Research Article

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Perception, awareness and attitude towards digital dentistry among dental students and recent graduates of Nobel Medical College and Teaching Hospital

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ABSTRACT

Introduction : Integration of digital technology in dentistry has significantly enhanced diagnostic accuracy, treatment planning and patient outcomes. However, its adoption is influenced by various factors including educational exposure and trainings that are required during the academic period of dental students.

Objective : This study aimed to assess the perception, awareness and attitude toward digital dentistry among dental students and recent graduates at a dental school in Eastern Nepal.

Methodology : An observational cross-sectional study was conducted among 196 undergraduate students and dental graduates at Nobel Medical College and Teaching Hospital. Data were collected over a period of 1 year from April 2024 to April 2025 through a structured questionnaire covering four domains: career vision, perception of digital dentistry, prior knowledge, and motivation for choosing dentistry. Ethical approval was obtained from Institutional Review Committee of Nobel Medical College prior to the start of the research. The data were analyzed using SPSS version 25 and correlation analysis was conducted to compare different parameters. Quantitative data was analyzed using descriptive statistics to summarize perception, awareness, and attitude of participants towards digital dentistry.

Result : Although only 40.3% participants had prior knowledge about digital dentistry, 90.8% expressed interest in using it in their future career. Most believed digital dentistry improves precision (83.7%) and laboratory efficiency (76%). However, only 3.1% considered themselves proficient in using digital technology and 87% identified themselves as beginners. Majority of participants noted that less than 5 dental schools include digital dentistry in their curriculum.

Conclusion : The study reveals a positive attitude and perception among dental students and recent graduates toward digital dentistry despite limited self-perceived knowledge and exposure. The findings suggest a need for curriculum reforms and training to prepare future dental professionals for the evolving digital world.

Keywords: Computer aided designing; computer aided milling; curriculum reforms, dental education; digital dentistry.

INTRODUCTION

The healthcare services including dentistry have been continuously upgrading, supported by recent technological advances. The introduction of new and advanced digital technologies in dentistry

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has positive impacts in the quality of dental care.[1,2] Technologies such as cone beam computed tomography (CBCT), 3D intraoral and facial scanners, 3D printers, and integrated processing software, such as the computer-assisted design/computer-assisted-manufacturing (CAD/CAM) prosthetic software are transforming the entire field of dentistry through their effective application.[3,8]

These modern technologies have significantly enhanced diagnostic accuracy, treatment planning, and patient care outcomes. For instance, intraoral scanners provide high contrast magnified views of tooth preparations on a computer screen, which can also be shown to patients. This allows real-time adjustments and accurate planning focused on aesthetics and functionality, ultimately enhancing the quality of dental treatments.[7,9] Similarly, CBCT provides a detailed view of the teeth, bones, nerve pathways, and soft tissues, allowing dentists and maxillofacial surgeons to diagnose and plan dental treatments with precision.[5,6,10]

Despite several benefits of these advanced and modern technologies, several factors have delayed their implementation in dentistry. Studies suggest that the adoption of the technologies is not straightforward but several factors play important role in the process. These include the features of the test or tool, the context of the setting where it is introduced to practitioners, and the characteristics of the clinicians using it.[11] Limited inclusion of newer technology in current syllabus of dentistry of different universities of Nepal possesses significant problem in their adaptation among newly trained dentists.

The study aimed to measure the perception, awareness, and attitude toward digital dentistry among dental students and recent graduates from a dental school in eastern Nepal. Their opinions and behaviors toward digital dentistry hold significant value, considering that they may be among the first adopters of new advancements. The study will direct institution offering dental degree to incorporate teaching materials comprising of new and continuously updated digital dental technologies in their syllabus as well as to invest on newer machines.

METHODOLOGY

An observational cross-sectional study was adopted to identify the perception, awareness, and attitude toward digital dentistry among dental students and recent graduates of Nobel medical college and teaching hospital. Participants for the study included undergraduate dental students and recent graduates practicing dentistry at Nobel medical college and teaching hospital, Biratnagar in Eastern Nepal. The sample size was calculated by using Cochran's formula. i.e. $n=z^2pq/d^2$. The sample size was calculated based on a confidence interval (Z) of 95% and an estimated prevalence rate (p) of 50% with 7% margin of error (d). Sample size was calculated to be 196.

