



Assessment of Knowledge and Awareness Regarding Dental Implants Among Undergraduate Dental Students: A Cross-Sectional Questionnaire-Based Study

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ABSTRACT

Background: Dental implants have become an important treatment modality for the replacement of missing teeth. Undergraduate dental students are expected to develop adequate knowledge and awareness regarding implant indications, treatment planning, surgical principles, prosthetic rehabilitation, complications, and maintenance. Assessing their current level of knowledge can help identify educational gaps and improve undergraduate implant dentistry training. **Aim:** To assess the knowledge and awareness regarding dental implants among undergraduate dental students and to evaluate the association between knowledge levels and selected academic and educational factors. **Materials and Methods:** A cross-sectional questionnaire-based study was conducted among 200 undergraduate dental students. Participants were recruited from different years of the Bachelor of Dental Surgery (BDS) program. A structured, self-administered questionnaire consisting of questions related to the basic principles of dental implants, indications and contraindications, implant treatment planning, osseointegration, implant prosthodontics, complications, and maintenance was used for data collection. Each knowledge-based question was assigned one mark for a correct response and zero for an incorrect or “do not know” response. Awareness-related responses were analyzed separately. Data were statistically analyzed using descriptive statistics and appropriate inferential tests. A p-value of <0.05 was considered statistically significant. **Results:** Among the 200 participants, the overall knowledge regarding dental implants was found to be moderate, with considerable variation according to academic year. Students in the senior clinical years demonstrated higher knowledge and awareness scores than students in the junior years. Students who had previously received formal teaching or clinical exposure to implant dentistry demonstrated significantly higher knowledge scores than those without such exposure ($p < 0.05$). Although most students were aware of dental implants as a treatment option for replacing missing teeth, gaps were identified in areas related to implant treatment planning, loading protocols, peri-implant diseases, prosthetic components, and long-term maintenance. **Conclusion:** Undergraduate dental students demonstrated satisfactory general awareness but variable knowledge regarding dental implant therapy. Greater clinical exposure and structured undergraduate education in implant dentistry may help improve students’ understanding and confidence in implant treatment planning and prosthetic rehabilitation.

INTRODUCTION

Dental implants have emerged as a predictable and widely accepted treatment option for the replacement of missing teeth.¹ Unlike conventional fixed or removable prostheses, implant-supported restorations provide support through osseointegration and can restore oral function, aesthetics, and patient comfort. Advances in implant design, surface characteristics, surgical techniques, digital planning, and prosthetic procedures have further expanded the clinical applications of implant therapy.^{2,3}

Successful implant treatment requires a multidisciplinary understanding of diagnosis, treatment planning, surgical procedures, implant biomechanics, prosthetic rehabilitation, maintenance, and management of complications.⁴ Appropriate patient selection and treatment planning are particularly important because factors such as systemic health, bone quantity and quality, periodontal status, oral hygiene, occlusion, parafunctional habits, and patient expectations can influence treatment outcomes. Therefore, dental professionals should possess adequate fundamental knowledge of implant dentistry before entering independent clinical practice.⁵

Undergraduate dental education plays an important role in developing the foundational knowledge and clinical competence required for future dental practice. Although implant dentistry is increasingly incorporated into dental curricula, the extent of theoretical teaching and clinical exposure may vary considerably between institutions. Students may also acquire information through lectures, clinical demonstrations, seminars, textbooks, continuing education programs, and observation of implant procedures. Differences in such exposure may consequently influence their knowledge and awareness of implant therapy.⁶

Previous surveys among dental students have demonstrated variability in their understanding of implant indications, contraindications, treatment planning, surgical procedures, prosthetic components, complications, and maintenance. Inadequate knowledge in these areas may affect students' confidence in discussing implant treatment with patients and may limit appropriate referral and interdisciplinary treatment planning after graduation. Assessing students' knowledge therefore provides an opportunity to identify specific educational deficiencies and areas that require greater emphasis within the undergraduate curriculum.⁷

Questionnaire-based cross-sectional studies provide

a practical method for evaluating knowledge and awareness across different academic levels. Comparing students from different years of undergraduate dental education can also help determine whether knowledge increases with progression through the curriculum and clinical exposure. Furthermore, evaluating the relationship between previous implant-related education or clinical exposure and knowledge scores can provide useful information for curriculum development.

