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Awareness and Attitude of Dental Professional Towards the Application of Digital Dentistry in Clinical Practice

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***Abstract*: Introduction: Digital dentistry is revolutionizing the field of oral care. It combines advance technology with dental procedure making treatments more precise, efficient and comfortable. There are various types of digital dentistry technologies including digital imaging, computer aided design (CAD), 3D printing, Intraoral scanners. Methodology: A study based cross sectional study was carried out among dental practitioners in Pune City using convenience sampling method. The questionnaire administered via a Google form comprised 27 multiple choice questions. These questions was aimed to assess the awareness and attitude of dental professionals towards the use of digital dentistry in clinical practice. Result: In a recent study, we asked dental professionals about their awareness and attitude towards digital dentistry. 247 dental professional participated in the study which consisted of a questionnaire. 95.9% of dentists are interested in receiving training in digital dentistry. 64.7% prefer digital dentistry. 55.4% dentists agree that the future of dentistry is going digital. Conclusion: In the dental office, CAD/CAM technology enables clinicians to deliver accurate and aesthetically pleasing indirect fixed restorations during the same visit. Chairside digital impression systems contribute to the creation of precise laboratory models and restorations, reducing chairside time and enhancing esthetics with fine-tuned precision.**

***Keywords*: CAD/CAM, Intraoral scanner, CBCT, Chair side dentistry, Digital dentistry.**

1. Introduction

Digital dentistry is revolutionizing the field of oral care. It combines advance technology with dental procedure making treatments more precise, efficient and comfortable. There are various types of digital dentistry technologies including digital imaging, computer aided design (CAD), 3D printing, Intraoral scanners. These enhancements enable dentist to create digital models of patient's teeth, design restoration digitally and even fabricate them in house [1]. With the help of digital imaging dentist are able to provide more accurate diagnosis, precise treatment planning and computer made restoration [2]. This innovative approach not only improves the efficiency and effectiveness of dental treatment but also enhances patient comfort and satisfaction. It allows for a seamless communication between dental professional and laboratories as it can be easily stored and shared [1]. There may be a learning curve for dentist transitioning from traditional methods. In today's dental practice, digital dentistry plays a crucial role, it offers a broader exposure to advanced technologies and techniques, keeping experts knowledgeable about the most recent developments in the subject. On the other hand chairside dentistry is where procedures are performed directly at the dental chair without the use of digital technology. In terms of preference, it really depends on the specific needs and preferences of both the dentist and the patient. Digital dentistry can provide more precise results and improved efficiency, making it a great choice for complex cases or those who value latest technology. Digital dentistry is making waves in the field of aesthetics and accuracy [1]. In the realm of aesthetics, digital dentistry offers unparallel precision and customization with tools like computer aided design (CAD) and 3D printing [3], [4]. Dentists can create restorations that not only perfectly fit a patient's mouth but also blend seamlessly with natural teeth. Accuracy is another area where digital dentistry shines [3], [5], [6]. Traditional methods can be messy, uncomfortable and prone to errors. However, with the digital scanning technology dentist can obtain highly digital impression of teeth and gums in a matter of minutes. This not only eliminates the need for messy impression but also ensures a more comfortable experience for the patient for greater efficiency and productivity enabling dentist to provide high quality dental care in a shorter amount of time. This is particularly significant in a world where time is of essence, patients are looking for convenient and efficient dental solution [1]. With the aid of digital imaging, dentist can visualize simulate treatment outcomes, allowing patients to have a clear understanding of their options and make informed decisions. This level of transparency and patient involvement fosters trust and strengthens the dentist patient relationship. Digital dentistry also plays a vital role in the field of dental education and research. It enables dental students to gain hands on experience with advanced tools and techniques, preparing them for the future of dentistry [7]. Doctors today are embracing digital dentistry because of it numerous advantages. It has become the new future of dentistry offering enhanced patient experiences

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and better overall results. The integration of digital dentistry has truly transformed the field, paving the way for a brighter and more innovative future.

