



Awareness, Knowledge and Attitude of Dental Practitioners to Use Intra Oral Scanners (Ios) And Digital Impressions - A Questionnaire Based Study

¹Dr Smita Khalikar, ²Dr Kalyani Moharil, ³Dr S.P Dange, ⁴Dr Kishor Mahale
¹Professor, ²PG student, ³Joint director DMER, Professor, ⁴Head of Department, Professor
Department of Prosthodontics, Government Dental College and Hospital, Aurangabad

***Corresponding Author:**

Dr Kalyani Moharil, PG, MDS

Department of Prosthodontics, Government Dental College and Hospital, Aurangabad

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Aim: - Impressions are the integral part of the restorative dentistry. Accurate impressions lead to accurate restorations and prosthesis. Digital impressions are gaining popularity nowadays. Hence the aim of the study was to assess Awareness, Knowledge and Attitude of Dental Practitioners to Use Intra Oral Scanners and Digital Impressions.

Materials and Methods: -A closed ended questionnaire was distributed online among 150 practicing dentists. The questions focused on assessing the awareness, Knowledge about digital impressions and intraoral scanners, about its application, advantages, Disadvantages. Data obtained was compiled on a MS Office Excel Sheet (v 2019, Microsoft Redmond Campus, Redmond, Washington, United States). Data was subjected to statistical analysis using Statistical package for social sciences (SPSS v 26.0, IBM). The results were analyzed against variables age, qualification, years of practice, area of practice and test of significance was applied.

Results: - About 76% of the practitioners were aware of digital impressions, however only 30% use intraoral scanners in practice. Higher financial commitments were the major hindrance in the use of intraoral scanner. The major advantage to the use of intraoral scanners was time efficiency according to most of the practitioners. Younger dentist were more optimistic to the use of intraoral scanners ..

Conclusion- Optical impressions decrease or eliminate the waste created by impressions materials, cast etc hence they make the way towards sustainable practice or green dentistry. The awareness about digital scanners needs to be increased and more emphasis should be given on incorporating about digital dentistry in BDS Curriculum.

Keywords: Accuracy, Digital impressions, Digitization, Intra Oral Scanners;

INTRODUCTION

Dental impression is a negative imprint of an oral structure used to produce a positive replica, used as a permanent record or in the production of a dental restoration or prosthesis. Thus, accuracy in the development of the impression is a determining factor to assure a successful fabrication and survival of both fixed and implant-retained prosthesis ⁽¹⁾ The digital impression concept is emerging rapidly in dentistry. Digital impression is the first step in digital workflow. Various intraoral and extraoral scanners are available in market. Intraoral scanners (IOS) are devices for capturing direct optical impressions in dentistry ^[2]

Similar to other three-dimensional (3D) scanners, they project a light source (laser, or more recently, structured light) onto the object to be scanned, in this case the dental arches, including prepared teeth and implant scan bodies (i.e., cylinders screwed on the implants, used for transferring the 3D implant position). The images of the dento gingival tissues (as well as the implant scan bodies) captured by imaging sensors are processed by the scanning software, which generates point clouds ^[2]. These point clouds are then triangulated by the same software, creating a 3D surface model ^[2].

The concept of intraoral scanning for a dental application was introduced in 1973 (Duret, 1973). A few years later, a chair-side scanning device utilising CAD/CAM technology was available commercially and manufactured by Sirona Dental Systems (CEREC)^[2]. The digital impressions are likely to replace the conventional impressions in future. Hence a questionnaire-based study was conducted to assess Awareness, Knowledge and Attitude of Dental practitioners to use Intra oral scanners and digital impressions. The questionnaire focussed on deducing the advantages, disadvantages and applications of intraoral scanners (IOS) according to dental practitioners in India.

Material and Methods

To accomplish the purpose of the study, an original questionnaire was created with close ended questions to optimize quantification. The questions were of multiple-choice type. The questions focused to assess the knowledge, attitude and awareness regarding digital impressions. The questionnaire was divided in two sections. First sections constituted the epidemiological variables and later section consisted the multiple-choice questions. To obtain results representative of the population sample size was calculated. Since the survey was conducted during Covid 19 Pandemic. An online rather than postal survey was used. The questionnaire was distributed via online survey platform (Google Forms), and a link was sent to the target population by means of email.

