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Knowledge, Attitude, and Practice of Ergonomics Principles among Undergraduates Studying Bachelor of Dental Surgery

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ABSTRACT

Introduction: Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. Successful application of ergonomics, assures high productivity, evasion of illnesses and injuries, leading to increased satisfaction among workers. On the other hand, unsuccessful application can lead to work-related musculoskeletal disorders (MSDs) among dental professionals.

Objective: The objective of this study was to assess knowledge, attitude, and practice of ergonomics principles among undergraduates studying bachelor of dental surgery.

Methods: A descriptive cross-sectional study design was carried out among 172 students studying bachelor of dental surgery at Kathmandu Medical College, Kathmandu Nepal. Census technique was used to collect the data. A structured questionnaire was used as a data collection tool.

Results: The study revealed that nearly (69) 40% of the students had a knowledge about the ergonomic principles. Whereas, (112) 65% students of all the years as a whole had a good attitude towards ergonomics. But only (34) 20% students as a whole were using the principles of ergonomics into practice.

Conclusions: Although, (69) 40% had knowledge about ergonomics in dentistry. Only (34) 20% of the students had a practice of ergonomics . Thus, improvement in the level of knowledge is required but more importantly the application of knowledge into practice is recommended for better dental practice.

Keywords: Awareness; ergonomics; musculoskeletal disease.

INTRODUCTION

Ergonomics is defined as "an applied science concerned with designing and arranging things people use so that they can interact most efficiently and safely". Following the basic norms of ergonomics assures high productivity, avoidance of illnesses and injuries, and increased satisfaction among workers.[1,2.] Most

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of the time, the dentist works for a longer period of time without taking a rest in between the procedures. This may lead to multiple occupational musculoskeletal problems.[3] The degree of musculoskeletal problems encountered by a dentist ranges from discomfort, pain, functional disability and diminished work performance. The symptoms are usually ignored until they worsen and becomes chronic.[3] Following the basic principles of ergonomics can prevent work-related musculoskeletal disorders (MSDs).[4] This study was intended to assess knowledge, attitudes, and practice of ergonomics among dental undergraduate studying at Kathmandu Medical College, Kathmandu, Nepal.

METHODS

An observational, descriptive cross-sectional study was conducted after the approval of the study from Institutional Review Committee(IRC) of Kathmandu Medical College Public Limited, on February 10,2023(Ref:10022023/04). The data Collection time period was from March 2023 to April 2023. The College of Dental Surgery, Kathmandu Medical College Public Limited, was chosen as the study site. As all the students from first years to final year were the study unit so Census was used for collecting the data. Total of 172 students were involved in the study, out of which 110 were female and 62 were males (table 1 and 2). A written informed consent was taken from each student before participating in this study. The valid and reliable set of questionnaire was used as a study tool in this study.[5] The study respondents were asked to fill a pre-designed set of questionnaires. The valid and reliable semi-structured questionnaires were taken from the study conducted by El-Sallamy RM et al[5]. The questionnaire included 9 questions related to knowledge, 5 questions related to attitude and 8 questions related to practice.[5] Confidentiality was maintained at all the stage of data processing. All the data collected via questionnaire were entered in a MS-Excel sheets and master table were prepared. Later the data was imported in SPSS – IBM version 20 for the further analysis. For descriptive statistical calculations, mean, was calculated. Student t- test was used for checking the variation for age of the students of different academic years. For testing association between different variables, chi-square test was used. The Significance level was kept 5% ($p < 0.05$).

RESULTS

A total of 172 students were included in the study. As a Student t-test was used to check the variation for different age groups among the students, no significant variation in age was found. Thus, the study was focused on the objectives i.e., the year wise classification of the student's knowledge, attitude and practice. Many tables were generated but only those directly assessing the objectives of this study are presented here.

Table 3, illustrates the year wise classification of students and association between their educational year and levels of knowledge on the basis of the question asked. Only knowledge-based questions whose data were suitable for the tabulation for Chi- square test are reflected here. The last column shows the p-value for the significance, the level of significance was set at 95% CI, i.e., p- value, and less than 0.05 in the last column shows significant variation.

Likewise table number 4 & table number 5 illustrated on the practice of ergonomic principles by students and variation of knowledge of students on the basis of their genders respectively. Out of 8 questions related to the practice of ergonomic principles by the students, only one question fitted the chi – square test, thus it is represented in table 4. The variation was statistically insignificant (P> 0.05). Table 5, illustrates the association of knowledge of students on the basis of their gender. The level of significance was set at 5% i.e., those in the last column with the p- value less than 0.05 reflects the significant association of knowledge with respective genders, whereas others have the association but the association was statistically insignificant.

