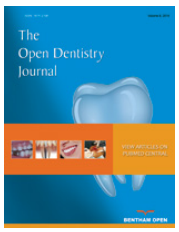

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RESEARCH ARTICLE

Assessment of General Dentists' Knowledge and Confidence towards Dental Implants and their Perceptions regarding Undergraduate Education

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Abstract:

Background:

Dentists are the primary sources of information regarding dental implants. Thus, they are required to be knowledgeable to meet patients' expectations.

Objective:

This cross-sectional study aims to evaluate dentists' knowledge and confidence in dental implants and investigate their perceptions regarding their undergraduate education.

Methods:

The study utilized a voluntary anonymous questionnaire, distributed among dentists, and graduates of King Abdulaziz University, Faculty of Dentistry, Jeddah, Saudi Arabia. The questionnaire sections were: demographics, perception regarding undergraduate education, confidence, and knowledge assessment. Descriptive statistics and Chi-square test at a statistical significance of P-value <0.05 were conducted.

Results:

The majority 75.5% reported sufficient theoretical information regarding implant dentistry during undergraduate education. However, only 12.2% reported sufficient clinical education. Limited participants had the chance to practice implant dentistry. About half of the participants 44.9% wished they were given this opportunity. Participants' confidence in different procedures ranged between 45.9% and 82.6%. Survey participants reported adequate knowledge in treatment planning 82.7%, in prosthetics 92.9%, and 79.6% in surgical aspects. No association was found between gender and knowledge sections, treatment planning, prosthetic, and surgical aspects of implant dentistry. Respective P-values were 0.45, 0.14, and 0.09.

Conclusion:

Participants were interested to obtain more clinical experience in implant dentistry during undergraduate education. Thus, adjustments are suggested to optimize the quality of education to meet graduates' expectations.

Keywords: Confidence, Dental education, Dental implants, Knowledge, Undergraduate education, Dentistry.

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1. INTRODUCTION

The ultimate goal of contemporary dentistry is to restore the normal health, function, and aesthetics of teeth. These goals can be accomplished with implant dentistry [1]. A dental implant has become a modern treatment procedure with high acceptance due to its success and predictability, leading to better patients' quality of life [2]. A successful dental implant is a healthy implant with no patient complaint and no clinical or radiographic signs of disease while a surviving dental implant is an implant that is present in the oral cavity regardless of its condition. With a survival rate of 98.8% and a success rate of 97.0%, dental implants are safe and durable and thus have been used widely as a reliable method to replace missing teeth [3].

Patients are becoming significantly aware of dental

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implants as a treatment option and continually seeking information [4 - 6]. Dentists were reported to be a primary source when patients are looking for reliable information [4] [7]. Therefore, it is significant to include implant dentistry in undergraduate dental education. General dentists are required to be comfortable with various aspects of implant dentistry to be able to meet their patient's expectations [2]. Moreover, they should be able to distinguish dental implant health from disease and be aware of when to request referrals for further management [8].

The involvement of implant dentistry in undergraduate education has been reported worldwide since the 1990s [2]. It started even before that in US dental schools, with 33% having incorporated implant dentistry in their undergraduate curriculum in 1974 [9]. This implementation percentage increased to 73% in 1989 [10] and 97% in 2006 [11]. In 2009, the First European Workshop on Implant Dentistry University Education required the integration of implant dentistry into undergraduate dental education [12].

It is important to assess the knowledge and perceptions of graduated dentists as this aids educators to evaluate their undergraduate curriculum and provide guidance for adjustment. Studies have evaluated undergraduate implant dentistry education from different geographic areas, such as the United States [9 - 11], Canada [11], Europe [12], Indonesia [13], India [1], and Saudi Arabia [14]. A survey-based study among Indonesian dental students stated that they were aware of dental implants as a treatment option; however, their knowledge was reported to be deficient and indicated a need to incorporate comprehensive implant dentistry courses in their undergraduate education [13]. Another survey-based study among Indian dental interns found that they were not prepared to practice implant dentistry and strongly recommended a review of their undergraduate education, as more than 70% reported insufficient information [1]. A study conducted in Saudi Arabia in 2009 among newly graduated dental students at King Abdulaziz University, Faculty of Dentistry, reported insufficient basic dental implant knowledge with a crucial need to revise undergraduate implant dentistry education [14]. This finding suggests that there might be a need to establish a better-structured curriculum to provide proper knowledge to undergraduate dental students.

