Review Article

Assessment of Knowledge, Attitude and Practice Towards Dental Ergonomic Principles in Occupational Health Among Undergraduate and Postgraduate Dental Students in Udaipur, Rajasthan, India

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Abstract

Background: Dentistry is a precision-based profession requiring prolonged static postures, fine motor control, and sustained visual attention. These occupational demands place dental professionals, particularly dental students, at a high risk of developing work-related musculoskeletal disorders (MSDs). Despite the high prevalence of MSDs globally and in India, ergonomic education and training remain inadequately integrated into dental curricula.

Objective: This study protocol outlines the methodology to assess and compare the knowledge, attitude, and practice (KAP) towards dental ergonomic principles in occupational health among undergraduate and postgraduate dental students in Udaipur, Rajasthan, India.

Methods: A cross-sectional, descriptive questionnaire-based study will be conducted among 400 undergraduate and postgraduate dental students from two randomly selected dental colleges in Udaipur. Data will be collected using a structured, self-administered questionnaire developed in accordance with ADA, OSHA, and FDI guidelines. Statistical analysis will be performed using SPSS version 26.0.

Ethics and Dissemination: Ethical approval has been obtained from the Institutional Ethics Committee of the concerned dental institution. The results of the study will be disseminated through peer-reviewed publications and academic presentations.

Protocol Registration: Not applicable.

Important Note: *This manuscript describes a study protocol; the study is yet to be conducted.*

Keywords: Study protocol, dental ergonomics, musculoskeletal disorders, occupational health, dental students

Introduction

Dentistry demands precision, sustained concentration, and repetitive fine motor movements, often performed in constrained postures for prolonged durations. These occupational characteristics significantly increase the risk of work-related musculoskeletal disorders (MSDs), particularly affecting the neck, shoulders, back, and upper limbs. The World Health Organization defines musculoskeletal disorders as conditions involving muscles, tendons, and nerves that are caused or exacerbated by repetitive strain, prolonged static postures, and poor ergonomic practices.[1]

Indian studies have reported a high prevalence of MSD-related symptoms among dental students, with approximately 82.3% of undergraduate and 89.1% of postgraduate students experiencing musculoskeletal pain. The most commonly affected regions include the neck, lower back, and shoulders. Variations in clinical exposure, procedural complexity, and academic responsibilities between undergraduate and postgraduate dental students may influence their ergonomic knowledge, attitudes, and practices.

Ergonomics is the scientific discipline concerned with optimizing the interaction between individuals and their work environment to enhance efficiency and reduce injury risk. In dentistry, ergonomic principles encompass appropriate operator positioning, patient chair adjustment, optimal working distance, instrument design, lighting, and the use of magnification aids. Despite its critical role in occupational health, ergonomic education in dentistry remains limited. Studies have shown that less than one-third of dental students possess adequate awareness of correct ergonomic practices.[2]

International evidence further highlights the magnitude of this issue, with a pooled prevalence of musculoskeletal disorders among dental healthcare providers reported to be approximately 78.4%. These findings emphasize the universal need for structured ergonomic training and preventive strategies within dental education.

Given the scarcity of region-specific data comparing undergraduate and postgraduate dental students, particularly in Rajasthan, this study protocol aims to outline a systematic approach to evaluate ergonomic knowledge, attitudes, and practices among dental students in Udaipur, India.

Aim

The main aim is to assess and compare ergonomic knowledge and attitudes among undergraduate and postgraduate dental students, identify critical gaps, and inform educational strategies that strengthen preventive occupational health and professional well-being.

Rationale of the Study

Dental students are exposed to clinical ergonomics early in their training, often without structured ergonomic guidance. Poor ergonomic habits developed during undergraduate and postgraduate training may persist throughout professional life, leading to chronic musculoskeletal disorders and reduced career longevity. Identifying gaps in ergonomic knowledge and practice at the student level is essential for designing targeted educational interventions.

Comparative assessment of undergraduate and postgraduate students will help determine whether increased clinical exposure translates into improved ergonomic awareness and behavior. The findings from this study will provide evidence-based data to inform curriculum reforms and reinforce occupational health strategies in dental education.[3]

Objectives

Primary Objective

- To assess the knowledge, attitude, and practice towards dental ergonomic principles in occupational health among undergraduate and postgraduate dental students in Udaipur, Rajasthan, India.[4]

Secondary Objective

- To compare the levels of knowledge, attitude, and practice between undergraduate and postgraduate dental students.

