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Assessment of the knowledge and awareness of intraoral scanners amongst the dental practitioners of Pimpri-Chinchwad Area

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Abstract:
Objective: The aim of this study was to assess the knowledge and awareness of intraoral scanners amongst the dental practitioners of Pimpri-Chinchwad Area.
Material and methods: This study was conducted at Dr. D.Y. Patil Dental College and Hospital, Pimpri. The questionnaire was structured and content validity was done. All questions that scored more than the minimum set value were included in the survey. The final version of the questionnaire was distributed through google form to 200 dental practitioners. Data was collected and entered into a spreadsheet (Excel 2010: Microsoft office) and analyzed by using descriptive statistics such as graph and percentage.
Results: Awareness regarding intraoral scanner was present among 99.1% dentists. The most common intraoral scanner, the dentists were aware are 3Shape followed by DentsplySirona, Planmeca, Medit, and Itero.
Conclusion: Most of the Dental practitioners were aware regarding the intraoral scanners and they even believed that intraoral scanner saves time in comparison to conventional method. Most of the dentists knew about the advantages and disadvantages of intraoral scanner. More than 3/4th of the dental practitioners preferred having a training programme at undergraduate college level.
Keywords: Intraoral scanners, knowledge and awareness, advantages, digital impression, conventional impression

Introduction: Dental practices now use electronic patient records, email, and other information- and communication-enabling technologies in addition to internet-based resources, such as websites and social media, to inform and communicate with patients and the public, particularly hard-to-reach populations.[1]Here, "digital technologies" refers to clinical and diagnostic tools that provide health services and result in information that is transmitted and stored digitally. This covers e-health devices like intraoral scanners and digital radiography equipment.

The physical impression method using stock trays and elastomeric impression material is currently the gold standard for impression techniques. Conventional impressions have several inherent issues and drawbacks, such as incorrect tray selection, the requirement for impression disinfection, the separation of impression material from impression tray, distortion of conventional impressions prior to pouring, and storage of the impressions in case the casts and dies need to be recreated. Significant issues arise when using plaster casts as representational dental models.[1]These include the potential for deformation based on the kind of impression material, the potential for loss or damage during storage, and the limited amount of storage space available. While work sequence standardisation can help mitigate these issues, it cannot completely solve them.

By their very nature, digital impression making with intraoral and extraoral scanners tends to reduce the mistake generated by traditional impression making and gypsum model casting, so it may be a useful strategy for increasing the accuracy of dental restorations. The process of creating digital impressions is the initial stage in the CAD/CAM dental prosthesis production process.[2]Digital data acquisition enhances treatment planning, increases productivity, makes data storage easier, promotes repeatability, treatment documentation, and reduces costs and times. It also improves communication between the laboratory and dental clinic.

Digital models can be created directly by using an intraoral scanner to scan the dentition, or indirectly by using laser or cone-beam computed tomography to scan plaster models or alginate impressions. The patient gag response is lessened and they are more comfortable with the digital approach, which does not need physical impressions and allows them to breathe freely while taking impressions.[3]

There are now alternatives to traditional impression taking, thanks to the development of intraoral scanning equipment over the past 20 years and the advent of computer-aided design/computer-aided manufacturing (CAD/CAM) technologies in the late 1980s. In the field of fixed prosthodontics, computer-aided implant planning complements the existing highly developed CAD/CAM technology. A more dependable and superior outcome might be achieved by perfectly coordinating the processes, which would also save the patient and the practitioner time.[2]

Trueness and precision are two factors that can be used to determine a scanner's accuracy. Trueness refers to the scanner's capacity to replicate a dental arch as nearly to its original shape as feasible, free from distortion or deformation, while precision, which is synonymous with reproducibility, measures how similar the images are which are obtained through repeated scanning under the same circumstances.[4]

In the Indian market, intraoral scanning is still not widely used. Therefore, the purpose of the current survey is to determine the potential causes of the restricted usage of intraoral scanners in the Indian market as well as to gauge dentists' familiarity with and understanding of the scanners among the local population.

Materials and method: This study was conducted at the Department of Prosthodontics and Crown and Bridge and Implantology, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune. Dental practitioners using or not using intraoral scanners amongst Pimpri Chinchwad area were selected for the study. Ethical consideration was taken from the institutional review board. The participants were selected based on the inclusion and exclusion criteria.

Subjects included in the study were the Dental practitioners who were available at the time of study and willing to participate. The questionnaire (Annexure-1) was structured for the purpose of the study. The first part of questionnaire included qualification of dental practitioner, clinical experience of dental practitioner and area of practice. The second part of questionnaire included 22 multiple choice questions which assess knowledge and awareness

of the Dental Practitioners about Intraoral Scanner amongst Pimpri Chinchwad area. Content validity of the questionnaire was done. For content validity, questions were distributed among 6 panelists.

Content Validity Ratio (CVR) was calculated for all questions to mark the question as essential and nonessential based on relevance and clarity, minimum score was set at 0.62 for 22 questions. The content validity ratio for each item was obtained. All questions that scored more than the minimum set value were included in the survey. None of the questions required to be eliminated from the questionnaire. The final version of the questionnaire was then distributed through google form to 200 dental practitioners. Total of 200 participants, without any bias and prejudice filled the form and replied within three months of time duration.

