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RESEARCH ARTICLE

Knowledge of Workplace Postural Requirements Among Private Dental Practitioners

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Abstract
Objective: We aimed to evaluate the basic postural requirements for dental professionals during routine patient care and to assess significant differences in the knowledge of postural requirements with demographic characteristics and clinical experience. Materials and methods: A cross-sectional online survey was conducted among Indian private dental practitioners with a clinical experience (CE > 1-year). They were invited to participate via WhatsApp through based practice networks. We collected data related to age, sex, educational qualification, and CE. The postural requirements questionnaire was adapted from Garbin et al which has 8 items. The total knowledge score of the postural requirements questionnaire was obtained and categorized as "inadequate (1-2), regular (3-4), satisfactory (5-7), and excellent (8)". A Chi-square test and Binary logistic regression was done to compare the knowledge of postural requirements with demographic variables and CE. Results: A total of 383 dental practitioners participated in this online survey, out of which 59.5% were females and mean age was 30.73. More than 1/3rd of the practitioners had an excellent level of knowledge regarding the postural requirements. The majority of the practitioners had satisfactory levels of knowledge. Only 6.8% had inadequate/regular knowledge. Bivariate analysis showed that significantly higher numbers of female dental practitioners (37.3%) showed excellent scores than males (27.1%) (P=0.038). Binary logistic regression showed that females were 1.6 times more likely to have excellent total knowledge scores (OR: 1.6). Conclusion: Our survey showed that more than 1/3rd of private dental practitioners had excellent knowledge of postural requirements.

Keywords
Postural requirements, ergonomics, dentists

INTRODUCTION

Dentistry requires static prolonged working posture, limited access, and poor illumination inside the oral cavity. Long static positions can lead to stretching and compression of the supporting structures. Due to this, there will be persistent contraction of muscles which leads restricted blood flow causing muscular fatigue and increased chances of muscle injury. Repetitive movements can lead to fatigue and give less time to muscle recovery which might lead to muscle

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injury. Persistent forciful movements can lead to muscle fatigue and lead to injury Due to this, dental practitioners are prone to various workplace musculoskeletal disorders (MSDs). Coupled with poor posture, there can be increased incidence of MSD. Literature on MSD among dental practitioners have shown a high prevalence (Chenna et al., 2022; Chikte et al., 2011; Hayes et al., 2009; Leggat et al., 2007; Puriene et al., 2007; ZakerJafari & YektaKooshali, 2018), often due to poor postural practices linked to lack of knowledge, negligence, and poor practices. Previous research showed a positive relationship between poor posture and the prevalence of MSD (Yousef & Al-Zain, 2009). This can lead to poor quality of life, decreased productivity, and poor performance in clinical practice.

"The International Ergonomics Association defines ergonomics as the scientific regulations concerned with the relations between humans, main beliefs, and methods to design a workplace to optimize human comfort and largely system performance"(Diaz-Caballero et al., 2010). The knowledge of ergonomics helps in understanding and applying the principles of safe, healthy, and comfortable work culture along with prevention of MSD, increasing productivity and improving the quality of life. Application of principles of ergonomics during patient care in the dental setting is prudent and helps in the prevention of MSD and stress.

Substantial literature exists on the prevalence and risk factors of MSD and postural habits (Chenna et al., 2022; Yousef & Al-Zain, 2009). Substantial literature exists on the knowledge, attitude, practices and behavior towards ergonomics from developing countries on dentists and dental students (Galla et al., 2022; Jadhav et al., 2018; Kalghatgi et al., 2014; Karibasappa & Rajeshwari, 2014; Ketkar & Malaiappan, 2020; M. Kumar et al., 2021; P. M. Kumar et al., 2020; Nayakar et al., 2020; Vyas et al., 2014). However, literature is scant on the knowledge of optimum postural requirements among dental practitioners in developing countries. Ergonomics is often neglected in the dentistry curriculum, with limited emphasis on operator positions (DCI, 2007). Thorough knowledge of the same is required among dental health care professionals. It is a prerequisite to have an appropriate posture during clinical dental practice. Identification of knowledge gaps is required for the development of training strategies. Hence, we aimed to evaluate the basic postural requirements for dental professionals during routine patient care. We also aimed to assess significant differences in the knowledge of postural requirements concerning demographic variables and clinical experience (CE).

