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Digital Shift in Prosthodontics: Dental Student Awareness of Intraoral Scanners and Future Trends. A Cross-Sectional Survey

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ABSTRACT

Aims: The primary aim of the study was to assess the awareness and knowledge of Intraoral Scanners (IOSs) among Undergraduate Dental students in Western Maharashtra, along with their perceptions of future adoption in Prosthodontics.

Settings and Design: Descriptive, cross-sectional survey conducted across multiple Dental Institutions in Western Maharashtra.

Materials and Methods: A structured Google Form questionnaire comprising 10 Multiple Choice Questions was circulated between June and July 2025. The questions assessed Knowledge, Usage, Application, and Perceptions of IOS in Prosthodontics. Data collection was conducted digitally through a secure, anonymized survey link.

Statistical Analysis: The responses obtained through the structured Google Form were compiled from Summary provided and systematically analysed. Descriptive statistics were applied to evaluate the demographic characteristics and to summarize participants' awareness and perceptions.

Results: Out of 176 participants, 68.2% were aware of Intraoral Scanners, and 60.2% had no hands-on experience. While 65.4% found IOS patient-friendly, only 56.3% strongly believed Digital Impressions could replace traditional techniques. Cost and lack of training were major barriers. Clinical year students exhibited greater familiarity and acceptance.

Conclusions: While the theoretical awareness of IOS is growing among Dental students, clinical exposure remains limited. Curriculum reform and inclusion of Digital training modules are essential to equip future practitioners with the competencies for Digital Prosthodontics.

Keywords: Intraoral Scanners, Digital Dentistry, Prosthodontics, Student Awareness.

INTRODUCTION

Ensuring patient comfort and satisfaction remains a fundamental objective in Dental care. Conventional impression techniques, long used in Prosthodontics, often involve materials like Alginate or Impression compounds, which require

significant operator skill and are susceptible to various procedural inaccuracies. Factors such as the type of tray, mixing ratios, setting times, and the ability to capture intricate oral details can significantly affect the precision of the final prosthesis [1,2,3].

The integration of Digital technologies, particularly Computer-Aided Design and Computer-Aided Manufacturing (CAD-CAM), has transformed Prosthodontic practices since the early 1980s by enhancing accuracy and clinical outcomes [10]. A key advancement within this Digital evolution is the introduction of Intraoral Scanners (IOSs), which offer a user-friendly and efficient alternative to conventional impressions [1-15].
IOS devices utilize advanced optical technologies, such as laser triangulation, confocal imaging, and wave front sampling, to capture high-resolution, three-dimensional representations of the oral cavity [5]. These scans are processed and saved in Standard Tessellation Language (STL) format, allowing for streamlined workflows and the ability to selectively rescan only compromised areas, thereby reducing procedural errors and patient discomfort [6].

Research supports the reliability of IOSs in both single and multi-unit prosthetic restorations [2,6], with ongoing developments exploring their use in fully edentulous cases [11]. As Digital Dentistry becomes increasingly integral to clinical practice, this study aims to assess the awareness and perceptions of Dental students regarding Intraoral Scanners and to evaluate their readiness for a transition toward digital impression techniques [1,4].

MATERIALS AND METHODS

Study design
The study utilized a descriptive, cross-sectional survey design to assess Intraoral scanner awareness and knowledge among Undergraduate Dental students [1,9]. It was conducted among Undergraduate Dental students enrolled in dental colleges in Western Maharashtra. A total of 176 students across all academic years, including interns, participated voluntarily [1].

Sample Size Estimation
The Pilot study was done among 15 Dental students, it was considered for estimation of actual Sample size, where the reliability was tested by using Cronbach's alpha value of 0.82. Hence, this study extended with main study. The Sample size was calculated with 85% statistical power, Alpha = 0.05, 95% Confidence interval (CI) and 10% margin of error considering expected proportion 0.7 considering of 165 minimum samples need to be enrolled in this study. Ultimately, 176 complete responses were collected.

Eligibility Criteria
Inclusion criteria included Undergraduate Dental students from 1st year to Internship, studying in colleges across Western Maharashtra. Students who gave informed consent and completed the survey within the stipulated period were included. Postgraduates and Dental Auxiliaries were excluded [1].