Responsibility

I am responsible for planning and conducting the study, obtaining ethical and official approvals, collecting and analyzing data using validated tools, ensuring participant confidentiality, and accurately reporting the findings to contribute meaningful evidence toward improving ergonomic education in dentistry.

Hypothesis

Alternative Hypothesis

Undergraduate and postgraduate dental students exhibit significantly different levels of knowledge, attitudes, and practices towards dental ergonomic principles related to occupational health.

Study Design

This will be a cross-sectional, descriptive questionnaire-based study.

Study Setting and Duration

The study will be conducted in two randomly selected dental colleges in Udaipur, Rajasthan, India, over a period of three months, from May 2026 to July 2026.

Study Population

The study population will consist of undergraduate and postgraduate dental students with active clinical exposure.

Sample Size Calculation

Sample size estimation was performed using G*Power software based on previous literature, with a confidence level of 95% and statistical power of 80%. The calculated minimum sample sizes were:[5]

- Knowledge assessment: 369 participants
- Attitude assessment: 349 participants
- Practice assessment: 379 participants

To ensure adequate representation and compensate for potential non-response, the sample size was rounded to 400 participants, distributed among undergraduate and postgraduate students.

Eligibility Criteria

Inclusion Criteria

- Undergraduate dental students (3rd year, 4th year, and interns)
- Postgraduate dental students (1st, 2nd, and 3rd year)
- Students involved in clinical practice
- Students providing written informed consent

Exclusion Criteria

- 1st and 2nd year undergraduate students
- Students without clinical exposure
- Students unwilling to participate

Data Collection Tool

A self-administered structured questionnaire will be used, developed in accordance with guidelines from the American Dental Association (ADA), Occupational Safety and Health Administration (OSHA), and Fédération Dentaire Internationale (FDI).[6]

The questionnaire comprises four sections:

Section 1: Demographic Details

Includes age, gender, academic level, year of study, institution name, clinical working hours, attendance of ergonomic training, and history of musculoskeletal discomfort.

Section 2: Knowledge

Consists of eight multiple-choice questions assessing understanding of dental ergonomic principles, operator

posture, working distance, ergonomic equipment, instrument design, and MSD-related outcomes.

Section 3: Attitude

Includes eight statements assessed using a five-point Likert scale (Strongly Agree to Strongly Disagree) to evaluate perceptions toward ergonomics in dental education and occupational health.

Section 4: Practice

Comprises eight self-reported items assessed using a four-point frequency scale (Never to Always) evaluating adherence to ergonomic practices during clinical work.

Data Collection Procedure

Two out of five dental colleges in Udaipur will be randomly selected. Eligible students will be recruited through random sampling from various academic years. After obtaining written informed consent, participants will complete the questionnaire under investigator supervision to ensure clarity and completeness. Completed questionnaires will be checked for consistency prior to data entry.[7]

Statistical Analysis Plan

Data will be entered and analyzed using SPSS software version 26.0 (IBM Corp., Armonk, New York, USA).

- Descriptive statistics will summarize demographic variables and questionnaire responses.
- Comparative analysis between undergraduate and postgraduate students will be conducted using Chi-square tests and independent t-tests.
- A p-value < 0.05 will be considered statistically significant.

Ethical Considerations

Ethical approval has been obtained from the Institutional Ethics Committee of the concerned dental institution (Annexure attached). Participation will be voluntary, with written informed consent obtained prior to enrollment. No personal identifiers will be recorded, and confidentiality will be strictly maintained. The study poses no physical or psychological risk to participants.

Following completion of the study, participants will be provided with health education on dental ergonomic principles to promote preventive occupational health practices.[8]

Dissemination Plan

The findings of the study will be disseminated through publication in peer-reviewed journals and presentations at academic and professional conferences.[9]

Protocol Status

This manuscript describes a study protocol; the study is yet to be conducted.

Expected Outcome

I am working towards generating evidence that supports improved integration of ergonomic principles into dental education, leading to increased awareness, early adoption of preventive practices, reduced risk of work-related musculoskeletal disorders, and the promotion of healthier, more sustainable careers for future dental professionals.

Source of Support: Nil

Conflict of Interest: Nil

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