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Ergonomic evaluation of dental students in Birjand using the REBA method in seven therapeutic areas

Abstract

Musculoskeletal disorders in dentistry lead to the loss of time, money, and health of dentists due to their incorrect body postures. Given the high prevalence of these problems and the significance of training and providing appropriate solutions to protect students who are at the beginning of their careers, this study attempts to evaluate the ergonomics of dental students in Birjand in seven treatment areas.

In this descriptive-analytical study, the body posture of 70 healthy dental students while working was investigated using the REBA (Rapid Entire Body Assessment) method as a random sampling with 20-30 minutes of direct observation and taking some photos during work. The data were reported as a percentage, relative frequency, and mean using SPSS-22 software. The data were analyzed using chi-square and t-test tests (a=0.05). Thirty sixth-year students, nineteen fifth-year students, and twenty-one fourth-year dental students were studied. In this regard, 51.4% had priority 2 (moderate risk level) and 42.9% had priority 3 (high-risk level). Different departments also affected the level of ergonomic risk. Students in the surgery department had a higher risk level. There was a significant difference between REBA scores in people with different heights (value>0.05). However, there was no significant difference in REBA scores regarding gender entry year, weight, and BMI (0.05<P value) Given the moderate and high-risk levels of most of the studied students, they need ergonomic intervention training.

Keywords: *Ergonomics, REBA, Body posture*

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Introduction

Each work environment may have some risks for the health of the people who are working given the conditions of that environment. Dentists are at a greater risk of musculoskeletal disorders due to their occupational characteristics (2. Musculoskeletal disorders are injuries and complications in muscles, nerves, tendons, ligaments, joints, cartilage, and spine, and are among the major causes of defects and pathologies in developed and developing countries (3). In the dentistry profession, static and dynamic activities cause the occurrence of musculoskeletal disorders. However, dentists do not have proper knowledge and understanding of ergonomic factors and their role in the health of their musculoskeletal system. They suffer from much biomechanical pressure in their work environment, which causes complications at the individual and social levels (4).

The primary risk factors for musculoskeletal disorders are repetitive work and the force entering the body during work, mechanical stresses, body posture while performing dental work, cold vibration, and external stresses. Among these factors, body posture while performing dental work is the most common risk factor (5). The high prevalence of pain caused by dental work has made many dentists consider muscle pain as part of their work. A study revealed that 5 out of 6 dentists experienced pain and discomfort during 12 months (6).

In another study conducted among dentists, the prevalence of neck, wrist, lower back, shoulder, 37%, and leg was reported at 58, 54, 46, 37, and 4%, respectively (7). Moreover, among dental students, the prevalence of neck, wrist, hand, shoulder, upper back, lower back, one or both knees, and elbow has been reported at 49.7, 47.8, 29.6, 23.9, 16.9, 14.1, and 1.4%, respectively (8). Based on the studies conducted on dentists and according to the rapid entire body assessment method, it was that they are at a high level of risk and there is a direct relationship between their working conditions and musculoskeletal problems (9). Many problems raised in the work environment can be eliminated currently by using ergonomic methods since ergonomics is the study of how humans interact with the work environment to achieve their goals (10). The analysis of postures can be a strong and effective technique for evaluating work activities ergonomically. Thus, the REBA method has been designed to assess the entire body rapidly (11). The present study was conducted for the ergonomic evaluation of dental students in Birjand in seven treatment areas given the prevalence of problems related to working conditions among dentists, the

lack of a study on the ergonomic condition of dental students in Birjand, and the significance of training on musculoskeletal disorders and providing appropriate solutions to improve the working conditions of dental students as future dentists.

Methods

This cross-sectional descriptive-analytical study was conducted after obtaining the necessary permissions from the Research Deputy and the Ethics Committee of the university with the ethics code of 1398.415.IR.BUMS.REC. In this regard, the author referred to the clinic of Birjand Faculty of Dentistry to conduct sampling before conducting the study. Informed consent was obtained from the students. Fourth--, fifth-, and sixth-year dental students who were physically healthy and were working in the clinic of Birjand Faculty of Dentistry were studied.

