

ASSESSMENT OF THE KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING STERILIZATION AND DISINFECTION OF IMPRESSION TRAYS AMONG UNDERGRADUATES, INTERNS, POSTGRADUATES: A QUESTIONNAIRE-BASED STUDY

Dentistry

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ABSTRACT

Conventional impression techniques are the primary method taught for taking impressions in most dental institutes. Although digital impression techniques have emerged, their adoption in countries like India remains limited due to the high cost of equipment and socioeconomic factors. As a result, conventional impressions continue to be widely used. However, these impressions can harbor microbes and pose a significant risk of infection. Therefore, it is essential to adhere to proper sterilization protocols to disinfect impression trays before reuse. Various studies indicate a significant lack of awareness among students in various dental institutes. This study aims to address this knowledge gap in undergraduates, interns, and postgraduates on sterilization and disinfection practices for impression trays, while also establishing a scientific basis for these protocols.

KEYWORDS

sterilization, impression, disinfection, infection

INTRODUCTION –

In today's era, digital impressions have become a significant method for making dental impressions¹. However, in a country like India, several factors such as the high cost of hardware, expensive training programs, and the socioeconomic background of the population have hindered the widespread adoption of digital impressions. As a result, conventional impression techniques are still primarily taught as the basic method in most dental institutions. This, however, exposes students to potential contamination from patients' saliva². To mitigate this risk, it is crucial to follow proper sterilization protocols to disinfect impression trays before reusing them. Therefore, dental institutions must educate students on the various sterilization methods for impression trays to ensure safe and effective practice.

Dental professionals take impressions daily, which exposes them to blood, saliva, and other potentially infectious materials. On an average, 1 ml of saliva contains around 750 million microbes³. This puts dental professionals at a higher risk of contacting infectious diseases such as AIDS, herpes, hepatitis, and tuberculosis⁴. Additionally, the risk of cross-contamination is increased if proper sterilization protocols for impression trays are not followed.

Various authoritative organizations^{5,6}, manufacturers⁷, academic researchers^{8,9}, and textbooks on dental materials¹⁰⁻¹⁴ consistently propose diverse guidelines for sterilization and disinfection procedures.

Impression trays are considered semi-critical items. According to CDC guidelines⁵, if impression trays are sterilized without being wrapped, they should be used immediately. The ADA guidelines⁶ recommend that when instruments need to be stored after sterilization, they should be wrapped in materials such as muslin, clear pouches, or paper, following the manufacturer's specifications.

Studies have shown that perforated impression trays harbour higher levels of microbial flora compared to other types of trays. Despite this, perforated trays are still commonly used for alginate impressions due to their better retentive properties. Non-disposable plastic impression trays are also considered potential sources of infection^{15,16}. Therefore, disposable impression trays and autoclavable metal trays are considered superior for infection control.

It is the responsibility of the dental professionals making impressions, to strictly adhere to proper sterilization and disinfection protocols. Failure to follow these protocols increases the risk of infection for both dental professionals and anyone handling the impressions. Several studies have investigated the knowledge of sterilization practices during impression procedures among dental professionals. These studies reveal a notable lack of awareness within these groups. Consequently, this study aims to bridge the knowledge gap regarding the sterilization and disinfection of impression trays among undergraduates, interns, and postgraduates, while also establishing a scientific foundation for sterilization practices related to impression trays.

MATERIALS AND METHODS –

A validated structured questionnaire containing 16 questions was distributed to undergraduates, interns and postgraduates from various dental institutes in Maharashtra. The questionnaire was divided into three sections: Section 1 focused on knowledge-based questions (Figure2), Section 2 covered practice-related questions (Figure3), and Section 3 addressed attitude-related questions (Figure3).

The study had a sample size of 117. A total of 120 responses were obtained which was sufficient according to the calculated sample size (Figure1)

P	Your guess of Population P (any value<1)	0.57
1-a	Confidence level set by you	0.95
Z	Z value associated with confidence	1.96
d	Absolute precision (Value less than P)	0.09
n	Minimum sample size	117

$$n = \left(\left[\frac{Z^2}{d^2} \right] \cdot \frac{P(1-P)}{d^2} \right)$$

Figure 1 - SAMPLE SIZE: Estimation of Population Proportion

The study objectives were clearly explained to the participants, and informed consent was obtained from them. The validated questionnaire was distributed through a Google Form shared via WhatsApp to dental undergraduates, interns, and postgraduates from various dental institutions in Maharashtra.

