



ASSESSING KNOWLEDGE, ATTITUDE, AND PRACTICES OF DENTAL PRACTITIONERS TOWARDS 3D PRINTING IN DENTISTRY: A QUESTIONNAIRE-BASED SURVEY

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ABSTRACT The rapid advancement of dental technologies, particularly 3D printing, has significantly impacted patient care and treatment outcomes. This study aims to assess the knowledge, attitudes, and practices of dental practitioners towards 3D printing in dentistry. A questionnaire-based survey targeting 108 dental practitioners from Tumkur district, Karnataka, was conducted to evaluate their familiarity, application, benefits, and challenges of 3D printing technology. The results revealed a high level of awareness (100%) and interest in incorporating 3D printing (67.6%). However, there is a noticeable gap in recognizing specific applications, such as regenerative dentistry (4%) and complex design advantages (39.8%). This study highlights the need for targeted educational programs to enhance the adoption and efficient use of 3D printing in dental practices.

KEYWORDS : 3D printing, dental technology, knowledge, attitudes, practices, questionnaire survey, digital dentistry.

INTRODUCTION:

The integration of 3D printing technology in dentistry has revolutionized patient care, offering solutions like custom implant guides, prosthetics, and orthodontic appliances. Despite its potential, the successful adoption of 3D printing in clinical settings depends on dental practitioners' knowledge, attitudes, and practical application of this technology.(12)

This study aims to explore these dimensions among dental practitioners in Tumkur district, Karnataka, identifying gaps and opportunities for further education and integration.

Adopting new technologies like 3D printing requires a solid understanding of its applications, advantages, and challenges, particularly among dental practitioners who directly apply these innovations in clinical settings. Additionally, attitudes towards embracing digital technology play a critical role in its integration. Understanding these factors helps bridge the gap between available technology and its practical use, ensuring that patients receive the full spectrum of care possible with modern advancements.(5)

This study seeks to assess dental practitioners' knowledge, attitudes, and current practices concerning 3D printing in dentistry. By identifying gaps and promoting further educational initiatives, this research aims to contribute to the seamless adoption of 3D printing, ultimately enhancing patient care and improving treatment outcomes.

Methodology:

A questionnaire-based survey was conducted among 108 dental practitioners working in various institutions and clinics across Tumkur district. A self-structured questionnaire was designed with 15 closed-ended questions, categorized into three sections:

Knowledge: Familiarity with 3D printing technology, its applications, and benefits.

Awareness: Understanding of the diverse technologies related to 3D printing and the challenges in its implementation.

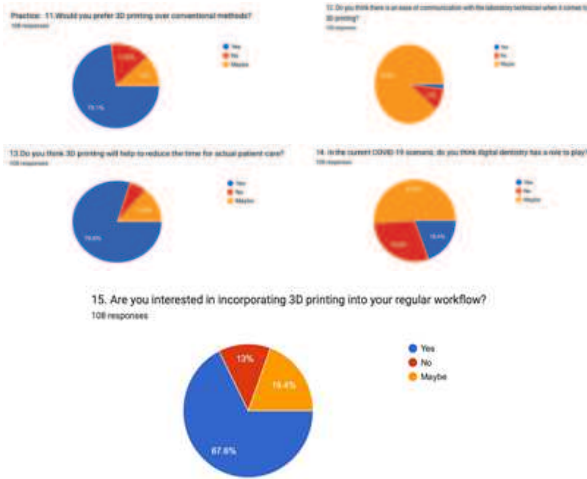
Practice: Current practices and preferences concerning 3D printing in clinical settings.

The survey was administered online using Google Forms, and the responses were analysed to identify trends and gaps in knowledge and practice.(1)

RESULTS

High Awareness: 100% of participants were aware of 3D printing technology in dentistry. Limited Application Knowledge: Only 25% recognized specific applications of 3D printing, while only 4% were aware of its use in regenerative dentistry. Training and Education: Only 6.5% of respondents had participated in training programs related to 3D printing (9). Positive Attitudes: 67.6% expressed interest in incorporating 3D printing into their practice, and 78.6% agreed on the accuracy of 3D-printed implant guides. Recognition of Complex Design Benefits: Only 39.8% acknowledged the advantages of 3D printing for complex designs. Digital Dentistry During COVID-19: 50.9% recognized the role of digital dentistry during the pandemic.(6)





