



Perception of Dental Healthcare Professionals towards Sterilization and Disinfection Protocol for Intraoral Scanners

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ABSTRACT:

Intraoral Scanners are now used in many areas of dentistry like any other intra oral digital instruments example- apex locators, intraoral cameras. Their use is expecting to increase further in the next decade. However, the Center for disease control and prevention (CDC) consider these as semi-critical complex instruments, these devices must be treated with heat or if, they are heat sensitive, they must be subjected to high level disinfectant. Their correct procedure thus remains questionable.

Through this article, we present a survey to assess the awareness among the dental health professionals towards intraoral scanners.

Aim- The aim of this study was to evaluate the awareness among dentists and dental laboratories towards the sterilization and disinfection of intraoral scanners.

Methodology- we prepared a close ended questionnaire having 13 questions using "Google Forms" and distributed it among the participants across the country. The data collected was analyzed by using SPSS (statistical package for social services) version 21.0 software.

Result- out of 620, total of 86 responses were received. Nearly 70% of the participants stated that they were aware of the sterilization process of intraoral scanners and stated that they use disposable sleeves along with the scanners. 67% of the participants advice their patients to use mouthwash before the scan. 48.2% of the participants think that using alcohol based disinfectant is sufficient in meeting the minimum basic standards for sterilization.

Conclusion- The risk of cross contamination do exist with the intraoral scanners as they come in contact with the skin, saliva, mucous membrane. Proper sterilization method recommended by the manufacturer must be considered while using these instruments. Single use disposable sleeve must be used wherever possible.



Introduction- The use of intraoral scanner is increasing every year in various aspects of dentistry that involves diagnosis of oral conditions like tooth wear, dental caries, plaque etc.¹

Centre for disease control (CDC) suggest that these intraoral scanners should be considered as semi-critical complex instruments as they come in direct contact with the skin, mucous membrane.²

As the use of these instruments is increasing progressively, more question arise with correct sterilization procedure. Their design feature is a disadvantage as their nozzle is non removable and does not allow the sterilization by the conventional method. However, some scanner companies are providing the multiuse sleeves that are autoclavable, or single use disposable sleeve can be discarded after use.³

So, a survey was conducted to access the perception of various dental healthcare professionals towards the sterilization and disinfection protocol that they followed while using intraoral scanners.

Method- In this observational study, a close ended questionnaire with 13 questions was formed using GOOGLE FORMS. The link was shared to 620 **people** from all over the country. Among these, 253 were prosthodontists, 8 dental laboratories using intraoral scanners from Indore city and 359 were dentists from other dental specialties. A total of 85 responses were obtained.

Data was collected, then tabulated in excel sheet and analyzed using SPSS (statistical package for social services) version 21.0. Descriptive statistics was performed. The comparison of categorical variables was done using Chi-square test. Value of <0.05 was considered as statistically significant.

Results: The study was conducted on 620 subjects of which only 86 responses were obtained. This might be due to the fact that many of these professionals were not using intraoral scanners and still use only conventional impression technique for impression making.

Among the study participants, 80 (93.0%) reported that they use IOS in their clinical practice. Most of the participants has been using IOS for less than 5 years

(83.5%). Majority of the participants (74.1%) scan less than 5 patients per day. It is expected that as more people become aware of the advantages for these digital IOS over conventional impression, more number of dental healthcare professionals will start using it in coming years.

On assessing the awareness about the sterilization and disinfection protocol for IOS, 71.8% of the participants seem to be aware, while 9.4% reported to be unaware and remaining 18.8% of the participants were unsure about the sterilization method for the IOS.

On asking the method used for sterilization and disinfection of IOS, a wide majority (71.8%) of the participants responded that they only wipe the scanner tip with alcohol based disinfectants while only 20.3 % stated that they use both heat sterilization and alcohol based disinfectant. Few participants recommend not to use the alcohol based disinfectant frequently as it may damage the glass. This recommendation contradicts the statement by Jain V et al (2023)⁴ who stated that alcohol based disinfectant prevents the mirror damage. 63.5 % of the participants reported to follow the instructions given in the user manual for sterilization. Among all the participants, around 67% advice their patients to use mouthwash prior to the scan while remaining do not consider it necessary. Around 57.6% of the participants also advice their patients to use mouthwash after the scan. Of all the responses, around 71.8% stated that they are aware about the sterilization and disinfection protocol mentioned in the user manual, while 28.2% reported to be unaware of the method mentioned in their user manual.