2. Materials and Methods

A study based cross sectional study was carried out among dental practitioners in Pune City using convenience sampling method. The questionnaire administered via a Google form comprised 27 multiple choice questions. These questions was aimed to assess the awareness and attitude of dental professionals towards the use of digital dentistry in clinical practice. The questionnaire underwent a thorough review by subject matter experts who assessed its relevance, comprehension, and clarity. Based on their evaluation, appropriate corrections were made. Questionnaire tool was used in the above research study to perform principal component analysis. The questionnaire's validity, measured by Aiken's V, was determined to be 0.813, indicating good validity. To assess reliability, we calculated the Cronbach's alpha value based on the average ratings of four evaluators, which yielded a value of 0.863, indicating good agreement among the evaluators. Statistical analysis was performed using Statistical Product and Service Solution (SPSS) version 21 for Windows (SPSSInc, Chicago, IL). Descriptive quantitative data was expressed in mean and standard percent their problems deviation respectively. Descriptive qualitative data was expressed in percentage/proportion. Confidence interval was set at 95% and probability of alpha error (level of significance) set at 5%. Power of the study set at 80%. Chi square test was used to find out association of various factors with knowledge, attitude in relation to digital dentistry among dental professional.

Prior to the final study involving overall 246 dental professionals, a pilot study with 20 dentist was conducted to validate a questionnaire and determine the appropriate sample size(n=246) computed using the single proportion formula,

$$n = Zu2^2 xpx (1-p) / d^2$$

The questionnaire was distributed through an online link shared by the corresponding author to dental practitioners in Pune. Before filing out the questionnaire, the purpose was explain to the respondents and the participations was considered consent. There were 27 multiple-choice questionnaire that assessed knowledge, attitude and practice. The options for these questions were formulated by the corresponding author. A total of 246 responses were collected to an online form using goggle forms. The results were documented in Excel sheets, and tables were created to comprehensively evaluate the validity and reliability of the questionnaire.

3. Result

In a recent study, we asked dental professionals about their awareness and attitude towards digital dentistry. Out of the 247 professionals who participated, 94.7% were interested in learning about digital dentistry (table 1, figure 1). Interestingly, 56.2% believed that all dental practices currently use digital tools, while 21.9% disagreed and 14.5% were unsure. When it came to awareness of different digital technologies, 70.8% of professionals were knowledgeable (table 2, figure 2).

Specifically, 53% were aware of CBCT, 55.8% knew about CAD/CAM, 76.9% were familiar with intraoral scanners, and 53.8% were knowledgeable about CT scans. Additionally, 36% had used CBCT, 28.7% had used CAD/CAM, 67.6% had used intraoral scanners, and 27.1% had used CT scans. It's interesting to note that 51.8% of professionals had attended workshops and hands-on courses for digital dentistry, while 48.1% hadn't. During their internships, 54.2% of dentists learned about digital dentistry. In terms of staying up to date, 61.1% of dentists suggested educational courses, while 18.6% and 4% recommended professional associations and trade publications, respectively. Overall, 54 dentists strongly agreed and 128 agreed that digital dentistry has its advantages, while 1 disagreed and 19 strongly disagreed (table 3, figure 3). Furthermore, 23% believed that digital dentistry positively impacts appointment duration, and 61.5% agreed with this statement.

According to the survey, 59 out of 247 dentists believe that chairside dentistry provides immediate results, while 178 dentists prefer digital dentistry (table 4, figure 4). 95.9% of dentists are interested in receiving more training in digital dentistry (table 5, figure 5). 23.4% prefer chairside dentistry for better outcomes, while 64.7% prefer digital dentistry. 55.4% dentists agree that the future of dentistry is going digital table 6, figure 6).