DISCUSSION

The findings from this study highlight several key aspects that align with previous research on the adoption of 3D printing technology in dentistry, while also uncovering areas that require further attention. The high level of awareness regarding 3D printing technology (100%) among dental practitioners is consistent with global trends, as seen in studies like those by Aditya Acharya et al. (2021) and Mahesh Suganna et al. (2022), where similarly high levels of awareness (98.9% and 98%, respectively) were reported(1). This suggests that dental professionals are increasingly familiar with the advancements in digital technology, acknowledging its growing importance in clinical practice. Despite this strong awareness, the results reveal gaps in the depth of knowledge, particularly regarding specific applications of 3D printing. Only 25% of participants were able to identify key applications of 3D printing in dentistry, and an even smaller percentage (4%) were aware of its potential in regenerative dentistry. This gap in knowledge mirrors the findings of Aditya Acharya et al. (2021), where limited recognition of the full scope of 3D printing's applications was also observed(1). This suggests that while dental practitioners may be aware of 3D printing technology in a general sense, many lack detailed knowledge of its advanced applications, such as in tissue regeneration or complex prosthetics. Expanding the knowledge base through focused educational initiatives can help practitioners better understand and apply these technologies in clinical settings. Participation in training programs related to 3D printing was notably low, with only 6.5% of respondents having undergone formal training. This indicates a clear need for increased opportunities for hands-on training and professional development. Previous research, such as the study by Amol A. Dhokar et al. (2020),(2) emphasized the importance of continuous education in the field of digital dentistry. The overwhelming support (91.7%) for further education from the current study participants highlights the desire among practitioners for more structured learning experiences. By offering targeted workshops, seminars, and certification programs, dental institutions and professional bodies can facilitate the practical application of 3D printing technologies, ensuring that practitioners are fully equipped to integrate them into their practices. The positive attitudes expressed by participants towards the incorporation of 3D printing into their dental practices (67.6%) reflect optimism about the technology's potential to enhance patient care. This finding is consistent with global studies, such as that by Abarna Jawahar et al. (2021), which also demonstrated favourable attitudes among practitioners regarding the potential benefits of 3D printing in dentistry. The perception of increased accuracy in procedures, particularly for implant guides (78.6%), aligns with the results of Mahesh Suganna et al. (2022), where practitioners reported similar confidence in the precision of 3D-printed guides. However, the lower recognition of the benefits for complex designs (39.8%) suggests that some practitioners may not fully understand the versatility of 3D printing for intricate cases, such as in orthodontics or maxillofacial reconstruction. Addressing this knowledge gap through case studies and real-world applications could help practitioners appreciate the full scope of 3D printing's capabilities. Another critical finding was the moderate recognition of the role of digital dentistry during the COVID-19 pandemic, with only 50.9% of participants acknowledging its significance. The pandemic presented an opportunity for digital tools, such as 3D printing, to be more widely adopted to minimize patient contact and enhance remote treatment

planning. However, the relatively low awareness of this indicates that digital dentistry may still be underutilized, even in situations where it could offer significant benefits. Encouraging the use of digital tools in crisis scenarios or routine care could not only improve patient outcomes but also streamline workflows and enhance safety in clinical settings. Lastly, the strong desire for further education (91.7%) reinforces the need for ongoing training to keep up with rapidly evolving dental technologies. As seen in the studies by Amol A. Dhokar et al. (2020) and Aditya Acharya et al. (2021)(1), there is a global trend towards embracing digital dentistry, but this adoption requires sufficient educational resources to ensure that practitioners can fully integrate and apply these technologies in their practices. Continuous learning opportunities, particularly in the form of hands-on workshops, certification programs, and seminars, will be essential in closing the gap between awareness and practical application.

CONCLUSION

In conclusion, this study highlights both the positive outlook of dental practitioners towards 3D printing and the areas "where further education is needed. While awareness of the technology is high, the depth of knowledge, particularly regarding advanced applications, remains limited. By addressing these gaps through targeted educational initiatives, the dental community can ensure a more seamless integration of 3D printing into clinical practice, ultimately improving patient care and treatment outcomes. Furthermore, fostering greater recognition of the role of digital dentistry in both routine and crisis scenarios will be key to promoting widespread adoption and optimizing its potential benefits.

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