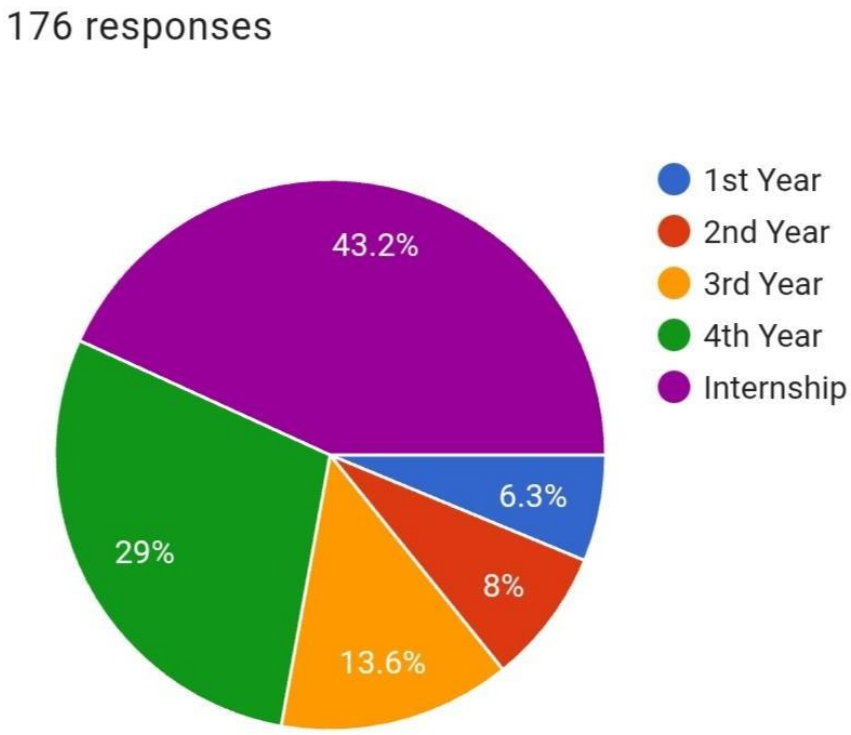
Research Tool
A Multiple-choice questionnaire comprising 10 questions overall, was prepared and validated through expert feedback. The questions covered awareness, usage, application areas, benefits, and barriers related to IOS [1,4,9].

Data Collection
A structured Google Form questionnaire comprising 10 Multiple Choice Questions was circulated between June and July 2025. The questions assessed knowledge, usage, application, and perceptions of IOS in Prosthodontics [1,2,9]. Data collection was conducted digitally through a secure, anonymized survey link.

