



“To Evaluate the Knowledge on Various Types of Implant and Impression Techniques in Oral Implantology Practice Among Dental Students & Practitioners in Uttarakhand State: A Survey Based Study”

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ABSTRACT

Background: With the tremendous progress in dental implantology, it becomes important that dental practitioners remain abreast of existing techniques and technology. This study evaluated the awareness and comprehension of different dental implants and impression methods among dental practitioners and students in Uttarakhand.

Objectives: The current study was done to evaluate the knowledge on various types of implant and impression techniques among dental students & practitioners in Uttarakhand state .

Material and Method: A survey questionnaire was conducted among dental students and professionals of Uttarakhand, including the types of implants (Endosteal, Subperiosteal, Zygomatic), impression methods (open tray, closed tray, digital), and use of digital aids like intraoral scanners and CAD/CAM technology.

Results: The majority of the participants were aware of conventional implant systems and impression techniques, but significant gaps in knowledge were observed in newer and digital methods. Knowledge and acceptance of advanced technologies such as intraoral scanning and CAD/CAM systems were low.

Conclusion: The present study indicates a moderate awareness of contemporary implantology among dental practitioners in Uttarakhand, with substantial gaps in knowledge and application of advanced and digital techniques.

1. Introduction

Dental implantology is now a consistent way of restoring oral function and aesthetics, depending on material quality, accurate implant placement, and correct

impression techniques.¹ New implants are much more durable and biocompatible than older methods such as dentures. But their longevity will depend on clinical skill in choosing the right systems (e.g., Endosteal,



Subperiosteal, Zygomatic) and in mastering impression techniques, open/closed tray and digital.² Though digital technologies, like intraoral scanners, enhance accuracy and patient comfort, most practitioners use traditional methods, which can lead to distortion and discomfort.³

The research targets evaluation of dental student and practitioner knowledge in Uttarakhand on implant systems, materials, and impression techniques. As the field of implantology evolves, keeping clinicians informed of new technology and best practice is paramount. Knowledge gaps may result in issues such as prosthetic misfit or implant failure, affecting patient outcomes.³ The research hopes to identify areas of strength and weakness in current training to inform curriculum revisions and continuing education initiatives and meet changing clinical needs.

Uttarakhand dental education should synchronize with advancements in technology to equip professionals with competency for managing challenging cases. Digital aids, as promising as they are, need to become familiar and an integral part of regular practice.⁶ The research emphasizes that assessing practitioners' comfort with innovations and knowledge of evidence-based practice must be gauged. With the identification of knowledge deficits, the research can inform targeted professional development and generate expertise in fundamental and novel methods.⁵

Finally, the study emphasizes the need for lifelong learning in implantology. As materials and techniques change, ongoing education guarantees clinicians provide high-quality, patient-focused care. For Uttarakhand, closing knowledge disparities will increase clinical excellence, decrease complications, and increase treatment duration, helping both providers and patients.^{4,5}

The current study sets out to assess dental implant system knowledge and impression techniques' understanding among dental students and practitioners in Uttarakhand with aims to assess familiarity with implant types (Endosteal, Subperiosteal, Zygomatic), evaluate awareness of implant materials, determine proficiency in conventional and digital impression techniques, and identify gaps in clinical training and technology

adoption. Through examination of these variables, the study aims to bring into focus educational requirements and maximize readiness for contemporary implantology challenges, aligning with changing standards in patient care.

2. Methods

A 20-item structured multiple-choice questionnaire was created to evaluate knowledge of dental implant types (Endosteal, Subperiosteal, Zygomatic), materials (Titanium, Zirconia), and impression techniques (Closed/Open Tray, Digital) among dental students and practitioners of Uttarakhand.⁷ The questionnaire contained questions on implant components (i.e., impression copings, scan bodies) and material pros/cons, and was designed to assess both basic and advanced clinical knowledge.^{8,9}

Google forms were sent out among dental colleges and clinics in Uttarakhand, in a balanced ratio of academic and professional viewpoints. Predefined options were chosen by the participants, allowing for quantifiable analysis of gaps in proficiency as well as familiarity with technology.⁸ Practice-based questions checked knowledge like best cases for digital versus traditional impressions and criteria for choosing materials for particular cases.⁹

Inclusion criteria aimed at volunteers, existing dental students in Uttarakhand colleges, and local practitioners who were practicing. Exclusion criteria excluded non-consenting participants, practitioners who were practicing outside Uttarakhand, and non-Uttarakhand students to keep the location-specific.

