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Original Research Article

Self-assessment of ergonomics among undergraduate dental students in Bangalore-interventional study

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ABSTRACT

Background: Occupational health hazards are common in many sectors and are on a continuous rise. The goal of ergonomics is to establish a safe, healthy, and comfortable working environment. When applied to dentistry, a sound knowledge on ergonomics seeks to reduce cognitive and physical stress, prevent occupational diseases and improve productivity. To evaluate self-assessment of ergonomics among undergraduate students.
Methods: A single blinded, parallel-arm randomized control trial was conducted among 120 undergraduate students who fulfilled prespecified inclusion and exclusion criteria. Data was collected using validated questionnaire with 4 domains; socio-demographic details, knowledge, attitude, practice and MDOPAI scale to assess self-evaluation. Data were analysed, considered statistically significant at $p \leq 0.05$.
Results: The mean knowledge scores of control and intervention group before intervention was 2.33±1.09 and 2.58±1.19 respectively, while after training it was significantly increased in intervention group to 4.2±0.89. Percentage of subjects with positive attitude among control group and intervention group was 30% and 45%, while after intervention was 58.3% and 78.3% respectively. Among intervention group self-assessment scale, MDOPAI scores were significantly improved from baseline to intervention i.e. 1.6% to 26.6%.
Conclusions: The study concluded that the knowledge, attitude and practice scores of ergonomics in dentistry was significantly improved after intervention.

Keywords: Ergonomics, Self-assessment, Musculoskeletal disorders, Interventional study

INTRODUCTION

A profession where dentist work is limited to only to the mouth, and needs repeated, precise force applications.[1] Working in a profession like dentistry should not and cannot be considered as a trivial job as an operator struggles to hold a balanced posture while half of the body's mass is contracted to stay movement less.[2,3] Work-related musculoskeletal disorders (WMSD) are most frequently seen amongst dental professionals. It is a main occupational hazard issues being faced by the fraternity and statistics have shown that it contributes around half of all money towards the correction of work-related injuries. Literature suggests that in 2004, nearly $131 million income was directed towards MSDs among dentists.[2,4] In 2010 it is reported that73% of dentists had neck and back pain even after they practice of four hand dentistry with the proper use of ergonomic equipment, studies have shown an increase in neck and back, shoulder and arm disorders in dentistry deviate from 63% to 93% worldwide.[3,5] There is a way to decreasing WMSD

disorders by performing regular precise exercise and the appropriate use of ergonomics assures high efficiency and reduction of illness and injuries as well as increased satisfaction among workers.[6,7] This paper aims to compare knowledge, attitude and practice of ergonomics in dentistry amidst third and final year undergraduate students and to evaluate self-assessment of ergonomics amidst undergraduate pupils using photographs.

METHODS

A single blinded, parallel-arm interventional study was designed to evaluate self-assessment of ergonomics among undergraduate students using photographs at a dental college and hospital. Data was collected using convenience sampling from 20-25 years, from January 2020 to January 2021 among third-and fourth-year undergraduate students of Vokkalighara Sangha dental college and hospital in Bangalore. Students with history of injuries or disabilities of head, neck, or trunk region were excluded. Sample size was calculated from the knowledge prevalence of a previous study and it was arrived at 120 including the 10% loss of follow up.[5] Ethical clearance was from the institutional review board and ethical committee, consent was obtained from study subjects prior to study.

For the study purpose final year students formed intervention group, third years formed control group. Students were randomly selected from attendance register using lottery method until the desired sample size was obtained for the study. Figure 1 gives the study design, data was collected using self-administered questionnaire and Modified scale-dental operator posture assessment instrument (M-DOPAI) scale over a period of 1 year, follow up data was collected twice in the interval of 1 month from the baseline.[8] The whole exercise took around 20-25 mins for the intervention group where, 10-15 mins was the intervention in the form of power point presentation, during which the investigator also discussed the photographs and addressed doubts of the study subjects. Ethical clearance was obtained from the institutional ethical committee.