Data obtained was compiled on a MS Office Excel Sheet (v 2019, Microsoft Redmond Campus, Redmond, Washington, United States). Data was subjected to statistical analysis using Statistical package for social sciences (SPSS v 26.0, IBM). Descriptive statistics like frequencies and percentage for categorical data, Mean & SD for numerical data has been depicted. Normality of numerical data was checked using Shapiro-Wilk test & was found that the data followed a normal curve; hence parametric tests have been used for comparisons. Comparison of frequencies of categories of variables with groups was done using chi square test. For all the statistical tests, $p < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study as 80%.

Questionnaire of the study

Awareness, Knowledge and Attitude of Dental practitioners to use Intra oral scanners and digital impressions - A Questionnaire based study.

Age-

Sex

Area of Practice –

Qualification –

Specialty

Years of Practice – Less than 5 years

5-10years

10-15years

More than 15 years

Q 1) Are you affiliated with any college?

A) Yes

b) No

Q2) Are you aware of digital impressions?

a) Yes

b) No

Q3) Do you use a intraoral scanner for impressions?

a) yes, occasionally

b) yes, regularly

c)No

d)May be in future

Q4) What do you think are the advantages of using intraoral scanner?

a) Time efficient

b) Less patient discomfort

c)Simplified clinical procedure

d)Better Communication with patients and technician

e) Easy to maintain record

Q5) According to you, what are the disadvantages of intraoral scanner?

a) Purchasing and managing cost

b) Technique Sensitive

- c) Learning curve
- d) Difficulty in detecting subgingival marginal lines

Q6) Compared to conventional impression what do you think about the accuracy of digital impression?

- A) Accurate for all impressions
- b) Accurate for single tooth and FPD upto 4 elements.
- c) Less accurate for all situation
- d) Comparable to conventional impressions

Q7) According to you what are the clinical indications of intraoral scanner?

- a) Crowns and Short span FPDS
- b) Digital Smile Designing
- c) Guided Implant Surgery
- d) Complete Denture

RESULTS –

The total number of 150 valid questionnaire from dental practitioners based in India were obtained. Out of the total respondents 49% were male and 51% were female. Considering the age of the participants almost 39% belong to the age group of 26-30years, followed by age group 20-25 years which constituted almost 38%. 5 % of the total respondents were more than 40 years of age. Hence, we can consider that younger population participated more in the study. 86% of all the dental practitioners involved in study were practicing in urban areas, rest 14% practiced in rural area. While considering the educational qualification more than half of the practicing dentist (62%) were graduates, although a significant number of

correspondents had taken further post-graduation training. Among the post graduates 16% constituted the prosthodontist. Majority of the dentist had a practice of less than 5 years, 15% had a practice of 5-10 years. 53 % of the total participants had an affiliation with an institution. The test of significance was applied to responses with the variables like age, sex, area of practice, qualification and years of practice. Most of the response showed non-significant results with respect to various variables, other results have been further discussed.

76.5 % were aware about the digital impressions and intraoral scanners however only 6% of them used them regularly in the practice and 23% used occasionally that constitute about 30 % of the total practitioner have incorporated making impressions digitally 32% agreed to use intraoral scanners in future however 38% were reluctant. Most of the respondents availing the benefit of intraoral scanners were of age group 25-30 which was statistically significant. when years of practice were taken into account practitioners working less than 5 years were optimistic to the use of intraoral scanners, younger practitioners are more inclined towards incorporating digitization than the older practitioners.

About 38.3% agreed that digital impressions cause less patient discomfort. According to 19% IOS provide better communication between patients and technician, 15.4 % were of the opinion that digital impressions are time efficient. Post graduates constituted majorly with the response that chief advantage of IOS was that it provides better communication between patients and technician which was statistically significant.