For assessing the attitude among the students, in a total 5 questions were asked. The responses were not suitable to draw an association with the academic year of students, as Chi- Square test could not give the level of association; also other statistical tests were not used to draw the association. Similarly, in regards to gender-based association in the case of questions related to attitude and practice; none of the response fitted the tabular analysis of chi- square test done, thus those table would not be helpful to give a clear inference and hence not represented here. Only the table those were suitable to apply Chi - Square test and only the variables where association could be reflected is presented in the result section here.

Table 1: Total number of respondent according to years of study

Years of Study	Numbers	Percent (N=172)
First Year	41	23.8
Second Year	30	17.4
Third Year	26	15.1
Fourth Year	42	24.4
Final Year	30	17.4
Total	172	100.0

Table 2: Sex Distribution of total Respondents.

Sex Distribution	Numbers	Percent (N=172)
Female		
Male	110	63.9
Total	62	36.1
	172	100.0

Table 3: Knowledge of students of different academic year and their knowledge.

Do you know the best posture of the dentist sitting?							
Response	First Year (N= 41)	Second Year (N=30)	Third Year (N=26)	Fourth Year (N= 42)	Final Year (N=30)	df	p- value
Yes	10	15	18	18	24	6	.039
	11.7%	17.6%	21.1%	21.1%	28.2%		
To Some Extent	15	9	6	16	9	6	.012
	27.2%	16.3%	10.9%	29%	16.3%		
No	12	7	3	6	4	1	.062
	37.5%	21.8%	9.3%	18.7%	12.5%		
Do you know the best level of the dentist shoulders and site of elbow and upper arms?							
Yes	20	15	13	21	22	6	.161
	21.9%	16.4%	14.2%	23%	24.1%		
To Some Extent	19	10	8	17	8	6	.063
	30.6%	16.12%	12.9%	27.4%	12.9%		
No	5	5	5	4	0	1	.025
	26.3	26.3%	26.3%	21%	0.0%		
Do you know the best site for forearms and operating fingers of the dentist?							
Yes	14	5	9	11	16	6	.008
	25.4%	9%	16.3%	20%	29.0%		
To Some Extent	10	14	12	19	14	6	.001
	14.4	20%	17.3%	27.5%	20%		
No	20	11	5	12	0	1	.001
	41.6	22.9%	10.4%	25%	0.0%		
Do you know the degree of the sight-line and the light-line?							
Yes	5	5	5	11	11	6	.127
	13.5%	13.5%	13.5%	29.7%	29.7%		
To Some Extent	8	12	15	10	15	6	.117
	13.3%	20%	25%	16.6%	25%		
No	5	21	14	26	10	1	.015
	6.6%	28%	18.6%	34.6%	13.3%		
Do you know the points on the body, including fingertips and feet, that come in contact with patients and objects for stable control and sightings of the operating points?							
Yes	2	2	8	10	15	6	.001
	5.4%	5.4%	21.6%	27%	40.5%		
To Some Extent	6	8	5	20	30	6	.000
	8.6%	11.5%	7.2%	28.9%	43.4%		
No	5	8	17	28	8	1	.000
	7.5%	12.1%	25.7%	42.4%	12.1%		
Do you know, when designing and equipping the treatment room, what specifics should dentists be looking for?							
Yes	1	3	5	8	11	6	.000
	3.7%	11.1%	18.5%	29.6%	40.7%		