Oxford Dictionary described confidence as " the feeling of trust and belief in someone's or your ability to do things successfully ". Dental student confidence while providing patient care is significant in assessing undergraduate education outcomes. Confidence was found to be influenced by the teaching strategy, with a higher level of confidence associated with clinical training compared to problem-based learning and theoretical teaching [15]. Previous studies have investigated students' confidence regarding different dental procedures, root canal treatment [16], complete and partial dentures [17], oral maxillofacial surgery [18], and different restorative procedures [19]. However, despite the high demand for dental implants, studies assessing students' confidence regarding implant-related procedures are lacking.

Therefore, this cross-sectional study aims to evaluate the knowledge and confidence of general dentists toward dental implants and investigate their perception regarding their undergraduate education at King Abdulaziz University, Faculty of Dentistry, 13 years after the previous study by Aljohani and Alghamdi [14].

2. MATERIALS AND METHODS

2.1. Study Population and Sample Size Calculation

This cross-sectional questionnaire-based study was performed on general dentists graduates of King Abdulaziz University, Faculty of Dentistry, Jeddah, Saudi Arabia, in the year 2021 (n=151). The study lasted from December 2021 to March 2022. The Raosoft sample size online calculator was used for sample size calculation [20]. With a total population size of 151 graduates, 50% response distribution, 90% confidence level, and a 5% margin of error, the recommended calculated sample size was 98 participants. The anonymous questionnaire utilized an online format using Google Forms. After obtaining approval from The Research Ethics Committee of King Abdulaziz University, Faculty of Dentistry, the questionnaire link with detailed information regarding the research was forwarded to all participants through social media (WhatsApp). Reminders were sent every 2 weeks. Participants gave their informed consent to participate in the study. Participation was voluntary and the data obtained were confidential.

2.2. The Questionnaire

The questionnaire contained four sections. The first included demographic information. The second included 11 closed-ended questions to assess participants' perceptions regarding their undergraduate education. The third included 9 (four-point Likert scale) questions to assess participants' confidence towards different dental implant-related procedures (1 was not confident and 4 was very confident). If participants answered 1 or 2, they were considered as not confident. However, if their answer was 3 or 4, they were considered as confident. The fourth included 21 closed-ended questions to evaluate participants' knowledge regarding implant dentistry. These questions were grouped into three subsections, (1) treatment planning, (2) prosthetic, and (3) surgical aspects with each including 7 closed-ended questions. For each group, if the participants answered all 7 questions correctly (100%), they were considered to have an excellent level of knowledge. If they answered 4 to 6 questions correctly (more than 60%), they were considered to have a sufficient level of knowledge. Lastly, if they answered 0 to 3 questions correctly (less than 60%), they were considered to have an inadequate level of knowledge.

2.3. Validity and Reliability

The questionnaire was developed by the authors and validated before conducting the study. Two independent dental academicians in the field of implant dentistry evaluated the questionnaire for content validation. To assess the clarity of the questionnaire, it was distributed among 60 general dentists and previous graduates of King Abdulaziz University, Faculty of Dentistry, Jeddah, Saudi Arabia, in the year 2020. According to their feedback, the questionnaire was modified and finalized.

Internal reliability was assessed using Cronbach's alpha for the perception, confidence, and knowledge section. Each had a Cronbach's alpha > 0.7 (0.71, 0.77, and 0.75 respectively).

2.4. Statistical Analysis

The data were coded, tabulated, and analyzed using the Statistical Package for Social Sciences software (SPSS) version 28. Descriptive statistics in addition to Chi-square tests to assess the association, were conducted. Statistical significance was set at P-value < 0.05.

3. RESULTS

The response rate was (64.9%) with 98 general dentists out of 151 invited completing the questionnaires. The participants ranged in age from 24-25 years and included 66 (67.3%) females and 32 (32.7%) males.

3.1. Perceptions Regarding Undergraduate Education

The majority of participants, 74 (75.5%) reported that they were provided sufficient theoretical information about dental implants during their undergraduate education. However, the opposite was reported for clinical knowledge as only 12 (12.2%) reported sufficient clinical information (Fig. **1**).

Some participants were involved in implant dentistry during their undergraduate education with dental residents in the postgraduate clinics. The majority, 78 (79.6%) had the opportunity to treatment plan a dental implant case or review a CBCT, 38 (38.8%) had the chance to attend a dental implant surgical procedure, and only 29 (29.6%) attended the prosthetic procedure.