Despite the increasing importance of implant dentistry in contemporary clinical practice, information regarding the level of implant-related knowledge and awareness among undergraduate dental students remains variable. Therefore, the present study was designed to assess the knowledge and awareness regarding dental implants among 200 undergraduate dental students, and to evaluate the association of knowledge levels with academic year and previous educational or clinical exposure to implant dentistry

MATERIALS AND METHODS

Study Design and Setting

A cross-sectional, questionnaire-based study was conducted to assess the knowledge and awareness regarding dental implants among undergraduate dental students. The study included 200 undergraduate Bachelor of Dental Surgery (BDS) students from different academic years of a dental institution. The study was conducted over a predefined study period following approval from the Institutional Ethics Committee.

Study Population

The study population comprised undergraduate BDS students who were enrolled in the institution during the study period. Students from different academic years were included to permit comparison of knowledge and awareness according to academic level and clinical exposure.

Sample Size

A total of 200 undergraduate dental students were included in the study. Participants were recruited using a convenient sampling technique according to the availability and willingness of students to participate.

Inclusion Criteria

Undergraduate BDS students enrolled during the study period.

Students who voluntarily agreed to participate.

Students who provided informed consent.

Students who completed the questionnaire adequately.

Exclusion Criteria

Postgraduate dental students and interns.

Students who were not available during the data-collection period.

Students who declined participation.

Questionnaires with substantial missing or incomplete responses.

Questionnaire Development

A structured, self-administered questionnaire was developed after reviewing relevant literature concerning implant dentistry and undergraduate dental education. The questionnaire was designed to assess both knowledge and awareness of dental implants and was divided into two major sections.

Section A: Sociodemographic and academic information

This section recorded:

Age

Gender

Academic year

Previous formal teaching regarding dental implants

Attendance at implant-related seminars/workshops

Previous observation or assistance during implant procedures

Self-rated familiarity with implant dentistry

Section B: Knowledge and awareness regarding dental implants

The questions covered the following domains:

Basic principles of dental implants

Indications and contraindications

Osseointegration

Patient evaluation and treatment planning

Implant placement and loading

Implant components and prosthetic rehabilitation

Peri-implant tissue health and complications

Implant maintenance and follow-up

The knowledge questions were predominantly multiple-choice questions (MCQs) with a single best answer. Awareness questions were assessed using appropriate response options.

Questionnaire Validation

Before the main survey, the questionnaire was evaluated for content validity by faculty members with experience in prosthodontics and implant dentistry. A pilot evaluation was performed on a small group of students who were not included in the final sample. The questionnaire was subsequently modified for clarity, comprehensibility, and appropriateness of terminology.

Knowledge Scoring

Each knowledge-based question was scored as follows:

Correct answer: 1 mark

Incorrect answer: 0 marks

“Do not know” response: 0 marks

The individual scores were summed to obtain the total knowledge score for each participant. Higher scores indicated better knowledge regarding dental implant therapy.

For interpretation, the overall knowledge score could be categorized as:

Poor knowledge: <50% of the maximum score

Moderate knowledge: 50–74%

Good knowledge: ≥75%

Awareness responses were analyzed separately and expressed as frequencies and percentages.

Data Collection

The questionnaire was distributed to eligible students either in printed form or through a secure electronic survey format. Participants were informed about the purpose of the study and were instructed to complete the questionnaire independently without consulting reference materials. Participation was voluntary, and no personally identifying information was collected.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee before commencement of the study. All participants were informed about the purpose and procedures of the study. Written/informed consent was obtained before participation. Participation was voluntary, and students were permitted to withdraw from the study at any stage without any academic consequences. Confidentiality and anonymity of the collected data were maintained throughout the study.

Statistical Analysis

The collected data were entered into a statistical software package and analyzed using appropriate descriptive and inferential statistical methods. Categorical variables were expressed as frequencies and percentages, whereas continuous variables such as age and knowledge scores were expressed using mean $\pm$ standard deviation or median and interquartile range, depending on data distribution.

The association between knowledge scores and categorical variables such as academic year, previous implant-related teaching, seminar/workshop attendance, and clinical exposure was assessed using the chi-square test, independent *t*-test, one-way ANOVA, or their non-parametric equivalents, as appropriate. The normality of continuous variables was assessed before selecting parametric tests. A two-sided *p*-value <0.05 was considered statistically significant.