MATERIALS AND METHODS

A cross-sectional online survey among private dental practitioners was conducted. Indian private dental practitioners with more than 1-year of clinical experience were invited to participate. Dentists who were not into private dental practice were excluded from the study. The online survey link was sent through WhatsApp through based practice networks. Sample size was calculated based on the response distribution of 50% which yielded a sample of 377 with a precision of 5% and confidence interval of 95%.

We prepared a questionnaire in English that had information on age, sex, educational qualification, and CE. The postural requirements questionnaire was adapted from Garbin et al (Garbin et al., 2011). It has 8 items with responses as "yes (1)" or "no (0)" (Table 1). The items from the questionnaire were from ergonomic guidelines for proper posture, treatments, instrument manipulation and adequacy of dental offices in patient treatment laid down by International Standards Organization.

Analysis was done using SPSS version 20. A p-value of <0.05 was considered statistically significant. The total knowledge score of the postural requirements questionnaire was obtained by adding the responses to all the questions. Subsequently, the score is categorized as "inadequate (1-2), regular (3-4), satisfactory (5-7), and excellent (8)" (Garbin et al., 2011). Age and years of CE were dichotomized using a median split. Total knowledge score was dichotomized as excellent or optimum (8) and sub-optimum (less than 8). Chi-square test was used to compare the total knowledge score with demographic variables and CE. Binary logistic regression was done to evaluate the relationship between total knowledge score and significant predictors.

Permission to conduct the study was obtained from "Kasturba hospital and Kasturba Medical College institutional ethics committee

(IEC: 263/2021)", and informed consent was sought from all the dental practitioners.

RESULTS

A total of 383 dental practitioners participated in this online survey, out of which 59.5% were females. The mean age was 30.73 (SD: 6.65; Range: 24 -67; Median: 29). The mean CE was 6.18 (SD: 6.33; Range: 1-38; Median: 3 years). Most of the dental practitioners had post-graduate qualifications (60.3%).

More than 90% of dental practitioners have responded "yes" to Q2, Q4, and Q7. Almost 40% of dental practitioners have answered "no" to Q8. Similarly, more than 1/4th of the practitioners responded as "no" for Q3. More than 1/5th of the practitioners have responded "no" for Q1 (Table 1). More than 1/3rd of the practitioners had an excellent level of knowledge regarding the postural requirements. The majority of the practitioners had satisfactory levels of knowledge. Only 6.8% had inadequate/regular knowledge.

Table 1. Distribution of responses to postural requirements questionnaire among the dental practitioners

	Question	No / N (%)	Yes / N (%)
Q1.	"The angle between the lower and upper leg, with the legs slightly spread, must be ~ 110 or slightly more."	84(21.9%)	299(78.1%)
Q2.	"The dentist should sit symmetrically upright and as far back as possible in the seat, tilting the upper body forward to a maximum of 10—20º, avoiding rotation and lateral slopes."	28(7.3%)	355(92.7%)
Q3.	"The head of the surgeon-dentist can be tilted forward to up to 25º."	102(26.6%)	281(73.4%)
Q4.	"The pedal drive must be positioned close to one of the feet, so that it does not have to be directed laterally during its operation."	28(7.3%)	355(92.7%)
Q5.	"The upper limbs are next to the upper body in front of the trunk, with the forearm raised from ~ 10º to a maximum of 25º."	49(12.8%)	334(87.2%)
Q6.	"The working field (patient's mouth) must remain aligned with the front of the upper body, such that the distance between the working area in the mouth and the eyes (or glasses) of ~ 35-40 cm."	42(11.0%)	341(89.0%)
Q7.	"The hand tools should be positioned within the visual field of the dentist at a distance of 20—25 cm".	37(9.7%)	346(90.3%)
Q8.	"A dental operating light must be able to be positioned around the head of the dentist, before and sideward so that the light beam is parallel to the viewing direction."	151(39.4%)	232(60.6%)

Bivariate analysis showed that significantly higher numbers of female dental practitioners (37.3%) showed excellent scores than males (27.1%) (P=0.038). No significant differences were seen in the distribution of knowledge scores concerning age, educational qualification, and years of CE (Table 2).

