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Original Article

Dentistry Section

Knowledge of Computer Ergonomics among Third and Final year Dental Students: A Cross-sectional Survey from Nagpur, India

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ABSTRACT

Introduction: During the Coronavirus Disease-2019 (COVID-19) pandemic, the world has experienced many changes, including increased computer and internet usage. Spending more time on computers can lead to the development of various postural problems, resulting in pain and inefficiency in the workplace.

Aim: To assess the knowledge of computer ergonomics among third and final year Bachelor of Dental Surgery (BDS) students at VSPM's dental college in Nagpur, Maharashtra, India.

Materials and Methods: This cross-sectional, questionnaire-based study was conducted on third and final year students between November 2020 and February 2021 in the Department of Oral Medicine and Radiology at VSPMDCRC, Nagpur, Maharashtra, India. Ethical clearance was obtained from the Institutional Ethical Committee (IEC/VSPMDCRC/15/2020). A self-administered questionnaire, formulated and validated by independent subject experts, was used. A total of 216 students were included in the study over a two-month period. Informed consent was obtained from the students. The questionnaire consisted of 34 questions on computer usage and knowledge of ergonomics, and the responses were recorded. Descriptive statistics were performed using Statistical Packages for Social Sciences (SPSS) version 20.0 for Windows. Quantitative data were expressed as mean and standard deviation. The association between categorical variables was checked using the Chi-square test, with a significance level set at 5%.

Results: The mean age of the students was 22.20 years total of 216 students, including 158 females and 58 males, were included in the study. The results showed that 20.37% of third year students (44/96) and 31.48% of final year students (68/96) were aware of the term "ergonomics". The majority of students were unaware of the principles of ergonomics. However, 169 (78.2%) students knew the correct position of the head and neck while using a computer. Additionally, 164 (75%) students were aware of the need for lower back support, 167 (77.3%) were aware of the placement of input devices, and 174 (80.6%) were aware of the alignment of devices. Moreover, 168 (77.8%) subject knew that the monitor and working surface should be glare-free, and 120 (55.6%) were aware that a sloped desk surface is required for reading or writing. Furthermore, 157 (72.7%) subjects used a headset or speakerphone while writing, typing, or talking on the phone, and 164 (75.9%) subjects took regular eye breaks.

Conclusion: The present study highlights a lack of practical knowledge and application of ergonomics among the participants. There is a need to prioritise creating awareness and developing healthy ergonomics practices among dental students through Continuing Dental Education programs (CDE). The authors also recommend that the curriculum for healthcare courses should incorporate healthy ergonomics practices as a part of the curriculum.

Keywords: Coranavirus disease 2019, Computer vision syndrome, Dentistry, Musculoskeletal disorders, Posture, Work efficiency

INTRODUCTION

Ergonomics is defined as the process of designing or arranging workplaces, products, and systems so that they fit the user who uses them. This is applicable for all fields like dentistry, nursing, engineering, computer science, etc., [1-4]. The Coronavirus Disease (COVID)-19 pandemic has adversely impacted our lives, both personally and professionally. During this time of the pandemic, out of sheer uncertainty, author willingly adopted technology as a part of our daily routine life. Presently, university students, including medical/dental students, have increased screen time for educational and research purposes. Several studies have reported an increase in the frequency of Computer Vision Syndrome (CVS) among computer users, also seen in medical students [5,6]. Globally, over the past decade, there has been a 25% increase in the number of individuals suffering from musculoskeletal conditions [7,8]. Ergonomics emerges as a concern because the majority of these musculoskeletal conditions are related to computer use [9]. A little knowledge about the principles of ergonomics in workstation setup and exercises can be helpful in preventing discomfort and maximising productivity [2,4]. Since long been noticed that work-related injuries decrease productivity, and prevention of these work-related injuries not only improves efficiency but also increases creativity. Therefore, the role of ergonomics is essential in modern working society. Proper ergonomic interventions can reduce the incidence of computer-related health problems [10-12]. Most of the research work in terms of cross-sectional surveys has evaluated dental ergonomics [4], but computer ergonomics for dental students has not yet been studied. There is no published literature related to the use of computers and/or laptops for online education, especially during the COVID-19 pandemic in the medical/dental field in India. Therefore, the present study attempts to bridge the literature gap by evaluating the knowledge of computer ergonomics among undergraduate dental students. The current cross-sectional survey focuses on evaluating the knowledge and implications for dental students while using computers/laptops for their professional and personal use. In India, ergonomics is a relatively novel concept; hence, the findings of this study can form a foundation for future

research and ergonomic training and also prepare the students to enter the workforce and excel in their chosen profession.