Convenience sampling was used selecting dental students and dental surgeons of Nobel medical college and teaching hospital. Inclusion criteria of the participants included dental students and dental surgeons, graduated after 2021 and practicing dentistry at the institution who gave informed consent to participate in the survey.

Ethical approval was obtained from Institutional Review Committee of Nobel medical college and teaching hospital (Reference no. NMC/IRC/25/2024, Date: March 31,2024) prior to the start of the research. Additionally, permission was obtained from departmental head of department of prosthodontics and maxillofacial prosthesis. The study was conducted from April 2024 to April 2025.

A printed survey form was handed to each participant after obtaining their consent. The questionnaire was adopted from the survey conducted and published by Sharab et al.[4] among predental students in USA in 2022 which is an open access article that allows use, sharing and adaptation as long as appropriate credit is given to the original author(s)

and corresponding author was informed through mail. The questionnaire-based survey was divided into four categories; (1) Career vision, (2) attitude towards digital dentistry, (3) prior knowledge of digital dentistry, and (4) personal intelligence and attitude towards dentistry. The first category included details about the current involvement in the dental field and their vision as future dentists. The second category showed students perception of digital dentistry. The third category provides an insight into dental student's attitude towards the usage of digital dentistry and reveals participant`s prior knowledge of digital dentistry. The fourth category incorporated questions about the reason(s) for choosing dentistry as a future career and what was/were their inspiration.

In the fourth category participants were allowed to select more than one option

RESULTS

A total of 196 participants aged between 17-28 years were included in the study with mean age being 21.7 years. Among them, 138 (70.4%) were female and 58 (29.6%) were male (Table 1). The study participants were engaged in different academic sessions and clinical activities of the dental institution (Table 2).

The first survey category assessed participants current dental field activities and their future vision as dentists. Most participants were primarily involved in studying (86.2%), followed by clinical practice or internships than shadowing and campus involvement. Most participants (90.8%) thought they would use digital dentistry in their career.

Majority of the participants saw themselves being involved in private practice while average number saw themselves as faculty members and considered themselves attending continuing medical education (CME). The least interest was in research; as 28.1% wanted to be involved in research in the future (Table 3).

Table 1: Distribution of participants according to gender

Gender	n (%)
Female	138 (70.4%)
Male	58 (29.6%)

Table 2: Distribution of participants according to their study level

Level	n (%)
First Year	71(36.2%)
Second Year	56(28.6%)
Third Year	10(5.1%)
Fourth Year	8(4.1%)
Final Year	24(12.2%)
Internship	10(5.1%)
Graduated/Clinical Practice	17(8.7%)

Table 3: Students awareness for career vision

Questionaire	n (%)
1. Do you see yourself using digital dentistry in your future career?	
a. Yes	178 (90.8%)
b. No	18 (8.2%)
2. Which of the following are you primarily involved in?	
a. Campus extracurricular activities	7 (3.6%)
b. Shadowing	1 (0.5%)
c. Volunteering	8 (4.1%)
d. Studying	152 (77.6%)
e. Internship	11(5.6%)
f. Job/Professional Practice	17(8.7%)
3. Select all that apply: which of the following do you see yourself being involved in as a dentist?	
a. Research involvement	55(28.1%)
b. Private practice	130(66.3%)
c. Faculty member	67(34.2%)
d. Attending continuing educational seminars	68(34.7%)

In the second category, the participants were evaluated regarding their perception and awareness of digital dentistry. Out of total participants, 83.7% believed digital dentistry would provide more precise results than conventional dentistry. Participants were asked about CAD/CAM, a term frequently used since the beginning of digital dentistry, 68.4% of the participants responded correctly as Computer-Aided Design and Computer-Aided Manufacturing. Among the participants, 83.2% believed digital dentistry would revolutionize their workplace and 59.7% stated that they had no prior knowledge about digital dentistry. On accessing the competence of participants, only 3.1% of the participants considered themselves as proficient in using technology while maximum number of participants thought themselves as beginners and few believed they were skilled. When the participants were asked about the work efficiency of digital dentistry in the lab, 76% of the participant believed that digital technology would increase the efficiency of the lab work while 17.3% thought that it wouldn't make any difference in work efficiency (Table 4).