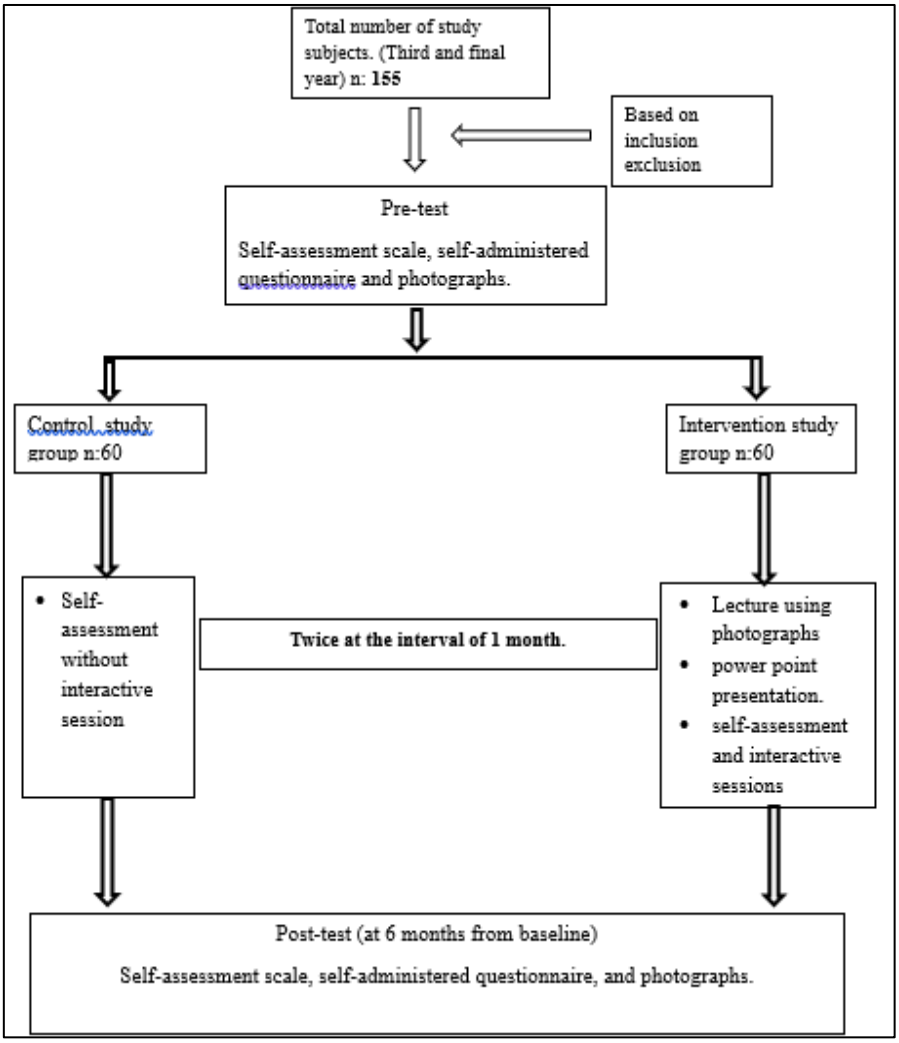

Figure 1: Study design.

Self-administered questionnaire with 4 domains: A pre-tested, self- administered questionnaire to assess knowledge, attitude and practice score extracted and modified from Kalghatgi et al and Siddiqui et al.[5,9] Knowledge domain consisted of 5 questions; each item were measured by scales: 1 (yes), 0 (no' and 'don't know'). The total scores ranged from 0 to 5 points: the higher scores, the better knowledge on ergonomics. Attitude domain contains 7 items with a 5-point Likert scale strongly agree, agree, neutral, disagree and strongly disagree for each question. Each item was measured by: 0 (negative or neutral), 1 (positive) for attitudes. The total attitudes scores ranged from 0-7 points, respectively: the higher score, the stronger positive attitude towards ergonomics. Practice domain consists of 10 items assessed by 'yes', 'no' and 'sometimes' each item was measured by: 0 (no, sometimes), 1 (yes) responded to follow correct working posture for practice. The total practice scores ranged from 0-10 points, respectively. The higher score, the better practice of ergonomics in dentistry.

Self-assessment and application of ergonomics in routine clinical practice were assessed using modified scale-dental operator posture assessment instrument (M-DOPAI) given by Partido BB, wright BM 2018.[8] Data collected was analysed statistically by computing descriptive statistics like mean, standard deviation, and confidence interval. The data were analysed using the statistical package SPSS version 19.0. Following statistical tools were used to analyses the data. For continuous variables mean, standard deviation, student's t-test, Analysis of variance (ANOVA) and Post hoc test. For categorial variables: Median, interquartile range, Mann-Whitney U test, Friedman test, Wilcoxon Signed-Rank Test.

RESULTS

In the present study about 67 (55.8%) of the study subjects belonged to the age group of 20-21 years. The mean age of control and intervention group was found to be 21.6±1.232 and 21.8±1.027 respectively. Majority of the study subjects were females i.e. 84 (70%). Around 44 (73.4%) of females and 16 (26.6%) of males formed the control group. While 40 (66.6%) females and 20 (33.4%) males formed the intervention group.