MATERIALS AND METHODS

This cross-sectional survey was in the Department of Oral Medicine and Radiology at VSPMDCRC, Nagpur, Maharashtra, India between November 2020 and February 2021. The study was approved by the institutional ethical committee of VSPM DCRC (IEC/VSPMDCRC/15/2020). Informed consent was obtained from the students.

Inclusion and Exclusion criteria: The study included third and final year dental undergraduate students who were willing to participate. Forms with incomplete responses were excluded.

Sample size calculation: Manual calculations were performed using the following formula to calculate the sample size using the Chi-square test.

$$n' = \frac{n}{4}\left[1 + \sqrt{1 + \frac{4}{n|p_1 - p_2|}}\right]^2$$

Here, n=177 is the sample size from reference study [1].

p_1-p_2=0.20 [1].

'p' is the precision taken from the previous study.

Therefore,

$$n' = \frac{177}{4}\left[1 + \sqrt{1 + \frac{4}{177 * 0.20}}\right]^2$$

$$n' = 44.25\left[1 + \sqrt{1.11299}\right]^2$$

$$n' = 44.25\left[1 + \sqrt{1.11299}\right]^2$$

$$n' = 186.86$$

Therefore, the total minimum calculated sample size was 187.

Study Procedure

A customised self-administered questionnaire was designed [1,2,9,11,12] and validated by independent subject experts. The final questionnaire consisted of a set of 34 questions framed around knowledge of computer usage, working postures and seating, uses of mouse/keyboard, uses of monitor, table and accessories, and rest breaks/exercise parameters. Questions for personal characteristics were also recorded. Informed consent was obtained from the students. The questionnaire was then circulated among third and final year undergraduate students both online through Google Forms and offline through circulated questionnaire papers.

Personal details such as name, age, sex, year, height, weight, dominant hand, use of lens/specs, or any physical morbidity were recorded. Computer usage details (screening time, type of usage, purpose of use), working postures (positioning of head, neck, arm, elbow, and wrist), seating (chair height and chair adjustment), uses of mouse/keyboard, uses of monitor (angulation of keyboard, distance from monitor), table and accessories (usage of accessories such as document folder, earphone, footstool), and rest breaks/exercise parameters (frequency and type of breaks) were also recorded.

Data was summarised based on the responses given by students regarding personal characteristics and computer usage.

STATISTICAL ANALYSIS

Statistical analysis was performed using the Statistical Package for Social Science (SPSS) version 20 for windows. Quantitative data were expressed as mean and Standard Deviation (SD). Data normality was checked using the Shapiro-wilk test. The level of significance was set at 5%. The association between categorical variables was checked using the Chi-square test.

RESULTS

All 216 students completed the questionnaire. [Table/Fig-1] shows that the mean age of participants was 22.20 years, height 162.60 cm, and weight 56.72 kg. [Table/Fig-2] shows the details regarding the personal characteristics of the 216 participants included in the study. Among them, 149 (69%) had a normal Body Mass Index (BMI), 35 (16.2%) were underweight, 27 (12.5%) were overweight, and 5 (2.3%) were obese. The majority of students, 158 (73.1%), were females, and 58 (26.9%) were males. Among all participants, 8.2% of third year students and 6.7% of final year students were left-handed, making a total of 7.4% left-handed subjects. Among the participants, 91.8% subjects from third year students and 93.3% of final year students were right-handed, making a total of 92.6% right-handed subjects. A total of 88 (40.7%) students were using prescribed contact lenses. A total of 24 (11.1%) students reported having some physical co-morbidity [Table/Fig-2].

Parameters	N	Minimum	Maximum	Mean	SD
Age (in years)	216	20	26	22.20	0.941
Height (in cm)	216	140	187	162.60	9.247
Weight (in kg)	216	32	87	56.72	10.705

[Table/Fig-1]: Descriptive statistics.