The third category assessed the participants' prior knowledge of digital dentistry. When asked how many dental schools in Nepal include digital dentistry in their curricula, 38.3% chose less than five. Out of the total participants, 48.5% thought that prosthodontics department utilizes the digital dentistry the most followed by oral and maxillofacial surgery (32.7%), general dentistry (12.2%) and periodontics (6.6%). Among the participants, 43.9% believed that that there will be no decline in the quality of patient care using digital dentistry if used in all steps while 14.3% believed that anything computerized loses the personal human touch or interaction. When the students were asked to estimate the amount of studying hours in dental school, maximum i.e., 40.3% indicated that amount of studying ranges from 30 to 40 hours (Table 5).

Table 4: Participant's perception of digital dentistry

Questionaire	n (%)
1. Does digital dentistry provide more precise results than conventional dentistry?	
a. Yes	164 (83.7%)
b. No	32(16.3%)
2. What does CAD/CAM stand for?	
a. Computer-aided design and computer-aided manufacturing	134 (68.4%)
b. Computer-aided dentistry and computer-aided medicine	16 (8.2%)
c. Computer-analyzed dentistry and computer-analyzed medicine	35 (17.9%)
d. Computer-adapted dentistry and computer-adapted medicine	11 (5.6%)
3. Do you see digital dentistry revolutionizing the workplace?	
a. Yes	163 (83.2%)
b No	33 (16.8%)
4. Do you have any prior knowledge of digital dentistry?	
a. Yes	79 (40.3%)
b. No	117 (59.7%)
5. Do you consider yourself skillful in using technology?	
a. Beginner	172 (87.8%)
b. Skilled	18 (9.2%)
c. Proficient	6 (3.1%)
6. How much do you think digital dentistry has improved work efficiency in the lab?	
a. Decreases efficiency	13 (6.6%)
b. No difference	34 (17.3%)
c. Increases efficiency	149 (76%)

Table 5: Prior knowledge to digital dentistry

Questionaire	n (%)
1. How many dental schools in Nepal do you think to include digital dentistry in their curricula?	
a. < 5 Dental Schools	75 (38.3%)
b. 5–10 Dental Schools	64 (32.7%)
c. > 10 Dental Schools	57 (29.1%)
2. Which dental field do you think utilizes digital dentistry the most?	
a. General Dentistry	24 (12.2%)
b. Oral and Maxillofacial Surgery	64 (32.7%)
c. Periodontics	13(6.6%)
d. Prosthodontics	95 (48.5%)
3. Do you think that there will be a decline in the quality of patient care using digital dentistry?	
a. Yes, anything computerized loses the personal human touch or interaction	28 (14.3%)
b. Not at all	82 (41.8%)
c. Not if used in all steps	86 (43.9%)
4. How many hours/weeks do you think you will be studying in dental school?	
a. 30–40 hours	79 (40.3%)
b. 40–60 hours	62 (31.6%)
c. 60–70 hours	23 (11.7%)
d. 70+ hours	32 (16.3%)

Table 6: Personal intelligence and attitude towards dentistry

Questionaire	n (%)
1. Why are you considering dentistry as your future career?	
a. Financial security	28.9%
b. Work-life balance	29.6 %
c. Inspired by dentist	19.9%
d. Family career(family member dentist)	7.7 %
e. Other	14.3%
2. What has inspired you to pursue dentistry as your career?	
a. Shadowing	51.5%
b. Volunteering	13.3 %
c. Family dentist	15.3 %
d. Workshop	11.2 %
e. None of above	8.7 %

The fourth category accessed participant's consideration towards dentistry as a future career. About 29.6% participants chose dentistry because of easy work-life balance while 28.9% chose due to financial security and the rest were inspired by their fellow dentists and/or existing family career.

