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Original Article

Postural Assessment and the Prevalence of Musculoskeletal Disorders during Routine Clinical Examinations among Otolaryngologists in Isfahan City, Iran

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Keywords
Ergonomics; Position; Otolaryngology; Quick Exposure Check (QEC); Loading on the upper body assessment (LUBA)

Abstract

Background: Otolaryngologists are susceptible to various musculoskeletal disorders (MSDs) in the absence of suitable posture, because of working in various postures in offices and hospitals. The present study aimed to assess the risk of postures whilst either standing or sitting during routine examinations, estimate the prevalence of MSDs, and determine the relationship between these disorders and postures among otolaryngologists in Isfahan City, Iran.

Methods: In this study, photos were taken of the postures of 39 otolaryngologists in Isfahan City during patient examination and were analyzed using Quick Exposure Check (QEC) and loading on upper body assessment (LUBA) tools. Based on the risk of their postures, they were categorized into three groups of low-risk, medium-risk, and high-risk. Moreover, the Nordic Musculoskeletal Questionnaire (NMQ) was used for the assessment of the prevalence of MSDs.

Results: Based on the LUBA tool, otolaryngologists were at medium risk while examining patients' throats, and high risk during ears and nasal examinations; the QEC tool assessed this risk as low. Data resulting from the NMQ revealed that 31 participants (79.4%) had at least one MSD, which was a remarkable number. Based on data analysis, the relation between LUBA posture scores and the prevalence of MSDs was not statistically significant.

Conclusion: The prevalence of MSDs was remarkably high in some body regions, which might be due to inappropriate sitting or standing postures during common examinations. This can be prevented by educating practitioners about suitable postures.

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Introduction

Work-related musculoskeletal disorders (WMSDs) are among the most prevalent health problems and cause numerous disabilities.[1-3] Various factors such as the workplace, personal factors, and psychosocial risk factors are associated with the incidence of WMSDs. Work-related factors include the specific work environment and circumstances, the force applied by the individual during working, the frequency and repetition of movements, the duration of work, and exposure to vibration.

Individual factors include age, gender, muscle strength, and physical ability. The psychosocial factors include job pressure and stress, lack of social support, and low job satisfaction level.

In various studies, there has been a great deal of interest in examining exposure to WMSD risk factors and implementing ergonomic changes to reduce its incidence rate. Most of these studies have focused on the waist, shoulder, upper extremity, and neck, since WMSDs have been reported in these areas of the body.

The current techniques for assessing exposure to risk factors associated with WMSDs include self-report, observational methods, and direct measurement.[4] Various studies have reported the observational method, among the aforementioned methods, as a better and more effective method to evaluate the health of the employees of a workplace in terms of cost, capacity, overall look, accuracy, reliability, and sensitivity.

Most of the studies regarding placement position have been based on individual reports and mostly on questionnaires completed by the staff; this further highlights the need for objective studies.[5]

Accordingly, a valid observational technique called loading on upper body assessment (LUBA) was employed in the current study. This method has been designed on the basis of the experimental data (as numerical relative scores) on the pain and difficulty felt in a set of movements in the joints including wrists, elbows, shoulders, arms, neck, and back. This technique is employed for the sitting or standing postures with the lower limbs well maintained in a balanced position.

In addition, in the present study, one of the most up-to-date and validated techniques of the observational method, called the quick exposure check (QEC), was utilized. This technique is carried out on the basis of the participation of the observer and the employee through analyzing the four major areas of the body most susceptible to MSDs (neck, shoulder, upper extremity, and lumbar). Compared to other evaluation methods, QEC examines a greater range of physical risk factors including pressure, posture, frequency of movements, the need for visual acuity, and vibration in four areas, in addition to dealing with psychosocial factors such as work stress and job satisfaction in interaction with the target group.

