

Knowledge, Attitude, And Awareness in Dentists on The Computer Technology Applications in Surgical Implant Dentistry

Meer Zakirulla, MDS* Najeeb Muflih Alqahtani** Waad Salem A Alarram*** Rasha Hussain Al-Zahrani, BDS**** Ali Ahmed Alshehri*** Nawaf Ali Alshehri*** Mohammed Saleh Alqahtani*** Saeed Ali Alqahtani*** Mohammed S Alshahrani, BDS***** Ebtisam Nasser M Al Hatlan, BDS**** Sundus Saad Alqarni*** Rahaf Mohammed G Alamry*** Jawaher Ali A Alalyah*** Asma Fayz S Alshehri***

ABSTRACT

Study Design: Cross-sectional

Aim: This study aimed to evaluate the knowledge, attitude, and awareness in dentists on the computer technology applications in surgical implant dentistry.

Methods: A cross-sectional study was conducted after receiving clarifications regarding the objectives of the research and signing a statement of informed consent. The participants of the study comprised of total number of 300 dental surgeons (Male-186; Female-114) with age range from 20- to 55- years-old to understand the knowledge, attitude, and perception among dentists on the computer technology applications in surgical implant dentistry. The questionnaire was formulated and given and data was collected from dental surgeon. The data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS 20). A P-value of less than 0.05 was considered to be statistically significant.

Results: The majority of participants, 198(66%) were said that they were aware of the use of digital technologies in your practice? (e.g.-RVG, CBCT, Intraoral Scanner). Majority of participants 267(89%) agreed that currently available digital technologies users friendly. Participants 155 (52%) stated that they will prefer OPG as imaging modality while planning implants. Majority of the dentists 219 (73%) agreed that their patients would prefer implant placement over conventional methods for replacing tooth.

Conclusions: Study findings revealed that dental professionals possess a high level of knowledge and education towards dental implants with digital applications. However, further progress is needed on all educational levels, in addition to advanced level training of dental implant placement for the purpose of enabling dentists to carry out dental implant procedures with a higher level of confidence.

Keywords: Knowledge, Implants, Computer technology, Questionnaire, Saudi Arabia

* Assistant Professor
Department of Pediatric Dentistry & Orthodontic Sciences
College of Dentistry
King Khalid University
Abha, Saudi Arabia.
E-mail: drzak786@gmail.com

** Student
BMC College
Aseer, Saudi Arabia.

*** Intern
College of Dentistry
King Khalid University
Abha, Saudi Arabia.

**** General Dentist
Abha, Saudi Arabia.

***** General Dentist
Ministry of Health
Khamis Mushayt
Saudi Arabia.

INTRODUCTION

Implantation dentistry is experiencing a transformational electronic rebellion that is reshaping the method by which we diagnose and treat our patients. The method has been made easier and more streamlined by the inclusion of cutting-edge processes and products. In an age where modern technologies have permeated every aspect of our lives, it has also found a substantial area in the field of transplant medicine. One of the main objectives in oral implant operation is to properly place the implant as per the planning, which is facilitated by clinical imaging¹. Implant treatment encompasses three important phases: treatment planning, clinical intervention, and bionic restoration, each deeply affecting the succeeding stages². Osseo-integrated tooth implants have gained popular acceptance for addressing missing gums. These implants offer ease, steadiness, and a healthy look that surpasses choice solutions³. Also, dental implants exhibit amazing sturdiness, with a duration extending beyond a century. This has made them a favored option for many people seeking long-term medical answers⁴. Our productivity has increased as a result of the widespread use of phones, tablets, and other modern technology, which has also had an impact on scientific techniques. The use of electronic tools and technologies in dental implantation has resulted in workflows that improve patient care delivery, increasing its effectiveness and efficiency. Modern technologies are mainly important in implantation odontology, where it can be harnessed to its total probability⁵. The advent of intraoral scanning devices, cone beam computed tomography (CBCT), implant planning software, and dental laboratory software has empowered clinicians to apply these technologies in their daily clinical routines. This consolidation of digital resources allows for simplified and powerful workflows, eventually benefiting our patients by optimizing the transplant care approach.