Almost half of the participants think that using alcohol based disinfectant is adequate enough to meet the minimum basic standards for sterilization (48.2%). While the 51.8% do think that using alcohol based disinfectant is not adequate enough to meet the basic minimum standards of sterilization. Around 70.6% of the participants use disposable tips with their scanners. Almost 31.8% of the participants stated that using disposable sleeve might affect the quality of the scan and around 31.8% think that using these disposable sleeve may not affect the quality of the scan. Remaining participants were not sure about the effects of disposable sleeves on the quality of the scan.

**Table 1. Distribution of study subjects based on response to various questions.**

| Question | Response | Number of subjects | Percentage |
|--|--|--------------------|------------|
| Do you use intra-oral scanner? | Yes | 80 | 93.0% |
| | No | 6 | 7.0% |
| Since when you are using intraoral scanner? | Less than 5 years | 71 | 83.5 |
| | More than 5 years | 9 | 10.6 |
| | Don't use scanner | 5 | 5.9 |
| On how many patients you use scanners in a day? | Less than 5 | 63 | 74.1 |
| | 5-10 | 10 | 11.8 |
| | More than 10 | 7 | 8.2 |
| | Do not use scanner | 5 | 5.9 |
| Are you aware about the sterilization protocol for intraoral scanners? | Yes | 61 | 71.8 |
| | No | 24 | 28.2 |
| Which method you use for sterilization of intraoral scanner? | Wiping the tip with alcohol-based disinfectant | 60 | 70.6 |
| | Heat sterilization | 0 | 0.0 |
| | Both A and B | 20 | 23.5 |
| | Do not use scanner | 5 | 5.9 |
| How frequently you subject your scanner tip to heat sterilization? | As stated in the user manual | 54 | 63.5 |
| | Using other method | 26 | 30.6 |
| | Do not use scanner | 5 | 5.9 |
| Do you advice your patient to use mouthwash before using intraoral scanner? | Yes | 57 | 67.1 |
| | No | 23 | 27.1 |
| | Do not use scanner | 5 | 5.9 |
| Do you advice your patient to use mouthwash after using intraoral scanner? | Yes | 49 | 57.6 |
| | No | 31 | 36.5 |
| | Do not use scanner | 5 | 5.9 |
| Are you aware about the sterilization method of intraoral scanners mentioned in the user manual? | Yes | 61 | 71.8 |
| | No | 19 | 22.4 |
| | Do not use scanner | 5 | 5.9 |
| | Yes | 64 | 75.3 |



| | | | |
|--|--------------------|----|------|
| Do you think that the steam sterilization will affect the quality of your scan? | No | 21 | 24.7 |
| Do you think that using alcohol-based disinfectant is adequate enough to meet the basic minimum standards for sterilization? | Yes | 41 | 48.2 |
| | No | 44 | 51.8 |
| Have you used disposable sleeves with intraoral scanners? | Yes | 60 | 70.6 |
| | No | 20 | 23.5 |
| | Do not use scanner | 5 | 5.9 |
| Do you think that using disposable sleeves may affect the quality of the scan? | Yes | 27 | 31.8 |
| | May be | 30 | 35.3 |
| | No | 28 | 32.9 |

Figure 1. Distribution of study participants based on response to the question “Do you use intra-oral scanner?”

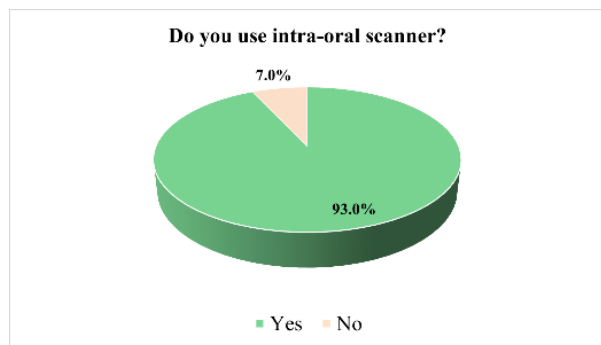


Figure 2. Distribution of study participants based on response to the question “Since when you are using intraoral scanner?”

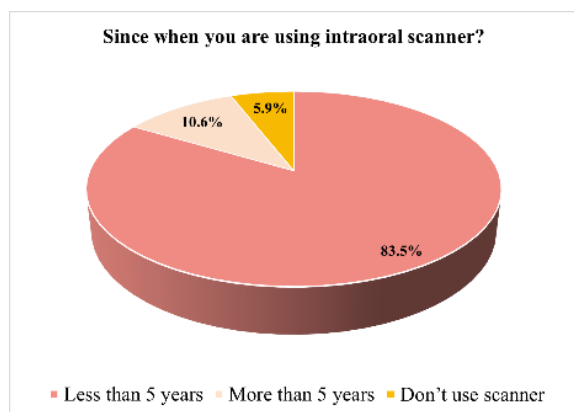


Figure 3. Distribution of study participants based on response to the question “Since when you are using intraoral scanner?”