Table 1
People interested in learning about digital dentistry

	N	PERCENTAGE
YES	234	94.7
NO	4	1.6
UNCERTAIN	9	3.6
TOTAL	247	99.9

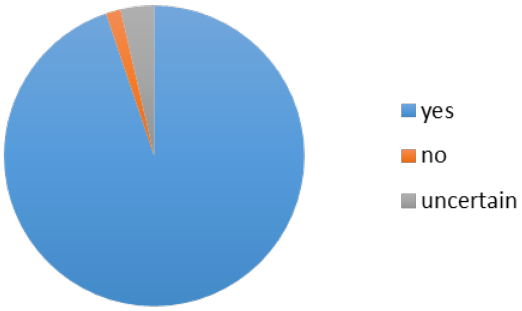

Fig. 1. People interested in learning about digital dentistry

Table 2
Awareness about different types of digital technologies in dental practices

	N	PERCENTAGE
YES	175	70.8
NO	40	16.1
UNCERTAIN	32	12.9
TOTAL	247	99

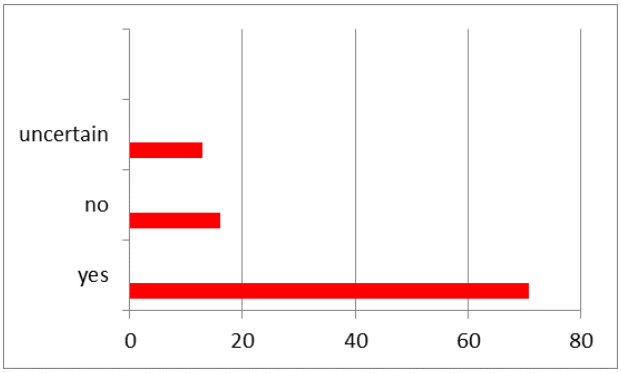

Fig. 2. Awareness about different types of digital technologies in dental practices

Table 3
Advantages of digital dentistry

	N	PERCENTAGE
STRONGLY AGREE	55	22.2
AGREE	128	51.8
NEUTRAL	44	17.8
DISAGREE	1	0.4
STRONGLY DISAGREE	19	7.6
TOTAL	247	99.8