Table 2. Bivariate analysis of demographic factors with total knowledge scores of postural requirements questionnaire among the dental practitioners

		Total knowledge score		P-value
		Sub-optimal N (%)	Excellent or optimum N (%)	
Age in years	≤29	132(65.7%)	69(34.3%)	0.61
	≥30	124(68.1%)	58(31.9%)	
Sex	Male	113(72.9%)	42(27.1%)	0.038
	Female	143(62.7%)	85(37.3%)	
Clinical experience in years	≤3	131(68.2%)	61(31.8%)	0.143
	≥3	125(65.4%)	66(34.6%)	
Educational qualification	Graduation	95(62.5%)	57(37.5%)	0.563
	Masters	161(69.7%)	70(30.3%)	

Binary logistic regression showed that females were 1.6 times more likely to have excellent total knowledge scores (OR: 1.6). There was no change in the odds ratio after adjusting for covariates (age, educational qualification and clinical experience). However, there was no significant association between sex and knowledge scores (Table 3). Post-hoc power analysis yielded a power of 99% for distribution of knowledge scores between males and females.

Table 3. Binary logistic regression between sex and total knowledge scores of postural requirements questionnaire among the dental practitioners

Predictor	P-value	OR	95% CI
Sex	0.038	1.6	1.03-2.5
Sex (Adjusted for age, educational qualification, and clinical experience)	0.062	1.6	0.98-2.6

DISCUSSION

Maintaining correct posture is a pre-requisite for any profession and dentistry is no exception. Correct posture during clinical dental practice would prevent work related MSD, increase efficiency, and decrease stress and there by improve the quality of life. There are many challenges to maintain correct posture viz., optimum knowledge and practices regarding ergonomics, type, and duration the procedure, intermittent stretching between patients, number of patients treated, patient inflow, armamentarium, appropriate training in the curriculum etc. Optimum knowledge and best practices regarding ergonomics is very essential to maintain the posture during dental practice. Hence, we conducted an online survey among private dental practitioners to evaluate the postural requirements for clinical practice which has clinical relevance in terms of prevention of MSD.

Our survey showed that more than 1/3rd of private dental practitioners had excellent or optimum scores with respect to the knowledge of postural requirements. Substantial dental practitioners lacked knowledge on positioning of the operating light (Q8: 39%) which is a prerequisite for dental practice followed by head tilting position (Q3: 27%) and the angle between the lower and upper legs (Q1:22%). Similar trend of lack of knowledge was seen for Q1 and Q8 among dental students(Garbin et al., 2011). However, the overall knowledge to various postural requirements was much higher than previous study among dental students(Garbin et al., 2011). This difference could be due to the inclusion of experienced dental practitioners in our study.

There were no significant differences in the distribution of knowledge scores with respect to age, educational qualification, and CE. Previous research showed higher knowledge among specialists than general dental practitioners (Kalghatgi et al., 2014; Karibasappa & Rajeshwari, 2014). However, female dental practitioners had better knowledge than males, which was similar to previous studies(Alyahya et al., 2018; Vyas et al., 2014). El-Sallamy et al. showed no significant difference between male and female dental students(El-sallamy et al., 2018). Based on the findings of our research, there is a deficiency in the knowledge levels of postural requirements which exist irrespective of age, educational qualification, and CE of the dental practitioners which can be attributed due to the lack of inclusion of the same in the curriculum during training years.

