability in industrialized nations and developing countries (1,2) which are the most common causes of work-related disabilities as a result of financial and medical costs (3). These disorders have a part of nearly 48% of all work-related diseases (1). Although, work has an essential role in community development in the areas of social and

economic, working conditions can cause a lot of problems that one of them is a work-related physical disorder that decreases the work efficiency. This is mainly due to poor work health and its training among people. According to a general estimation, about 150 million people are involved in disorders that this figure is 4 times more than 20 years ago (4). Musculoskeletal disorders are injuries and diseases of the muscles, tendons, ligaments, joints, nerves, blood vessels and all support structures that are involved in the motion (5); that is usually caused by prolonged and/or

repetitive stress occurs in tissues (6). In general, any disruption or damage to the musculoskeletal system that may be resulted from the job or be severed by it is called MSDs (2).

A group of people, who due to various tasks in the case of standing, sitting and repetitive with the body position outside the normal situation are at risk of physical disorders, are hairdressers. A study was done on people with standing jobs, stated that generally the maximum pressure is on the back, knees, hands, neck and shoulder, respectively (7). Poor working conditions and frequent bending and rotation, as well as the lack of adequate time for resting cause problems in the lumbar and knee; the main reason for the high prevalence of knee pain can be linked to work in a standing position for a long time (6). Several studies on the analysis of musculoskeletal problems among the hairdressers in Iran and abroad have been done but the lack of such researches among women who have this profession is obvious; in particular, women are at greater risk than men against MSDs (8,9). Several studies found high prevalence of musculoskeletal problems among hairdressers and risk factor of posture were reported at a high level and required corrective actions (10,11). According to various risk factors in the occupation, such as awkward working postures, use of inappropriate tools, repetitive motions and very long duration of work, the increasing prevalence of these disorders is foreseeable hairdressers (12,13).

Aims of the study:

Regards to the lack of studies around ergonomics evaluation of female hairdressers' working conditions in Iran and many problems can arise in this area; this study was developed to assess the posture and musculoskeletal disorders among female hairdressers in Tehran, 2015.

Materials & Methods

In this cross-sectional study, by interviewers visiting and through observation and interviews, the posture and musculoskeletal problems of 114 volunteer female hairdressers, who were randomly selected, were performed. Demographic factors were collected by a questionnaire which was included age, work experience, numbers of clients in a day, duration of work per day, marital status and education level. Body map was applied to assess MSDs. Participants' postures have been analyzed, using Postural Loading on the Upper Body Assessment (LUBA) method. LUBA is a technique for evaluating the stress of the posture on the upper limbs. It has been developed based on new experimental data to achieve a composite index of perceived discomfort in the groups of joints as ankle, shoulder, elbow and neck. Generally, at the first step work cycles would be filmed to identify aimed postures. In this study, due to the restrictions and adhere to codes of ethics and privacy, filming did not take place. To identify postures that should be studied, direct observations were used. In the next step, those postures were considered that had the largest numbers or the most damages to the musculoskeletal system. In the third step each of the four joints' motions, wrist, shoulder, elbow and neck which was selected in the previous step, was evaluated. In the fourth step, the pressure on the posture was calculated, using the following formula (14).

$$\text{Eq. (1)} \quad \text{PS} = \sum_{j=1}^n \sum_{i=1}^{m_j} S_{ij}$$

PS: posture score, j: the jth joint, i: the ith motion of the joint, n: the number of joints that took score, M_j : the number of assessed motions of the jth joint and S_{ij} : score of the ith motion of the jth joint.

Finally, based on the score, postures would be divided into four categories and each one needs its related corrective action according Table 1.

It illustrates that whether the posture is acceptable or not (15).

Table 1) Level of corrective action in LUBA method

pressure situation Index	Condition	Level of corrective action
5 or less	Acceptable	1
5 to 10	Require further study , changes and ergonomic intervention in the future	2
10 to 15	Require corrective actions and ergonomic interventions such as workplace redesign or change in procedure	3
More than 15	Need to immediate investigation and taking corrective actions immediately	4

Also, data were analyzed by Mann-Whitney, Kruskal Wallis and Spearman correlation tests through SPSS-V20.

