



# Comparison of the Risk of Musculoskeletal Disorders among Normal and Students with Hearing Abnormalities in Ilam City

Iraj Alimohammadi<sup>1</sup> , Shahram Vosoughi<sup>1</sup> , Jamileh Abolghasemi<sup>2</sup> , Athena Rafieepour<sup>1</sup> ,  
Seyed Hosein Tabatabaei<sup>3</sup> , Batool Delshadi<sup>4,\*</sup> 

<sup>1</sup> Occupational Health Research Center, Department of Occupational Health Engineering, School of Public Health, Iran University of Medical Sciences, Tehran, Iran

<sup>2</sup> Department of Biostatistics, School of Health, Iran University of Medical Sciences, Tehran, Iran

<sup>3</sup> Department of Occupational Health Engineering, School of Public Health, Iran University of Medical Sciences, Tehran, Iran

<sup>4</sup> Department of Ergonomics, School of Public Health, Iran University of Medical Sciences, Tehran, Iran

## Abstract

### Article History:

Received: 13/08/2022

Revised: 07/09/2022

Accepted: 07/09/2022

ePublished: 23/09/2022



\*Corresponding author: Batool Delshadi, Department of Ergonomics, School of Public Health, Iran University of Medical Sciences, Tehran, Iran.  
Email: batool.delshadi@yahoo.com

**Objectives:** Inappropriate sitting posture on bench can contribute to pain and musculoskeletal disorders in students. Hearing and vision disabilities may be the cause of inappropriate sitting postures among students. Therefore, the aim of the present study was to compare the risk of musculoskeletal disorders in normal and students with hearing abnormalities in Ilam city.

**Methods:** Twenty students with hearing abnormalities (case) and 40 students with normal hearing (control) from primary schools in Ilam city of both genders were randomly included in the study. The worst recorded sitting posture of students on the bench was evaluated by the RULA method. Digimizer software was used to survey the body angles of the students while sitting on the bench. The used for analyzing the obtained data in 95% confidence interval.

**Results:** The results of posture evaluation showed that there was a significant difference in rula scores between case and control groups ( $P = 0.001$ ). Deviation from the natural angles of the body in the case groups was more than the control group ( $P < 0.001$ ), which has a direct and significant relationship with the increased risk of musculoskeletal disorders.

**Conclusion:** Musculoskeletal disorders possibility incidence were more common in students with hearing abnormalities compared to typical students which was due to an increase in deviation from the natural angles of the body and inappropriate postures. Given the limitation of the sample size, the present study recommends further research with the same goal and encourages interventional studies to correct the posture of hard of hearing students.

**Keywords:** Students; Hard of hearing; Musculoskeletal disorders; Ilam city



## Extended Abstract

### Background and Objective

Musculoskeletal disorders are a major problem in today's societies, which are mainly reported in older ages. But the onset of these disorders often goes back to childhood and adolescence, and especially to school days. Inappropriate posture of children while sitting in a school chair is one of the most common causes of musculoskeletal pain during school, mainly due to deviation from normal body angles. Hard of hearing (HOH) is health problem that can affect children's sitting conditions in the classroom. Hearing loss is the fourth leading cause of disability in the world. However, educational support for children with HOH is limited. These students often do not benefit from amenities in the classroom, which can result in undesirable postures when straining to better hear the teacher's voice and changing the normal curvature of the spine results in the deviation of normal body angles.

### Materials and Methods

The present study was conducted on students between 6 and 13 years' old who were studying in Ilam. The number of samples in the group of (HOH) students (case group) and normal hearing (NH) students group (control group) were estimated to be 20 and 40 using the mean difference sampling formula in two independent groups and statistical parameters obtained from similar studies, respectively. In order to select hearing impaired people, the list of students with hearing impairments in Ilam education department was used. Then, 10 male subjects in both genders were randomly selected from the list of people with (HOH). A total of 40 students with normal hearing with equal proportion of both male and female genders were randomly selected as the control group and after obtaining informed consent, they were included in the study. Demographic information and variables such as age, height, weight and brief general health status of participants were obtained by interviewing parents and demographic questionnaire. In order to increase the accuracy, students' hearing was reassessed using an audiometer and children were divided into two groups of normal (NH) ( $25 \geq \text{dB}$ ) and hearing impaired ( $25 \leq \text{dB}$ ) based on their hearing threshold. Neck angles with trunk, trunk with bum and lateral bending angle of trunk were measured in all participants of the present study using Digimizer software. The students' posture was recorded using a camcorder while sitting in the classroom. The risk assessment of musculoskeletal disorders was performed using the worst registered posture for participants using RULA method. In this method, the posture of different parts of the upper extremity was scored by using related tables in RULA method and then, by summing up the obtained results, the necessity of corrective changes was determined according to the risk level of musculoskeletal disorders. Data analysis was performed using at 95% confidence level.

### Results

Independent T-test showed no significant difference

between BMI and age variable in case and control groups ( $P < 0.05$ ). The results of independent T-test showed that deviation from normal trunk, bum and head and trunk angles in hearing-impaired students was significantly higher than normal hearing students, but lateral bending angle was not significantly different between the control and case groups ( $P = 0.11$ ). The effect of gender factor on deviation from normal body angles was not significant in the sample size by head angle with trunk ( $P = 0.55$ ), trunk with bum ( $P = 0.47$ ) and lateral bending angle of trunk ( $P = 0.08$ ). The results of RULA evaluation showed that the level of corrective action in the case group was higher than the control group. The effect of gender factor on corrective measures was not significant in this study ( $P = 0.15$ ). The results of Pearson correlation test showed that there was a significant and direct relationship between deviation from normal body angles and RULA corrective measures level in right and left half of body ( $P = 0.05$ ). In other words, with increasing deviation from normal body angles, the incidence rate of musculoskeletal disorders and the level of need for corrective measures increase.

### Discussion

The results of body posture in this study showed that deviation from normal body angles in (HOH) students was higher than normal hearing students. Melo et al. stated in their study that students with sensorineural hearing loss due to atrial hypothyroid system are impaired in regulating their postural control, which may be associated with undesirable ergonomic habits in school environment and cause deviations in their spine. In the present study, the tendency to bend head forward and deviation of head and trunk angle from normal body angles were significantly higher in (HOH) students than normal hearing students. Sousa et al. reported a similar result in postural control instability in children with (HOH) in the form of tendency to bend head forward due to vestibular disorders. Considering the important role of vestibular system in motor development and balance, children with this type of disorder usually have less balance retention power which can increase the risk level of musculoskeletal problems. The results of RULA evaluation in this study showed that the urgency of corrective action in (HOH) students is more than normal hearing students. In their study on a group of male students, Ilbeigi et al. reported that bending and rotation angles due to poor sitting on school benches had a significant relationship with neck and back pain and increased rates of musculoskeletal problems.

### Conclusion

The results of this study showed that (HOH) students are at higher risk of postural abnormalities and musculoskeletal disorders. Therefore, further studies on the prevalence of musculoskeletal problems and physical condition modification in people with hearing disabilities, especially in childhood, are recommended.