Otolaryngologists perform ear, pharyngeal, and nose examinations with an otoscope, a tongue depressor, and a speculum, respectively, as the most common clinic examinations. Given the repetition of these interventions and the particular posture that physicians take, there is the possibility that the physicians will maintain an improper posture, which may be one of the causes of MSDs among these individuals. Since this group is part of the community's specialist forces, emergence of such problems among them will impose a heavy financial and health burden on the community, and investigating the causes and, if possible, intervening and preventing these causes can be highly effective.

Methods

This cross-sectional, descriptive-analytical study was conducted on 59 otolaryngologists. The list of these specialists was prepared by the medical council of Isfahan, Iran. Given the low number of otolaryngologists in Isfahan, all of them were regarded as the target group in this study and no specific sampling was performed among them. The study on these specialists

lasted from April to December 2014. The study exclusion criteria included diseases affecting the musculoskeletal system such as osteoarthritis, rheumatoid arthritis, and other connective tissue (CT) diseases, crystalline arthropathies, congenital MSDs (kyphosis, scoliosis, etc.), fractures, and a history of surgeries on the musculoskeletal system. In addition, physicians who were not willing to cooperate were excluded; a total of 20 individuals were excluded given these criteria.

The ergonomist took photos of the doctors with a digital camera (in their office or clinic) while they were performing ear, pharyngeal, and nose examination using an otoscope, a tongue depressor, and a speculum (common clinical examinations), respectively. Then, using the QEC and LUBA evaluation techniques, the otolaryngologists were classified into the three groups of low, medium, and high risk of MSDs. Based on the QEC scoring system, a score below 65, 65-81, and 82-113 was considered as low risk, medium risk, and high risk, respectively. Moreover, based on the LUBA system, a score of less than 5, 6-10, and 11-15 was considered as low risk, moderate risk, and high risk, respectively. The physicians were asked to complete the Nordic Musculoskeletal Questionnaire (NMQ).[6]

This questionnaire, with a validated reliability, was employed to assess MSDs among the otolaryngologists. Statistical analysis was performed on the collected data in SPSS software (version 20, IBM Corporation, Armonk, NY, USA).

To examine posture and determine the low-risk, medium-risk, and high-risk target groups in the two groups of with and without MSDs, the Mann-Whitney test was exploited. Moreover, Spearman's correlation coefficient was utilized to determine the relationship between posture and the number of MSDs. The relationship of the scores of each of these two with the presence and number of MSDs obtained from the NMQ was also examined using the related tests (χ^2, etc.). A $P < 0.050$ was considered as the significance level for the relationship between the variables.

Results

In accordance with the data obtained from the NMQ, 35 (89.7%) and 4 (10.3%) of the study population were men and women, respectively, and the mean age of the subjects was 46.9 ± 4.7 years.

Table 1 illustrates the frequency distribution of the posture score obtained by the specialists examined during their routine clinical examinations by different areas of the body and the whole body based on the LUBA method.

Table 1. Frequency distribution of the otolaryngologists' posture score during routine clinical examinations by different body areas using the loading postural upper body assessment method

Common examinations	Body areas	Posture score (Mean ± SD)	Maximum	Minimum
During ear examination	Wrist	2.55 ± 0.08	3	2
	Elbow	2.00 ± 0.00	2	2
	Shoulder	2.42 ± 0.14	3	1
	Neck	2.45 ± 0.14	3	1
	Waist	3.00 ± 0.00	3	3
	LUBA index	12.42 ± 0.25	14	10
During pharyngeal examination	Wrist	2.00 ± 0.00	2	2
	Elbow	1.75 ± 0.07	2	1
	Shoulder	1.30 ± 0.07	2	1
	Neck	3.12 ± 0.39	6	1
	Waist	2.45 ± 0.14	3	1
	LUBA index	10.60 ± 0.53	14	6
During nose examination	Wrist	1.85 ± 0.13	3	1
	Elbow	2.00 ± 0.00	2	2
	Shoulder	1.30 ± 0.07	2	1
	Neck	1.00 ± 0.00	1	1
	Waist	3.00 ± 0.00	3	3
	LUBA index	9.15 ± 0.20	11	8

SD: Standard deviation; LUBA: Loading postural upper body assessment

According to table 2 results, it is observed that the risk of developing MSDs among the 39 otolaryngologists examined using the LUBA method during the ear, nose, and pharyngeal examinations was in the medium and high categories. In this way, during the ear, pharyngeal, and nose examinations, most of the physicians were at high risk (74.3%), medium risk (56.4%), and medium risk (74.3%) of MSDs, respectively.