Results

After walking and talking through process in dressing & beauty salons, 114 female hairdressers were prepared to participate in this research voluntarily. Mean and standard deviation of their age and work experience were 34.5 ± 9.8 and 10 ± 8 years, respectively. In addition, they worked on average 8.9 hours per day. In terms of education level, less than 14.2% of subjects were lower than diploma, 58.4% had diploma, 16 persons were upper diploma and others had bachelor's degree. In addition, 18 participants (15.8%) had a second job. Also, based on our findings, 113 hairdressers (99.12%) had experienced the pain at least in one area of their bodies during the last year. Also, right knee pain with the rate of 57% was the highest and upper back area accompanied with the right hip by 14.9% was the lowest. Frequency and percentage of MSDs were listed in Table 2.

The relationship between demographic factors and MSDs, using Spearman correlation, was revealed that there was a significant relationship between MSDs with daily work time, the number of clients and work experience ($P < 0.05$) (Table 3). The results of the hairdressers posture evaluation which were

aided by LUBA revealed that shoulder postures with the highest presence in levels 1 of corrective action (71.1%) were better than other parts. For elbow, 50.1% of postures have been reported in middle levels. On the other hand, 44.2% of neck postures were at the highest risk level and in this sense had the worst conditions. Also, at 5.8% of cases equals to 6 persons, calculated points were between 10 and 15, which means that control measures are needed by redesigning the workstation and postures or modifications of work procedures as soon as possible (level 3 of corrective actions). On 94.2% of cases, equivalent to 98 people calculated scores was more than 15. It means that this situation need to immediate investigation and taking corrective actions immediately (corrective action level 4). None of the cases was not in both the first and second level of corrective action.

The analysis was performed by Kruskal-Wallis test to determine the difference between the level of corrective actions, the status of each of the studied four limbs in LUBA method and the MSDs among hairdressers with different levels of education. Results showed that there was a significant difference for wrist posture ($P < 0.05$) as well as the work condition was worst between participants with lower diploma. The difference between the symptoms of MSDs and scores of the four limbs posture (neck, wrist, elbow and shoulder) among other qualitative demographic variables such as

second job and marital status about were analyzed by Mann-Whitney test. The results showed that there was a significant difference between posture score of shoulder and second

job merely ($P < 0.05$) and people with second jobs had experienced poorer conditions. In other variables there was not found a significant relationship ($P > 0.05$).

Table 2) The prevalence of MSDs in the last year (BM) (n=114)

Body part		Frequency	%	Body part		Frequency	%
Neck		58	50.9	Elbow	R.	21	18.4
Shoulder	R.	39	34.2		L.	19	16.7
	L.	37	32.5	Butt.	R.	17	14.9
Back	Upper	17	14.9		L.	18	15.8
	Lower	61	53.5	Hand	R.	27	23.7
Arm	R.	12	10.5		L.	30	26.3
	L.	10	8.8	Thighs	R.	38	33.3
Leg	R.	63	55.3		L.	36	31.6
	L.	65	57				

R.: Right, L.: Left

Table 3) Spearman's Correlation coefficients between demographic, MSDs (n=114)

		Age	Work time	Client No.	Work experience	MSDs
Age	Coefficient	1				
	Sig.					
Work time	Coefficient	0.149	1			
	Sig.	0.115				
Client No.	Coefficient	0.144	0.386*	1		
	Sig.	0.156	0.001			
Work experience	Coefficient	0.562**	0.278**	0.419**	1	
	Sig.	0.001	0.002	0.001		
MSDS	Coefficient	0.152	0.186*	0.242*	0.286**	1
	Sig.	0.106	0.048	0.016	0.002	

* $P < 0.05$, ** $P < 0.01$

Discussion

The results showed that the symptoms of MSDs among hairdressers were very high. Other researchers in similar with this study had reported the same results (12,16). In general, studied subjects were encountered with symptoms of MSDs in different areas of their bodies. Based on obtained results from body map, most of the hairdressers had complained from knee, neck and arm pain, in line with the previous studies (11,12,15). Also, about one-third of persons had experienced shoulder pain that was in consistent with a designed study by Hokmabadi et al. (2) and Wahlstrom et al who found high shoulder problem among female