To evaluate their knowledge, all the three groups were asked various

questions about the sterilization and disinfection of impression trays. Additionally, these groups were surveyed on the practices they follow for sterilizing impression trays. Finally, their attitudes towards sterilization and disinfection protocols were assessed.

Data collection and analysis were done through Microsoft Excel 2017

Knowledge Related Questions –

Q1. Which Type Of Impression Trays Should You Preferably Use To Take Alginate Impression

- Metal perforated trays
- Plastic trays
- Disposable trays
- Custom made trays

Q2. Should Impression Trays Be Washed Before Impression Making Procedure

- Yes
- No

Q3. What Is The Most Practical Method Of Sterilization Of Metal Impression Trays

- Chemical
- Boiling
- Autoclave

Q4. Most Effective Method Of Sterilization Of Metal Impression Trays

- Boiling
- Autoclave
- Chemical

Q5. Which Among These Is A High-level Disinfectant For Impression Trays

- Glutaraldehyde
- Chlorine
- Sodium hypochlorite
- Iodophors

Q6. Uv Chamber Works As AFor Impression Trays

- Sterilizer
- Disinfectant

Q7. Can Custom Made Acrylic Impression Trays Be Autoclaved

- Yes
- No

Q8. What Is The Most Common Method To Check The Sterilization Efficiency Of Autoclave

- Biological
- Chemical
- Physical

Figure 2 – Knowledge related questions

Practice Related Questions –

Pq1. How Often Do You Sterilize Impression Trays During Impression Making Procedure

- Before every patient
- Weekly once
- Monthly once
- Monthly multiple times

Pq2. How Do You Take Impression In Newborn Cleft Patients

- Impression trays
- Finger manipulation using gloves
- None

Pq3. How Do You Proceed With The Sterilization Of The Gloves Which Is Used To Take Impression In Newborn Cleft Patients

- Autoclave
- Using 2 percent Glutaraldehyde solution
- Use pre – sterilized surgical gloves

Pq4. How Do You Disinfect Custom Made Acrylic Impression Trays

- 1:10 sodium hypochlorite
- Autoclave

- Boiling
- None

Pq5. How Do You Sterilize Intraoral Scanner Tips During Digital Impression Making Procedure

- Boiling
- Autoclave
- Wiping with surgical spirit

Pq6. In Case Of Restricted Mouth Opening, How Do You Sterilize Metal Sectional Impression Trays

- Autoclave
- Chemical methods
- Boiling

Attitude Related Questions –

A1. Do You Feel Impression Trays Should Be Sterilized After Every Use

- Yes
- No

A2. Is It Important To Check For Sterilization Efficiency Of Autoclave Monthly Sterilizing Impression Trays

- Yes
- No

Figure 3 – Practise and attitude related questions

Statistical Analysis

Data was collected and compiled on to MS office excel worksheet and was subjected to statistical analysis using an appropriate package like SPSS software version 25 for Windows (SPSS Inc, Chicago, IL). Data normality was checked by using Shapiro-Wilk test. Quantitative data was expressed in mean and standard deviation respectively. Intergroup comparison of parameters between the 3 groups was done using One Way ANOVA Test. Keeping alpha error at 5%, and Beta error at 20%, Power at 80% $p \leq 0.05^*$ was considered statistically significant.

RESULTS

A total of 120 responses were collected via Google Sheets. Knowledge-related questions are presented in Figure 2, while practice and attitude related questions are detailed in Figure 3. Regarding the type of impression trays preferred for alginate impressions, the majority of postgraduates, interns, and undergraduates concurred that metal perforated impression trays are the preferred choice. No statistically significant differences were observed among the three groups (Image 1).

Only a small number of participants across all the three groups agreed that impression trays should not be washed before making impressions, whereas the majority reported washing their impression trays prior to use (Image 2).

The majority of postgraduates ($n=44$) agreed that autoclaving is the most effective method for sterilizing impression trays. A statistically significant difference was observed among the three groups (Image 4).

When asked about the use of high-level disinfectants for impression trays, many postgraduates indicated a preference for sodium hypochlorite. A statistically significant difference was observed among the groups (Image 5).