RESULTS

A total of 200 undergraduate dental students participated in the study. The participants represented different academic years of the BDS program. The mean age of the participants was 21.34 ± 1.52 years. Of the 200 students, 72 (36.0%) were male and 128 (64.0%) were female.

Knowledge and Awareness Regarding Dental Implants

The overall mean knowledge score was 16.82 ± 3.74 out of 25, indicating a moderate level of knowledge among the study participants. Based on the predefined scoring criteria, 38 (19.0%) students demonstrated poor knowledge, 112 (56.0%) demonstrated moderate knowledge, and 50 (25.0%) demonstrated good knowledge.

Awareness of dental implants as a treatment option for replacing missing teeth was high, with 184 (92.0%) students reporting awareness of implant therapy. However, knowledge was comparatively lower regarding implant treatment planning, loading protocols, prosthetic components, peri-implant diseases, and long-term maintenance.

Knowledge According to Academic Year

Knowledge scores increased progressively with academic year. The mean knowledge score was 13.42 ± 3.21 among second-year students, 15.28 ± 3.34 among third-year students, 17.46 ± 3.18 among fourth-year students, and 19.12 ± 2.76 among final-year students.

A statistically significant difference in knowledge scores was observed among the different academic

years (one-way ANOVA, $p < 0.001$), with final-year students demonstrating the highest scores.

Effect of Previous Educational Exposure

Among the 200 students, 126 (63.0%) reported having received formal teaching regarding dental implants, while 74 (37.0%) reported no previous formal teaching. Students with previous formal exposure demonstrated a significantly higher mean knowledge score (18.02 ± 3.25) compared with students without formal exposure (14.78 ± 3.42 ; $p < 0.001$).

Similarly, 84 (42.0%) students had attended an implant-related seminar or workshop. Their mean knowledge score (18.31 ± 3.14) was significantly higher than that of students who had not attended such programs (15.73 ± 3.72 ; $p < 0.001$).

Clinical Exposure to Implant Procedures

A total of 76 (38.0%) students reported having previously observed or assisted in an implant procedure. These students demonstrated significantly higher knowledge scores (18.47 ± 3.01) than students without clinical exposure (15.80 ± 3.70 ; $p < 0.001$).

The findings indicated that both formal educational exposure and clinical exposure were significantly associated with better knowledge regarding dental implants in table 1.

One-way ANOVA: $p < 0.001$

DISCUSSION

The present cross-sectional study assessed the knowledge and awareness regarding dental implants among 200 undergraduate dental students. The findings demonstrated that although general awareness of dental implants was high, the overall level of detailed knowledge was predominantly moderate. The mean knowledge score was 16.82 ± 3.74 out of 25, with 56.0% of participants demonstrating moderate knowledge, 25.0% demonstrating good knowledge, and 19.0% demonstrating poor knowledge. These findings suggest that familiarity with dental implants among undergraduate students does not necessarily translate into comprehensive understanding of implant therapy.

A high proportion of students (92.0%) were aware of dental implants as a treatment option for replacing missing teeth. This high level of awareness may be attributed to the increasing use of implant-supported rehabilitation in contemporary dental practice and the

Table 1: Demographic and Academic Characteristics of Participants

Variable	Category	n	%
Gender	Male	72	36.0
	Female	128	64.0
Previous formal implant teaching	Yes	126	63.0
	No	74	37.0
Implant seminar/workshop attended	Yes	84	42.0
	No	116	58.0
Observed/assisted implant procedure	Yes	76	38.0
	No	124	62.0

Table 2

Table 2. Knowledge Score According to Academic Year		
Academic year	Mean knowledge score $\pm$ SD	Interpretation
2nd year	13.42 $\pm$ 3.21	Moderate
3rd year	15.28 $\pm$ 3.34	Moderate
4th year	17.46 $\pm$ 3.18	Moderate
Final year	19.12 $\pm$ 2.76	Good
Overall	16.82 $\pm$ 3.74	Moderate

greater availability of information through undergraduate teaching, clinical exposure, professional seminars, and digital media. However, gaps were identified in more specific areas, particularly implant treatment planning, loading protocols, prosthetic components, peri-implant diseases, and maintenance. These areas require a greater understanding of both surgical and prosthodontic principles and may therefore be more difficult for students with limited clinical exposure.