Characteristics	Frequency	Percentage
Year		
Third year	96	44.4%
Final year	120	55.6%
Age (years)		
Below 20	4	1.9%
21-24	197	91.2%
Above 24	15	6.9%
Gender		
Male	58	26.9%
Female	158	73.1%
BMI		
Less than 18.5 (underweight)	35	16.2%
18.5-24.99 (normal)	149	69%
25-29.99 (overweight)	27	12.5%
30 or above obese	5	2.3%
Dominant hand		
Left hand	16	7.4%
Right hand	200	92.6%
Use of prescribed contact lenses/spectacles		
No	88	40.7%
Yes	128	59.3%
Do you suffer from any physical morbidity?		
No	192	88.9%
Yes	24	11.1%

[Table/Fig-2]: Personal characteristics of study participants.

[Table/Fig-3] shows that 45 (20.8%) students used desktop computers, while 171 (79.2%) used laptops. The average screen time was between 4-6 hours per week. Seventeen (7.9%) students used a mouse, 56 (25.9%) used a keyboard, and 143 (66.2%) used both a mouse and a keyboard. A total of 42 (19.4%) students used computers for academic purposes, while 159 (73.6%) used them for non academic purposes.

Characteristics	Frequency	Percentage
Type (laptop/desktop)		
Desktop	45	20.8%
Laptop	171	79.2%
Screening time (weekly)		
2-3 hours	74	34.3%
4-5 hours	58	26.9%
6-7 hours	52	24.1%
8-9 hours	1	0.5%
Above 10 hours	31	14.4%
Type of input devices		
Mouse	17	7.9%
Keyboard	56	25.9%
Both	143	66.2%
Purpose of use		
Academic	42	19.4%
Non academic	159	73.6%
Both	15	6.9%

[Table/Fig-3]: Computer usage characteristics.

[Table/Fig-4] shows that among third year students, 44 (20.37%) were aware of ergonomics, while 52 (24.07%) were not. In the final year, 68 (31.48%) students were aware of ergonomics, and 52 (24.07%) were not. The p-value of 0.113 suggested that there was no statistically significant difference in awareness of ergonomics between students in their third and final years. The relationship between knowledge of ergonomics principles and the year of study revealed that among third year students, 31 (14.35%) claimed to have knowledge of ergonomics principles, while 65 (30.09%) did not. In the final year, 43 (19.91%) students indicated knowledge of ergonomics principles, while 77 (35.65%) did not. The p-value of 0.586 indicated that there was no significant association between knowledge of ergonomics principles and the year of study [Table/Fig-5].

Question	Third year n (%)	Final year n (%)	Total n (%)	Chi-square value	p-value
Are you aware of the term 'Ergonomics'?					
No	52 (24.07)	52 (24.07)	104 (48.15)	2.507	0.113
Yes	44 (20.37)	68 (31.48)	112 (51.85)		
Total	96 (44.44)	120 (55.56)	216 (100)		
If yes, do you know any principles of ergonomics?					
No	65 (30.09)	77 (35.65)	142 (65.74)	0.297	0.586
Yes	31 (14.35)	43 (19.91)	74 (34.26)		
Total	96 (44.44)	120 (55.56)	216 (100)		

[Table/Fig-4]: Knowledge of ergonomics.