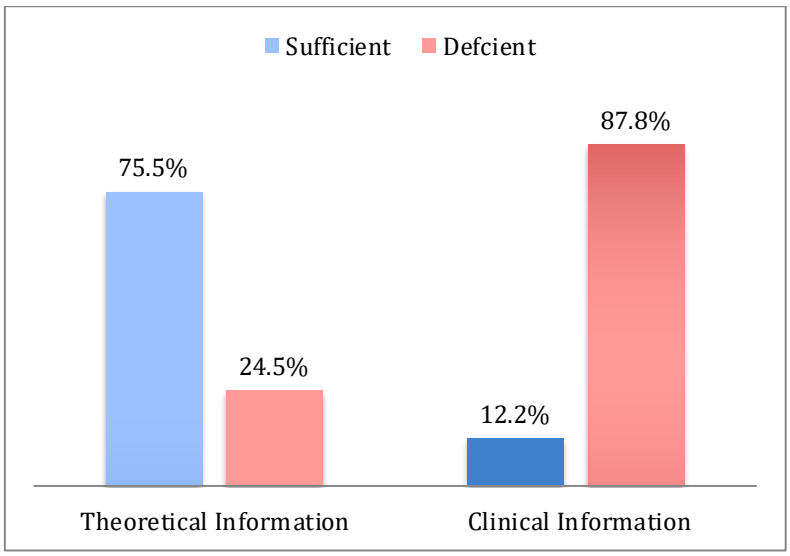

Fig. (1). Participants' perceptions about the appropriateness of level implant dentistry-related training they received during undergraduate education.

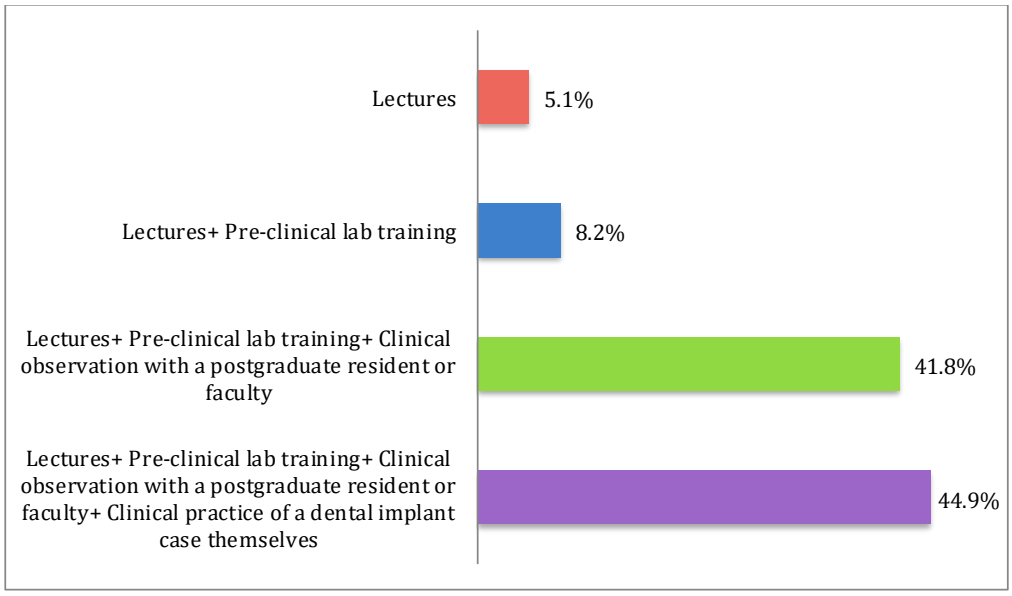

Fig. (2). Participants' opinion regarding the appropriate level of undergraduate education regarding implant dentistry.

After graduation and during their internship training year, limited participants had the chance to practice implant dentistry themselves. In this group, 2 (2%) exclusively practiced the surgical part, 12 (12.2%) the prosthetic part, and only 2 (2.0%) both the surgical and prosthetic parts, all under supervision.

About half of the participants, 44 (44.9%) wished that they had the opportunity to practice implant dentistry. These participants think that the proper extent of undergraduate implant dentistry education should involve theoretical lectures, simulated practice in the preclinical lab, and clinical observation of a case with a postgraduate resident or faculty to be followed with the clinical practice of a dental implant case themselves under supervision (Fig. **2**).

The majority of participants, 86 (87.8%) were planning to practice implant dentistry and they were looking forward to continue their education. Of these, 35 (40.7%) were planning to increase their knowledge in surgical aspects only, 14 (16.3%) in prosthetic aspects only, and 37 (43.0%) in both surgical and prosthetic aspects. When they were further asked about their plans, 25 (29.1%) were planning to join a one-year postgraduate program or fellowship, 34 (39.5%) were interested in observation with dental specialists, 17 (19.8%) will attend short-term continuing education courses, and 10 (11.6%) will read professional books, attend conferences, and online webinars.