By concentrating on cohorts that are specific to Uttarakhand, the research delineated regionally applicable findings regarding training requirements. Results will elucidate digital workflow adoption rates, material science literacy, and procedural precision in order to inform targeted training interventions directly.^{8,9}

Sample size

The sample size for the present cross-sectional survey was calculated using the standard formula for estimating



proportions with a 95% confidence level and a 5% margin of error. The formula used is:

$$n = Z^2 \times P(1-P)/e^2$$

where n is the required sample size, Z is the Z-score corresponding to the desired confidence level (1.96 for 95%), pp is the estimated proportion of the population with the attribute of interest (assumed as 0.5 for maximum variability), and ee is the margin of error (0.05). Substituting these values, the minimum required sample size was calculated as:

$$n = (1.96)^2 \times 0.5(1-0.5) / (0.05)^2$$

$$= 3.8416 \times 0.25 / 0.0025 = 384.16$$

Therefore, a minimum sample size of 385 participants was considered adequate. Since the target population (dental students and practitioners in Uttarakhand) is finite, the finite population correction (FPC) was also considered where appropriate to adjust the sample size. Ultimately, a total of 300 participants (180 students and 120 practitioners) were included in the study based on voluntary participation and availability.

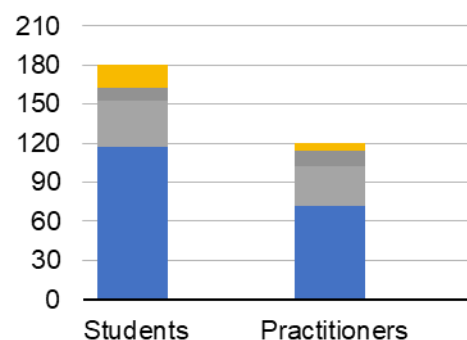
3.Results

According to the survey of 300 respondents (180 dental students and 120 practitioners) in Uttarakhand, the findings offer a detailed analysis of prevailing knowledge and practice trends in dental implantology and impression techniques.

1. Knowledge of Implant Types

The majority of respondents exhibited good knowledge of prevalent implant types, with 60% of students and 65% of practitioners identifying Endosteal implants correctly, and 30% of students and 25% of practitioners identifying Subperiosteal implants correctly. Yet, less common types were known to very few: only 5% accurately identified Transosteal implants, and 8% Intraosseous implants. This indicates a need for increased awareness of specialized or more advanced implant systems, which may affect management of complicated clinical cases.

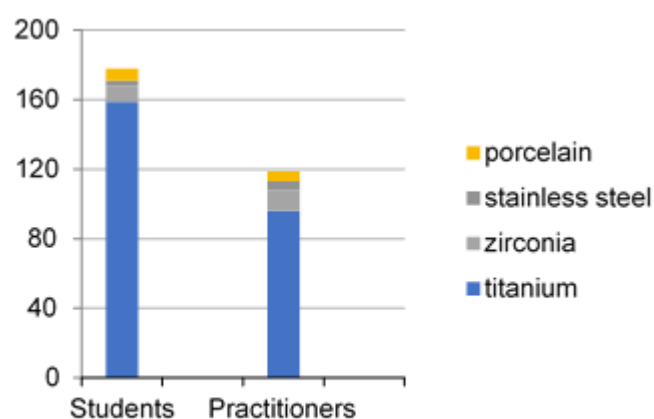
■ ENDOSTEAL ■ SUBPERIOSTEAL



Graph 1 -Comparative knowledge of different implant types

2. Familiarity with Implant Materials

Titanium was appropriately named as the main material for dental implants by 85% of students and 90% of practitioners, indicating high familiarity with standard clinical practice. Nevertheless, only 5% of students and 8% of practitioners identified Zirconia as an alternative, and even fewer knew about its particular strengths and weaknesses. This indicates a necessity for further education on new materials and their clinical use to increase treatment options.

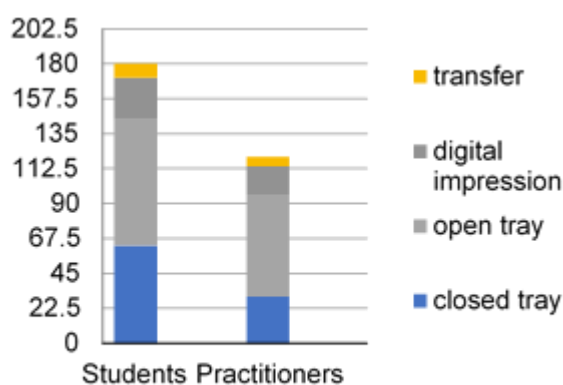


Graph 2 -Comparative knowledge of different implant materials



3. Skill in Impression Methods

There was a high degree of experience with digital impression methods, as 80% of both groups accurately identified intraoral scanners as a digital impression method. However, conventional methods are still widespread: 35% of students and 40% of practitioners continue to use the closed tray method as part of their routine. Although digital impressions are viewed as more comfortable and accurate, cost, familiarity, and access restrict their common use. Open tray technique was also clearly known, with 45% of students and 55% of clinicians correctly identifying the correct use.