The students who had a history of surgical accidents and congenital and hereditary diseases related to posture were excluded from the study. For this purpose, a checklist was prepared, and the demographic characteristics of the students, including gender, height, weight, and BMI were recorded. To evaluate the body posture while doing the work, the observational technique of Rapid Entire Body Assessment (REBA) was used. This technique is one of the newest methods of analyzing the posture of body posture during work according to the possibility of the risk of musculoskeletal disorders. It was introduced in 2000 by Hignett and McAtamney. The reliability and validity of this method were examined in the study by Ferdiansyah et al. (12*).* Ten students were randomly selected from each department of restorative endodontics, periodontics, surgery of pediatric oral diseases, and prosthetics. At the beginning of the work, each student was directly observed by the researcher, and after 20-30 minutes of direct observation and taking some photos while working, the ergonomic posture of the students was evaluated using the REBA method.

In the REBA method, different parts of the body are divided into groups A and B for analysis. Group A includes the score of the trunk, neck, and legs, and Group B includes the score of the arms, forearms, wrists, and shoulders. Each part of the body is given a score based on the movement it performs and the angles of its placement. Then, the final score is obtained by applying force. Then, the REBA final score is interpreted using the REBA score to determine the level of risk and the need to change the posture based on the score obtained and to plan corrective measures (Table 1). The collected data were entered into SPSS-22 software. Descriptive information was reported using central indices, dispersion, and appropriate charts. To analyze the data, Chi-square or Fisher's test, and T-test were used given the normality of the data at a significance level of 0.05.

Results:

Among all participants, 38 were male and 32 were female. Also, 30 were sixth-year students, 19 were fifth-year students, and 21 students were fourth-year students. The mean of scores was obtained at 7±1.8. The lowest score was 3 (low-risk level) and the highest score was 11 (very high-risk level). The results showed that 2.9% (n=2) of the participants had a low-risk level, 51.4% (n=36) had a moderate risk level, 42.9% (n=30) had a high-risk level, and 2.9% (n=2) had a very high-risk level.

Table 2 shows that the mean scores of REBA are significantly different among different departments of the faculty (p-value = 0.013). Accordingly, the highest score is related to the surgery department and the lowest score is related to the prosthesis department. Also, based on Table 3, the sixth-year students have lower mean scores compared to the fifth-year students and the fifth-year students have lower mean scores compared to the fourth-year students. However, no significant relationship was observed between students' years of study and mean REBA scores (p-value=0.097).

Table 4 also shows the REBA scores among the students with different heights. The highest scores were related to people with a height range of less than 160 cm and the lowest scores were related to people with a height range of more than 180 cm. There was a significant relationship between height and mean scores (value = 0.046). However, no significant relationship was found between weight and mean scores (p-value = 0.596) and between BMI and mean scores (p-value = 0.368)**.** Among all the participants of the study, 38 were male and 32 were female. The mean and standard deviation of REBA scores was 6.9±1.9 in males and 7±1.8 in females and no significant difference was observed between male and female groups (P-value=0.44).

Discussion

Examining the body posture of the subjects during work using the REBA method showed that the level of risk of most of the students is in the moderate and high range, which can lead to musculoskeletal problems. Thus, these people need to correct their body posture while working. These results are in line with those of previous studies conducted in Iran (13). In the present study, 51.4% of students have a score of 3 (a moderate risk level) and 42.9% of students had a score of 4 (a high-risk level). This result suggests that most students need corrective measures and it is consistent with the results of the study by Asghari Pour (7).

Also, the mean and standard deviation of REBA scores in both male and female groups were 6.9±1.9 and 7±1.8, respectively. There was no significance between the two genders. It is consistent with the results of a study by Barkat et al. (14). In this study, there was no significant relationship between student's academic year and mean REBA scores. It indicates that students have not received sufficient training in the field of ergonomic principles and related factors along with other

training and the students graduate with the same incorrect body posture that they started working. The results of a study by Yaqoubi et al. also confirm this result (13).

Investigating the clinical departments of the faculty revealed that the highest risk was related to the surgical department, followed by the oral diseases, pediatric dentistry, and restorative dentistry departments, and the lowest risk was related to the dental prostheses department. It is concluded that the high-risk level in the surgical department is due to the unbalanced standing posture and use of high force. The reason for the high level of risk in the oral diseases department is that this course is usually offered to students of lower years and the students in this department have their first encounter with patients and do not have sufficient experience.