The participants were asked about their inspiration for choosing dentistry. Most of the students (51.5%) were influenced by shadowing while 15.3% participants reported that they were inspired by their family dentist (Table 6).

DISCUSSION

This study assessed the perception, awareness, and attitude toward digital dentistry among undergraduate students and practicing dental graduates at a dental school in Eastern Nepal. Most of the participants belonged to first (36.2%) and second (28.6%) years of their BDS program, which belong to newer generation that is more likely to be digital natives and demonstrate heightened proficiency and dependence on technology.[12]

Although only 40.3% of participants had prior knowledge about digital dentistry, 90.8% participants saw themselves using digital dentistry in their future career. It reveals a positive attitude among participants regarding the integration of digital technologies in dentistry which aligns with but is slightly lower than the 97% reported by Sharab et al. among American pre-dental students.[4]

Among the participants, 83.7 % of them believed digital dentistry provides more precise results than conventional dentistry while 83.2% participants saw digital dentistry revolutionizing the workplace. The belief that digital technologies can improve laboratory efficiency (76%) is encouraging and reflects a growing trust in the advantages offered by modern dentistry among the participants. It aligns with the current literature which supports the use of technologies like CAD/CAM, CBCT, and intraoral scanners to improve diagnostic accuracy, patient satisfaction, and treatment outcomes.[13 14]

However, despite this enthusiasm, the readiness to adopt digital tools remains limited. In our study, only 3.1% of students considered themselves proficient in digital technologies, while 87.8% rated themselves as beginners. This sharp contrast to Sharab et al., where nearly half (48.5%) identified as proficient and may suggests a lack of training infrastructure and exposure in Nepalese dental institutions but may require further studies in other institution to confirm and generalize the present data.[4]

This large gap suggests that although the enthusiasm for digital dentistry exists, there remains a significant skills gap, mainly due to limited exposure and access to hands-on training in digital tools during undergraduate education. This issue might be more severe in Nepal, where the majority of students believed that dental schools have not yet included digital dentistry in their curriculum. This shortage of institutional emphasis greatly hampers the ability of future dentists to develop the skills necessary to thrive in a digitally advanced clinical environment.

Furthermore, majority of participants saw themselves entering private practice (66.3%), with fewer aspiring to become faculty members (34.2%) which was similar to the study conducted by Nashleanas et al.'s where 58.9% participants immediately planned to enter private practice after completing their dental schools. It may pose challenges for the future of dental education and research in Nepal, where academic and research-focused professionals are essential for mentoring and curriculum development in emerging areas like digital dentistry.[15]

Most participants in this study believed prosthodontics makes the greatest use of digital tools, while, while Madfa et al.'s study highlighted its maximum use as diagnostic tools. These differences could be attributed to varied clinical exposures and local contexts. [16]

The results of our study might highlight the urgent need for curriculum reforms. Nobel medical college and teaching hospital should take steps and collaborate with affiliated university to revise the current syllabus to integrate digital dentistry in the undergraduate programs. Additionally, collaboration with manufacturers, provision of trained supervisors and inclusion of continuous dental education (CDE) credits in digital skills could greatly enhance the adoption of digital dentistry in Nepal.

Though the adoption of digital dentistry is challenging due to high initial cost and technical maintenance, it offers improvement in quality, precision, effectiveness and personalized treatment, reduction in labor cost, reduced production or treatment time, shorter waiting time and higher patient satisfaction which justifies initial expenditures.[13]

CONCLUSION

This study reveals a positive attitude and perception among dental students and recent graduates in Nobel medical college and teaching hospital towards the adoption of digital dentistry despite limited knowledge and low self-perceived proficiency. However, more extensive studies are required in multiple dental institutions in Nepal to reach to a more concluding findings. This study suggests a significant gap between enthusiasm and readiness in adoption of digital dentistry particularly due to inadequate exposure and lack of integration of digital dentistry in the current curriculum. To bridge this gap, dental institutions like this in Nepal must revise their current syllabus, provide hands-on training opportunities, and promote lifelong learning through continuing education.

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