Data was collected and entered into a spreadsheet (Excel 2010: Microsoft office) and analyzed by using descriptive statistics such as graph and percentage.

Results

Table 1- Overall awareness among the participants regarding intraoral scanner

Question number	Questions	Percentage of participants being aware
Q1	Awareness about intraoral scanner	99.1
Q2	Preference towards intraoral scanner	95.9
Q3	Intraoral being time saver compared to conventional method	88.8
Q4	Tooth mal-alignment affect intraoral scanning	19.7
Q5	Advantage of intraoral scanner	100
Q6	Difficulties faced during intraoral scanning	95.1
Q7	Training program should be conducted at undergraduate college level	96.9
Q8	Intraoral scanner simplify the communication between the dentist and the dental technician	98.7
Q9	Ease of finding a defect in the impression with intraoral scanner over conventional method?	84.3
Q10	Lengthy learning curve	12.6
Q11	Oral fluids, blood and food debris affect intraoral scanning	78.9
Q12	Ease of digital workflow over conventional workflow	80.2
Q13	Surrounding ambient light affect the accuracy of the Intraoral Scanners	26.9
Q14	Use of light while scanning with the intraoral scanner	34.5
Q15	Preference towards intraoral scanner	80.7
Q16	Preference towards scanner with true color impressions	74.9
Q17	Better fit of crowns fabricated through intraoral or conventional method	82.1
Q18	Preference of patients towards intraoral scanning	86.1
Q19	Preference towards intraoral scanner in taking impression for implant patients	75.3
Q20	Disinfection of intraoral scanner	91.9

Q21	Preference for buying intraoral scanner	84.8
Q22	Expense as a reason for not buying intraoral scanner	13.9

Discussion: One of the most important and time-consuming tasks at a dental office is taking a correct dental impression.[4]It is essential to ensure that the intraoral condition is replicated as exactly as possible during this process because any mistakes or inconsistencies could have a significant impact on the final restoration's quality. The limitations of traditional impressions are overcome by using an intraoral scanner.

An intraoral scanner is one of the newly used devices that has become very popular. The use of intraoral scanners enabled entirely digital dentistry workflows, which were previously only partially achievable due to the need to create working models and use laboratory scanners in order to create virtual casts from oral impressions.[5]

A key component of a chairside CAD/CAM system: Intraoral scanners, offer the advantage of being able to take virtual casts straight from the patient's mouth without the need for any further work processes. Intraoral scanners can swiftly and easily scan the soft tissues of the mouth and teeth.[6]The use of Intraoral scanners is still limited in the Indian market. Hence, the current survey was conducted to know the possible reasons for the limited use of introral scanners in the Indian market and also to test the knowledge and awareness of the dentists about the scanners in the local population.

Burhardt L et al in 2016 assessed perceptions and preferences for impression techniques in young orthodontic patients receiving alginate and 2 different digital impressions.[7]After each procedure, the patients were asked to score their perceptions on a 5-point Likert scale. Digital impressions were favoured by 51% of the subjects, whereas 29% chose alginate impressions, and 20% had no preference.[4]

In 2020, Revilla-León M et al quantified the impact of ambient lighting conditions on the accuracy of an intraoral scanner when maxillary complete-arch and maxillary right quadrant digital scans were performed in a patient. Significant difference in the trueness and precision values were found across different lighting conditions where Room light (RL) condition obtained the lowest absolute error compared with the other lighting conditions tested followed by Chair light (CL), Natural light (NL) and No light (ZL). A pair wise multi-comparison showed no significant difference between NL and ZL conditions.[5]

Dr. Aman Merchant et al in 2020 evaluated the knowledge and awareness of intraoral scanners and the effects of different lights on its accuracy among dentists. This study was done among the dental practitioners and dental students in India. A questionnaire was made and given to the dentist. It was found that most of the dental practitioners and dental students had knowledge about intraoral scanners but were not aware about the limitations and effects of different lights on the accuracy of intraoral scanners and hence, need to be educated on the same for obtaining better results.[2]

Lam WY *et al* in 2021 investigated the preference and perception on intraoral scanning and impression making among dental students. Final-year dental students from the 2019 and 2020 cohorts were invited to complete an online questionnaire via Google-Form and the data were collected. While intraoral scanning has perceived advantages, many students still prefer impression making that works more efficient to them.[6]

In the present study, the questionnaire (Annexure-1) was structured for the purpose of the study. The first part of questionnaire included qualification of dental practitioner, clinical experience of dental practitioner and area of practice. The second part of questionnaire included 22 multiple choice questions which assess knowledge and awareness of the Dental Practitioners about Intraoral Scanner amongst Pimpri Chinchwad area. Content validity of the questionnaire was done and then, the final version of the questionnaire was distributed

through google form to 200 dental practitioners. All the participants, without any bias and prejudice filled the form and replied within three months of time duration. Data was collected and entered into a spreadsheet (Excel 2010: Microsoft office) and analyzed by using descriptive statistics such as graph and percentage.