The high level of risk in the pediatric department can be due to the incorrect posture of children and not using the pediatric unit and the less visibility and accessibility of the students due to the patients' non-cooperation and not opening their mouths. The high level of risk in the restoration department may be due to the high stress of this treatment and the need for vision and precision.

Investigating the height of students shows that students with a height range of less than 160 cm have the highest level of risk. It may be due to the incorrect adjustment of the tabouret (dental stool) according to the person's height. This result was not consistent with the study by Ali Akbari et al. who evaluated the ergonomics using the RULA method (15). In this study, no significant relationship was observed between people's weight and test scores, which is in line with the study by Ali Akbari et al. (15). Additionally, no significant relationship was reported between the body mass index of subjects and the test scores, which was in line with the study by Nadri et al. (16).

Based on the results of this article, the probability of suffering from musculoskeletal problems is high, and various factors are involved in this regard. One of these factors is the lack of necessary ergonomic training in the dental curriculum. Some prestigious dental faculties around the world have included the necessary courses in the curriculum of these students (17).

In a study entitled “Prevention of Musculoskeletal Diseases in Dentistry”, Valachi et al. recommended the methods of prevention of these factors that cause skeletomuscular diseases. It means that skeletomuscular diseases can be prevented by correct posture and sitting, the flexibility of the body, and the use of ergonomic guidelines (18). Also, magnifying devices to reduce the neck bending angle, easy access to work tools to prevent excessive bending of the back, prevention of fixed posture, the lack of quick and rotating movements in the spine and back, the use of sufficient rest periods, the use of the whole hand while working, the prevention of continuous work with two fingers, and the prevention of inappropriate, continuous, and repetitive work should be considered in this regard (19).

The present study, like all studies, suffers some limitations. For example, the type of work that students do in a department could be different from another student, and working on the upper or lower jaw could make differences in REBA score that was sometimes related to students' inability to work with a mirror. This issue can be examined in other studies. Also, different results may be obtained in studies using a higher sample size.

Conclusion:

The results of the study revealed that the body posture of dental students of Birjand University of Medical Sciences is at a moderate and high-risk level. The worst postures were related to surgery, oral diseases, pediatrics, and restoration departments. Sufficient practical and theoretical training from the time of starting work to the end of education should be considered to reduce these vulnerabilities

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Table 1: The scoring with the REBA method and the need for corrective measures

REBA final score	Level of risk	Level of priority of corrective measures	Necessity and time of measures
1	Pardonable	0	It is not necessary
2-3	Low	1	It may be necessary
4-7	Moderate	2	It is necessary
8-10	High	3	It is necessary (the sooner)
11-15	Very high	4	It is necessary (immediate)

Table 2: The level of risk based on the mean and standard deviation in each of the departments with the REBA method

Number	Department	The mean and standard deviation of final scores	Level of risk
10	Restorative Dentistry	6.8±1.6	2
10	Endodontics	6.7±2.6	2
10	Periodontics	6.6±1.5	2
10	Pediatric Dentistry	6.8±2.4	2
10	Surgery	7.9±1.7	3
10	Oral Medicine	7.7±1.7	3
10	Prosthodontics	6.5±1.5	2

Table 3: The level of risk based on the mean and standard deviation of students' years of study with the REBA method

Number	Students' years of study	The mean and standard deviation of final scores	Level of risk
30	sixth-year students	6.4±2.2	2
19	fifth-year students	7.2±1.7	3
21	fourth-year students	7.5±1.1	3

Table 4: Relation between height, weight, and BMI with REBA mean scores

Variable	Variable details	Number	The mean and standard deviation of the score	Level of risk
Height (Cm)	< 160	9	7.7±1.9	3
	160-170	32	7±1.5	3
	170-180	18	6.8±2.6	2
	>180	11	6.4±1.2	2
Weight	<50	9	7.2±1.9	3

Variable	Variable details	Number	The mean and standard deviation of the score	Level of risk
(Kg)	50-60	20	7±1.9	3
	60-70	25	6.9±1.7	2
	70-80	9	7.2±2.7	3
	>80	7	6.4±1.5	2
BMI	<18.5	16	7.1±1.9	3
	18.5-25	45	6.9±1.7	2
	>25	9	7±2.6	3

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