Question	Year of study		Total	Chi-square value	p-value
	Third year	Final year			
What should be the position of head and neck while using computer?					
Bend downward	22 (10.19)	17 (7.87)	39 (18.06)	4.213	0.122
Bend upward	5 (2.31)	3 (1.39)	8 (3.7)		
Upright	69 (31.94)	100 (46.3)	169 (78.24)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Your back when sitting should be at what angle?					
120°	1 (0.46)	3 (1.39)	4 (1.85)	7.152	0.067
45°	14 (6.48)	8 (3.7)	22 (10.19)		
75°	20 (9.26)	16 (7.41)	36 (16.67)		
90°	61 (28.24)	93 (43.06)	154 (71.3)		
Total	96 (44.44)	120 (55.56)	216 (100)		
How should be the placement of elbow while operating the computer? Elbow should be bent at about:					
120° angle	9 (4.17)	11 (5.09)	20 (9.26)	4.04	0.401
45° angle	31 (14.35)	50 (23.15)	81 (37.5)		
75° angle	1 (0.46)	0 (0)	1 (0.46)		
90° angle	49 (22.69)	49 (22.69)	98 (45.37)		
Any other position	6 (2.78)	10 (4.63)	16 (7.41)		
Total	96 (44.44)	120 (55.56)	216 (100)		
How must be the wrist/hand while working on computer?					
Depressed downward in relation to forearms	9 (4.17)	9 (4.17)	18 (8.33)	0.336	0.845
Elevated up in relation to forearms	26 (12.04)	31 (14.35)	57 (26.39)		
Flat and straight in relation to forearms	61 (28.24)	80 (37.04)	141 (65.28)		
Total	96 (44.44)	120 (55.56)	216 (100)		
The position of thigh while working should be parallel to the floor?					
Not at all	14 (6.48)	8 (3.7)	22 (10.19)	3.654	0.056
Yes	82 (37.96)	112 (51.85)	194 (89.81)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Your legs when sitting should be at what angle?					
45°	21 (9.72)	22 (10.19)	43 (19.91)	0.828	0.661
75°	20 (9.26)	22 (10.19)	42 (19.44)		
90°	55 (25.46)	76 (35.19)	131 (60.65)		
Total	96 (44.44)	120 (55.56)	216 (100)		
How should your feet be placed while working on the computer?					
Any of the above	12 (5.56)	25 (11.57)	37 (17.13)	8.526	0.036*
Feet should be placed flat on the floor	58 (26.85)	80 (37.04)	138 (63.89)		
Forefoot should be placed at higher level than the hindfoot	20 (9.26)	11 (5.09)	31 (14.35)		
Hindfoot should be placed at higher level than the forefoot	6 (2.78)	4 (1.85)	10 (4.63)		
Total	96 (44.44)	120 (55.56)	216 (100)		

[Table/Fig-5]: Working postures.

In the first question, which aimed to explore the association between the preferred head and neck position while using a computer and the year of study (third year or final year), a total of 47 (21.76%) students did not know the correct position of the head and neck, with a p-value of 0.122. These results suggest that there is no statistically significant association between the chosen head and neck position and the students' academic year, although awareness regarding working posture was found to be higher in final year students. In the second question, which examined the relationship between the preferred back angle while sitting and the year of study, 62 (28.66%) students did not know the correct position (p-value of 0.067). These findings also indicate that there is no strong statistical evidence to conclude a significant connection between the chosen back angle categories and the year of study among students.

The present examined how students in their third and final years of study perceive their chairs in terms of lower back support, adjustability, comfort, and ergonomic preferences. We found that

a high proportion of both third year 73 (33.8%) and final year 91 (42.13%) students felt that their chairs provided adequate lower back support, with no significant difference between the two groups (p-value=0.972). Similarly, when asked about chair adjustability, a substantial number of students in both years {60, (27.78%) of third year and 79 (36.57%) of final year} reported having adjustable chairs, and the difference between the two groups was not statistically significant (p-value=0.611). When considering comfort, more final year students 85 (39.35%) felt that they could sit without pressure on the back of their knees when their backs were supported compared to third year students 63 (29.17%), but the difference was not significant (p-value=0.413). In terms of the distance between the front of the seat pan and the back of their knees, there was no significant difference between the two groups (p-value=0.405). However, significantly more final year students 64 (29.63%) correctly indicated "at eye level with the monitor screen" as the ideal chair height compared to third year students 51 (23.61%), with a p-value of 0.047* [Table/Fig-6].

In present study, authors thoroughly examined how students' ergonomic habits and preferences for workstation setup are influenced by their academic year. The results revealed some noteworthy patterns. Firstly, a substantial number of final year students 102 (47.22%) reported having their input devices aligned with their keyboards, compared to third year students 65 (30.09%) who showed a lower percentage. This significant difference, with a p-value of 0.003*, implies that final year students are more likely to follow ergonomic guidelines for input device placement. Similarly, when assessing the alignment of their keyboard and monitor, it was found that 104 (48.15%) of third year students responded affirmatively, while only 70 (32.41%) of final year students did so. The p-value of 0.011* demonstrates a clear distinction, indicating that third year students tend to have a stronger preference for having their keyboard and monitor in alignment. However, when examining the preferred tilt of the keyboard, authors discovered that there was no substantial association with the year of study, as evidenced by a high p-value of 0.642. The year of study did not seem to impact whether students preferred a positive or negative tilt for their keyboard [Table/Fig-7].