Table 2. Frequency distribution of physicians' posture in the three levels examined during routine clinical examinations based on the loading postural upper body assessment method

	Risk of MSDs [n (%)]		
	Low	Medium	High
During ear examination	0 (0)	10 (25.6)	29 (74.3)
During pharyngeal examination	0 (0)	22 (56.4)	17 (43.5)
During nose examination	0 (0)	29 (74.3)	10 (25.6)

MSDs: Musculoskeletal disorders

Given the mean LUBA index of the physicians during ear (12.45) and pharyngeal (10.6) examinations, the physicians on average were at a high risk of developing MSDs and required immediate corrective actions through redesigning the workplace or working methods. During the nose examination, on average, the physicians were at a medium risk (9.15) of developing MSDs, requiring further investigations and corrective modifications during subsequent evaluations, but no immediate intervention was required.

Of the 39 otolaryngologists under study, 31 (79.5%) had at least one MSD based on the NMQ data, and only 8 (20.50) of them showed no MSDs. Of the 31 physicians with MSDs, 11 (35.48%), 8 (25.80%), 5 (16.13%), 2 (6.45%), 4 (12.9%), and 1 (0.03%) had problems in only 1 area, 2 areas, 3 areas, 4 areas, 5 areas, and 6 areas of their body, respectively. Table 3 displays the rate of MSDs by the physician's body area, with the highest number of MSDs in the neck [17 (43.6%) cases] followed by the shoulders (38.5%) and the lowest number of MSDs in the ankles/feet [2 (5.1%) cases].

Table 3. Frequency of musculoskeletal disorders by body area

	MSD	
	No	Yes
Neck	22 (56.4)	17 (34.6)
Shoulders	24 (61.5)	15 (38.5)
Above waist	30 (76.9)	9 (23.1)
Elbows	31 (79.5)	8 (20.5)
Wrists/hands	36 (92.3)	3 (7.7)
Below waist	30 (76.9)	9 (23.1)
Pelvis/thighs	33 (84.6)	6 (15.4)
Knees	32 (82.1)	7 (17.9)
Ankles/feet	37 (94.9)	2 (5.1)

MSDs: Musculoskeletal disorders

To determine the relationship of the physicians' posture score during the routine clinical examinations obtained using the LUBA instrument with MSDs, the χ^2 and Pearson correlation coefficient tests were used separately for the three routine clinical examinations. There was no significant relationship between the physicians' posture during the routine clinical examinations and MSDs ($P > 0.050$). The small value of the correlation coefficient of the number of MSDs with the LUBA index during the clinical examinations confirmed this issue; however, concerning this value for the ear examination (correlation coefficient of 0.25), it can be declared that the number of MSDs increases with an increase in the LUBA index (worsening of the posture during examination). This analysis was also valid for pharyngeal and nasal examinations with correlation coefficients of 0.18 and 0.25, respectively.

Based on the QEC method results, the mean risk score of the physicians' posture during the ear, pharyngeal, and nose examinations was 61.23, 54.56, and 54.43, respectively. Table 4 presents the frequency distribution of the QEC scores obtained by the physicians during routine clinical examinations by body area and the whole body.

Based on QEC scores, the otolaryngologists were classified into the three low-risk, medium-risk, and high-risk groups regarding the risk of MSDs.