hairdressers in Sweden (17). A study in Taiwan depicted that low back pain and neck pain had higher amounts among different parts of the bodies of female hairdressers and pain in shoulder was ranked as the third (18). On the other hand, the lowest amount of MSDs was reported in the upper back and buttocks areas (14.9%). Mahdavi et al. (19) showed the same results in a study on the Iranian hairdressers. Our results showed that low back and knee pain rate was high because most of hairdressers had standing work style more than half of her work shift. On the other hand, due to improper workstation design, hairdressers required to work in a poor shoulder posture. Hence shoulders were at high risk as well as poor chair and tables design/work demands led to neck

problem for studied persons. In a study among 33 Iranian barbers, it had been found that 42% of the subjects had neck pain as well as 39% had suffered from back pain. Also, they reported that with special trainings courses and relaxation sports in the rest times in this occupational group was critical to prevent the occurrence of such disorders in future (10). In this study, except for one, other people (over 99%) had experienced MSDs. This amount for Australian hairdressers have been reported equals to 70% (13). Also, this study revealed that there was not a significant difference between married and single hairdressers, similar to Froorash *et al.* research (12). Prolonged sitting, use of vibrating tools, reaching far and awkward body postures are some of the main risk factors that effect on the occurrence of musculoskeletal disorders of people in this sort of occupation (20).

LUBA method showed that all cases were at levels 3 and 4. This result was higher than other similar works surprisingly (12, 17). However, a study found high proportion of analyzed posture in these levels (18).

Our finding can be interpreted based on this fact that the number of clients as well as spent average time per clients were higher than other researches probably. However, in a study on female hairdressers, most of the studied postures were in high-risk levels (17). There was not a significant relationship between work experiences, second job, working hours with MSDs in different areas of their bodies. In line with our results, Hokmabadi *et al.* achieved a significant relation between the working hours and MSDs, but they did not find a relationship between the age and work experience with MSDs (2). Aweto *et al* found a relationship between age and work experience with WMSDs (21). The outputs of a study among barbers in Shiraz illustrated the association between age and marital status with MSDs (22). Despite the fact that only females were examined in the study and there was not a possibility to compare MSDs between men and

women, previous studies demonstrated that female hairstylists are in higher risk of wrist problems due to more prolonged tasks (23). In addition, according to previous studies, in the view points of MSDs women are more prone than men (10, 12) and it can be concluded that women are at greater risk.

Conclusion

In general, our findings indicated that the Iranian female hairdressers suffered from MSDs, with emphasis on the upper limbs due to their work demands and requirements. In addition, according to the results of the LUBA method (level 3 and 4), it is anticipated that most of them would be in greater risk of MSDs prevalence in near future. Based on this fact, prompt workstations redesign or work procedure changes are necessary. Therefore, it is essential that in order to the prevention of disease, an educational program accompanied with engineering modification of the workstations and tools have been considered. Changing of standing works to sitting postures, working with assistant or application of ergonomic chairs can be good examples for work improvement in dressing & beauty salons.

Footnotes

Acknowledgments:

The authors would like to express their thanks to of all participants in this research as well as vice chancellor for research and technology, Qom University of Medical Sciences due to financial support.

Conflict of Interest:

The authors stated no conflict of interest.

References

1. Rahimifard H, Hasheminezhad N, Choobineh AR, Heydari HR, Tabatabaei SHR. Evaluation of musculoskeletal disorders risk factors in painting workshops of furniture industry. *Qom Univ Med Sci J* 2010;4(2):45-54. (Full Text in Persian)
2. Hokmabadi RA, Esmailzade M, Mahdinia M. Ergonomic assessment of working postures of hairdressers

by Rapid Entire Body Assessment method. *J North Khorasan Univ Med Sci* 2011;3(4):49-54. (Full Text in Persian)

3. Sharifnia S, Haghdoost A, Hajhosseini F, Hojjati H. Relationship between the musculoskeletal disorders with the ergonomic factors in nurses. *Koomesh* 2011;12(4):372-378. (Full Text in Persian)

4. Dehghan C, Amiri Z, Rabiee M. Prevalence of musculoskeletal pain among a group of Iranian dentists, (Tehran-1999). *J Dent Sch* 2003;21 (2):185-192. (Full Text in Persian)

5. Saremi M, Lahmi M, Faghihzadeh S. The effect of ergonomic intervention on dentists' musculoskeletal disorders. *Daneshvar Med* 2006;13(64):55-62. (Full Text in Persian)

