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## AN ASSESSMENT OF KNOWLEDGE AND AWARENESS OF DENTAL STUDENTS TOWARDS INFECTION CONTROL, WITH A SPECIAL EMPHASIS ON PROSTHODONTICS AFTER COVID 19 PANDEMIC

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### ABSTRACT:

**Background and objectives:** Covid-19 pandemic has caused an unprecedented human and health crisis worldwide. It remained a main concern for the dental professionals. Dental practitioners began to seriously worry about the infection and cross-infection control after its rapid and extensive spread. The study was planned to assess dental students' knowledge and awareness towards infection control after COVID-19 pandemic and related prosthodontic infection management practices.

**Materials and methods:** A questionnaire-based study was planned and conducted among 380 dental students in the Post graduate Department of Prosthodontics and Crown & Bridge, Indira Gandhi Govt. Dental College Jammu. The current interim guidance and information for general and dental healthcare practitioners was provided by World Health Organization(WHO) and the US Centers for Disease Prevention and Control(CDC) for infection prevention in COVID-19 and this information served as the foundation for the questionnaire's design. A total of 380 respondents answered a questionnaire about the awareness, knowledge and infection control practices related to COVID-19 infection in dental clinics. To collect the data, a reasonable sampling strategy was used. The distribution of responses was shown using tables, bar graphs, and pie charts. For individual comparisons, the Chi-Square test was employed to ascertain the percentage of suitable answers.

**Results:** A total of 380 students, both graduate students and post-graduate students answered the questionnaire. The implementation of different infection control measures was good to excellent. Standard protocol/infection control measures like Personal protection equipment, hand hygiene, disposal of sharps and waste, sterilization and disinfection were known to about 92.9% (n=353) students as 95.3% students responded that they are very well taught about sterilization and disinfection as an integral part of their curriculum. Overall satisfactory self-assessment and satisfactory performance towards infection control policy was found.

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**Conclusion:**Regular training sessions, webinars, and educational initiatives about infection control in prosthodontic treatments are crucial. Throughout the student's learning period, the measures should be reinforced at each stage to help them become a routine. By following these measures, the spread of other infectious diseases such as the common cold, other viruses, and any future mutations of Covid-19 might be considerably reduced.

**Key Words:** Awareness, Infection control, Practice, Sterilization, Knowledge, COVID 19.

## **INTRODUCTION**

Human oral cavity is a potent environment for the transmission, inoculation, and growth of various infectious and harmful microorganisms. Blood and saliva are the common routes for transmission of such microbial agents in the dental operatory<sup>1</sup>. Transmission can be through direct contact with blood, saliva, and other secretions or indirect contact with contaminated instruments, equipment, and environmental surfaces or contact with airborne contaminants<sup>2</sup>. Thus, dental professionals are at continuous risk of infections caused by various microorganisms such as Mycobacterium tuberculosis, hepatitis B and hepatitis C viruses, staphylococci, streptococci, herpes simplex virus types 1, human immunodeficiency virus (HIV), mumps, influenza, rubella and virus like COVID-19 and its variant. Dentists are often exposed to patient's blood and blood-contaminated saliva during dental procedures, so there are increased chances of transmission of infections by various microorganisms between the members of dental team and the patients as well. Therefore, it is recommended that the importance of infection control should be explained meticulously to students in their early years in dental education and thus necessitates the implementation of infection control measures as an integral part in dental clinical practice. The use of effective infection control procedures and standard precautions in the clinical and laboratory setup will prevent the spread of infection to all dental health care professionals including staff and patients. For this purpose the Centre for Disease Control and Prevention (CDC) and American Dental Association (ADA) had also issued precautions and guidelines time to time<sup>2</sup>. It is the duty of every dental student to understand and implement these guidelines thoroughly while working on patient or doing any lab procedure. Dental education can play an important role in the training of dental students helping them to adopt adequate knowledge and awareness related to infection control measures. A questionnaire-based study was planned to evaluate knowledge and awareness among dental students to prevent various diseases with special emphasis on Prosthodontics related work.

## **MATERIALS AND METHODOLOGY**

The present epidemiological study was conducted in the Postgraduate Department of Prosthodontics and Crown & Bridge, using a self-structured questionnaire survey. The sample comprised of 377 dental students on the basis of Prevalence 57% with margin error of 5% and Type 1 error ( $\alpha$ ) is 0.05 and Type 2 error ( $\beta$ ) is 0.2 by using OpenEpi. The questionnaire form was circulated among dental students of different professionals to assess their knowledge and awareness. Consent was obtained by all participants in this study. Convenient sampling method was used for data collection, and the distribution of responses was presented as frequency and percentages. The survey was kept open for about 3 months and the responses were collected at the same time.

The questionnaire comprised of 25 close ended questions and were based on general knowledge and awareness regarding infection control and safety measures. An Institutional Ethical committee approved the study and the statistical analysis by using IBM SPSS statistics as frequency and percentage and diagrams have been constructed with the help of Microsoft excel software.