Out of 60 study subjects in each group, regarding knowledge majority in the control group, 40 (66.6%) had poor knowledge at pre-test. Among the intervention group, more than half 34 (56.6%) had poor knowledge at pre-test, whereas at the post-intervention majority i.e. 58 (96.6%) had good knowledge. Majority of the study subjects at pre-test in the control group 42 (70%) had a negative attitude towards ergonomics. Among the study subjects in the intervention group 27 (45%) had positive attitude which improved to 47 (78.3%) post-intervention. About practice in the control group, the majority 47 (78.3%) had a poor practice. Whereas in the intervention group 24 (40%) found to have good practice at pre-test, post-intervention practice score was found to improve to 33 (55%).

Among study subject majority of the intervention i.e. 50 (83.3%) and 47 (47%) control group, had scores ranging between 26-32 (harmful) at baseline. Around 30 (50%) in the intervention group and 52 (86.6%) in the control group had a scores ranging between 26-32 (harmful) at one month interval. At the interval of two months, control group around 52 (86.6%) still had harmful scores. Majority of the participants at post-intervention in intervention group 43 (71.6%) and 16 (26.6%) had scores ranging between 19-25 (compromised) and 12-18 (acceptable) respectively. The difference was found to be statistically significant at the interval of one month, two months and post-intervention.

In the control group, the mean score of knowledge at pre-test is 2.33±1.09, followed by 2.33±1.08, 2.1±0.95, 2.65±1.03 at the interval of one month, at the interval of two months, post-intervention respectively. Among the intervention group mean knowledge scores were 2.58±1.19, 3.4±0.64, 3.7±0.88, 4.2±0.89 at pre-test, at the interval of one month, at the interval of two months, post-intervention respectively. The difference between the control and intervention group knowledge was found to be statistically significant at the interval of one month, at the interval of two months, and post intervention this is seen in Table 1.

Mean comparison of attitude score at pre-test, interval of one month, two months and post-intervention between control and intervention group is seen in Table 2. Among the control group, median (IQR) was found to be 3 (2-4) at pre-test, 3 (2-5) at the interval of two months and post-test. Whereas an improvement was seen in the median score of intervention group from pre-test to post-intervention i.e. 3 (2-5) to 5 (4-5) respectively. The intergroup difference was found to statistically significant at the interval of one month, at the interval of two months and post-intervention.

Table 3 shows mean comparison of practice score at pre-test, interval of one month, two months and post-intervention between control and intervention group. Study subjects in the control group had a mean practice score of 1.91±0.33, 1.83±0.37, 1.80±0.30 and 1.82±0.32 at different time intervals pre-test, at the interval of one month, at the interval of two months and post-intervention respectively. Among the study subjects in the intervention group the mean practice score was found to be increasing from 1.98±0.31, 1.93±0.25, 1.94±0.25 to 2.21±0.22 from pre-test to post-intervention.

The difference among the two groups was statistically significant at the interval of two months and post-intervention.

Table 1: Mean comparison of knowledge scores at pre-test, interval of one month, two months and post-intervention group between control group and intervention group.

Variables	Control group, mean±SD	Intervention group, mean±SD	T[a]	P value[b]
Pre-test	2.33±1.09	2.58±1.19	1.21	0.232
At the interval of one month	2.33±1.08	3.4±0.64	6.602	0.0001*
At the interval of two months	2.1±0.95	3.7±0.88	9.507	0.0001*
Post-Intervention	2.65±1.03	4.2±0.89	9.076	0.0001*

*[a]unpaired students t-test, [b]p<0.05.

Table 2: Mean comparison of attitude score at pre-test, interval of one month, two months and post-intervention group between control group and intervention group.

Variables	Control group		Intervention group		Z[a]	P value[b]
	Median (IQR)	Mean rank	Median (IQR)	Mean rank		
Pre-test	3 (2-4)	2.46	3 (2-5)	2.13	1.360	0.174
At the interval of one month	3 (1.75-5)	2.49	4 (3-5)	2.23	-2.352	0.019
At the interval of two months	3 (2-5)	2.53	4 (3-5)	2.63	-2.585	0.010
Post-intervention	3 (2-5)	2.53	5 (4-5)	3.01	-2.389	0.0001

*[a]Mann-Whitney U test, [b]p<0.05.

Table 3: Mean comparison of practice score at pre-test, interval of one month, two months and post-intervention group between control group and intervention group.