Graph 3- Comparative knowledge of different implant impression technique

4. Challenges and Training Needs

There were significant knowledge gaps concerning specialized procedures, like narrow-diameter implant use and complex case impression techniques. Numerous participants (30% of students and 25% of practitioners) cited problems with conventional impression techniques, like tray distortion and accessing posterior implants. These results emphasize the importance of focused training in both traditional and digital approaches, particularly in dealing with demanding clinical situations.

5. Comparative Trends and Educational Implications

Results indicated that, in general, foundational knowledge is strong among students and practitioners alike but that practitioners are slightly more familiar with

practicalities, possibly because of clinical experience. Both groups, however, had comparable gaps in advanced topics and new technologies. The findings emphasize the need for ongoing professional development and curriculum revision, with emphasis on advanced implant types, alternative materials, and digital workflows.

Descriptive statistics, in the form of percentage distribution, were employed to compare both dental students' and practitioners' responses. This enabled a direct comparison of knowledge trends between the two groups. No inferential statistical tests were conducted in the preliminary analysis.

4. Discussion

The findings of this survey give a fair idea about the prevailing level of knowledge regarding dental implants and impression methods and techniques among dental practitioners and students in Uttarakhand. The survey, in general, reflected a quite high level of awareness, and the majority of the respondents had a clear perception of the fundamentals of dental implantology. For instance, the global acceptance of significant implant types that are most prevalent in the clinical environment mirrors that of a strong foundation in implantology. Additionally, the extensive understanding of Titanium as a main material utilized for more traditional dental implants is in line with the reality that titanium, due to its greater strength, biocompatibility and success rates over the years has become the material of choice.¹⁰

One of the most optimistic results of this survey is widespread familiarity with digital impression methods. It can be estimated that the transition to digital dentistry is well set in place, even in areas such as Uttarakhand, where 80% of the overall respondents identified usage of intraoral scanners in digital impression methods precisely. This increasing trend is a result of the international movement towards dental digital tools, which ensure the procedures are more precise, quicker, and less traumatic. This rise in digital technology also indicates better outcomes for patients since digital impressions are reported to be more accurate and comfortable for the patient than the conventional impression materials.⁹



While these are welcome trends, however, the survey also highlights a number of areas where knowledge is lacking and which require attention. For instance, awareness levels were much lower when it came to some of the more rarely encountered types, such as Transosteal and Intraosseous implants. These are less frequently utilized implants, yet they still possess a niche role in certain situations where anatomical difficulties exist or in those patients with such conditions as advanced bone resorption. The quite low awareness of these implants, with only 5% of the respondents having correctly identified Transosteal and 8% having identified Intraosseous implants, suggests a need for specific education on the whole spectrum of implant options, particularly for complicated cases that demand tailored treatment plans.^{11,12}

Moreover, narrow-diameter implants, utilized in many instances with limited bone volume or room, were less familiar as well. Most respondents did not see their worth in limited space situations (only 75% of respondents were able to correctly identify this situation). This may indicate a lack of clinical training on specialized implant methods for difficult cases, and that more specific training is needed in how to approach difficult implant situations, especially where there is compromised bone volume.¹³

Though digital impression methods are becoming increasingly popular, there still exists a section of respondents that utilizes conventional methods, including the closed tray technique. 40% of the practitioners indicated that the closed tray technique is still being utilized with frequency despite increasing utilization of digital impression techniques. This may be because of several reasons, including familiarity with older methods, lower initial expenses, or no access to newer digital equipment in some clinics. But being aware of the strengths and weaknesses of each method is important to ensure that the appropriate tool is used for the appropriate situation. For instance, closed tray systems are typically utilized when the placement of the implants is simple and the implants align well. With more complex cases, where accuracy is most essential, digital processes are more often employed.¹⁴

Besides these observations, the survey also pointed out some of the major issues that dental practitioners experience when employing conventional implant impression methods. Some of the most frequently cited issues are tray distortion, posterior implant access difficulty, and poor visibility in the oral cavity. These issues are not new but highlight the need to enhance procedural methods and develop the application of digital technologies that can reduce such issues.¹⁵

5. Conclusion

The following conclusions have been drawn from this study:

The questionnaire reports on a generally solid background knowledge in implantology, with 60% of dental students and 65% of professionals correctly naming endosteal implants as the most frequently used type. Titanium as the main material of the implants was known by 85% of the students and 90% of the professionals. Moreover, 80% of both accurately identified digital impression methods, reporting a positive movement toward up-to-date clinical procedures.

However, gap in knowledge could be seen—only 5% of all respondents correctly named transosteal implants, and only 8% named intraosseous types. Familiarity with zirconia as a substitute was minimal, as only 5% of students and 8% of practitioners named it. Additionally, 25% of students and practitioners could not correlate narrow-diameter implants with limited bone space. In spite of digital acceptance, 35% of students and 40% of practitioners continued to use the closed tray technique, and 30% of students and 25% of practitioners indicated problems with traditional impressions.

These findings reinforce that the requirement exists for specific training and curriculum development to enhance expertise in specialized implant systems and digital technology.

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