A significant number of interns ($n=36$) and postgraduates ($n=44$) agreed that UV chamber works as a disinfectant rather than a steriliser for impression trays (Image 6)

Many postgraduates agreed that custom made acrylic impression trays can be sterilised, and the result was statistically significant (Image 7). When questioned about the disinfection of custom-made impression trays, more than half of the postgraduates practised the disinfection using sodium hypochlorite (Image 12).

A larger number of postgraduates, compared to undergraduates and interns, reported wiping the intraoral scanner tips before taking digital impressions, with the result being statistically significant (Image 13). The vast majority of participants across all the three groups agreed that it is important to check the sterilization efficacy of the autoclave on a monthly basis (Image 16).

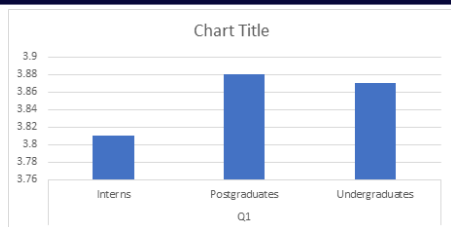


Image 1 – Mean value comparison between undergraduates, interns and postgraduates for Q1. p value-0.66

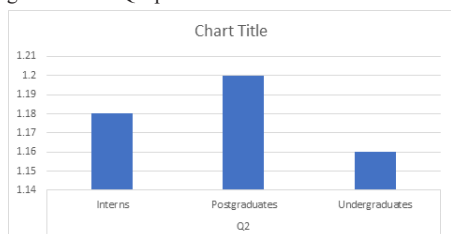


Image 2 – Mean value comparison between undergraduates, interns and postgraduates for Q2. p value-0.93

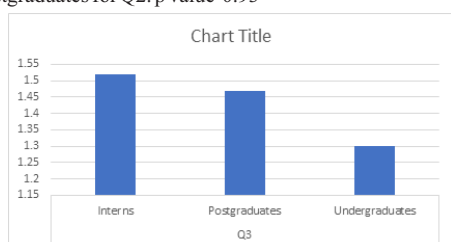


Image 3 – Mean value comparison between undergraduates, interns and postgraduates for Q3. p value-0.36

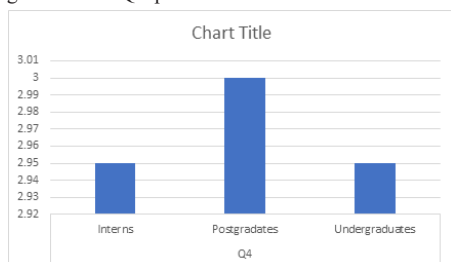


Image 4 – Mean value comparison between undergraduates, interns and postgraduates for Q4. p value-0.65

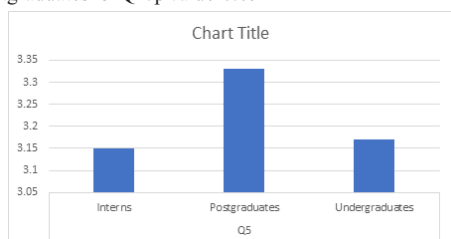


Image 5 – Mean value comparison between undergraduates, interns and postgraduates for Q5. p value-0.04*

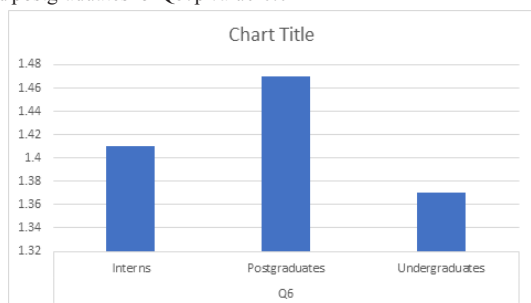


Image 6 – mean value comparison between undergraduates, interns and postgraduates for Q6. p value-0.64

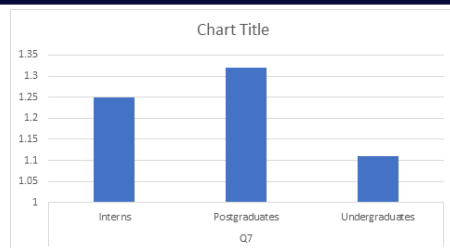


Image 7– mean value comparison between undergraduates, interns and postgraduates for Q7. p value-0.05*