The relationship between monitor distance, glare, and monitor tilt with the academic year of students was analysed. It was found that the distance of students' monitors was significantly associated with their year of study (p-value=0.0446*). However, when it came to the presence of glare on their monitors and work surfaces, there was no significant association with the year of study (p-value=0.27), suggesting that third year and final year students had similar experiences regarding glare. Likewise, the angle of monitor tilt also did not show a significant association with the year of study (p-value=0.344) [Table/Fig-8].

The results showed that most of the questions did not exhibit a significant association with the year of study. Specifically, questions about the availability of a sloped desk surface or angle board (p-value=0.854), the use of a headset or speakerphone while working (p-value=0.142), discomfort while using earphones/headphones

Question	Year of study		Total	Chi-square value	p-value
	Third year	Final year			
Does your chair support your lower back?					
No	23 (10.65)	29 (13.43)	52 (24.07)	0.001	0.972
Yes	73 (33.8)	91 (42.13)	164 (75.93)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Is your chair adjustable?					
No	36 (16.67)	41 (18.98)	77 (35.65)	0.258	0.611
Yes	60 (27.78)	79 (36.57)	139 (64.35)		
Total	96 (44.44)	120 (55.56)	216 (100)		
When your back is supported, are you able to sit without feeling pressure from the chair seat on the back of your knees?					
No	33 (15.28)	35 (16.2)	68 (31.48)	0.671	0.413
Yes	63 (29.17)	85 (39.35)	148 (68.52)		
Total	96 (44.44)	120 (55.56)	216 (100)		
What is the distance between the front of the seat pan and back of your knees?					
<2-3 inches	14 (6.48)	11 (5.09)	25 (11.57)	1.875	0.599
> 2-3 inches	29 (13.43)	42 (19.44)	71 (32.87)		
>2-3 inches	1 (0.46)	2 (0.93)	3 (1.39)		
About 2-3 inches	52 (24.07)	65 (30.09)	117 (54.17)		
Total	96 (44.44)	120 (55.56)	216 (100)		
What should be the correct height of the chair? The height should be such that the top inch of visible monitor screen should be					
Any of the above	17 (7.87)	8 (3.7)	25 (11.57)	7.946	0.047*
At higher level than your eyes	7 (3.24)	16 (7.41)	23 (10.65)		
At lower level than your eyes	21 (9.72)	32 (14.81)	53 (24.54)		
At the level with you eyes	51 (23.61)	64 (29.63)	115 (53.24)		
Total	96 (44.44)	120 (55.56)	216 (100)		
How should be the base of your chair?					
Any of the above	28 (12.96)	35 (16.2)	63 (29.17)	0.634	0.889
Five legged	10 (4.63)	11 (5.09)	21 (9.72)		
Flat based	28 (12.96)	31 (14.35)	59 (27.31)		
Four legged	30 (13.89)	43 (19.91)	73 (33.8)		
Total	96 (44.44)	120 (55.56)	216 (100)		

[Table/Fig-6]: Questions about seating.

Question	Year of study		Total	Chi-square value	p-value
	Third year	Final year			
Are all your input devices (mouse, tablet, etc.,) at the same level as your keyboard?					
No	31 (14.35)	18 (8.33)	49 (22.69)	9.092	0.003*
Yes	65 (30.09)	102 (47.22)	167 (77.31)		
Total	96(44.44)	120 (55.56)	216 (100)		
Are your keyboard and monitor located on a centered line in front of you?					
No	26 (12.04)	16 (7.41)	42 (19.44)	6.437	0.011*
Yes	70 (32.41)	104 (48.15)	174 (80.56)		
Total	96 (44.44)	120 (55.56)	216 (100)		
What should be the tilt of the keyboard?					
Negative tilt (downwards on moving away from you)	37 (17.13)	50 (23.15)	87 (40.28)	0.217	0.642
Positive tilt (upward on moving away from you)	59 (27.31)	70 (32.41)	129 (59.72)		
Total	96 (44.44)	120 (55.56)	216 (100)		

[Table/Fig-7]: Questions about keyboard/mouse.