3.2. Confidence

Participants' confidence in performing different dental implants related procedures ranged from 45.9% to 82.6%. Details on the procedures with the associated percentages are listed in Table **1**.

3.3. Knowledge Regarding Implant Dentistry

The majority of participants were knowledgeable in all three sections, 81 (82.7%) in treatment planning, 91 (92.9%) in prosthetics, and 78 (79.6%) in surgical knowledge (Fig. **3**). No significant association was found between participants' gender and different knowledge sections. (Treatment planning, prosthetic, and surgical. Respective P-values were 0.45, 0.14, and 0.09).

Table 1. Participants' confidence in performing different dental implants related procedures.

Procedure	Confidence (%)
Discuss dental implants as a treatment option to replace missing teeth and answer patients' questions	82.6%
The treatment plan for a dental implant case clinically	69.3%
Review 3-D CBCT scan for a dental implant case	56.1%
Discuss dental implant surgical procedures with a periodontist or dental implants surgeon	45.9%
Discuss dental implant prosthetic procedures with a prosthodontist or restorative dentist	56.1%
Examine a patient with an existing dental implant and determine whether it is healthy or diseased	46.9%
Evaluate a periapical radiograph of a dental implant for bone loss assessment	69.3%
Identify the different contributing factors, which can lead to dental implant disease	56.1%
Diagnose dental implant disease and complications to refer the patient to a specialist for further treatment	59.1%

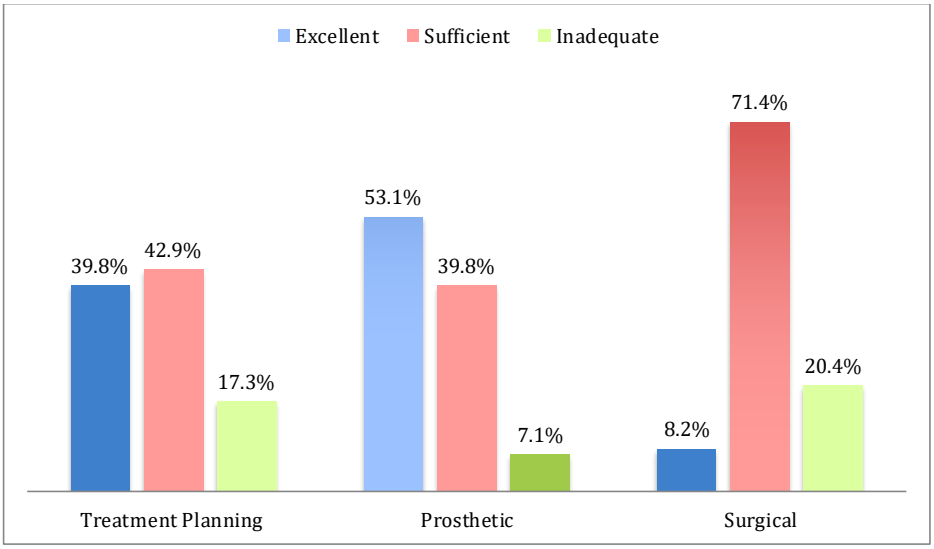

Fig. (3). Participants' level of knowledge regarding various aspects of implant dentistry (treatment planning, prosthetic, and surgical aspects).

4. DISCUSSION

The goal of undergraduate dental education programs is to graduate competent providers able to provide proper dental services, including dental implant procedures, within the limits of their qualifications. Thus, a well-structured undergraduate implant dentistry curriculum is crucial to meet this goal. Originally, implant dentistry education started with the involvement of theoretical lectures in some curricula while currently, almost all dental curricula include a series of comprehensive theoretical lectures [21, 22]. In addition, some dental programs, mainly in North America and Europe, incorporated clinical training in undergraduate dental education [23 - 26]. Upon assessing our participants' perception, the majority was satisfied with their undergraduate theoretical education, while only a minority was satisfied with clinical education. This result could be related to the predominant view that undergraduate implant dentistry education should mainly include theoretical education with a lack of clear guidelines on the adequate extent of clinical education. Much lesser satisfaction percentages regarding undergraduate theoretical education were reported in other studies (26.6%) in India [1] and (31%) in Indonesia [13].

Clinical observation of implant dentistry with specialists, both restorative and surgical, was reported in some undergraduate dental curricula [27, 28]. This opportunity was given to our students during their undergraduate education. However, limited participants had the chance to practice implant dentistry. This result is consistent with other dental programs which reported that only a small selected group of undergraduate dental students were provided with the opportunity to perform implant dentistry themselves after receiving extensive preparation [23, 24, 29].