Our study had limitations. It only evaluated the knowledge component of the postural requirements. It may not be necessary that optimum knowledge translates to good ergonomic postures during clinical dental practice. A previous study on dental students showed that knowledge was not entirely reflected. This could be due to the limited understanding of ergonomics, which creates a knowledge gap between theory and practice. Owing to the nature of the study (online survey), we could not evaluate the practice component of the same during chairside treatment. Knowledge of these ergonomic principles can be acquired at any stage, but the early installation of these principles during the training years can help maintain good posture and prevent the development of MSD among dental practitioners. Another limitation was that this study considered only those principles relevant to clinical dental practice with the dentist seated in the chair.

There are many additional tasks (like operator positions during radiography or film/sensor placement, use of a computer, and chair-side assistance) that require the adoption of ergonomic principles in the dental setting. Inclusion of these components needs exhaustive preparation and requires a lengthy questionnaire which may deter participation. Also, these additional components may or may not be practiced by all the dental practitioners. Future studies should focus on all the additional areas that require ergonomic posture in the dental setting. There is an urgent need for motivation and promoting of ergonomic principles for dental practitioners. Also, the application of ergonomic principles should not only be limited to the clinical dental practice but has to be extended to all routine daily activities to have a holistic approach to the prevention of the development of MSD.

Our survey showed that more than 1/3rd of private dental practitioners had excellent knowledge of postural requirements. There is an urgent need for motivation and promoting of ergonomic principles for dental practitioners.

Conflict of interest

No conflict of interest is declared by the authors. In addition, no financial support was received.

Ethics committee approval:

"Kasturba hospital and Kasturba Medical College institutional ethics committee (IEC: 263/2021)" approved the study protocol.

Author Contributions

Study Design: LM, , KCP, ATN; Data Collection: LM, AB, AC, AG, KCP, ATN; Statistical Analysis: KCP; Data Interpretation: KCP, ATN; Manuscript Preparation: LM, AB, AC, KCP; Final review and editing: KCP and ATN; Literature Search, KCP, ATN. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Alyahya, F., Algarzaie, K., Alsubeh, Y., & Khounganian, R. (2018). Awareness of ergonomics & work-related musculoskeletal disorders amongdental professionals and students in Riyadh, Saudi Arabia. *J Phys Ther Sci*, 30(6), 770. https://doi.org /10.1589/JPTS.30.770

Chenna, D., Pentapati, K. C., Kumar, M., Madi, M., & Siddiq, H. (2022). Prevalence of musculoskeletal disorders among dental healthcare providers: A systematic review and meta-analysis. *F1000Research* 2022 11:1062, 11, 1062. https://doi.org/10.12688 /f1000research.124904.1

Chikte, U. M., Khondowe, O., Louw, Q., & Musekiwa, A. (2011). A meta analysis of the prevalence of spinal pain among dentists. In *SADJ : journal of the South African Dental Association* (Vol. 66, Issue 5, pp. 214–218).

DCI. (2007). Dental Councıl of Indıa BDS course regulatıons 2007 *Dental Councıl of Indıa*.

Diaz-Caballero, A., Gomez-Palencia, I., & Diaz-Cardenas, S. (2010). Ergonomic factors that cause the presence of pain muscle in students of dentistry. *Med Oral Patol Oral Cir Bucal* 15(6), e906–e911. https://doi.org/10.4317 /medoral.15.e906

El-sallamy, R. M., Atlam, S. A., Kabbash, I., El-fatah, S. A., & El-flaky, A. (2018). Knowledge, attitude, and practice towards ergonomics among undergraduates of Faculty of Dentistry, Tanta University, Egypt. *Environ Sci Pollut Res Int*, 25(31), 30793–30801. https://doi.org/10.1007/ s1135 6-017-8615-3

Galla, A., Chowdhry, A., Bagga, A., Moradia, L., Tadikonda, A., Pentapati, K., & Mysore, N.-K. (2022). Dental practitioners' knowledge, attitudes, and practices of ergonomics - a cross-sectional web-based survey. *Acta Bio-Medica : Atenei Parmensis,* 93(S2), e2022048. https://doi.org/10.23750/abm.v9 3iS2.12908