	Frequency	Percent
Better communication with patients and technician	29	19.5
Easy to maintain record	15	9.4
Less patient discomfort	57	38.3
Simplified clinical procedures	26	17.4
Time efficient	23	15.4
Total	150	100.0

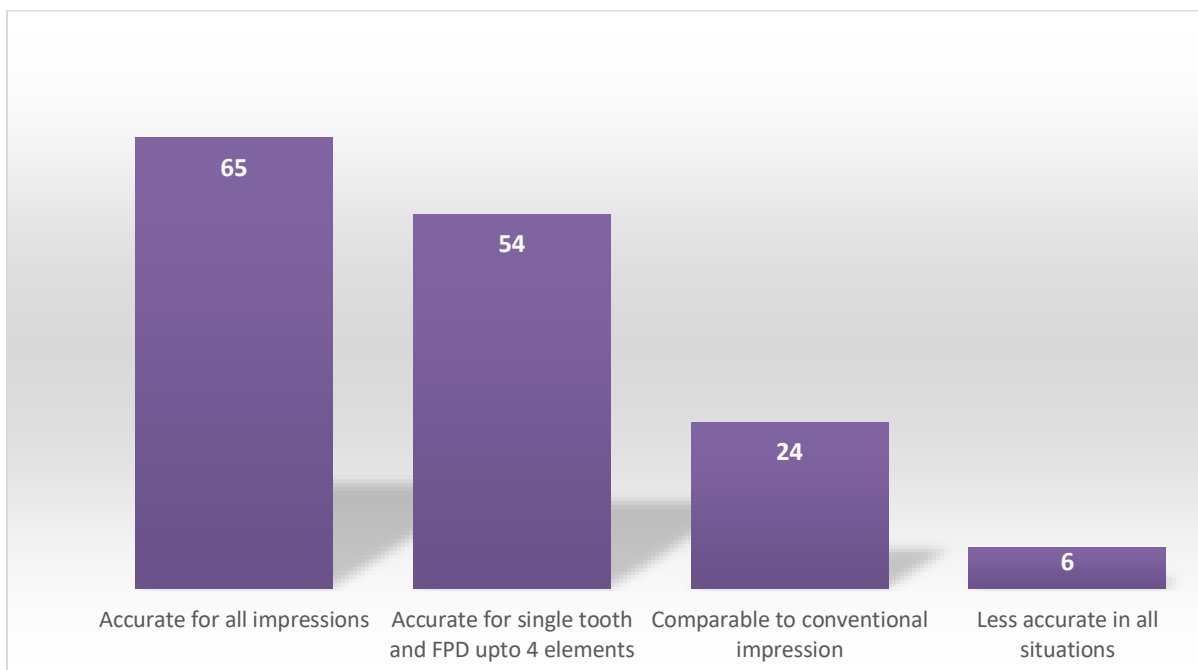
Table NO. 1 - ADVANTAGES OF DIGITAL IMPRESSIONS PERCENTAGE AND FREQUENCY DISTRIBUTION TABLE

When questioned about disadvantages or limitations of the digital impressions almost half of the correspondents that is 57% think that purchasing and managing cost is the greatest limitation which included BDS practitioners majorly which was statistically significant followed by difficulty in detecting subgingival margins (20.1).

	Frequency	Percent
Difficulty in detecting subgingival marginal lines	30	20.1
Learning curve	8	5.4
Purchasing and managing cost	86	57.7
Technique sensitive	23	15.4
Use of paste or powder for opacification	3	1.3
Total	150	100.0

Table 2- Frequency Distribution and percentage about disadvantage of Intraoral Scanners