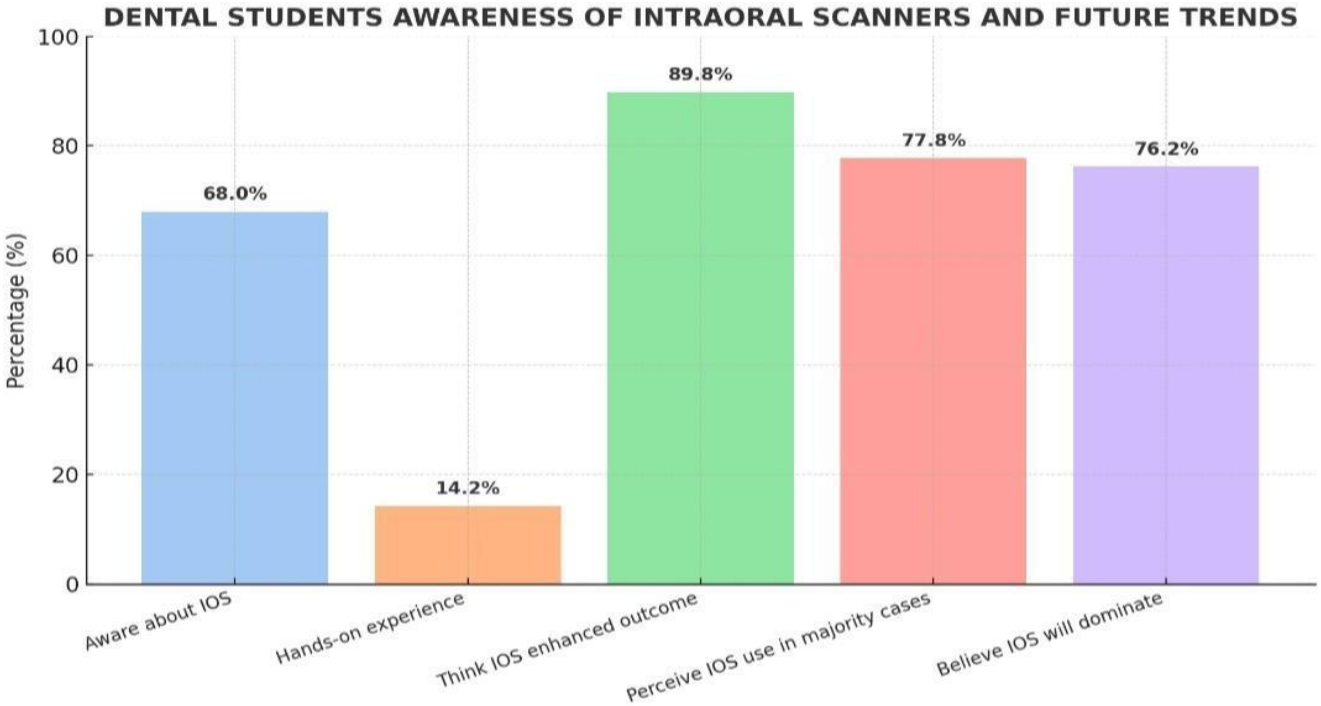
Statistical Analysis
The responses obtained through the structured Google Form were compiled from Summary provided and systematically analyzed. Descriptive statistics were applied to evaluate the demographic characteristics and to summarize participants' awareness and perceptions [1,8,9].

RESULTS

Demographic Data



A total of 176 Dental students participated in the survey. The highest participation was from Interns (43.2%), followed by Final-year students (29%).



HANDS-ON EXPERIENCE ON USAGE OF INTRAORAL SCANNERS

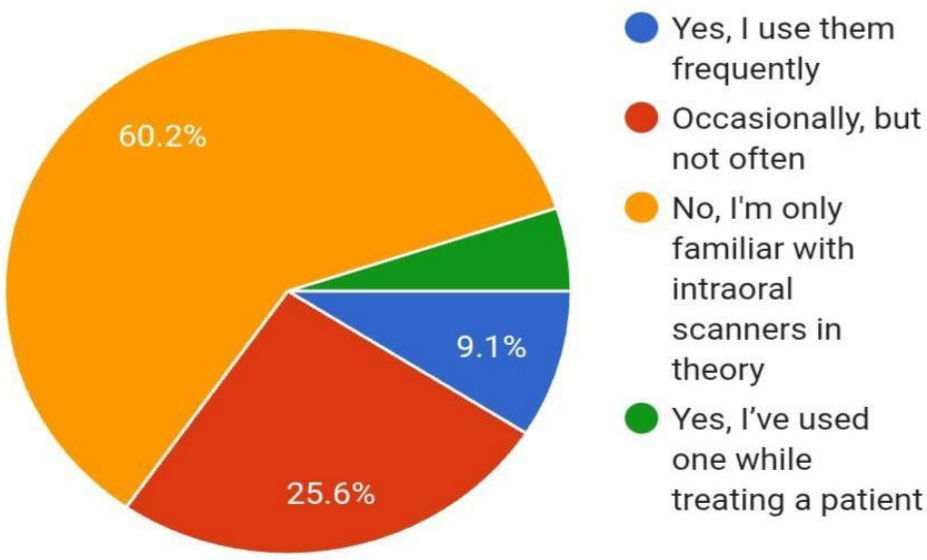
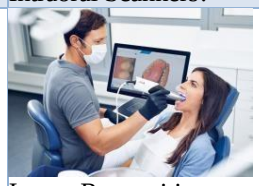


Table: Verified Responses from 176 Participants

Topic: Digital Shift in Prosthodontics: Dental Student Awareness of Intraoral Scanners and Future Trends. A Cross-sectional Survey.