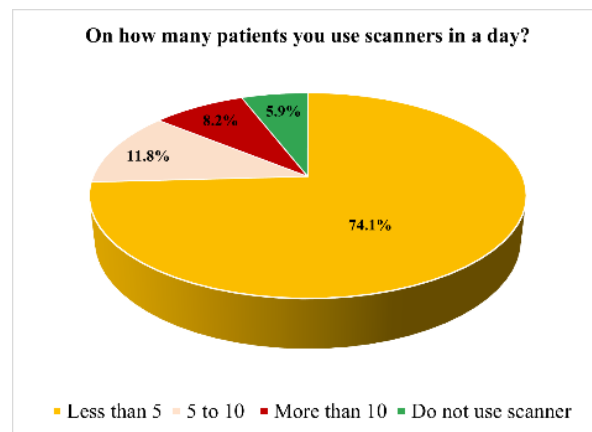


Figure 4. Distribution of study participants based on response to the question “Are you aware about the sterilization protocol for intraoral scanners?”

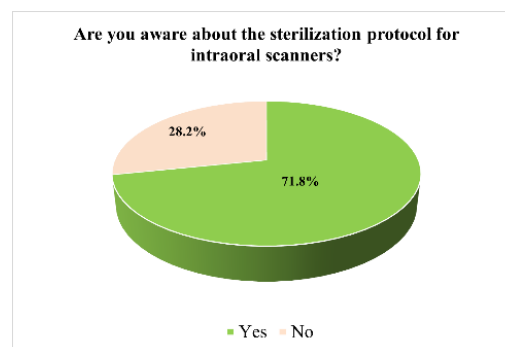




Figure 5. Distribution of study participants based on response to the question “Which method you use for sterilization of intraoral scanner?”

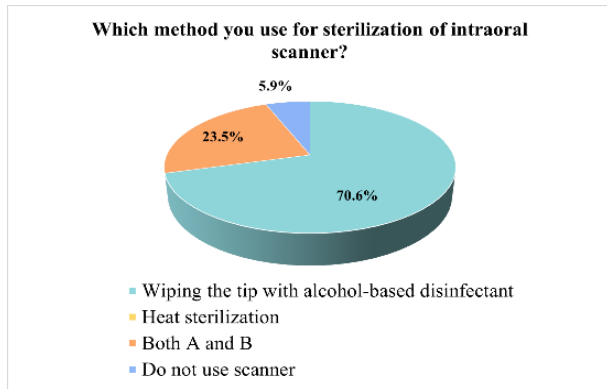


Figure 6. Distribution of study participants based on response to the question “How frequently you subject your scanner tip to heat sterilization?”

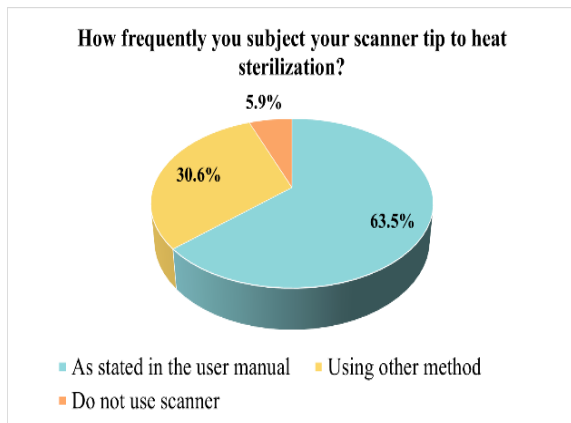


Figure 7. Distribution of study participants based on response to the question “Do you advise your patient to use mouthwash before using intraoral scanner?”

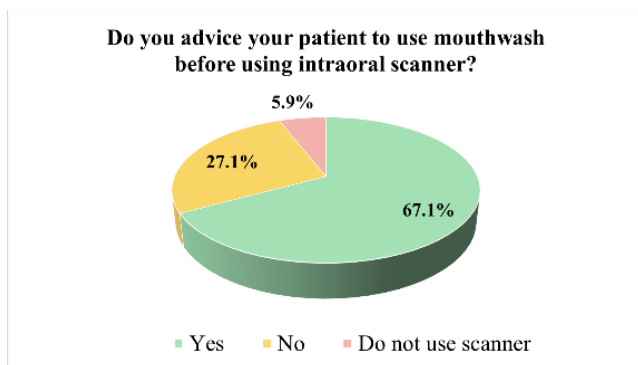


Figure 8. Distribution of study participants based on response to the question “Do you advise your patient to use mouthwash after using intraoral scanner?”

