

Assessment of knowledge, attitude and practice regarding digital dentures among dental practitioners of Gujarat state: A questionnaire based survey.

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Abstract

Statement of problem: It was important to assess the knowledge, attitude, and practice regarding digital dentures among dentists to identify existing gaps and understand the barriers to their clinical application.

Objective: The objective of this study was aimed to evaluate their familiarity with computer aided designing and computer aided manufacturing (CAD/CAM) technology and the extent of its use in clinical practice.

Methods: A descriptive cross-sectional, web-based survey was conducted among dental practitioners of Gujarat state to assess their knowledge, attitude, and practice regarding digital dentures. A minimum sample size of 130 participants was determined at a 95% confidence level, accounting for possible non-responses. Data were collected using a validated, structured questionnaire consisting of 15 open-ended and multiple-choice questions, which was circulated online.

Results: The survey included responses from 130 dental practitioners, of whom 90.8% were aware of digital dentures, while 9.2% lacked adequate knowledge. Despite high awareness, 37.7% of practitioners did not use digital workflows in routine practice, mainly due to high initial costs, lack of essential equipment, and limited access to digital denture laboratories.

Conclusion: The study concludes that although most dental practitioners are aware of digital dentures and recognize their advantages, their routine clinical use remains limited. High initial costs, lack of equipment, inadequate training, and limited laboratory support are the main barriers to adoption.

Keywords: CAD/CAM technology, Dental practitioners, Digital dentures, Prosthodontics, Digital dentistry, Gujarat.

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Introduction

Digital dentures are defined as complete removable prostheses fabricated using a computer-aided design (CAD) and computer-aided manufacturing (CAM) workflow, involving digital impressions, virtual designing, and milling or three-dimensional printing to achieve precise fit and comfort.^[1] Although dental technology has advanced rapidly, the number of edentulous patients remains significant, and since 1936, polymethyl methacrylate (PMMA) along

with the compression molding technique has been the standard method for denture fabrication.^[2] Conventional denture fabrication techniques are time-consuming, require multiple clinical and laboratory visits, and are prone to inaccuracies due to polymerization shrinkage, material distortion, and operator-dependent errors.^[3]

The introduction of CAD/CAM technology in prosthodontics has significantly transformed complete denture fabrication by improving accuracy, reducing errors, and decreasing

overall treatment time while maintaining high levels of patient satisfaction.^[1,2] CAD/CAM dentures fabricated from pre-polymerized PMMA blocks demonstrate improved mechanical properties, reduced residual monomer content, superior denture base adaptation, and enhanced biocompatibility when compared to conventionally processed dentures.^[3,4] Despite these advantages, the adoption of digital dentures in routine clinical practice remains limited due to high initial costs, need for specialized training, lack of digital infrastructure, and limited access to well-equipped dental laboratories.^[5,6]

Materials and Methods

A descriptive cross – sectional web-based study was done amongst general practitioners. Considering 95% of confidence level minimum 130 sample size was required, taking into consideration drop out of participants a sample size of 130 is kept. A total of 130 participants responded in survey through web-based questionnaire; which composed of validated 15 open and multiple-choice questions. After completion of data collection it was analyzed using descriptive analysis (Table No. 1).

Result:

The survey was conducted among 130 dental practitioners, of whom 90.8% were aware of digital dentures, while 9.2% lacked sufficient knowledge. Despite this high level of awareness, 37.7% of respondents did not employ digital workflows in their clinical practice, mainly due to high initial equipment costs, lack of essential infrastructure, and limited availability of laboratories equipped for digital denture fabrication. Additionally, 37.7% of practitioners had never used digital modalities for denture fabrication, and 23.1% had not used intraoral scanners. Among those familiar with scanner systems, 3Shape TRIOS 4 and Sirona Dentsply were the most preferred. A majority of respondents

(75.4%) believed that digital dentures reduced chairside time. Awareness of commercial digital denture systems was highest for Ivoclar (40%) and Sirona (32.3%); however, 40% of practitioners reported that they had never used digital dentures in clinical practice.

Discussion:

The present questionnaire-based survey was conducted to assess the knowledge, attitude, and practice regarding digital dentures among dental practitioners in Gujarat state. The results demonstrated a high level of awareness (90.8%) regarding digital dentures; however, actual incorporation of digital workflows into routine clinical practice was comparatively low. This discrepancy highlights the gap between theoretical awareness and practical implementation of CAD/CAM technology in prosthodontics.