Sr. No.	Question	Option A	Option B	Option C	Option D	Option E	Total (n= 176)
1.	Do you have any knowledge of Intraoral Scanners?	Yes (120) (68.2%)	No (56) (31.8%)				176
2.	 Image Recognition	Use of an IOS in Digital Prosthodontics (147) (83.5%)	Cavity preparation during restoration (25) (14.2%)	Enameloplasty (3) (1.7%)	Extraction (1) (0.6%)		176
3.	In Digital Prosthodontics IOS stands for?	Intraoral scanner (143) (81.3%)	iPhone Operating System (12) (6.8%)	Impulse Ossilometry System (18) (10.2%)	Internet Work Operating System (3) (1.7%)		176
4.	Have you come across Intraoral scanners in your practice or training?	Yes, I use them frequently (19) (9.1%)	Occasionally but not often (45) (25.6%)	No, I am only familiar with Intraoral Scanners in theory (106) (60.2%)	Yes, I have used one while treating a patient (9) (5.1%)		176
5.	Do you think IOS has enhanced Prosthodontic treatment outcomes?	Yes (158) (89.8%)	No (18) (10.2%)				176
6.	How do you perceive the use of Intraoral Scanners in Prosthodontics?	RPD (9) (5.1%)	CD (9) (5.1%)	FPD (9) (5.1%)	Implants (12) (6.8%)	All of the above (137) (77.8%)	176

7.	What is the best approach to limit infections caused by inadequate sterilization	Implementing strict sterilization and disinfection	Enhancing Hand Hygiene practice among dental	Utilizing digital alternatives like Intraoral Scanners,	Increasing the frequency of patient screening		176
	protocols	protocols for all dental instruments (68) (38.6%)	professionals (29) (16.5%)	reducing the use of conventional impression materials (66) (37.5%)	for infectious diseases (13) (7.4%)		
8.	Why might s clinician choose Intraoral scanning instead of traditional impression techniques when fabricating a prosthesis?	To improve accuracy and detail of impressions (48) (27.3%)	To enhance patient comfort by avoiding impression trays and materials (23) (13.1%)	To reduce the turnaround time for prosthesis fabrication (11) (6.3%)	To enable easy digital storage and transfer of impression data (l (1.1%)	All of the above (92) (52.3%)	176
9.	What is the end product generated by Intraoral Scanners	A physical cast model (24) (13.6%)	A 2 Dimensional radiographic image (25) (14.2%)	A Digital 3D model of the Oral cavity (110) (62.5%)	A photograp hic image of the teeth (17) (9.5%)		176
10.	Do you believe Digital impression methods using IOS will soon dominate over traditional approaches in Prosthodontics?	Yes (99) (56.3%)	No (11) (6.3%)	Not sure (31) (17.6%)	Possibly in the long-term (35) (19.9%)		176

Prosthodontics is evolving rapidly due to the integration of Digital technologies such as intraoral scanners (IOS), which are transforming conventional impression methods. These scanners offer enhanced accuracy, improved patient comfort, and increased efficiency. While digital workflows have been adopted in developed countries and many academic institutions globally, their inclusion in Undergraduate Dental education in developing regions, including India, is still emerging.

This study explores the awareness, understanding, and clinical readiness of Undergraduate Dental students in Western Maharashtra with respect to Intraoral scanners. It seeks to bridge the gap between modern technological advancements and traditional training by evaluating students' knowledge, attitudes, and perceived barriers. The outcomes of this research are intended to guide curriculum design, ultimately promoting digital competence in Prosthodontics practice.

DISCUSSION

This study highlights the growing awareness of Digital technologies among Dental students, particularly Intraoral Scanners (IOS), which are pivotal to modern Prosthodontics. Despite 68% of participants reporting awareness of IOS, clinical exposure remains low, with only 14.2% having had any hands-on experience. This suggests a significant gap between theoretical knowledge and practical training [1,9].

The high percentage (89.8%) thinking that Intraoral Scanners have enhanced treatment outcomes, perceiving IOS as more patient-friendly reflects the general acceptance of digital tools and aligns with previous international studies reporting enhanced patient comfort, reduced chairside time, and better impression accuracy with IOS usage [2,8]. However, financial concerns and limited institutional resources remain a barrier, as noted by 56% of students, echoing findings from other developing regions [3,6].