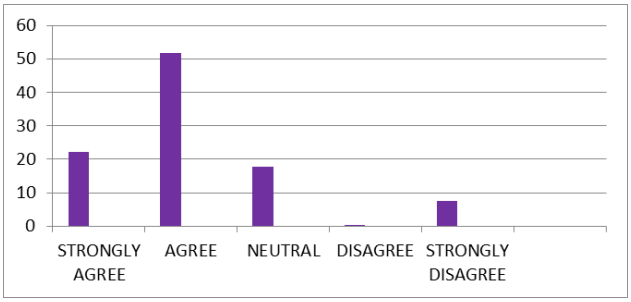

Fig. 3. Advantages of digital dentistry

Table 4
Immediate results are provided by the following

	N	PERCENTAGE
CHAIRSIDE DENTISTRY	59	23.8
DIGITAL DENTISTRY	178	72.0
OTHER	10	4.0
TOTAL	247	99.9

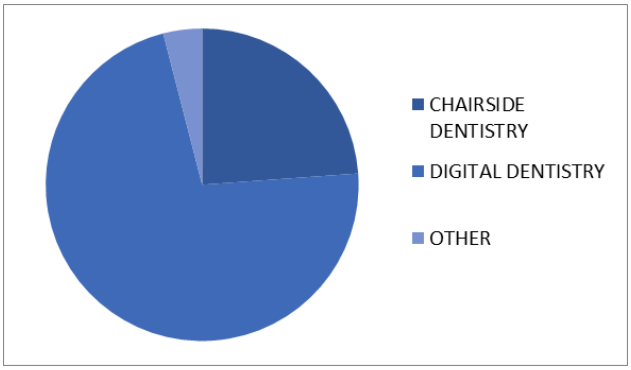

Fig. 4. Immediate results are provided by the following

Table 5
People interested in receiving more training in digital dentistry

	N	PERCENTAGE
YES	237	95.9
NO	10	4.0
TOTAL	247	99.9

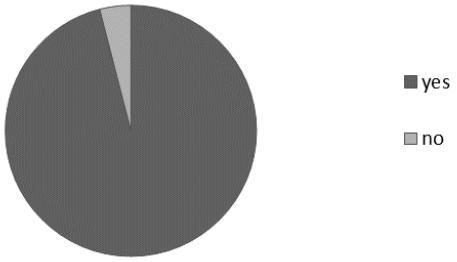

Fig. 5. People Interested in receiving more training in digital dentistry

Table 6
The future of dentistry is going digital

	N	PERCENTAGE
STRONGLY AGREE	49	19.8
AGREE	137	55.4
NEUTRAL	46	18.6
DISAGREE	11	4.4
STRONGLY DISAGREE	4	1.6
TOTAL	247	99.8

4. Discussion

Digital dentistry integrates advanced technologies like computer-aided design (CAD), computer-aided manufacturing (CAM), intra-oral scanners, and 3D printing to enhance dental procedures and patient outcomes. The acceptance of digital dentistry in clinical practice depends on the awareness and attitudes of dental professionals.[8] In our study, an impressive 95% of the cohort expressed interest in digital dentistry, a promising result compared to a similar study conducted by MM van der Zander et al. [9] in Netherlands showed that only 68% of the study population were interested in learning about digital dentistry. Regarding the future of dentistry going digital, over 75% of our participants believed it was possible in the near future. In contrast, a study by MA Schlenz et al. [10] found that 86% of their cohort planned to adopt digital dentistry soon due to factors like time efficiency, better feedback, easier handling, enjoyable practice, and increased fault tolerance. Another study by Sabalic M, Schoener JD [11] revealed a general inclination among participants to embrace digital technologies in dentistry.

When assessing the perceived advantageous effects of digital dentistry, 75% of our respondents agreed, surpassing a similar study in India by Jathanna VR, Jathanna RV, Jathanna R, where only 50% acknowledged the benefits of digitalization in dentistry [12]. In another Indian study by Nayakar R, Sardesai P, Killedar S, Patil A, Kakodker M, digitised dental products were rated of superior quality by practicing specialists compared to conventional products [13].

Concerning the timing of methods, a significant 72% of our cohort favoured digital dentistry, aligning with the findings of Alohli T.'s study [14]. While our study showed slightly over 70% awareness of different digital technologies in dentistry, a study by Acharya A. et al. [15] reported a higher awareness score of 98.9% in their cohort.

Digital dentistry encompasses a wide range of technologies and practices that leverage digital tools in dental care. Furthermore, referring to the study and the need for digitalization, benefits of digital dentistry vaguely surpasses it's demerits in view of the population.

A need for digitalization and modernization is crucial with respect to the fast growing demands of population for ease of access and the need of delivering faster health care services.

The future of digital dentistry holds exciting possibilities. Advancements may include enhanced diagnostic tools, AI-driven treatment planning, 3D printing of dental prosthetics, and improved virtual patient experiences. The use of intraoral scanners, CAD/CAM technology, and tele-dentistry is likely to become more widespread, offering efficient and precise solutions. Integration of data analytics and machine learning may further personalize treatment plans, optimizing outcomes. Additionally, advancements in materials and biotechnology could lead to more durable and natural-looking digital restorations.

5. Conclusion

In the dental office, CAD/CAM technology enables clinicians to deliver accurate and aesthetically pleasing indirect fixed restorations during the same visit. Chairside digital impression systems contribute to the creation of precise laboratory models and restorations, reducing chairside time and enhancing esthetics with fine-tuned precision. This transformative approach in CAD/CAM dentistry is reshaping how clinicians offer indirect restorations, leading to the fabrication of highly precise models and restorations, heightened chairside efficiency, and enhanced communication between clinics and laboratories. As dentistry is changing on a vast scale CAD/CAM in the future of dentistry.

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