To Some Extent	2 3.4	6 10.3%	14 24.1%	18 31%	18 31%	6	.000
No	17 19.5%	26 29.8%	17 19.5%	23 26.4%	4 4.5%	1	.000
Do you know the orbit range around the patients' head?							
Yes	3 10.7%	4 14.2%	5 17.8%	8 28.5%	8 28.5%	6	.525
To Some Extent	21 40.3%	6 11.5%	4 7.6%	12 23%	9 17.3%	6	.511
No	20 21.7%	20 21.7%	17 18.4%	22 23.9%	13 14.3%	1	.059
Do you know the ergonomic head rest and its benefits?							
Yes	2 4.2%	4 8.5%	7 14.8%	19 40.4%	15 31.9%	6	.002
To Some Extent	5 7.5%	14 21.2%	15 22.7%	14 21.2%	18 27.2%	6	.001
No	10 16.9%	22 37.2%	6 10.1%	19 32.2%	2 3.3%	1	.001
Do you know the ideal distance from the floor to the position?							
Yes	3 6.5%	2 4.3%	7 15.2%	13 28.2%	21 45.6%	6	.001
To Some Extent	10 16.6%	10 16.6%	8 13.3%	17 28.3%	15 25%	6	.001
No	16 24.2%	18 27.2%	11 16.6%	17 25.7%	4 6%	1	.000
Do you know the moving, exercise, and stretch exercise between patient's appointments?							
Yes	10 38.4%	0 0.0%	6 23%	5 19.2%	5 19.2%	6	.000
To Some Extent	13 24%	4 7.4%	7 12.9%	12 22.2%	18 33.3%	6	.000
No	3 3.2%	26 28.2%	13 14.1%	35 38%	15 16.3%	1	.000
Do you know how to maintain a comfortable environment, light, and temperature in the treatment room?							
Yes	6 16.2%	7 18.9%	7 18.9%	8 21.6%	9 24.3%	6	.021
To Some Extent	10 13.3%	11 14.6%	11 14.6%	21 28%	22 29.3%	6	.007
No	16 26.6%	15 25%	11 18.3%	16 26.6%	2 1.6%	1	.008

Table 4: Practice of Ergonomic Principles by students as of years of education.

How frequent do you work with your legs separated and your feet flat on the floor?							
	First Year (N= 41)	Second Year (N=30)	Third Year (N=26)	Fourth Year (N= 42)	Final Year (N=30)	df	p-value

Definitely Yes	8 19%	8 19%	8 19%	9 21.4%	9 21.4%	9	.407
Yes	10 13.8%	11 15.2%	8 11.1%	19 26.3%	24 33.3%	9	.316
Neutral	4 8.8%	10 22.2%	12 26.6%	14 31.1%	5 11.1%	1	.338
No	3 23%	2 15.3%	2 15.3%	4 30.7%	2 15.3%		

Table: 5 Variation of Knowledge of students on the basis of their gender

Do you know the benefits of ergonomic application?	Sex		Association	
	F (N=110)	M (N=62)	Df	P-Value
Yes	74 75.5%	24 24.4%	2	.263
To Some Extent	33 61.1%	21 38.8%	2	.337
No	3 15%	17 85%		
Do you know the popular operating posture that may cause musculoskeletal disorders?				
Yes	36 64.2%	20 35.7%	2	.158
To Some Extent	37 68.5%	17 31.4%	2	.126
No	38 61.2%	24 38.7%		
Do you know the best posture of the dentist sitting?				
Yes	60 70.5%	25 29.4%	2	.986
To Some Extent	37 58.7%	26 41.2%	2	.986
No	13 54.1%	11 45.8%		
Do you know the best level of the dentist shoulders and site of elbow and upper arms?				
Yes	61 67%	30 32.9%	2	.773
To Some Extent	37 69.8%	16 30.1%	2	.743
No	13 46.4%	15 53.5%		
Do you know the best site for forearms and operating fingers of the dentist?				
Yes	34 55.7%	27 44.2%	2	.332
To Some Extent	54 78.2%	15 21.7%	2	.320

No	23 54.7%	19 45.2%		
Do you know the degree of the sight-line and the light-line?				
Yes	15 44.1%	19 55.9%	2	.367
To Some Extent	37 82.3%	8 17.7%	2	.344
No	58 62.4%	35 37.6%		
Do you know the points on the body, including fingertips and feet, that come in contact with patients and objects for stable control and sightings of the operating points?				
Yes	13 38.2%	4 61.8%	2	.381
To Some Extent	47 62.6%	7 37.4%	2	.425
No	51 90.5%	6 9.5%		
Do you know, when designing and equipping the treatment room, what specifics should dentists be looking for?				
Yes	15 68.2%	7 31.8%	2	.326
To Some Extent	32 64%	18 36%	2	.345
No	63 63%	37 37%		
Do you know the ergonomic head rest and its benefits?				
Yes	31 62%	19 38%	2	.895
To Some Extent	46 66.6%	23 33.3%	2	.895
No	33 62.2%	20 37.7%		
Do you know the ideal distance from the floor to the position?				
Yes	28 52.9%	25 47.1%	2	.858
To Some Extent	40 72.8%	15 27.2%	2	.856
No	42 65.7%	22 34.3%		
Do you know the moving, exercise, and stretch exercise between patient's appointments?				
Yes	14 38.9%	22 61.1%	2	.686
To Some Extent	37 60.7%	24 39.3%	2	.678
No	59 78.7%	16 21.3%		
Do you know how to maintain a comfortable environment, light, and temperature in the treatment room?				