Table 4. Otolaryngologists' posture score during routine clinical examinations by different body areas based on the Quick Exposure Check

		Risk of MSDs [n (%)]		
		Low	Medium	High
During ear examination	Waist	13 (33.7)	26 (66.3)	0 (0)
	Shoulder/arm	39 (100)	0 (0)	0 (0)
	Wrist/hand	39 (100)	0 (0)	0 (0)
	Neck	39 (100)	0 (0)	0 (0)
During pharyngeal examination	Waist	39 (100)	0 (0)	0 (0)
	Shoulder/arm	38 (97.4)	1 (2.6)	0 (0)
	Wrist/hand	39 (100)	0 (0)	0 (0)
	Neck	38 (97.4)	1 (2.6)	0 (0)
During nose examination	Waist	39 (100)	0 (0)	0 (0)
	Shoulder/arm	10 (25.6)	29 (74.4)	0 (0)
	Wrist/hand	39 (100)	0 (0)	0 (0)
	Neck	39 (100)	0 (0)	0 (0)

MSDs: Musculoskeletal disorders

According to the results of the QEC tool during ear examinations, the posture score of the physicians in the lumbar region is somewhat significant, with 26 (66.7%) of the subjects being at a moderate risk of MSDs in this body area (Table 4). In addition, during the nose examination, the posture score of the doctors in the shoulder/arm area was somewhat significant, with 29 (74.3%) subjects at a moderate risk of developing MSDs during the nose examination. According to the results of the QEC tool regarding the pharyngeal examination, the physicians' posture in all four areas of the body (waist, shoulder/arm, wrist/hand, and neck) had a low risk of developing MSDs. The aforementioned findings and the standard intervals of the QEC instrument indicated that the overall risk of MSDs in the physicians investigated in this study was low considering their posture during the ear, nose, and pharyngeal examinations in the clinic.

Since all otolaryngologists in this study were at a low risk of developing MSDs based on the results of the QEC tool during routine clinical examinations, it was not possible to evaluate the significance of the relationship of the physicians' posture based on the QEC tool score with MSDs.

Discussion

In the present study, the prevalence of self-reported symptoms of MSDs and objective assessment of posture risk level among otolaryngologists in Isfahan during routine clinical examinations was investigated.

The most important reason for the difference between the results obtained using the LUBA and QEC methods is that the LUBA technique only addresses the posture of the individual and disregards other risk factors such as the load weight, working time, load carrying, frequency of movements, and the applied force that are included in the QEC tool. Moreover, LUBA focuses more on the evaluation of pressure due to different body postures on the upper limbs. Given that the risk score of the weight load carried by the otolaryngologists during examinations is zero in the QEC instrument, it is effective in the overall mean and reduces the posture risk score.

Moreover, taking into account the fixed posture of the study subjects and their lower extremities as well as the lack of load carrying during examinations, the scores of these risk factors are low in the QEC instrument for the subjects studied, thus reducing the overall mean posture risk score.[7] Therefore, the LUBA tool seems to be a more appropriate tool for investigating otolaryngologists' posture compared to the QEC tool.

The prevalence of MSDs is high among otolaryngologists, especially in the shoulder, neck, and upper lumbar region. The present study showed that 31 (79.4%) physicians had

developed at least one MSD and only 8 (20.5%) physicians had no MSDs. This figure is about double the value reported in the study by Mehrdad et al. regarding the incidence of MSDs among 405 Iranian physicians, regardless of their specialty, in 4 training hospitals.[8]

In a comparative study carried out by Rambabu and Suneetha on the prevalence of MSDs among dentists, surgeons, and general practitioners in India, this value was 61, 37, and 20%, respectively, which was lower in all the three groups compared to the otolaryngologists in the present study.[9] This result is due to the high-risk postures of these specialists while working, lack of variation in posture for hours, and high working hours. A study by Choobineh et al. revealed that the prevalence of MSDs was significantly greater among individuals working in an office in comparison to those who perform a physical activity while working.[10]

A study by Garcia et al. indicated that the three factors of work repeatability, exposure to high risk situations, and external factors have a significant impact on the incidence and severity of MSDs.[11] In general, MSDs impose a heavy financial burden on the society. In another study, it was estimated that 3.3% of total health care costs were related to these disorders, which is a very high amount.[12] However, Freimann et al. found that the prevalence of musculoskeletal pain was high among Estonian nurses.[13] Mental risk factors such as emphasis on pain and a tendency to physically perceive pain were important in the medical staff, and none of the risk factors measured could explain the high incidence and prevalence of MSDs.[13]