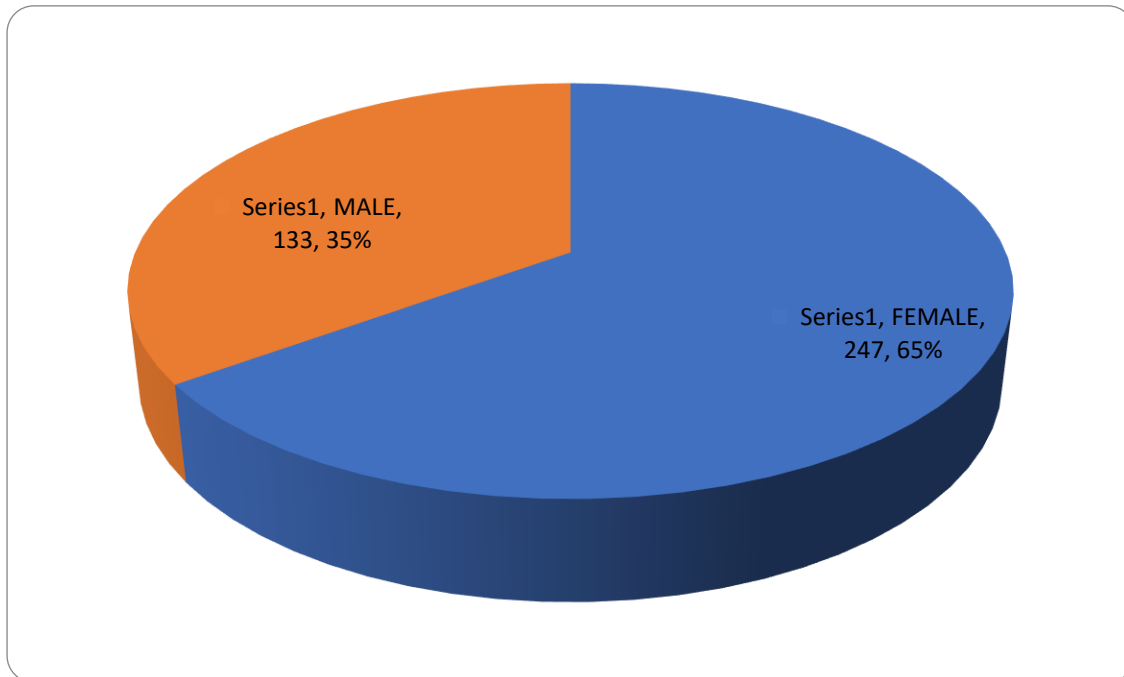
## **RESULTS**

The form was distributed to all participants, response rate was 100 %. Mean age recorded was 25.76+<sub>3.11</sub>. Out of 380 subjects, 35% (n=133) were males and 65% (247) females. Standard protocol/infection control measures like Personal protection equipment, hand hygiene, disposal of sharps and waste, sterilization and disinfection were known to about 92.9% (n=353) students as 95.3% students responded that they are very well taught about sterilization and disinfection as an integral part of their curriculum. Most of the participants are aware about COVID-19, its symptoms, mode of its transmission about 96.6% and most of them (76%) update themselves regarding infection control regularly after COVID 19 pandemic. BDS professionals and Post-graduate students do know about the WHO and CDC guidelines, but the result shows a difference of 18.7% students who don't know the guidelines. The BDS professionals around (47.6%) are still using in-office appointments as the major source of managing patient appointments while about (51.6%) students are

more prone to tele- dentistry and web-based appointments for managing the patients. If we talk about Biosafety levels guidelines for dental clinical practice most students (77%) are very well verse with it. Students are very well aware (97.6%) of the diseases like Hepatitis, HIV AID, TB and COVID-19 along with their rate of transmission via saliva. Routine screening of the participants was done and (83.6%, n=318) participants were vaccinated for hepatitis-B, TB, COVID 19 and tetanus. Most students in the Prosthodontic clinic are concerned about infection management, as seen by their attitudes toward protective barriers such as gloves, face masks, eye wear, head caps, and gowns. More than 90% of the dental students in this study reported frequently washing their hands both before and after wearing gloves and in case of accidental contact with blood, saliva and contaminated items as well (96.8%). Pre-procedural mouth rinses like simple water, chlorhexidine gluconate solution and povidone-iodine solution (95%) has been used by majority of students. Majority of respondents (94.2%) informed that they rinse the impression under running water immediately after being removed from patient's mouth and disinfect the impression (92%). About (97%) students responded that disinfection procedure like cleaning and disinfection of removable prosthesis or fixed prosthesis is very important. Infection control at laboratory area in Prosthodontic clinic and dental chair as is important and students are very well aware of this. Approximately 97% of students demonstrated a high level of awareness regarding biomedical waste management.