Traditional dental panoramic tomography and periapical radiography, while commonly used, often lack complete three-dimensional (3D) information about the patient's anatomy. Additionally, traditional medical templates are frequently created based on medical casts, offering guidance on drill angulations and bone entry points but omitting references to the underlying morphological structures and accurate 3D guidance⁶. In order to get around these drawbacks, ongoing medical implantology analysis focuses on creating methods that provide the best 3D implantation branding while taking bionic and anatomical parameters into account. Guided transplant therapies have drastically improved therapeutic processes and health. Three-dimensional (3D) information, driven by the growing supply of cone-beam computer tomography with reduced radiation exposure and lower costs, is gaining momentum in the dental industry. The positioning of implants is further improved by navigated implant surgery, especially in the maxillary canal, mental foramen, and maxillary sinus, which are biologically sensitive⁷.

A new era of accuracy, effectiveness, and patient-centric maintenance has been brought in by the electronic revolution in implant dentistry. With the inclusion of cutting-edge electronic tools and technologies, professionals have the means to enhance the precision of transplant positioning and increase patient effects. While challenges and academic gaps persist, continued research and a commitment to embracing electric advancements may definitely elevate the quality of oral treatments in Saudi Arabia and the past, ensuring that patients receive the best care possible⁸. Despite the clear advantages of digital technologies in implantation medicine, there is a disinclination among several Saudi practitioners to choose 3D stamping due to insufficient knowledge. This emphasizes the urgent need for Saudi Arabian dental practitioners to better understand different methods and 3D imaging

applications. Minimal experiments have been conducted on 3D printing and imaging uses in the perspective of dental remedies, emphasizing the necessity of more studies. Therefore, the aim of this study is to assess the knowledge, Attitude, and Perception among dentists on the computer technology applications in surgical implant dentistry

METHODS

A cross-sectional study was conducted after receiving clarifications regarding the objectives of the research and signing a statement of informed consent. The participants of the study comprised of total number of 300 dental surgeons (Male-185; Female-115) with age range from 20- to 55- years-old to understand the knowledge, attitude, and perception among dentists on the computer technology applications in surgical implant dentistry. Simple random sampling method was employed in the study to collect the sample. Ethical approval [IRB/KKUCOD/ETH/2022-23/049] for performing the survey was obtained from the Scientific Research Committee of King Khalid University, College of Dentistry.

Questionnaire Structure: The study involved a total of 300 dental professionals practicing in the Aseer region of Saudi Arabia. The questions were designed and were circulated through online google forms among dental surgeons, questionnaire that was divided into two sections: demographic data (age, gender, year of experience and level of education) and ten questions with multiple-choice responses and questions that had the option of being answered "yes" or "no". Piloting was used to evaluate the questionnaire's validity and reliability.

Piloting: Before the main data collection, the questionnaire was pre-tested with a comfort sample of 20 dentists. These participants were interviewed to gather feedback on the questionnaire's clarity, length, and overall acceptability. Based on their feedback, necessary adjustments and corrections were made to the questionnaire.

Validity and Reliability: The questionnaire underwent validity and reliability testing to ensure that it measured what it intended to measure consistently. This is a common practice in survey research to ensure the quality and accuracy of the data collected. Validity was assessed to ensure that the questionnaire was appropriate for the study's objectives and the characteristics of the participants.

Data Evaluation: Both descriptive and analytical statistical strategies were employed to investigate the info collected from the individuals. The evaluation was executed using SPSS 18 software program. Overall, it seems like a structured and systematic approach was taken to design, test, and administer the questionnaire to gather data from dental surgeons in the Aseer region of Saudi Arabia for the research study. The use of pilot testing and validity checks reflects an effort to ensure the quality and reliability of the data collected.

RESULTS

A total of 300 (186 males and 114 females) dentists responded to the questionnaire. 12% of study subjects were of 20-30 years, 68% were of 31-40 years, 14% were of 41-50 years, and 6% were >50 years [Table 1]. Knowledge, attitude, and perception among dentists on the computer technology applications in surgical implant dentistry were shown in Table 2. The majority of participants, 198(66%) were said that they were aware of the use of digital technologies in your practice? (e.g.- RVG, CBCT, Intraoral Scanner). Majority of participants 267(89%) agreed that currently available digital technologies users friendly.