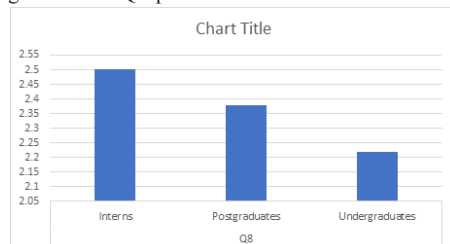


Image 8– Mean value comparison between undergraduates, interns and postgraduates for Q8. p value-0.32

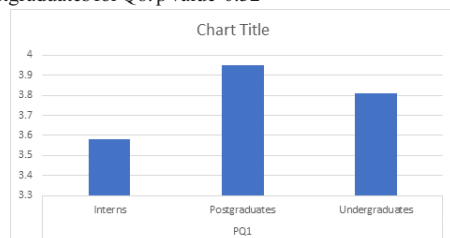


Image 9– mean value comparison between undergraduates, interns and postgraduates for PQ1. p value-0.02*

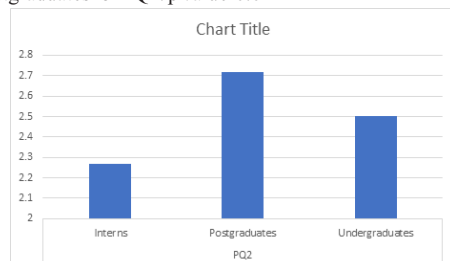


Image 10– mean value comparison between undergraduates, interns and postgraduates for PQ2. p value-0.03*

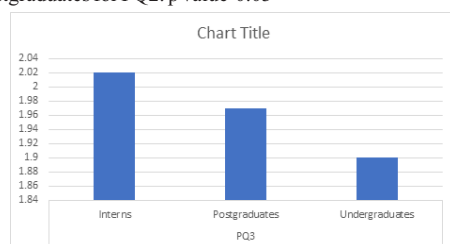


Image 11– mean value comparison between undergraduates, interns and postgraduates for PQ3. p value-0.57

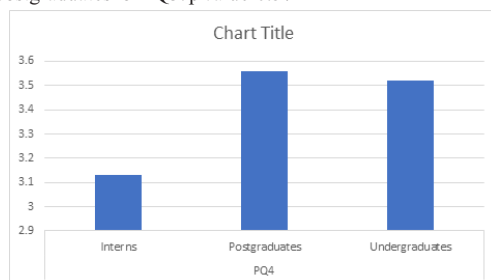


Image 12– mean value comparison between undergraduates, interns and postgraduates for PQ4. p value-0.01*

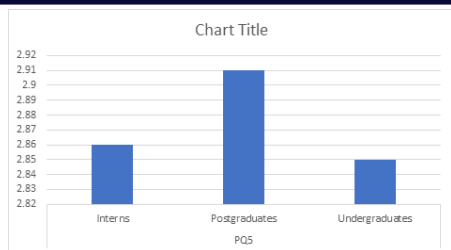


Image 13– mean value comparison between undergraduates, interns and postgraduates for PQ5. p value-0.05*

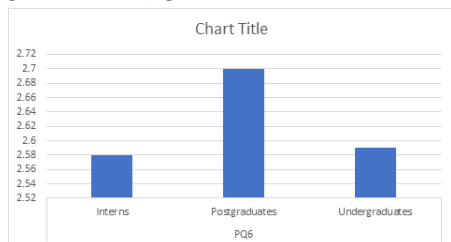


Image 14– mean value comparison between undergraduates, interns and postgraduates for PQ6. p value-0.63

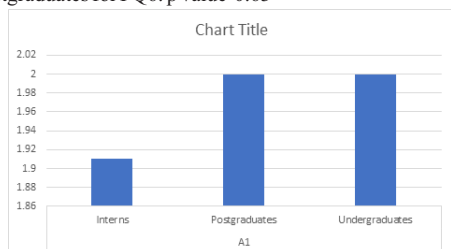


Image 15– mean value comparison between undergraduates, interns and postgraduates for A1. p value-0.02*

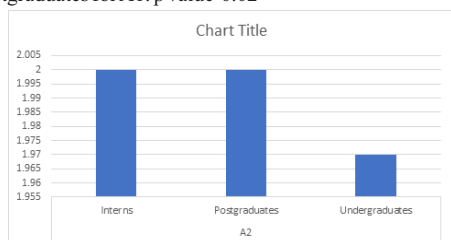


Image 16– mean value comparison between undergraduates, interns and postgraduates for A2. p value-0.42

DISCUSSION

Impression making procedures are a routine part of dental practice, used to record the teeth and surrounding anatomical structures. Impression trays, which are commonly used, are a significant source of infection, as they become contaminated with saliva. Various infections, including Hepatitis B, HIV, and Mycobacterium tuberculosis, can be transmitted from one individual to another^{17,18}. Therefore, it is essential that all materials used in impression procedures, including the impression trays, be thoroughly disinfected and sterilized.

