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Original Research Article

Knowledge and Awareness about Different Bone Graft Materials among CRI Dental Students in Chengalpet District, Tamil Nadu, India: A Cross-Sectional Survey

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Abstract: ***Background*:** Bone graft materials are widely used in periodontal therapy, implant dentistry, and oral and maxillofacial surgery. Adequate knowledge of graft types, properties, and indications is important for appropriate clinical decision-making among future dentists. ***Objective*:** To assess the knowledge and awareness regarding different bone graft materials among Compulsory Rotatory Internship (CRI) dental students in Chengalpet district. ***Methods*:** A descriptive cross-sectional survey was conducted among CRI dental students in Chengalpet district. A structured, self-administered 20-item multiple-choice questionnaire was used to evaluate knowledge on bone graft definition, classification, biological properties, indications, contraindications, and clinical applications. Each correct response was scored as 1 (total score 0–20). Knowledge levels were categorized as poor (0–7), moderate (8–14), and good (15–20). Descriptive statistics (mean, standard deviation, frequencies, and percentages) were used to summarize data. ***Results*:** A total of 154 students participated. The mean knowledge score was 13.44 ± 4.66 (range: 2–20). Good knowledge was observed in 52.6% of participants, moderate knowledge in 31.8%, and poor knowledge in 15.6%. Higher awareness was noted for basic concepts and general clinical indications of bone grafts, while lower scores were observed for questions related to graft biology, specific material properties, and criteria for material selection. ***Conclusion*:** CRI dental students demonstrated overall moderate to good knowledge of bone graft materials. However, deficiencies in advanced concepts and material selection were identified. Strengthening undergraduate clinical teaching and focused educational interventions may help bridge these gaps and improve clinical preparedness.

Keywords: Interns, Dental Students, KAP, Bone Graft, Cross Sectional Study.

INTRODUCTION

Bone grafting is an integral component of dental practice, serving to restore lost or deficient alveolar bone in a variety of clinical scenarios including periodontal disease, trauma, congenital defects, and preparatory procedures for dental implants [1, 2]. Successful regenerative outcomes depend on the selection and application of appropriate graft materials that support osteogenesis, osteoinduction, and osteoconduction [3-5].

In dentistry, bone graft materials are broadly classified based on their origin into autografts, allografts, xenografts, and alloplastic substitutes [6]. Autografts, harvested from the patient's own body, are considered

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the gold standard due to their inherent osteogenic potential, whereas allografts and xenografts provide osteoinductive and osteoconductive properties without donor-site morbidity [7-10]. Synthetic alloplastic materials offer an alternative with consistent quality and unlimited supply but may vary in biological performance. Despite a wide range of available materials, the choice of graft is influenced by clinical indication, defect characteristics, biological properties, and practitioner familiarity [11-15].

Dental education plays a critical role in equipping future clinicians with essential understanding of bone graft characteristics, indications, and limitations [16, 17]. However, existing evidence indicates variable levels of knowledge among dental students and practitioners regarding bone graft materials, with significant gaps in understanding advanced concepts and material selection criteria [18]. Assessing the level of knowledge and awareness in this area is essential for identifying educational needs and improving curriculum design to ensure sound clinical decision-making [19].

Therefore, this study aimed to evaluate the knowledge and awareness of different bone graft materials among Compulsory Rotatory Internship (CRI) dental students in Chengalpet district through a structured cross-sectional survey.

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional questionnaire-based study was conducted to assess knowledge and awareness regarding bone graft materials among Compulsory Rotatory Internship (CRI) dental students. Ethical approval was obtained from the Institutional Ethics Committee of (Approval No: ___). Written informed consent was obtained from all participants. Participation was voluntary, and confidentiality and anonymity were maintained

Setting

The study was carried out in dental colleges located in Chengalpet district, Tamil Nadu, India. Data collection was conducted over a period of three months from September 2025 to November 2025. Questionnaires were administered during internship postings in academic settings.

Participants

Eligibility Criteria

CRI dental students currently undergoing internship in selected dental colleges in Chengalpet district during the study period were eligible. Students who provided informed consent and completed the questionnaire were included. Those who declined participation or submitted completely unfilled questionnaires were excluded.

Selection of Participants

Participants were recruited using a convenience sampling approach. All eligible interns available during the data collection period were invited to participate.