Table 1: Demographic data includes age, gender, year of experience, and level of education

AGE	Total (n)-300	%
20-30 years	36	12%
31-40 years	204	68%
41-50 years	42	14%
>50 years	18	6%
GENDER		
Male	186	62%
Female	114	38%
Year of Experience		
< 5 years	126	42%
6-10 Years	114	38%
>10 years	50	20%
Level of Education		
Bachelor	246	82%
Master	54	18%

Table 2: Response of dentists towards knowledge, attitude, and awareness about computer technology applications in surgical implant dentistry

QUESTIONNAIRE	Total (n)-300	%
Q1. Do you use digital technologies in your practice? (e.g.-RVG, CBCT, Intraoral Scanner)?		
Yes	198	66%
No	102	34%
Q2. Are the currently available digital technologies users friendly?		
Yes	267	89%
No	33	11%
Q3. Which imaging modality do you prefer while implant planning?		
<input type="checkbox"/> OPG	155	52%
<input type="checkbox"/> CBCT	64	21%
<input type="checkbox"/> OPG+CBCT+CT	81	27%
Q4. Do the patients in your clinic/practice prefer going for implant placement over conventional methods for replacement of tooth?		
Yes	219	73%
No	81	27%
Q5. Do you believe that digital approach will have additional benefits over the conventional approach?		
Yes	285	95%
No	15	5%
Q6. Have you received any professional training in implant placement?		
Yes	267	89%
No	33	11%
Q7. Are you aware of any software for digital implantology?		
Yes	255	85%
No	45	15%
Q8. Do you think introduction of digital techniques might improve the quality and function of rehabilitation?		
Yes	195	65%

No	69	23%
May be	36	12%
Q9. Have you heard about digital impression making?		
Yes	204	68%
No	96	32%
Q10. Have heard about new implant placement technique called DYNAMIC NAVIGATION (a three-dimensional (3D) software monitors and tracks the bone drilling and the implant placement in real time during the entire procedure)		
Yes	255	85%
No	45	15%

n = Number; % = Percentage.

Participants 155 (52%) stated that they will prefer OPG as imaging modality while planning implants. Majority of the dentists 219 (73%) agreed that their patients would prefer implant placement over conventional methods for replacing tooth. As many as 285 (95%) of dentists believe that digital approach will have additional benefits over the conventional approach. 267 (89%) and 255 (85%) replied that they have received professional training in implant placement and aware of digital implantology software respectively. Majority of dentists had knowledge regarding the new implant placement technique called Dynamic Navigation, which tracks the bone drilling and the implant placement in real time during the entire procedure. The response to question on preference on imaging modality during implant planning in their dental clinic are shown in Figure 1.

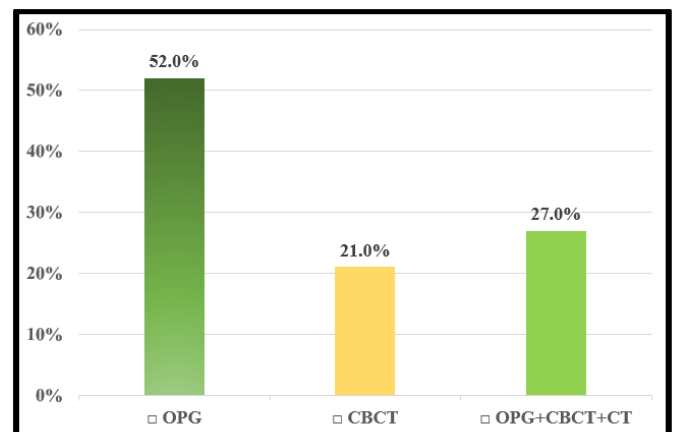


Figure 1: Response of dentists regarding on preference on imaging modality during implant planning in their dental clinic