Questions	Year of study		Total	Chi-square value	p-value
	Third year	Final year			
At what distance your monitor is positioned from you?					
Any of the above	18 (8.33)	16 (7.41)	34 (15.74)	1.616	0.0446*
Atleast an arm's length away	51 (23.61)	63 (29.17)	114 (52.78)		
Less than an arm away	27 (12.5)	41 (18.98)	68 (31.48)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Is your monitor and work surface free from glare?					
No	18 (8.33)	30 (13.89)	48 (22.22)	1.205	0.272
Yes	78 (36.11)	90 (41.67)	168 (77.78)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Is your monitor tilted?					
No	55 (25.46)	61 (28.24)	116 (53.7)	0.895	0.344
Yes	41 (18.98)	59 (27.31)	100 (46.3)		
Total	96 (44.44)	120 (55.56)	216 (100)		

[Table/Fig-8]: Questions about monitor.

(p-value=0.47), and the use of footstools to relieve leg pressure (p-value=0.182), the presence of a document holder (p-value=0.072) did not demonstrate a strong link with the students' academic year. The availability of space for forearm placement at the table edge (p-value=0.036*) appeared to differ significantly between third year and final year students, suggesting potential differences in ergonomic preferences or needs among these two groups [Table/Fig-9].

Questions	Year of study		Total	Chi-square value	p-value
	Third year	Final year			
Is there a sloped desk surface or angle board for reading and writing tasks if required?					
No	42 (19.44)	54 (25)	96 (44.44)	0.034	0.854
Yes	54 (25)	66 (30.56)	120 (55.56)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Is there document holder either beside the screen or between the screen and keyboard if required?					
No	45 (20.83)	71 (32.87)	116 (53.7)	3.241	0.072
Yes	51 (23.61)	49 (22.69)	100 (46.3)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Are you using a headset or speakerphone if you are writing or keying while talking on phone?					
No	31 (14.35)	28 (12.96)	59 (27.31)	2.156	0.142
Yes	65 (30.09)	92 (42.59)	157 (72.69)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Do you feel any discomfort while using your earphones/headphones?					
No	57 (26.39)	77 (35.65)	134 (62.04)	0.52	0.471
Yes	39 (18.06)	43 (19.91)	82 (37.96)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Is there space for placement of forearm at the edge of the table top?					
No	34 (15.74)	27 (12.5)	61 (28.24)	4.391	0.036*
Yes	62 (28.7)	93 (43.06)	155 (71.76)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Footstools help take pressure off your legs?					
False	23 (10.65)	20 (9.26)	43 (19.91)	1.778	0.182
True	73 (33.8)	100 (46.3)	173 (80.09)		
Total	96 (44.44)	120 (55.56)	216 (100)		

[Table/Fig-9]: Questions about table and accessories.

The results revealed that taking breaks while using a computer was not significantly associated with the students' academic year, with a p-value of 0.052. This suggests that third year and final year students had different tendencies when it came to taking breaks during computer work. However, for the types of breaks taken, such as stretching, walking, or other activities, it was found that there was no significant association with the academic year, as indicated by a p-value of 0.583. This implies that the choice of break activity did not vary significantly between the two academic year groups. Additionally, the question of whether students took regular eye breaks from looking at their monitor also did not exhibit a significant association with the year of study, as reflected in a p-value of 0.117. This implies that the practice of taking regular eye breaks was relatively consistent across both third year and final year students [Table/Fig-10].

Questions	Year of study		Total	Chi-square value	p-value
	Third year	Final year			
Do you take any break while using computer?					
Not at all	5 (2.31)	3 (1.39)	8 (3.7)	7.736	0.052
Regular	40 (18.52)	51 (23.61)	91 (42.13)		
Sometimes	36 (16.67)	59 (27.31)	95 (43.98)		
Unsure	15 (6.94)	7 (3.24)	22 (10.19)		
Total	96 (44.44)	120 (55.56)	216 (100)		
What kind of breaks do you take while working?					
Any other	30 (13.89)	30 (13.89)	60 (27.78)	1.08	0.583
Stretching	40 (18.52)	56 (25.93)	96 (44.44)		
Walking	26 (12.04)	34 (15.74)	60 (27.78)		
Total	96 (44.44)	120 (55.56)	216 (100)		
Do you take regular eye breaks from looking at your monitor?					
No	28 (12.96)	24 (11.11)	52 (24.07)	2.452	0.117
Yes	68 (31.48)	96 (44.44)	164 (75.93)		
Total	96 (44.44)	120 (55.56)	216 (100)		

[Table/Fig-10]: Questions about rest breaks/exercise.