The observation that clinical-year students (3rd year onwards) showed more confidence and acceptance of IOS supports Hypothesis 2. This emphasizes the need for progressive inclusion of Digital Dentistry modules during later academic years [4,7]. The study also supports Hypothesis 4, showing that while students value digital skills, many feel inadequately prepared due to limited curricular exposure [5,9].

CONCLUSION

Although awareness of Intraoral scanners among Dental students is relatively high, there is an evident lack of hands-on experience and clinical training. The findings support the need to revise existing Dental curriculum by integrating structured training on IOS and other Digital tools to meet future clinical demands. Educational Institutions should prioritize resource allocation, hands-on demonstrations, and simulation-based learning for seamless transition to Digital Prosthodontics.

LIMITATIONS

The study is geographically limited to Dental Colleges in Western Maharashtra, and the data is self- reported, introducing potential response bias. Additionally, the cross-sectional design limits inference on cause and effect between academic exposure and attitude.

Financial Support and Sponsorship
Nil.

Conflicts of Interest
There are no conflicts of interest.

REFERENCES

[1] Ketharinath N, Kiruppashini T, Kabilan P, Nagappan C. Digital prosthodontics in near future: Awareness among the dental students on intraoral scanners and its probability of replacement over conventional method in the near future of prosthodontics: A cross-sectional survey. The Journal of Indian Prosthodontic Society. 2024 Oct 1;24(4):359-65.
[2] Marques S, Ribeiro P, Falcão C, Lemos BF, Ríos-Carrasco B, Ríos-Santos JV, et al. Digital impressions in implant dentistry: A literature review. Int J Environ Res Public Health 2021;18:1020.
[3] Chee W, Jivraj S. Impression techniques for implant dentistry. Br Dent J 2006;201:429-32.
[4] Christopoulou I, Kaklamanos EG, Makrygiannakis MA, Bitsanis I, Perlea P, Tsolakis AI. Intraoral scanners in orthodontics: a critical review. Int J Environ Res Public Health 2022;19:1407.
[5] Logozzo S, Zanetti EM, Franceschini G, Kilpelä A, Mäkynen A. Recent advances in dental optics – Part I: 3D intraoral scanners for restorative dentistry. Opt Lasers Eng 2014;54:203-21.
[6] Giménez B, Özcan M, Martínez-Rus F, Pradíes G. Accuracy of a digital impression system based on active wavefront sampling technology for implants considering operator experience, implant angulation, and depth. Clin Implant Dent Relat Res 2015;17 Suppl 1:e54-64.
[7] Kim J, Park JM, Kim M, Heo SJ, Shin IH, Kim M. Comparison of experience curves between two 3-dimensional intraoral scanners. J Prosthet Dent 2016;116:221-30.
[8] Yuzbasioglu E, Kurt H, Turunc R, Bilir H. Comparison of digital and conventional impression techniques: Evaluation of patients' perception, treatment comfort, effectiveness and clinical outcomes. BMC Oral Health 2014;14:10.
[9] Mangano F, Gandolfi A, Luongo G, Logozzo S. Intraoral scanners in dentistry: A review of the current literature. BMC Oral Health 2017;17:149.
[10] Mörmann WH. The evolution of the CEREC system. J Am Dent Assoc 2006;137:7S-13S.
[11] Jung S, Park C, Yang HS, Lim HP, Yun KD, Ying Z, et al. Comparison of different impression techniques for edentulous jaws using three-dimensional analysis. J Adv Prosthodont 2019;11:179-86.
[12] Al-Bakri IA, Hussey D, Al-Omari WM. The dimensional accuracy of four impression techniques with the use of addition silicone impression materials. J Clin Dent 2007;18:29-33.
[13] Luthardt RG, Loos R, Quaas S. Accuracy of intraoral data acquisition in comparison to the conventional impression. Int J Comput Dent 2005;8:283-94.
[14] Zafar MS, Amin F, Fareed MA, Ghabbani H, Riaz S, Khurshid Z, Kumar N. Biomimetic aspects of restorative dentistry biomaterials. Biomimetics 2020;5:34.
[15] Ender A, Attin T, Mehl A. In vivo precision of conventional and digital methods of obtaining complete-arch dental impressions. J Prosthet Dent 2016;115:313-20.