The high level of awareness observed in the present study is in agreement with findings reported by Sri et al., who documented good knowledge and a positive attitude toward digital dentures among dentists.^[8] Similarly, Gawali et al. reported that increasing academic exposure and rapid technological advancements have significantly improved awareness of digital dentistry among dental professionals.^[5] Despite this, both studies reported limited routine clinical usage, suggesting that awareness alone does not translate into adoption.^[5,8]

In the present study, 37.7% of practitioners reported never using digital workflows for denture fabrication. The primary barriers identified were high initial investment costs, lack of essential equipment, and limited access to digital denture laboratories. These findings are consistent with those reported by Bidra et al. and Alsabeeha et al., who emphasized that financial constraints and infrastructural limitations remain the major obstacles to the widespread adoption of CAD/CAM complete dentures, particularly in developing countries.^[1,6]

Although 75.4% of respondents believed that digital dentures reduce chairside time, a substantial proportion had never used digital dentures clinically. Infante et al. demonstrated that CAD/CAM dentures reduce the number of clinical appointments and laboratory errors; however, they also emphasized that successful clinical outcomes are dependent on operator training and laboratory support.^[2] This supports the present finding that lack of hands-on training and clinical exposure may reduce practitioner confidence in adopting digital dentures.

Regarding accuracy and precision, 47.7% of participants perceived digital dentures to be more accurate, while 38.5% favored conventional dentures. This mixed perception reflects the transitional phase of digital denture adoption. Goodacre et al. reported superior denture base adaptation in CAD/CAM dentures compared to conventionally fabricated dentures.^[3] Similarly, Zandinejad et al. demonstrated improved fit, material properties, and clinical outcomes in milled and 3D-printed dentures.^[4] However, concerns related to retention and occlusal accuracy expressed by some respondents indicate the need for greater clinical exposure and long-term outcome studies.

Awareness of intraoral scanners and commercial digital denture systems was moderate, with 3Shape TRIOS and Sirona being the most recognized systems. Wimmer et al. reported similar findings, showing greater familiarity with leading digital systems among practitioners who had received training or continuing education in digital workflows.^[7] This emphasizes the importance of structured educational initiatives, workshops, and curricular integration to improve practical adoption of digital dentures.

Overall, the findings suggest that while dental practitioners demonstrate a positive attitude toward digital dentures and recognize their advantages, practical limitations continue to restrict widespread clinical use. Integration of digital dentistry into undergraduate and

postgraduate curricula, increased availability of affordable digital systems, and improved collaboration between academic institutions and dental laboratories may help overcome these challenges.^[1,5,7]

Conclusion

The present study assessed the knowledge, awareness, attitude, and clinical practice related to digital dentures among dental practitioners. Although most respondents demonstrated good awareness of CAD/CAM technology and expressed a positive attitude toward digital dentures, their routine clinical application remained limited. High initial costs, inadequate equipment, insufficient training, and limited access to digital denture laboratories were identified as the major barriers to adoption, consistent with previously published literature.^[1,5,6] Enhanced educational exposure, hands-on training programs, and improved infrastructural support are essential to bridge the gap between knowledge and practice and to facilitate wider adoption of digital dentures in routine prosthodontic practice.^[1,2,7]

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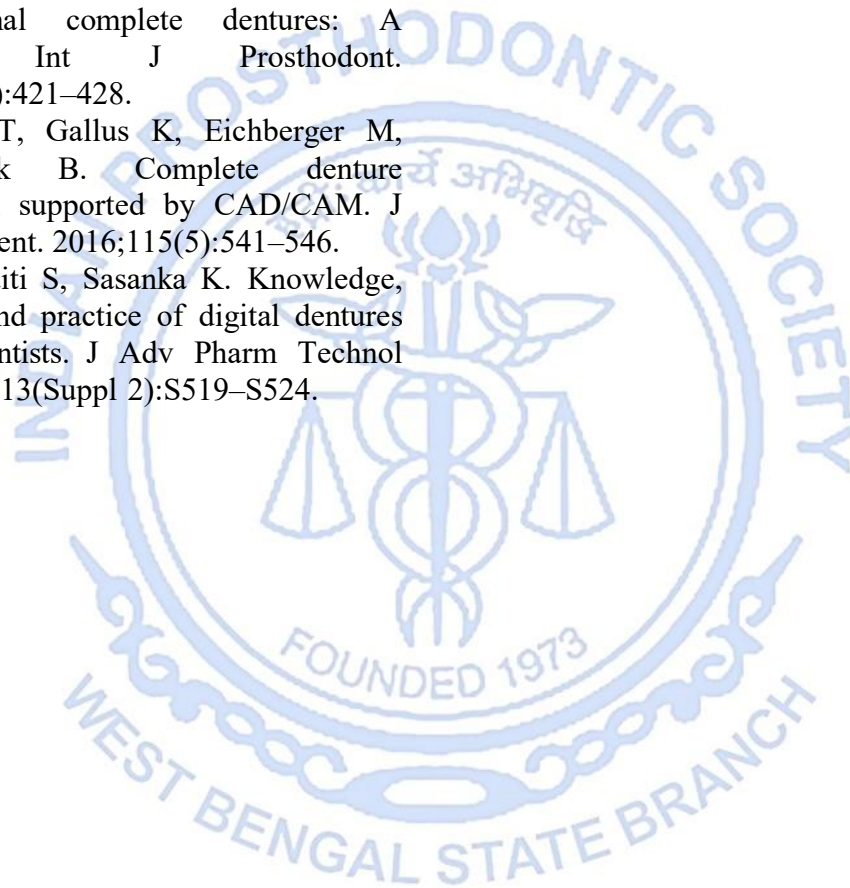