DISCUSSION

Recently, there has been an exponential increase in the use of digital technology for office work, education, and recreational purposes, especially among students for academic as well as non academic purposes. As the use of computers has increased lately amidst the COVID-19 pandemic, it is essential for users to know and apply principles of ergonomics to reduce the risk of computer-related

health problems [13,14]. In present study, students reported average weekly computer usage compared to those found in computer science engineering and information technology students in Karnataka, which was 18.17 hours/week [1]. The findings of present study are similar to a study conducted by Bisht D and Bakhshi R on Agricultural students, which stated that the usage of computers among medical and other faculty students is increasing nowadays [2]. The results of present study showed that most of the subjects were unaware of ergonomics and its goals. Intergroup comparison showed that there was no statistically significant difference in the awareness of ergonomics between students in their third and final years. These results highlight that the year of study does not significantly impact the possession of knowledge about ergonomics principles among students who are already aware of the concept.

Joshi P et al., revealed in their study based on computer users of State Agricultural Universities students in India that the majority of their participants did not have adequate knowledge about computer ergonomics, which is in accordance with the present study [9]. The finding is also similar to the results generated by Mohamed SS and Mohamed S in the study conducted among information technology professionals in Karnataka [1]. Hasan AS et al., found awareness of ergonomics in only 41 (31.7%) of resident doctors in their study [7].

In every aspect of life, the dependence on computers is ever-increasing, and this widespread use has led to some important "user" health concerns [11]. Therefore, it is important for users to know the correct working posture related to computers. The majority of subjects in this study were able to correctly answer the questions related to working postures of the head, neck, back, wrist, hand, thigh, and feet. However, the majority of subjects were unaware of the correct placement of the elbow while operating computers [8,12,13]. In all cases, the year of study does not appear to have a substantial impact on the preferences for head and neck positions or back angles or the position of the wrist/hand, elbow, or legs when sitting while using a computer, highlighting the potential influence of other factors on these choices.

Seating/chair position is vital for one to comfortably work on computers. The dimensions of the backrest should be large enough to support the user's entire back, including the lumbar region. The height and tilt of the chair should be adjustable and should adapt to the lumbar curve [7]. The majority of the subjects were aware of the item related to low back support (164, 75.9% correct responses) and an adjustable chair (139, 64.4% correct responses). The top of the monitor should be at or slightly below eye level [1]. Overall, the study suggests that while there are some differences in chair preferences and ergonomic knowledge between the two groups, the majority of students in both years have similar perceptions regarding chair comfort and adjustability. In present study, 115 (53.5%) of the participants were aware of the ideal height of the computer monitor. Chairs should have a stable, five-legged base with caster wheels [12]. Only 21 (9.7%) participants knew the feature regarding the base of the chair. A total of 148 (68.5%) subjects were able to sit without feeling pressure from the chair seat on the back of their knees when the back was supported. Although doing an intragroup comparison between students of the third and final years of study, their perception of knowledge in terms of lower back support, adjustability, comfort, and ergonomic preferences was statistically not significant. Overall, the study suggests that while there are some differences in chair preferences and ergonomic knowledge between the two groups, the majority of students in both years have similar perceptions regarding chair comfort and adjustability.

Research done by Gabriel DR et al., stated that there is a relationship between students' sitting posture, seat height, and table height, and faulty sitting posture, seat height, height of the table increases the discomfort scores of students. An interpretation can be made from their analysis, that seating position and table height directly affect the comfort level of the students [14]. He made and recommended a prototype design 3D model for the computer workstation for the most optimal comfort level as per recommended dimensions of measurement of the chair and table, which decreases the risk of the contraction of musculoskeletal disorders for users who are using computer workstation setups.