Variables

The primary outcome variable was knowledge level regarding bone graft materials. Knowledge domains included the definition and purpose of bone grafts, types and sources of graft materials, biological properties such as osteogenesis, osteoinduction, and osteoconduction, clinical indications and contraindications, as well as potential complications and assessment of graft healing.The main study variable was total knowledge score. No exposures, predictors, or confounders were specifically evaluated due to the descriptive nature of the study.

Data Sources and Measurement

Data were collected using a structured, self-administered 20-item multiple-choice questionnaire developed from standard dental textbooks and peer-reviewed literature. Each item had one correct response. A pilot test was conducted among a small group of CRI students (not included in final analysis) to ensure clarity and face validity. Minor modifications were made accordingly.

Each correct response was scored as 1 and incorrect or missing responses were scored as 0. Total scores ranged from 0 to 20. Knowledge levels were categorized as: Poor (0–7), Moderate (8–14), Good (15–20). All participants received identical questionnaires and standardized instructions.

Study Size

The study size was based on feasibility and the number of eligible CRI students available during the study period. A total of 154 students participated, and all scorable questionnaires were included in the final analysis.

Quantitative Variables

Knowledge scores were treated as continuous variables for calculation of mean and standard deviation and as categorical variables when grouped into poor, moderate, and good knowledge levels. The predefined cut-offs were based on total score distribution.

Statistical Method

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Continuous variables were summarized as mean, standard deviation, minimum, and maximum values. Categorical variables were presented as frequencies and percentages. Item-level missing responses were minimal and treated as incorrect responses for scoring purposes. As this was a cross-sectional study using convenience sampling, no analytical adjustment for sampling strategy was required.

RESULTS

Participant Characteristics

A total of 154 Compulsory Rotatory Internship (CRI) dental students participated in the study and were included in the final analysis. All returned questionnaires contained scorable responses; therefore, no questionnaires were excluded due to complete non-response. Item-level missing responses were minimal and were treated as incorrect responses during scoring.

Overall Knowledge Scores

The total knowledge scores ranged from 2 to 20. The mean knowledge score among participants was 13.44 ± 4.66, indicating a moderate overall level of knowledge with observable variability in performance. The summary of overall knowledge scores is presented in Table 1.

Distribution of Knowledge Levels

When categorized using predefined score ranges, 81 participants (52.6%) demonstrated good knowledge, 49 (31.8%) demonstrated moderate knowledge, and 24 (15.6%) demonstrated poor knowledge. The distribution showed that more than half of the participants achieved scores within the good knowledge category. The distribution of participants according to knowledge level is shown in Table 1.

Table 1: Overall knowledge and awareness regarding bone grafts among dental students (n = 154)

Variable	**Mean ± SD**
Total knowledge score (0–20)	13.44 ± 4.66
Minimum score	2
Maximum score	20
Knowledge level categories*	**n (%)**
Poor (0–7)	24 (15.6%)
Moderate (8–14)	49 (31.8%)
Good (15–20)	81 (52.6%)

**Knowledge level based on total questionnaire score*

Item-Wise Knowledge Responses

Item-wise analysis demonstrated variation in knowledge across domains. High proportions of correct responses were observed for fundamental concepts, including the definition of bone grafts (89.4%), clinical use in periodontal surgeries (81.5%), and application in sinus lift procedures (77.5%).

Moderate levels of correct responses were noted for identifying the best osteogenic material (autograft) (62.3%) and sources of allografts (57.0%) and xenografts (68.2%).

Lower proportions of correct responses were observed for advanced concepts, such as identification of purely osteoconductive grafts (43.7%) and preferred materials for ridge preservation (40.4%). Detailed item-wise response distribution is presented in Table 2.

Table 2: Item-wise correct responses to bone graft knowledge questionnaire (n = 154)