Variables	Control group, mean±SD	Intervention group, mean±SD	T[a]	P value[b]
Pre-test	1.91±0.33	1.98±0.31	1.19	0.232
At the interval of 1 month	1.83±0.37	1.93±0.25	1.73	0.08
At the interval of 2 months	1.80±0.30	1.94±0.25	2.77	0.006*
Post-intervention	1.82±0.32	2.21±0.22	7.76	0.0001*

[a]unpaired students t-test, [b]p<0.05

Mean comparison of MDOPAI score at pre-test, interval of one month, two months and post-intervention between control and intervention group. Among study subjects in the control and intervention group at pre-test, the mean MDOPAI scale score was 27.6±1.76 and 26.93±2.42 respectively. The difference between the control and intervention groups was found to be significant at the interval of one month, at the interval of two months and post-intervention.

DISCUSSION

As the common saying goes 'health is wealth' is mostly bygone in the process of regular professional activities. Musculoskeletal pain is considered a major issue among dentists that affects logicality and gratification; the main reason for this may be attributed to abnormal workplace ergonomics.

In the present study more than half of the study subjects were females and this was consistent with the other studies. This is like the trends across the globe for example in Finland, most practising dentists are women. In Russia women constitute nearly half of the dental workforce. Nearly half of new students to dental undergraduate collages in the United Kingdom are females. The similar thing is also occurring among Indian students also, where nearly more than half of the students in all dental colleges and hospital are females.[10,11] Gender is considered here a risk factor for developing WMSD. Results of a study conducted by Khan et al showed that female dental students showed a higher prevalence of WMSD symptoms than males. The reason could be petite body mass and less muscle tone affecting a greater number of females.[10]

In the present study, at base line, 50% of the study subjects among the control group had overall good knowledge on ergonomics these results were like the study conducted by Kalghati et al, Garbin et al and Barlean et al who reported satisfactory knowledge score only among half of the study subjects. In contrast, some studies showed that overall awareness of ergonomics was lower among undergraduate students in India.[1,5,12,13] A study conducted by Kumar et al concluded that knowledge of working postures, postural necessities and their clinical uses was not satisfactory amidst the dental students surveyed.[14] These results might be because ergonomics has not been taught in the colleges in India.

According to the DCI, ergonomics is not incorporated in the syllabus of dentistry that should be followed respectively at undergraduate and post graduate. Books and study materials helps us learn various aspects of ergonomics to be followed during dental process, but lack emphasis on these ergonomic principles this is leading to the low levels of knowledge and skills seen in the present study. About 93% of students had never attended a seminar or a lecture or a workshop on WMSD at their dental college.[5,15,16]

In the present study, less than half of the study subjects in both groups had a positive attitude towards ergonomics. Low positive attitude seen at baseline in this study was in accordance with the study conducted by Karibasappa et al, Sharma et al The majority of dentist didn't seek the medical expert advice or treatment for the WMSD, this clearly shows the lack of a positive attitude towards the ergonomics as well as their health.[17,18] However, the intervention group students had better attitudes at the baseline when compared to control group the probable reason for this could be because of the living being affected by various WMSD during a year clinicals. Such a positive attitude shows scope for imparting better knowledge, and converting knowledge into practice but also stronger approval of ergonomics principles and guidelines during every day dental procedures.[5]

In the present study majority of the study subjects self-assessed their posture as harmful in both groups as they were bending their neck while working on the patients beyond the acceptable range of moments. These results were consistent with the study conducted by Khan where they found that bending and twisting of the neck were found to be highly associated with neck and upper-back discomfort and neck extension, flexion and rotation were identified as possible risk factors contributing to neck discomfort and pain.[10]

In the present study, after the intervention, 71.6% of the study subjects fell under the category of compromised and 26.6% of them in acceptable. These results were consistent with the study conducted by Gharekhani et al where the results were acceptable in nearly all of the cases while back support was acceptable in only less than half of the cases.[19] Post intervention, in the present study, intervention on ergonomics was shown to be successful in the promotion of knowledge, attitude and practice of upcoming dentists regardless of gender. Even though the study was conducted using the appropriate sample size and statistical analysis the convenience sampling technique limits its external validity. Since it is a self-assessed study, the assessments can at times be overestimated if not under, which can be the limitation of the study. Even with the above limitations the study throws light on the ergonomics in dentistry which is most neglected topic both clinically and theoretically.

CONCLUSION

The findings of this study concluded that the knowledge, attitude, and practice among the study subjects at baseline were poor, which improved significantly in the intervention group at post-intervention. There is a need to influence and encourage ergonomics through well designed dental instruments and working stools and there is the need for strong implementation of ergonomics. The photographs were used to help dental faculty to improve skills and increase awareness of their postures during treating patients and improve musculoskeletal health.

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