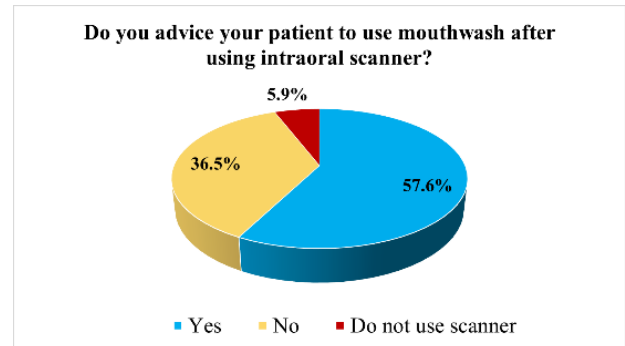


Figure 9. Distribution of study participants based on response to the question “Are you aware about the sterilization method of intraoral scanners mentioned in the user manual?”

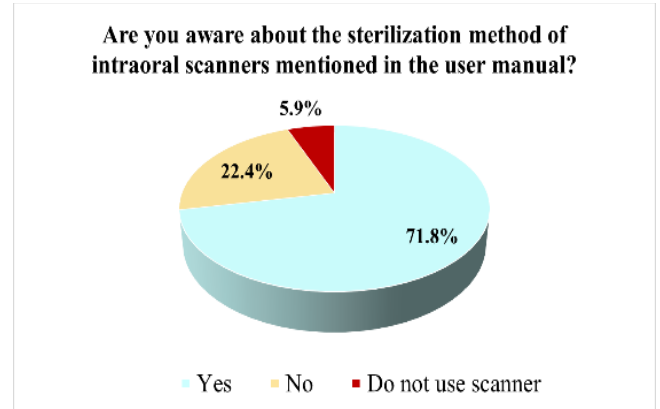


Figure 10. Distribution of study participants based on response to the question “Do you think that the steam sterilization will affect the quality of your scan?”

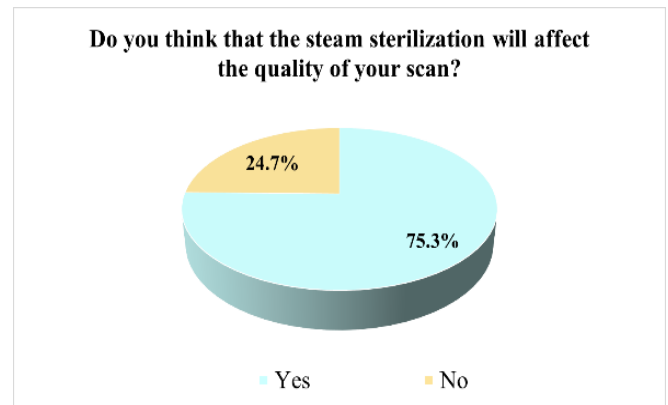




Figure 11. Distribution of study participants based on response to the question “Do you think that using alcohol-based disinfectant is adequate enough to meet the basic minimum standards for sterilization?”

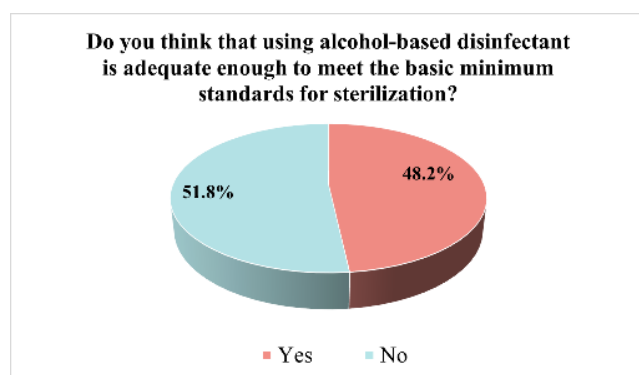


Figure 12. Distribution of study participants based on response to the question “Have you used disposable sleeves with intraoral scanners?”