Q no	**Correct concept tested**	**Correct n (%)**
Q1	Bone graft = surgical procedure to replace missing bone	135 (89.4%)
Q2	Not a function: Whitening teeth	118 (78.1%)
Q3	Same individual graft: Autograft	112 (74.2%)
Q4	Synthetic graft: Alloplast	71 (47.0%)
Q5	Best osteogenic potential: Autograft	94 (62.3%)
Q6	Allograft source: Human donor	86 (57.0%)
Q7	Xenograft source: Animals	103 (68.2%)
Q8	Lowest immune rejection: Autograft	103 (68.2%)
Q9	Pure scaffold (osteoconduction): All of the above	66 (43.7%)
Q10	DFDBA property: Osteoconductive	109 (72.2%)
Q11	Common clinical use: Periodontal surgeries	123 (81.5%)
Q12	Sinus lift uses: Bone graft	117 (77.5%)
Q13	Implant role: Supports osseointegration	107 (70.9%)
Q14	Contraindication: Uncontrolled diabetes	84 (55.6%)
Q15	Ridge preservation material: Xenograft/alloplast	61 (40.4%)
Q16	Main success factor: Patient health & oral hygiene	118 (78.1%)
Q17	Usually performs grafting: Periodontist/oral surgeon	113 (74.8%)
Q18	Major xenograft concern: Cross-species disease transmission	97 (64.2%)
Q19	Assess healing: Radiographic imaging	98 (64.9%)
Q20	Importance of awareness: Clinical decision-making	122 (80.8%)

DISCUSSION

The present cross-sectional study assessed knowledge and awareness regarding bone graft materials among CRI dental students and found an overall moderate level of knowledge, with a mean score of 13.44 ± 4.66. More than half of the participants demonstrated good knowledge, while a smaller proportion showed moderate to poor knowledge. Students generally performed well on fundamental concepts such as the definition and clinical uses of bone grafts, whereas comparatively lower scores were observed in areas related to biological properties and material selection. These findings suggest that while foundational awareness exists, deeper conceptual understanding required for clinical decision-making may be insufficient among a notable proportion of interns [20-25].

This pattern is consistent with previously published research. Kothari *et al*., (2022) reported that dental students possessed general awareness of bone grafting but demonstrated limited knowledge of biological mechanisms and specific graft materials [25]. Similarly, Isnandar *et al*., (2023) found variable and often inadequate knowledge among dental professionals regarding graft classification and biological principles [26]. Yao *et al*., (2019) observed that although dental students often achieve acceptable theoretical knowledge, deficiencies remain in clinically relevant decision-making, indicating that theoretical exposure alone may not ensure applied competence [27]. AlZarea (2020) also noted that students were familiar with regenerative materials but lacked depth in understanding indications and material selection criteria [28].

Educational exposure and clinical experience appear to play important roles in knowledge acquisition. Schweyen *et al*., (2020) emphasized that implant and graft-related knowledge improves with clinical exposure but may remain incomplete without targeted instruction [29]. Likewise, Shigli and Hebbal (2021) identified variability in biomaterial knowledge between interns and graduates, with interns often demonstrating only moderate preparedness in material selection [30]. The present findings align with these observations and highlight the importance of reinforcing advanced biological and material-selection concepts during undergraduate and internship training.

Several limitations should be considered when interpreting the findings. The use of convenience sampling within a single geographic district may limit representativeness and introduce selection bias. It is possible that academically motivated students were more likely to participate, potentially leading to overestimation of knowledge levels. The questionnaire, although pilot-tested, was not subjected to formal psychometric validation, which may introduce measurement bias and affect reliability. Self-administered questionnaires are also susceptible to response bias, including guessing and social desirability effects. Additionally, scoring missing responses as incorrect could have slightly underestimated knowledge levels. The cross-sectional design limits causal inference, and potential confounding variables such as prior academic performance or clinical exposure were not assessed.

Despite these limitations, the study provides useful insight into current knowledge levels among CRI dental students. The consistency of findings with other studies suggests that the observed pattern—adequate basic awareness but weaker advanced understanding—is likely genuine rather than solely a result of bias. However, the magnitude of knowledge levels should be interpreted cautiously.

In terms of external validity, the results may be generalisable to CRI dental students in similar educational settings where bone grafting is part of the curriculum but may not receive extensive clinical emphasis. Caution is warranted when extrapolating these findings to undergraduate students at earlier stages, postgraduate trainees, or practicing clinicians, as knowledge levels are likely influenced by training stage and clinical exposure.

Overall, the findings support the need for strengthened educational strategies, including case-based learning, clinical demonstrations, and focused teaching on graft biology and material selection, to enhance preparedness of future dental practitioners in regenerative procedures.

CONCLUSION

CRI dental students demonstrated moderate to good knowledge of bone graft materials, with stronger understanding of basic concepts than advanced biological principles and material selection. The identified knowledge gaps highlight the need for greater emphasis on applied and clinically oriented teaching in regenerative dentistry. Strengthening educational strategies and clinical exposure may improve preparedness for evidence-based graft selection and use. Further multi-center research is recommended to support curriculum development.

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