6. Tajvar AH, Hasheminejad N, Bahrampoor A, Modiri M. A survey on prevalence of musculoskeletal symptoms in the bakers of Kerman. *Zahedan J Res Med Sci* 2011;13(5):52. (Full Text in Persian)

7. Mostaghaci M, Salimi Z, Javaheri M, Hoseininejad S, Salehi M, Davari M et al. Evaluation of the musculoskeletal disorders and its risk factors in the workers of an agricultural equipment- manufacturing plant. *Occup Med Q J* 2012;3(3):19-25. (Full Text in Persian)

8. Yu W, Yu ITS, Li Z, Wang X, Sun T, Lin H, et al. Work-related injuries and musculoskeletal disorders among factory workers in a major city of China. *Accident Analysis and Prevention* 2012;48:457-463.

9. Widanarko B, Legg S, Stevenson M, Devereux J, Eng A, Mannetje A, et al. Prevalence of musculoskeletal symptoms in relation to gender, age, and occupational/industrial group. *Int J Ind Ergon* 2011;41(5):561-572.

10. Reza-Soltani A, Auzagee Sh, Eghlidi J, Sayadli S. Job related factors concerning neck and back disorders in hair dressers . *Iran Occup Health J* 2008;5(3-4):29-34. (Full Text in Persian)

11. Miri MR, Hosseini MH, Sharifzadeh GHR. Evaluation of ergonomic postures of hairdressers by REBA in Birjand. *Ofoh-E-Danesh* 2008;14(2):39-44. (Full Text in Persian)

12. Froorash E, Mazloomi A, Habibi M, Taqhavi M, Sheri S, Moharami S. Ergonomic evaluation of body postures and effective risk factors contributing musculoskeletal disorder in barbers in Sardasht. *J Health Saf Work* 2012;1(2):45-50. (Full Text in Persian)

13. Best M, French G, Ciantar JP, Didzys D, Geneveve F, Claire M, et al. Work related musculoskeletal disorders in hairdressers. *J Occup Health Saf Australia New Zealand* 2002;18(1):67-76.

14. Kamalinia M, Nasl Saraji G, Kee D, Hosseini M, Choobineh A. Postural Loading Assessment in Assembly Workers of an Iranian Telecommunication Manufacturing Company. *Int J Occup Saf Ergon* 2013;19(2):311-319.

15. Kee D, Karwowski W. LUBA: an assessment technique for postural loading on the upper body based on joint motion discomfort and maximum holding time. *Appl Ergon* 2001;32(4):357-366.

16. Mussi G, Gouveia N. Prevalence of work-related musculoskeletal disorders in Brazilian hairdressers. *Occup Med (Lond)* 2008;58(5):367-369.

17. Wahlstrom J, Mathiassen SE, Liv P, Hedlund P, Ahlgren C, Forsman M. Upper Arm Postures and Movements in Female Hairdressers across Four Full Working Days. *Ann Occup Hyg* 2010;54(5):584-594.

18. Fang HL. An Investigation into the Solutions for Work-related Musculoskeletal Disorders in the Hairdressing Industry. [PhD Thesis]. Taiwan: De Montfort University; 2010.

19. Mahdavi S, Mahdavi MR, Safary M, Rashidi R, Dehghani T, Kosari M. Evaluation of the risk of musculoskeletal disorders using Rapid Entire Body Assessment among hairdressers in Khorramabad, Iran, in 2014. *J Occup Health Epidemiol* 2013;2(3):138-145.

20. Tsigonia A, Tanagra D, Linos A, Merekoulis G, Alexopoulos EC. Musculoskeletal Disorders among Cosmetologists. *Int J Environ Res Public Health* 2009;6:2967-2979.

21. Aweto HA, Tella BA, Johnson OY. Prevalence of work-related musculoskeletal disorders among hairdressers. *Int J Occup Med Environ Health* 2015;28(3):545-555.

22. Rezaeian T, Piroozi S, Ghanbari N, Moghimi F, Motiallah T. The Prevalence of Leg Pain among Female Hairdressers: A Case Study in Shiraz in 2010. *Phys Treat* 2015;5(1):33-40.

23. Chen HC, Chang CM, Liu YP, Chen CY. Ergonomic risk factors for the wrists of hairdressers. *Appl Ergon* 2010;41(1):98-105.