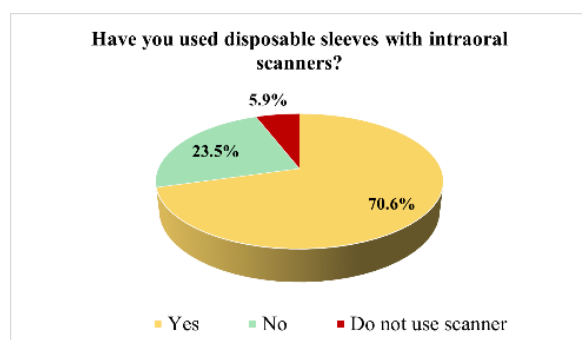
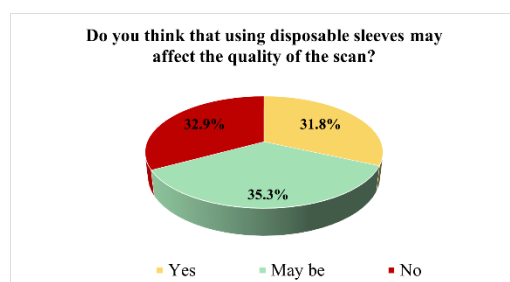


Figure 13. Distribution of study participants based on response to the question “Do you think that using disposable sleeves may affect the quality of the scan?”



Discussion: the goal of this survey was to evaluate the perception of various dental professionals towards the sterilization and disinfection of digital intraoral scanners.

Intraoral scanners are among the most widely used digital intraoral instruments and their use is expected to increase in the next decade. Alvarez S et al² stated that these intraoral scanners come under the category of semi critical complex instruments and it is difficult to sterilize them with the conventional method. Perea Perez et al (2015)⁵ had reported two cases in the dental clinics with viral disease transmission (hepatitis B and C) having serious complications. It was thus determined that dental procedures should have a check for cleaning, sterilization and disinfection of the clinical instruments. This is considered as among one of the eleven basic procedures for safety in dental procedures.

Several authors in the past had emphasized on using clear and well established protocols to inform and train persons in charge. This ensures their proficiency and awareness in preventing the misconception among staff. Since intraoral scanners require contact with skin, mucus membrane, teeth, oral fluids and other biological materials, it becomes necessary that we continue safety measures for patients in clinics.

In our study, survey questionnaire was sent to 620 participants. We received only 85 responses. Few of them stated that they use conventional impression technique. Various studies in the past have demonstrated that these conventional impressions are equal or superior to digital impressions when considering trans arch scanning is considered (Chuang et al 2022)⁶ also the distance and angulation errors associated with digital impressions are too large when we fabricate restorations for partially edentulous arches (Alsharbaty et al 2018).⁷

The results of our survey disclosed that 71.8% of the participants were aware of the sterilization protocol followed for IOS. Majority of the participants use alcohol based disinfectant and state it is adequate enough to meet the minimum basic standards of infection control. Around 3/4 th of the dental professionals are aware about the sterilization protocol mentioned in the user manual. Around 2/3rd of the participants advice their patients to gargle with mouthwash prior to digital impression as they think it may help in reducing the risk of cross contamination. 1/3rd of the participants also advice their patients to use mouthwash after scan. These responses are in accordance with the Hunter A et al (2014)⁸ who in his study on PSP plates, stated that using pre- procedural mouthrinse helps in reducing the bacteria on Photo-



stimulable phosphor plates. Study by Riberio et al(2015)⁹ stated that disinfection of semi-critical products with alcohol 70% or in approximate concentration cannot be recommended to all healthcare products in unrestricted way. About 75% of the participants think that using heat sterilization may affect the quality of the scan. However, there was not much difference in the number of participants who think that using alcohol based disinfectant is sufficient enough to meet the minimum basic standards for disinfection to those who don't think the same. This may be attributed to the fact that majority of the participants use disposable sleeves/tip. This response is in accordance to the finding of Struther M et al (2023)³ who stated that these single use sleeves should be recommended as it helps in infection control to a significant portion.

Conclusion: Intraoral scanners have now become the integral part of modern day dental practice. It has improved patient satisfaction, has reduced chair side time, frequent remakes and has overcome the drawbacks of conventional impression technique.¹ Its use has increased since Covid-19 and will continue to increase. We carried out this study to gauge the perception of dental professionals towards sterilization and disinfection protocol for IOS. From this study we find that majority of the participants were aware about the sterilization process mentioned in the user manual. Most of the participants advice their patients to use mouthwash prior to the scan. They use to wipe the scanner tip with alcohol based disinfectant since they use disposable sleeves and or tip available with their scanner company. However, we lack clinical data mentioning as to which extent these disposable sleeves are effective in reducing the risk of cross contamination.

From study, it was suggested that:

1. We should use single use disposable sleeves as wiping the tip with just alcohol based disinfectant may not be sufficient
2. If required, dry heat should be preferred over autoclaving as it may damage the glass of IOS.
3. Wiping the tip frequently with alcohol based disinfectant may cause scratches in the glass affecting the scan

We require more awareness and application in the daily use about the sterilization and disinfection protocol along with the maintenance.

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