Yes	16 47.1%	18 52.9%	2	.378
To Some Extent	59 73.8%	21 26.2%	2	.376
No	35 60.4%	23 39.6%		

DISCUSSION

The principles of ergonomics are found to be neglected from knowledge, attitude and practice point of view among dental students. It is a well-established fact that musculoskeletal problems are one of the major concerns among the practicing dentists globally. [6,7,8] Therefore ergonomics principles should be taught to a dental student in the early stage of their career to avoid work related musculoskeletal problems in future. [9-15]This study revealed that about (69) 40% of the students had knowledge about ergonomics which had the findings similar to other studies. [16, 17] In the current study, 112 (65%) showed a response for positive attitudes towards ergonomics. The result is consistent with study done by Madaan V et al, where the level of attitude was 75%, which shows a good reflection of acceptability and willingness to adopt the ergonomic principles in routine dental practice by the study subjects.[18] It was observed that students had sufficient knowledge, attitude regarding the importance of proper working postures, and position during providing treatment but did not result in the desired behavior. As only (34) 20% of the students gave the positive response for practice of ergonomics. This indicates that knowledge may not motivate sufficiently to adapt ergonomic principles. These findings are closely related to other studies which showed a positive significant correlation of knowledge with attitude and negative significant correlation with practices.[19] The current study did not explain the reasons behind the noncompliance of ergonomic principles among dental students in their daily practice. To recognize the gap between fair knowledge and positive attitude further studies are demanded.

In this study, there was no significant variation in genders of the students, their age, and their level of knowledge, attitude and practice. On the contrary, the study done by Kritika Vyas et al, showed males had more positive attitude and behavior than females towards ergonomics in routine dental practice.[3] In the present study, there was a significant association between academic level of the students and their knowledge and attitudes towards ergonomics. This was in agreement with a study done by Kalghatgi et al, which reported a remarkable association with increase in academic level.[1]

The dentists who keep themselves involved in physical activities are less prone to musculoskeletal disorders. The lack of physical inactivity among dentists seems to put them at risk for the occurrence of work musculoskeletal disorders (WMSDs).[13.] Maintaining the posture and following the ergonomics principles is utmost important to prevent from musculoskeletal disorders.[20] In the current study, more than half of the student's i.e.,91 (53%) never work with the legs separated and the feet flat on the floor. Also, 77 (45%) reported that they worked in the upright position and the spine resting on the back of the stool. Only 26 (15%) of the students always orient the operating field to the elbow level of the working hand. Only 9 (5%) of the participants always made an effort to maintain neutral posture while working compared to 93 (54%) of them who never did that. Only 14 (8%) of the participants always orient the beam of light perpendicular to the observational direction compared to 17 (10%) of them who never did that. All students under this study never use loops for magnification during work. This was in agreement with another study done in King Abdul-Aziz University (KAU) during clinical procedures. Their results showed that 43% of the students placed their patients' chair within normal limits (almost supine), 50% of the students' backs were bent, 33% of students' elbows were below the level of the quadrant treated, 50% of the students approached the maxillary arch directly, and only three male students used magnifiers.[21] Drawing the conclusions from the present study and comparing it with similar studies showed that there is a lack of knowledge about ergonomics among dental students and even having knowledge about ergonomics the positive behaviour toward practicing dentistry following ergonomics principles is very less.

This study should be considered as a base line study, more studies should be done in future in larger sample size for better understanding of knowledge, attitude and practice on ergonomics.

CONCLUSIONS

The dental students should be very well oriented to ergonomics principles during their undergraduate studies so that work related musculoskeletal problems can be avoided. The knowledge of ergonomics will help them to practice dentistry in a proper way in future. As per the findings of the present study only 40% of the students had fair knowledge regarding ergonomics. and only 20% of students had good practice. But 65% of students had a positive attitude towards ergonomics. Although ergonomic working principles is taught to the dental students at their dental colleges and incorporated into their curriculum. It is very

important for the oral health professionals to emphasize on practicing ergonomics in their routine dental practice to avoid major ergonomics-related health problems.

Conflict of Interest: None

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