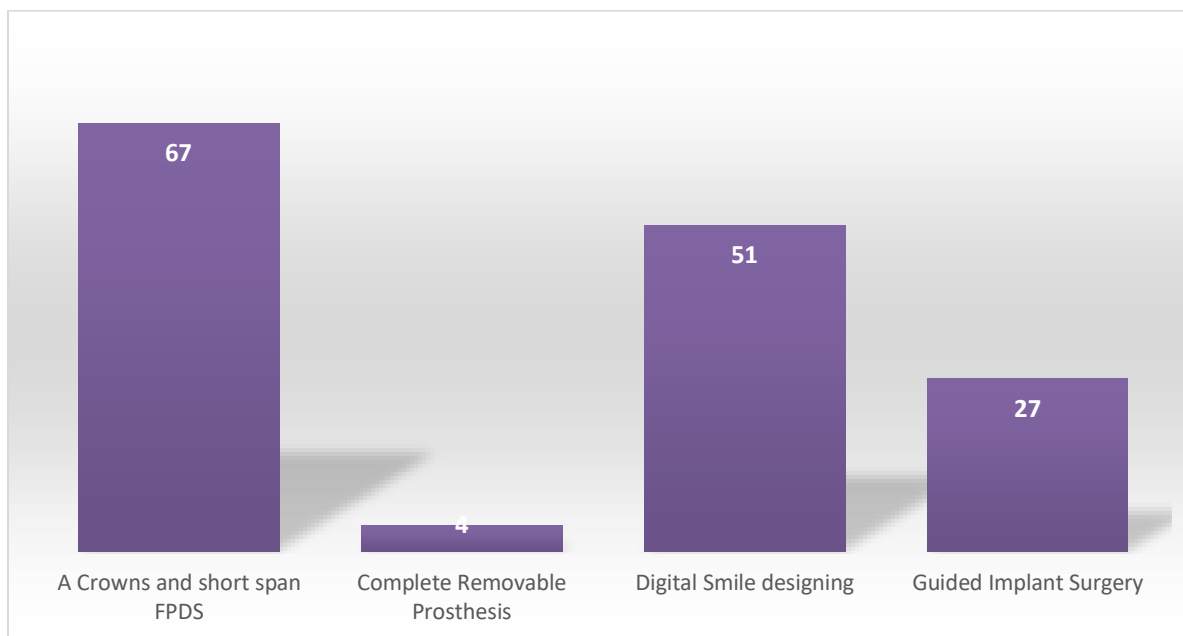
When enquired about accuracy of the digital impressions almost , 43.6% inferred that it is accurate for all impressions with higher frequency among BDS graduates which was statistically significant .



Graph 1 – Accuracy of intraoral scanners

According to 36.2% IOS is accurate for single tooth and FPD up to 4 elements ,however 16% thinks that the accuracy is comparable to conventional impressions , 4% were of the opinion that digital impressions are

inaccurate in all the clinical situations. 45% used the digital impressions for a crown and short span Fixed partial denture, 34% for digital smile designing, 18% for guided implant surgery and about 2% for complete denture.



Graph 2 - Application of Intraoral Scanners

DISCUSSIONS-

Dentistry is moving towards digitization. Introduction of CAD/CAM has opened new horizons in modern dentistry, digital impressions with intraoral scanners marks the first step in computer aided designing and milling. Impressions are considered to be most critical as fabrication of prosthesis is concerned. Inaccurate impressions may lead to inaccurate impressions which in turn leads to prosthetic failure. As the digital impressions is emerging in dentistry, this study aimed at assessing the awareness about the same.

About 76% were aware about digital impressions. Most of the practitioners practicing digital impressions were young. Hence, we can say that, younger practitioners are more inclined towards accepting the advances since younger generation is more technosavy. Dentist practicing for longer period may be satisfied with conventional methods. The perceived advantages of the digital impressions according to Mangano et al³ are-

Less patient discomfort - Especially in patients where conventional methods cannot be tolerated in cases of gag reflex or children

Less time required - The full arch scan take about 3min and the time to pour the cast, obtain model,

disinfection of the tray and impression is also saved. The STL file is directly uploaded and designing can be started immediately.

Better Communication with the technician and the patients too-

The technician can assess the impression in the real time, if impression is to be repeated it can be done in the same appointment. Digital impressions are the powerful tool for the patient education since life like image can be seen on the screen which leads to better patient understanding,

Easy to maintain record -The patient record is stored in the STL file format. No need to maintain plaster models which may wear over a period of time. The file can be transferred easily via internet to the laboratory or the other clinics for further communication.

Simplified Clinical procedures – Optical impressions prevent the use of trays and hence the error by selecting the incorrect tray is also prevented. optical impressions are easily and selectively repeatable, no need to disinfect tray, impressions.