In the present study, although there was no significant relationship between the physicians' posture during routine clinical examinations and MSDs, with an increase in high-risk postures during the examination, the incidence rate of MSDs and their frequency in the individuals increased, indicating a relationship between these two variables. A similar study on radiologists has shown that there is a significant relationship between musculoskeletal pain and working hours and age groups.[14] Furthermore, a significant relationship was observed between shoulder belt pain and age group in radiologists.[14]

Additionally, a similar study on pathologists suggested that the highest incidence of MSDs was observed in the neck (31.3%) and neck/shoulder areas (21.1%).[15] Moreover, there was a significant relationship between the working hours of specialists and the prevalence of MSDs ($P = 0.010$).[15]

In another study, the prevalence of MSDs in the cervical area among otolaryngologists was significantly higher compared to cardiologists; this difference may be due to the high-risk postures of the subjects in this study.[16] In the study by Mehrdad et al., long sitting and standing, neck bending, work experience, and working hours in each shift were the main contributing factors to the prevalence of MSDs among Iranian physicians.[8]

In a study conducted on radiologists' posture in the city of Isfahan, Vahdatpour et al. found that posture and type of activity during work had a significant impact on the risk of developing MSDs at work.[14] In a cross-sectional study performed by Yasobant and Rajkumar on dentists, laboratory technicians, nurses, physicians, and hospital physiotherapists in India, prolonged working in a fixed posture, working in a clumsy posture, and dealing with excessive numbers of patients or samples per day were mentioned as the main causes of MSDs.[17] However, in a study on 3798 individuals in the United States, Warren et al. found that the most important biomechanical factors causing MSDs consisted of fixed postures, pulling, pushing, and lifting repeatedly, in addition to frequent bending of the neck.[18]

Furthermore, in the studies carried out by Szeto et al. on surgeons,[19] Andersson et al. on dentists,[20] and MacDonald and King on echocardiographists,[21] the highest rate of MSDs was observed in the neck; this is consistent with the results of the present study.

A study by Mohammadfam et al. showed

that there was a significant relationship between the risk estimated by the LUBA technique and the prevalence of MSDs on the basis of the NMQ among the 115 workers of a factory.[7]

Given the cross-sectional nature of the study as well as the self-reporting method of collecting the NMQ data, it is necessary to interpret the study findings carefully. One of the problems and limitations of the present study was that self-reporting was accompanied by weaknesses such as difficulty recalling the complication. However, in the present study, the recalling period for reporting the symptoms was limited to 12 months in order to reduce the effect of this problem to some extent. Additionally, other limitations included the lack of cooperation of the physicians in responding to the NMQ carefully.

The total population of otolaryngologists in Isfahan was 59 individuals, of whom 20 were not willing to participate in the study despite the efforts of the researchers. In the future, more robust and comprehensive results can be achieved by examining a higher number of otolaryngologists in different cities.

Taking into account the findings of the analysis using the LUBA and QEC posture risk measurement tools, the LUBA tool seems to be a better tool for examining the postures of otolaryngologists compared to the QEC tool. Therefore, it is suggested that the LUBA instrument be used in similar studies to examine the postures of otolaryngologists. Furthermore, in order to improve the accuracy of the assessment, it is suggested that the patient's posture be adjusted and fixed during the examination to eliminate its effect on data differences.

Conclusion

In conclusion, given the high prevalence of MSD symptoms among the otolaryngologists in Isfahan and the medium and high risk of these symptoms in the posture analysis results, it is recommended that these individuals be trained on how to sit correctly during examinations. Furthermore, suitable stretching exercises, suitable relaxation time during the day such as developing a reasonable and preset schedule for examinations and rest, using ergonomically suitable chairs in hospitals and clinics, as well as adjusting patient posture during the examination can prevent the incidence of these disorders to a high extent.

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Conflict of Interest

Authors have no conflict of interest.

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