The keyboard height should allow the user to maintain the elbow in 90° flexion [7,11]. Lee S et al., in their study on workstation design and musculoskeletal discomfort, found that arm discomfort was associated with keyboard height above the elbow level [3]. The mouse should be at the same height as the keyboard, to either side of it. The position of the mouse should allow the user to maintain a straight, neutral wrist posture [7]. In the present study, a total of 167 (77.31%) participants showed awareness regarding the ideal keyboard and mouse position. Performing a comparison between final year students (102, 47.22%) and third year students (65, 30.09%), there was a statistically significant difference, with a p-value of 0.003*, indicating that final year students are more likely to follow ergonomic guidelines for input device placement.

On the contrary, when assessing the alignment of their keyboard and monitor, it was found that 104 (48.15%) of third year students responded affirmatively, while only 70 (32.41%) of final year students did so. The p-value of 0.011* demonstrates a clear distinction, indicating that third year students tend to have a stronger preference for having their keyboard and monitor in alignment. However, when examining the preferred tilt of the keyboard, authors discovered that there was no significant association with the year of study, as evidenced by a high p-value of 0.642. Overall, these findings suggest that final year students tend to exhibit better ergonomic practices in terms of input device alignment, whereas the choice of keyboard tilt appears to be independent of academic year.

The monitor should be placed at a comfortable distance from the user, where he/she can easily read all text with the head and trunk in an upright posture and the back supported by the chair. Generally, between 20 and 40 inches (arm's length) from the eye to the front surface of the computer screen is considered an ideal viewing distance [15]. Das A et al., found in his research work that 199 (62.4%) of people maintained a 40-inch viewing distance [8]. A total of 102 (47.2%) subjects were unaware of the distance at which the monitor should be placed in front of them. Intergroup comparison stated that the distance of students' monitors from them was significantly associated with their year of study (p-value=0.0446), showing that there was a difference in monitor positioning preferences between third year and final year students. The majority of students, 116 (53.7%), were unaware of the tilt of the monitor, and intergroup comparison did not show a significant association with the year of study (p-value=0.344), representing that this aspect was consistent among students of different academic years. If the user has to refer to documents while interacting with the screen or keyboard, it is ideal to use a document holder [7].

Postural loading on the neck muscles can be considerably minimised by using a document holder that presents source material at the same height and at the same distance as the screen. In present study, only 100 (46.3%) of the participants were aware of the need and position of a document holder, and year-wise, it appeared that there were potential differences in ergonomic preferences or needs among these two groups. A total of 157 (72.7%) subjects used a headset or speakerphone while writing, typing, or talking on the phone, while intergroup comparison did not show a significant relationship.

High repetition tasks or jobs requiring prolonged periods of static posture may be interspersed with several short rest breaks. A total of 75.9% took regular eye breaks, whereas only 91 (42.13%) participants were aware of mini breaks. During these breaks, users should be motivated to stand, stretch, and move around. This provides rest and allows the muscles adequate time to recover [3,8,12].

Occupational health is an important aspect that needs to be addressed, and initiatives should be made to encourage an environment in which considerable importance is given to the health and safety of workers. In developing countries such as India, adequate attention is not given to ergonomics principles and safety issues related to improper workplace setup. Due to poor awareness, cases of work-related injuries are generally not reported. Sound ergonomic knowledge and skills are essential to identify and solve workplace Musculoskeletal System Diseases (MSD) problems. Hazards due to a lack of ergonomic knowledge can be identified and managed through ergonomic training. College students represent a bridging period between education and work, so education and training should ideally begin at this level. The issues of computer ergonomics should be addressed during student life so that they can enter their chosen profession with good computer work behavior [1].

Limitation(s)

The present study only assessed the knowledge of computer ergonomics among dental students in the third and final year but did not evaluate their practical approach towards computer usage. Assessing practical application would have further helped in understanding the risks faced by students related to computer usage. This could be an area for future research studies. Moreover, as the study was conducted in one state, the findings cannot be generalised to all colleges in different parts of India.

CONCLUSION(S)

The findings of present study emphasised the essentiality of ergonomic training for students to improve awareness about musculoskeletal disorders and healthy postures. Hence, it needs to be taken into attention and action by university bodies to include an Ergonomics Training Program in the educational curriculum. This will not only help students increase efficiency in work and health but also prompt importance of these small changes in maintaining a healthy lifestyle.

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