Different levels of implant dentistry-related clinical education in undergraduate dental programs have been reported. These include hands-on laboratory training on models or a preclinical phantom lab [22, 25, 30, 31], the observation of surgical and restorative procedures [25, 26], resorting implants placed by implant specialists and, less frequently, placing dental implants after receiving special training [23, 24, 29]. When considering the type of implant restoration, undergraduate students mostly carried out simple cases such as single restoration and mandibular overdentures [23, 25, 28]. Half of the participants (44.9%) considered an adequate level of implant-related education for undergraduates to include comprehensive implant education which includes theoretical lectures, simulated practice in the preclinical lab, clinical observation with postgraduate residents or faculty, to be followed with clinical practice of a dental implant case themselves under supervision. This finding was consistent with Kroeplin and Strub's conclusions regarding undergraduate implant dentistry education [32]. On the contrary, in another study, only (18%) of the participants indicated the need to include the clinical practice of implant dentistry during undergraduate education [13].

The majority of our participants were planning to practice implant dentistry in the future and they were interested to increase their knowledge. About half of them were looking forward to gaining knowledge in both surgical and prosthetic aspects. This result was consistent with Ariani *et al.*'s study [13]. Studies have reported that dental providers who graduated from universities with a structured implant education program were more likely to be involved in dental implant treatment [33] and unlikely to refer cases to other providers [8]. Therefore, it is crucial to have well-constructed and comprehensive implant dentistry education in undergraduate dental programs to satisfy and meet graduates' expectations.

Students' confidence was found to have a positive correlation with the clinical experience [17]. Providing students with a clinical demonstration before performing dental treatment was shown to increase their confidence [15]. A higher confidence level was found with undergraduate advancement through the years and with increased clinical experience. The opposite is also true, low confidence was reported due to insufficient clinical training [16, 17]. This was similar to our results. The majority were exposed to dental implant treatment planning thus higher confidence was reported compared to surgical and prosthetic procedures. However, self-reported confidence is subjective and does not necessarily relate to clinical competence. As a result, over-confidence or under-confidence might be reported. Yet, the significance of confidence assessment is to recognize students' weaknesses and accordingly provide further education [34].

Dental implant cases usually involve treatment planning, and surgical procedures, to be followed with prosthetic procedures. Thus, to assess the knowledge regarding dental implants the survey questions were categorized into three sections. The majority showed adequate knowledge in all three aspects with only a minority showing inadequate knowledge, (17.3%) in treatment planning, (7.1%) in the prosthetic aspect, and (20.4%) in the surgical aspect. Conversely, other studies have reported larger percentages of unsatisfactory and deficient knowledge [35, 36]. Our study showed significant improvement in implant dentistry knowledge compared to Aljohani and Alghamdi's study, which was published in 2009 and performed in the same dental institution. The previous study reported a poor level of knowledge among dental graduates and pointed to a crucial need to adjust the implant dentistry curriculum [14]. Over the years, our undergraduate implant dentistry education was modified several times. These modifications included comprehensive well-constructed theoretical lectures integrated within different courses (prosthodontics, periodontics, and oral radiology), and preclinical education, providing undergraduate students the opportunity to treatment plan dental implant cases and observe different procedures with a postgraduate resident or faculty. Undergraduate students can also restore dental implants with certain criteria. However, they are not allowed to perform surgical placement of dental implants. Only selected graduates during their internship year and after surgical training can place dental implants. Our study revealed that almost half of the participants (44.9%) had the desire to practice implant dentistry during their undergraduate education, thus clinical adjustment is suggested to accommodate more dental students and provide them with an educational opportunity that fulfills their interest.

The present study was conducted among a relatively small sample of general dentists who are graduates of one dental

school in Saudi Arabia, which could introduce a bias in the results. Thus, our results may not be generalizable. Despite this possible limitation, the insights from our study could guide other educators in the assessment of their curricula.

CONCLUSION

Our study revealed adequate knowledge about dental implants among the majority of the participants. Participants' confidence in performing different procedures varied with the highest being dental implant treatment planning. Participants showed enthusiasm and great interest in gaining more implant dentistry experience. Curricular modification is suggested to optimize the quality of implant education to meet dental graduates' expectations.

ABBREVIATION

SPSS = Statistical Package for Social Sciences Software

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The research was reviewed and approved by The Research Ethics Committee of King Abdulaziz University, Faculty of Dentistry, Jeddah, Saudi Arabia. (Protocol number #308-11-21).

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were under the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The authors confirm that the data supporting the findings of this study are available within the article. The questionnaire and dataset analyzed during the study are available from the corresponding author, [S.B.A], upon reasonable request.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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Declared none.

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