TABLE No. 1

Questions	Options	Responses (%)
1. Are you aware of digital dentures?	<ul style="list-style-type: none"> • Yes • No 	<ul style="list-style-type: none"> • 90.8% • 9.2%
2. How many years of clinical experience do you have?	<ul style="list-style-type: none"> • 0–1 year • 1–5 years • 5–10 years • More than 10 years 	<ul style="list-style-type: none"> • 25.4% • 33.8% • 23.1% • 16.2%
3. Were you taught about CAD-CAM in your educational institution?	<ul style="list-style-type: none"> • Yes • No 	<ul style="list-style-type: none"> • 75.4% • 24.6%
4. How often do you use digital workflow for denture fabrication?	<ul style="list-style-type: none"> • Often • Sometimes • Never • Always 	<ul style="list-style-type: none"> • 16.2% • 42.3% • 37.7% • 3.8%
5. Do you use intraoral scanners in your practice?	<ul style="list-style-type: none"> • Yes • No 	<ul style="list-style-type: none"> • 76.9% • 23.1%
6. Which among the following do you prefer for intraoral scanning?	<ul style="list-style-type: none"> • Sirona-Dentsply • 3Shape TRIOS4 • Medit i500 • Align iTero • Not aware 	<ul style="list-style-type: none"> • 18.5% • 49.2% • 7.4% • 3.4% • 18.5%
7. Which denture systems are you aware of?	<ul style="list-style-type: none"> • Ivoclar • Sirona • Avadent • Baltic • Ceramill • Dentnca • Not aware 	<ul style="list-style-type: none"> • 40% • 32.3% • 5.5% • 1.2% • 0.8% • 3.3% • 16.9%
8. What do you think is the main advantage of digital dentures?	<ul style="list-style-type: none"> • Reduced chairside time • Better aesthetics • Better retention • Eco- friendly 	<ul style="list-style-type: none"> • 75.4% • 8.5% • 11.5% • 4.6%

9. How often do you use digital dentures in your clinical practice?	<ul style="list-style-type: none"> • Always • Often • Sometimes • Never 	<ul style="list-style-type: none"> • 5.4% • 10.8% • 43.8% • 40%
10. Do you have access to a well- equipped dental laboratory that can fabricate digital dentures?	<ul style="list-style-type: none"> • Yes • No • Not aware of any such lab nearby 	<ul style="list-style-type: none"> • 53.1% • 23.8% • 23.1%
11. In your opinion, which type of denture is more accurate and precise?	<ul style="list-style-type: none"> • Conventional dentures • Digital dentures • Don't know 	<ul style="list-style-type: none"> • 38.5% • 47.7% • 13.8%
12. What do you think is the advantage of PMMA?	<ul style="list-style-type: none"> • Less polymerisation shrinkage • Lesser residual monomer • Increased toughness 	<ul style="list-style-type: none"> • 70% • 17.7% • 12.3%
13. Do you think virtual- based technology helps in patient education?	<ul style="list-style-type: none"> • Yes, significantly • Yes, to some extent • No • Not sure 	<ul style="list-style-type: none"> • 63.8% • 32.3% • 1% • 2.9%
14. What are the main reasons for not adopting digital dentures in your clinical practice?	<ul style="list-style-type: none"> • High cost • Lack of training or confidence • Unavailability of necessary equipment • Perceived inaccuracy or poor retention • Lack of access to skilled technicians 	<ul style="list-style-type: none"> • 48.5% • 17.7% • 15.4% • 8.5% • 10%
15. Would you be interested in attending workshops or hands-on training sessions on digital dentures?	<ul style="list-style-type: none"> • Yes • No • Maybe 	<ul style="list-style-type: none"> • 73.1% • 7.7% • 19.2%