DISCUSSION

Successful implant treatment is driven by various aspects such as type of impression material, implant impression technique, implant angulation, etc. The vital objective of all the implant placement methods was to provide clinicians with the ability to work successfully and give the patient the best possible way. The current research summarises the knowledge, attitude, and perception among dentists on computer technology applications in surgical implant dentistry⁹. Dynamic navigation is an advanced technology that has significantly improved dental implant surgeries' precision and success rates. As you mentioned, it was initially developed and used in neurosurgery before being adopted in implant dentistry¹⁰. Dynamic navigation utilizes real-time imaging to guide the dental implant placement procedure. This means that as the surgeon is drilling and placing the implant, they can see the exact location and orientation of the implant

on a computer screen throughout the surgery. Advanced 3D software is a core component of dynamic navigation¹¹. It allows for creating a virtual implant placement plan based on the patient's specific anatomy. This planning is prosthetically driven, meaning it considers the final prosthetic restoration (such as a crown or bridge) that will be placed on the implant. CBCT scans typically capture high-quality 3D images of the patient's jaw and surrounding structures^{12,13}. These images are crucial for accurate treatment planning and surgical guide creation. The software generates the virtual implant placement plan to create a surgical guide. This guide is a physical tool that the surgeon can place in the patient's mouth during the procedure. It ensures that the implant is positioned exactly as planned, down to the millimetre and degree, based on the preoperative 3D planning¹⁴.

Dynamic navigation significantly improves the precision and safety of dental implant surgeries. It minimizes the risk of errors and ensures that the implant is placed in the optimal position for both functional and aesthetic outcomes. Because the implant placement is carefully planned in advance and guided in real-time, dynamic navigation can often reduce the overall surgical time compared to traditional implant placement techniques^{15,16}. Patients benefit from dynamic navigation as it can result in shorter and less invasive surgeries, reduced postoperative discomfort, and faster recovery times. Dynamic navigation is particularly valuable for complex cases where the anatomy is challenging or when multiple implants must be placed precisely to support an entire arch restoration. Dynamic navigation has revolutionized dental implant surgery by enhancing precision, safety, and patient outcomes. It combines advanced technology with the surgeon's skill to achieve predictable and successful results in implant dentistry. The accuracy and efficiency of dental manufacturers' production, including that of dental aligner models, occlusal and splints, bonding trays, positional guides for miniscrew insertion, onlays or veneers, etc., can be improved with the right tools¹⁷. A precise virtual representation of the prepared-tooth, implantation location, and dental arch can be created using laboratory scanners or intraoral scanners. Treatment can be planned in both fixed and removable prosthodontics, and restorations can be made utilizing computer-aided design technologies¹⁸.

According to our study results, 66% of participants had good knowledge regarding using digital technologies during dental practice. 89% of participants think that currently available digital technologies are user-friendly. As many as 285 (95%) of dentists believe that the digital approach will have additional benefits over the conventional method. A previous Saudi study with the same objective reported that 98% of people were found to be aware that 3D printing is used in Saudi Arabian dentistry, whereas 2% were not. The placement of implants was deemed the most correct and least complicated treatment by 78.60% of dentists and the least accurate and most complicated procedure by 21.40% of dentists¹⁹. Orthodontists in India were evaluated for their 3D printing knowledge, attitudes and practices in a study by Parikh et al., (2019)²⁰ claimed that 47.5% of orthodontists had used this technique; however, the current study only found that 85% of dental practitioners had some familiarity with it, which may be because all due advance continues dental education program and with social media. However, 68% of respondents to another poll were aware of digital impression making. 61.3% of respondents reported having no prior experience with this technology, primarily because it was unavailable in their field of expertise and was prohibitively expensive²¹. Limitation of this study was included a relatively smaller sample size only from southern Saudi Arabia. The results may vary with a larger sample size or a different geographic location of Saudi Arabia and otherwise.

CONCLUSION

Study findings revealed that dental professionals possess a high level of knowledge and education towards dental implants with digital applications. However, further progress is needed on all educational levels, in addition to advanced level training of dental implant placement for the purpose of enabling dentists to carry out dental implant procedures with a higher level of confidence.

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Competing Interest: None

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