Metallic perforated impression trays are the preferred choice for making alginate impressions due to their ability to securely interlock the alginate within the perforations, resulting in accurate impressions. The present study indicates that undergraduates, interns, and postgraduates recognize the preference for metallic perforated trays for this purpose. A study by Asad et al.¹⁹ found that 66.7% of the study group supported using metallic impression trays to reduce the risk of cross-contamination which is similar to the results of our study.

After the sterilisation of impression trays, they should directly be used to take impression without rinsing with water. A study by Amin et al.²⁰ highlights that washing sterilized impression trays before use can lead to contamination. A study conducted by Rubab Jawed et al.²¹ shows that 50% percent of participants washed impression trays before impression making, while a study conducted by Ukuoghene et al.²²

concluded that 100% of the participants washed their trays. This is an important consideration for professionals involved in making impressions. However, participants in our study demonstrated a lack of awareness on this issue, with the majority of them washing their impression trays before use.

Autoclave is widely regarded as the most effective sterilization method for metallic impression trays²³. It operates at 121°C or higher for 15 to 20 minutes and can also operate at 115°C/10 psi, 121°C/15 psi, and 134°C/30 psi. The efficacy of autoclave sterilization can be verified through biological, chemical and physical methods, with biological indicators being the most common. These indicators typically use spores of *Bacillus stearothermophilus* as a standard marker of sterilization effectiveness²⁴. Majority of the postgraduates in our study responded for autoclave as the most effective method of sterilisation of impression trays. Most of the interns and postgraduates also felt that, it is important to check the sterilisation efficacy of Autoclave on a monthly basis.

Chemical methods are among the most practical approaches for disinfection, with sodium hypochlorite being considered a high-level disinfectant. The contact period of chemicals with trays should be approximately 12-15 minutes for its disinfectant action. Sodium hypochlorite (HOCl) penetrates microbial cells, inhibiting enzyme activity, damage the cell membrane and DNA, and impair membrane transport capacity²⁵. In our study, more than half of the postgraduates were aware of sodium hypochlorite's role as a high-level disinfectant, aligning with findings from a study conducted by Jain et al.²

Ultraviolet (UV) radiation is a type of electromagnetic radiation with wavelengths ranging from 100 to 400 nm, categorized into UVA, UVB, and UVC. Among these, UVC is the most effective one²⁶. UV chambers works as a disinfectant for impression trays, as UV rays effectively eliminate microbes without the use of chemicals or heat. Many interns and postgraduates in our study are well aware about the disinfectant role of UV chamber.

Intraoral scanner tips are utilized for recording digital impressions, which helps to reduce chairside time of making conventional impression¹. Digital impressions provide a high degree of accuracy in impression-making techniques and allows a seamless transfer of images from the dental clinic to the dental laboratory for evaluation^{27,28}. In our study, majority of the postgraduates demonstrated awareness of the importance of disinfecting intraoral scanner tips by wiping with the surgical spirit.

To assess the attitudes of dental students, they were asked whether impression trays should be sterilized after each patient. Almost everyone responded affirmatively, emphasizing the importance of sterilizing impression trays after each patient.

CONCLUSIONS

This study reveals that the knowledge, practices, and attitudes of dental undergraduates and interns regarding the sterilization and disinfection of impression trays are inadequate when compared to postgraduates. This inadequacy increases the risk of disease transmission and cross-infection. Therefore, there is an urgent need to raise awareness among dental professionals about sterilization and disinfection protocols. Educating them on the importance of adhering to these protocols is crucial to minimize the risk of disease spread and ensuring patient and practitioner safety.

This study provides valuable insights into the knowledge and practices about the sterilisation and disinfection of impression trays among undergraduates, interns and postgraduates in their daily dental practices. However, its scope was confined to the state of Maharashtra, and the sample size was limited. Consequently, more extensive studies involving diverse regions and larger sample size seems necessary to gain a comprehensive understanding regarding the practise of sterilisation and disinfection protocols.

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