The major advantage according to this study experienced by the dentist was less patient discomfort

followed by better communication with the patients and the dentist. Especially during COVID times the disinfection and sterilisation has to be given special attention hence optical impressions should be preferred.

According to the study by Mangano et al^[3] the demerits of the digital impressions include

- 1) **Difficulty in detecting subgingival margins** – This is the most frequent problem associated. Problem occurs when subgingival area is to be recorded to give subgingival margins the light may not pass through the depth and it becomes difficult.
- 2) **Learning curve** – There is learning curve associated with the usage of IOS. Technosavy people may adapt to it earlier.
- 3) **Purchasing and managing cost** – The purchasing cost of an IOS is between 15-35 euros. The regular updates of the software mostly done annually constitute the managing cost.
- 4) **Technique sensitive** - digital impressions include proper angulation, distance of the scanner tip from the concerned region.
- 5) **Use of powder or paste for opacification**- Powder or paste was to be sprayed on the teeth for proper opacification. The accuracy of the impressions hence was dependent on the paste which was applied. An inappropriate opacization technique may result in layers of different thicknesses at various points of the teeth, with the risk of errors that reduce the overall quality of the scan. Use of powder is typical for 1st generation intraoral scanners. However modern IOS 3hape TriOS , Carestream CS3500, Align Technology Itero, Cerec Omnicam donot require powder application .

According to this study purchasing and managing cost was the major hurdle in the use of Digital impressions, difficulty in detection of subgingival margin being the second. The purchasing cost can be reduced with further advancements.

The accuracy of a dental impression is determined by two factors: “trueness” and “precision.” Trueness is defined as the comparison between a reference dataset

and a test dataset. Precision is defined as a comparison between various datasets obtained from the same object using the same scanner.⁵ According to this survey most of the dentist were of the opinion that Intraoral scanners are accurate in all clinical situations. Younger practitioners considered that accuracy of the intraoral scanners was more for single tooth and short span restorations. Ideally, an IOS should have high trueness (it should be able to match reality as closely as possible). An IOS should therefore be as true as possible, that is, it should be able to detect any impression detail and permit the establishment of a virtual 3D model as similar as possible to the actual model, and that little or nothing deviates from reality. The accuracy of optical impressions clinically satisfactory and similar to that of conventional impressions in the case of single tooth restoration and fixed partial prostheses of up to 4–5 elements [3,6,7,8,9]. In fact, the trueness and precision obtained with the optical impressions for these types of short-span restorations are comparable to those obtained with conventional impressions [3]. However, optical impressions do not appear to have the same accuracy as conventional impressions in the case of long span restorations such as partial fixed prostheses with more than 5 elements or full-arch prostheses on natural teeth or implants.

Intraoral scanners have a variety of applications in dentistry. The optical impressions are used for diagnosis, prosthesis fabrication, fabrication of obturators, surgical stents for implant surgery. This survey confirms that optical impressions are preferred for fabrication of crowns and short span fixed partial denture by most of the dentist. Guided Implant surgery is least preferred by the practitioners. Intraoral Scanners are not used at its full potential and awareness should be increased so that digital impressions are used at its maximum.

CONCLUSION-

Following conclusions can be deduced from this study

- 1) Digitization has become an important part of dentistry especially in this covid era where sterilization, lesser patient contacts have become imperative, hence efforts have to be taken so that majority of the practitioners pave their way to the digital dentistry, optical impression being the first step.

- 2) Lowering the purchasing and managing cost of the intraoral scanners should be our priority so that it can be made pocket friendly not only to the practitioners but also to the patients .
- 3) According to this study younger practitioners have more optimistic attitude towards intraoral scanners and are more aware. Area of practice, qualification doesn't seem to have a significant effect on the knowledge about optical impressions
- 4) The BDS curriculum should emphasize more on concepts of digitization, CAD/CAM so that students are made aware about it.

Optical impressions decrease or eliminate the waste created by impressions materials, cast etc hence they make the way towards sustainable practice or green dentistry.

LIMITATION-

This study has considerably less sample size and such study can be conducted on a larger scale. The awareness about different generations of intraoral scanners can be assessed.

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