Most of the Dental practitioners were aware regarding the intraoral scanners and they even believed that intraoral scanner saves time in comparison to conventional method. The most common intraoral scanner, the dentists were aware are 3Shape followed by DentsplySirona, Planmeca, Medit, and Itero. Most of the dentists knew about the advantages of intraoral scanner and the difficulties faced during intraoral scanning. More than 3/4th of the dental practitioners preferred having a training programme at undergraduate college level and they even believed that intraoral scanner simplifies the communication between the dentist and the dental technician. Most of the dentists thought that, with intraoral scanning, it is easier to find a defect in the impression than conventional method. 3/4th of the dental practitioners thought that oral fluids, blood and food debris affect intraoral scanning but, they even believed that the digital workflow is easier than conventional. Most of the dentists preferred intraoral scanner over conventional impression and they even preferred scanner with true color impressions. More than 3/4th of the dental practitioners were aware that the crowns fabricated through intraoral scanning have better fit and their patients also preferred intraoral scanning more than conventional. 3/4th of the dentists preferred intraoral scanner in taking impression for implant patients. Most of the dentists were aware about the methods of disinfecting intraoral scanner and they preferred to buy intraoral scanner.

Very few dentists believed that tooth mal-alignment affects intraoral scanning as well as that the intraoral scanning requires a lengthy learning curve. Few dental practitioners were aware that the surrounding ambient light affects the accuracy of the intraoral scanners and that no light should be used while scanning with intraoral scanner. Very few dentists felt intraoral scanner to be expensive and preferred not to buy it.

Sebastian B.M. Patzelt found that that Digital impression making was significantly faster and it might be beneficial in establishing a more time-efficient work flow.[8]Lukasz Burhardt found in his study that young orthodontic patients preferred the digital impression techniques over the alginate method, although alginate impressions required the shortest chairside time.[4]

Marta Revilla-León found that light conditions significantly influenced on the scanning accuracy of the IOS evaluated. Room Light condition obtained the lowest absolute error value of the digital scans performed.[5]Dr.Aman Merchant found that most of the dental practitioners and dental students had knowledge about intraoral scanners but were not aware about the limitations and effects of different lights on the accuracy of intraoral scanners. [2]

Ji-won Anh found that the precision of 3D images differed according to the degree of tooth irregularity, scanning sequence, and scanner type. However, from a clinical standpoint, both iTero® (Align Technology Inc., San Jose, CA, USA) and Trios® (3Shape Dental Systems, Copenhagen, Denmark) scanners were highly accurate regardless of the degree of tooth irregularity.[7]

Jung-Hwa Lim found that the single-image based system required repeated learning sessions for effective clinical application.[8] The newer system offered better trueness and precision and was less likely to be influenced by the length of clinical career or the region being scanned.

There are certain limitations to the current study.[9] The population in the present study was the dental practitioners, although another study could also be conducted by covering the general population, so as to know their awareness, knowledge and problems regarding the Intraoral scanners.[10]

Additional studies are recommended to fully understand the advantages, disadvantages, the impact of lighting conditions on the accuracy, and patient preference for intraoral scanner.[11] Critical analysis of the topic and panel discussion should be arranged for better understanding of the topic. A written questionnaire should be given to the audience to verify their understanding. More frequent surveys should be circulated in the colleges to increase the awareness among the students.

Conclusion: Within the limitations of this questionnaire survey, the following conclusions were drawn:

1. Most of the Dental practitioners were aware regarding the intraoral scanners and they even believed that intraoral scanner saves time in comparison to conventional method.
2. The most common intraoral scanner, the dentists were aware are 3Shape followed by DentsplySirona, Planmeca, Medit, and Itero.
3. Most of the dentists knew about the advantages of intraoral scanner and the difficulties faced during intraoral scanning.
4. More than 3/4th of the dental practitioners preferred having a training programme at undergraduate college level and they even believed that intraoral scanner simplifies the communication between the dentist and the dental technician.
5. Most of the dentists thought that, with intraoral scanning, it is easier to find a defect in the impression than conventional method. 3/4th of the dental practitioners thought that oral fluids, blood and food debris affect intraoral scanning but, they even believed that the digital workflow is easier than conventional.
6. Most of the dentists preferred intraoral scanner over conventional impression and they even preferred scanner with true color impressions.
7. More than 3/4th of the dental practitioners were aware that the crowns fabricated through intraoral scanning have better fitand their patients also preferred intraoral scanning more than conventional.
8. 3/4th of the dentists preferred intraoral scanner in taking impression for implant patients.
9. Most of the dentists were aware about the methods of disinfecting intraoral scanner and they preferred to buy intraoral scanner.
10. Very few dentists believed that tooth mal-alignment affects intraoral scanning as well as that the intraoral scanning requires a lengthy learning curve.
11. Few dental practitioners were aware that the surrounding ambient light affects the accuracy of the intraoral scanners and that no light should be used while scanning with intraoral scanner.
12. Very few dentists felt intraoral scanner to be expensive and preferred not to buy it.

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