Garbin, A. J. ., Garbin, C. A. S., Diniz, D. G., & Yarid, S. D. (2011). Dental students' knowledge of ergonomic postural requirements and their application during clinical care. *Eur J Dent Educ*, 15(1), 31–35. https://doi.org/10.1111/J.1600-0579.2010.0 0629.X

Hayes, M. J., Cockrell, D., & Smith, D. R. (2009). A systematic review of musculoskeletal disorders among dental professionals. Int J Dent Hyg, 7(3): 159-165. https://doi.org/ 10.1111/j.1601-5037.2009.00395.x

Jadhav, H. C., Vishwakarma, P. Y., Dodamani, A. S., Kshirsagar, M. M., Dodamani, G. A., & Naik, R. G. (2018). Awareness Among Dentists Regarding Ergonomics in Dental

Practice: A Cross-sectional Survey. *J Oral Health Community Dent*, 12(3), 85–89. https://doi.org/10.5005/jp-journals-10062-0032

Kalghatgi, S., Prasad, K. V. V., Chhabra, K. G., Deolia, S., & Chhabra, C. (2014). Insights into ergonomics among dental professionals of a dental institute and private practitioners in Hubli-Dharwad twin cities, India. *Saf Health Work* 5(4), 181–185. https://doi.org/10.1016/j.shaw.2014.09.001

Karibasappa, G., & Rajeshwari, K. (2014). Dentists' Knowledge, Attitude and Behavior towards the Dental Ergonomics. *IOSR J Dent and Medical Sci*, 13(5), 86–89. https://doi.org/10.9790/0853-13528689

Ketkar, G. N., & Malaiappan, S. (2020). Knowledge Attitude and Practice of Ergonomics and Musculoskeletal Disorders as an Occupational Hazard among Periodontists in India – A Questionnaire Based Survey. *J Pharmaceutical Res Int*, 32(20), 162–183. https://doi.org/10.9734/jpri/2020/v32i2030739

Kumar, M., Mishra, G., Vaibhav, R., Priyadarshini, S., Simran, & Turagam, N. (2021). Assessment of knowledge about ergonomics and determining musculoskeletal disorders in dentists: An original research. *J Pharm Bioallied Sci* 13(5), S391–S394. https://doi.org/10.4103/jpbs.JPBS_591_20

Kumar, P. M., Sahitya, S., Penmetsa, G., Supraja, S., Kengadaran, S., & Chaitanya, A. (2020). Assessment of knowledge, attitude, and practice related to ergonomics among the students of three different dental schools in India: An original research. *J Edu Health Promotion*, 9(1), 266. https://doi.org/10.4103/jehp.jehp_208_20

Leggat, P. A., Kedjarune, U., & Smith, D. R. (2007). Occupational health problems in modern dentistry: A review. In Industrial Health (Vol. 45, Issue 5, pp. 611–621). *Ind Health*.https://doi.org/10.2486/indhealth.45.611

Nayakar, R., Joshi, D., & Patil, A. K. (2020). Knowledge, Awareness, and Practices about Ergonomics among Dental Postgraduate Students -A Cross Sectional Study. *Int J Scientific Study*, 8(7), 35–40.

Puriene, A., Janulyte, V., Musteikyte, M., & Bendinskaite, R. (2007). General health of dentists. Literature review. *Stomatologija*, 9(1), 10–20.

Vyas, K., Parihaar, L., Rajoria, K., Arora, J., Pandit, A., & Singh, J. (2014). Knowledge, Attitude and Behavior towards "ERGONOMICS" among Oral Health Professionals in Jodhpur city, Rajasthan, India. *Int J Prev Clin Den Res*, 1(3), 5–9.

Yousef, M., & Al-Zain, A. (2009). Posture Evaluation of Dental Students. *J King Abdulaziz Uni Med Sci*, 16(2), 51–68. https://doi.org/10.4197/med.16-2.5

ZakerJafari, H. R., & YektaKooshali, M. H. (2018). Work-Related Musculoskeletal Disorders in Iranian Dentists: A Systematic Review and Meta-analysis. *Saf Health Work*, 9(1), 1–9. https://doi.org/10.1016/j.shaw.2017.06.006