An important finding of the present study was the significant association between academic year and knowledge score. Knowledge increased progressively from the second year to the final year, with final-year students achieving the highest mean score. A similar observation was reported by Sakshi et al., who found greater knowledge of dental implants among senior undergraduate dental students.⁸ This finding is clinically understandable because students in the senior years receive greater exposure to clinical dentistry and are more likely to encounter fixed and removable prosthodontics, oral surgery, periodontology, as well as multidisciplinary treatment planning. Their increased academic experience may provide a broader foundation for understanding implant therapy.

Students who had received formal teaching regarding dental implants demonstrated significantly higher knowledge scores than those without such exposure. The mean score among students with previous formal teaching was 18.02 ± 3.25 compared with 14.78 ± 3.42 among students without formal teaching. This difference emphasizes the importance of structured educa-

tional content in developing fundamental knowledge of implant dentistry. Merely encountering implant treatment in clinical practice may not be sufficient without systematic instruction covering diagnosis, treatment planning, implant components, surgical principles, prosthetic rehabilitation, and maintenance.

Similarly, students who had attended an implant-related seminar or workshop demonstrated significantly higher knowledge scores. Educational activities outside routine classroom teaching may provide additional opportunities for students to interact with clinicians, observe clinical cases, and understand current treatment concepts. Such activities may therefore complement the theoretical component of the undergraduate curriculum.

Clinical exposure was also significantly associated with knowledge. Students who had previously observed or assisted in an implant procedure had a higher mean knowledge score than those without such exposure. Clinical observation can help students connect theoretical concepts with actual treatment procedures, including implant placement, impression making, abutment selection, provisionalization, and definitive prosthetic rehabilitation. However, clinical exposure should ideally be accompanied by appropriate supervision and structured discussion to ensure that students understand the rationale behind each clinical step rather than simply observing the procedure.

The findings also have implications for undergraduate dental education. Implant dentistry is inherently multidisciplinary, involving prosthodontics, periodontology, oral surgery, radiology, and restorative dentistry. Therefore, undergraduate teaching should not be restricted to the definition and basic principles of implants. Students should also be introduced to patient selection, diagnostic evaluation, treatment planning, implant biomechanics, surgical-prosthetic relationships, implant-supported prostheses, peri-implant tissue health, complications, and maintenance protocols.

The moderate overall knowledge identified in this

Table 3

Table 3. Knowledge According to Implant-Related Educational Exposure			
Exposure	Yes: Mean $\pm$ SD	No: Mean $\pm$ SD	p-value
Formal implant teaching	18.02 $\pm$ 3.25	14.78 $\pm$ 3.42	<0.001
Seminar/workshop	18.31 $\pm$ 3.14	15.73 $\pm$ 3.72	<0.001
Clinical observation/assistance	18.47 $\pm$ 3.01	15.80 $\pm$ 3.70	<0.001

study may also reflect the limited opportunity for undergraduate students to participate directly in implant treatment. Implant placement and prosthetic rehabilitation may be performed predominantly by postgraduate students or specialists in many dental institutions. Consequently, undergraduate students may have adequate theoretical awareness but insufficient practical exposure. Incorporating case-based learning, treatment-planning exercises, seminars, demonstrations, and supervised clinical observation could help bridge this gap.^{9,10}

From a clinical perspective, improving undergraduate knowledge of implant dentistry is important because newly graduated dentists may encounter patients seeking implant treatment even when they do not personally perform implant placement.^{11,12} A dentist should be able to identify appropriate candidates, recognize contraindications and risk factors, explain basic treatment options, provide appropriate preventive and maintenance advice, and make timely referrals to implant specialists when required

Limitations

The study has certain limitations. The use of a cross-sectional design allows assessment of knowledge at a particular point in time but cannot establish a causal relationship between educational exposure and knowledge. The use of convenience sampling may also limit the generalizability of the findings to dental students from other institutions. Furthermore, questionnaire-based studies may be influenced by response bias and may not necessarily reflect actual clinical competence. Future multicentric studies involving larger and more diverse student populations could provide a broader assessment of undergraduate knowledge regarding implant dentistry.

CONCLUSION

The present study demonstrates that undergraduate dental students had high general awareness but only moderate overall knowledge regarding dental implants. Knowledge was significantly higher among students in senior academic years and among those with previous formal teaching, seminar/workshop participation,

or clinical exposure. These findings highlight the importance of strengthening structured implant dentistry education and providing appropriate clinical exposure during undergraduate dental training.

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