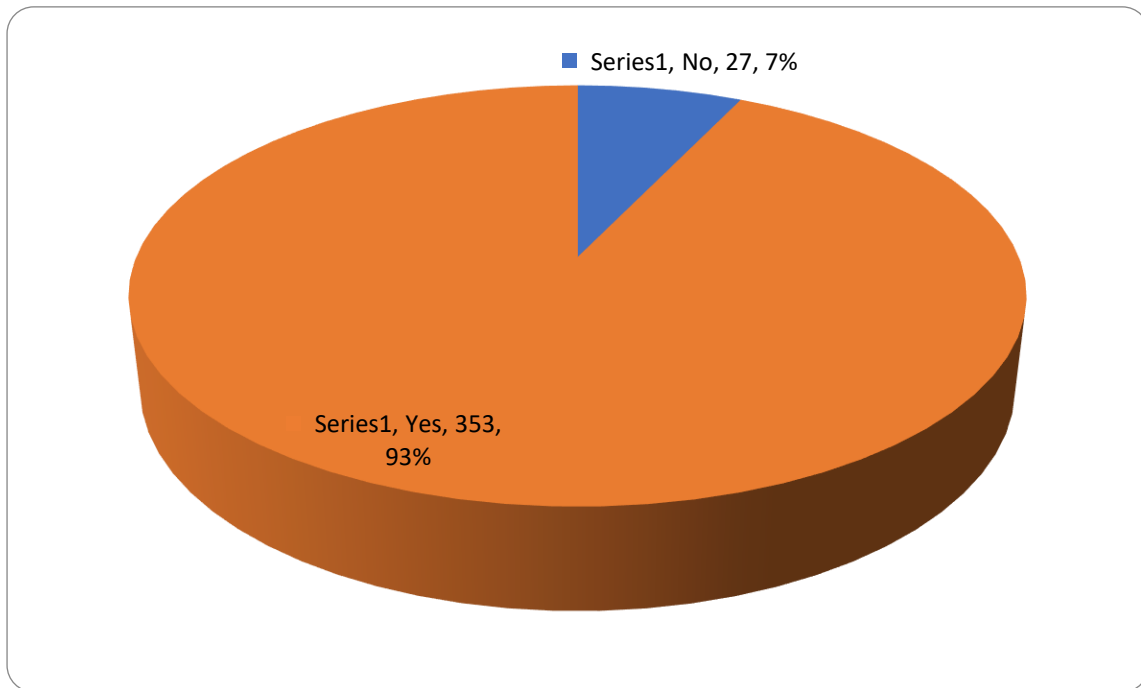
Distribution of subjects studied.		
Gender	Frequency	Percent
FEMALE	247	65.0

MALE	133	35.0
Total	380	100.0
Mean age =25.76±3.11, minimum age =20 and maximum age =35		

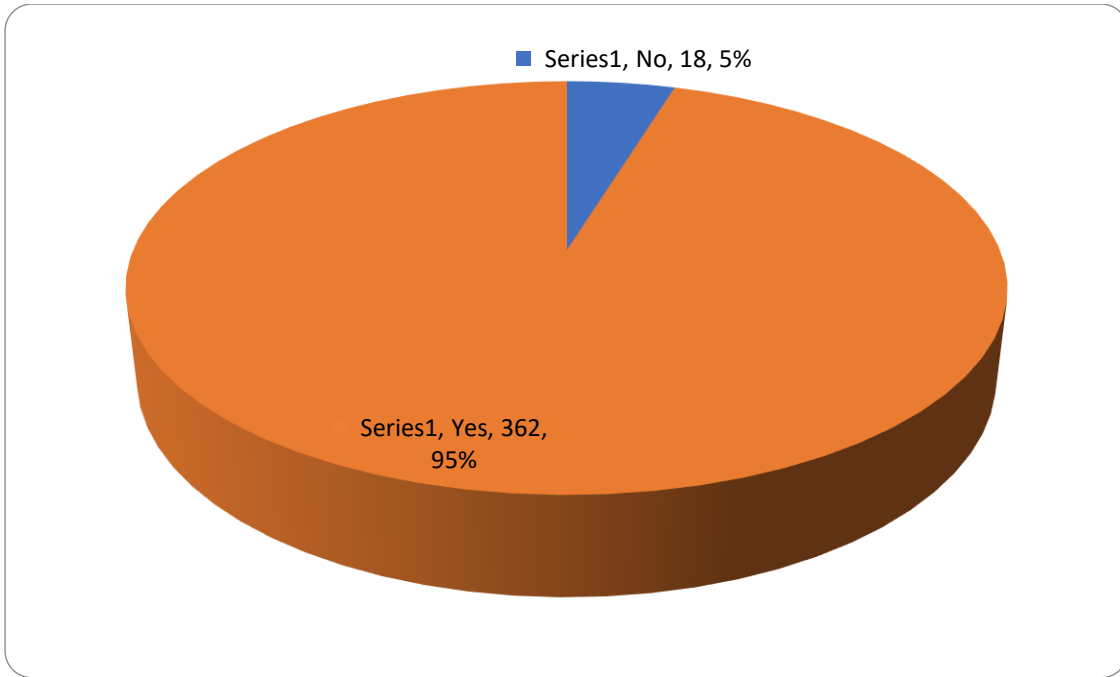


Q1 Do you know about any standard protocol/infection control measures like Personal protection equipment, hand hygiene , disposal of sharps and waste, sterilization and disinfection?

Options	Frequency	Percent
No	27	7.1
Yes	353	92.9
Total	380	100.0

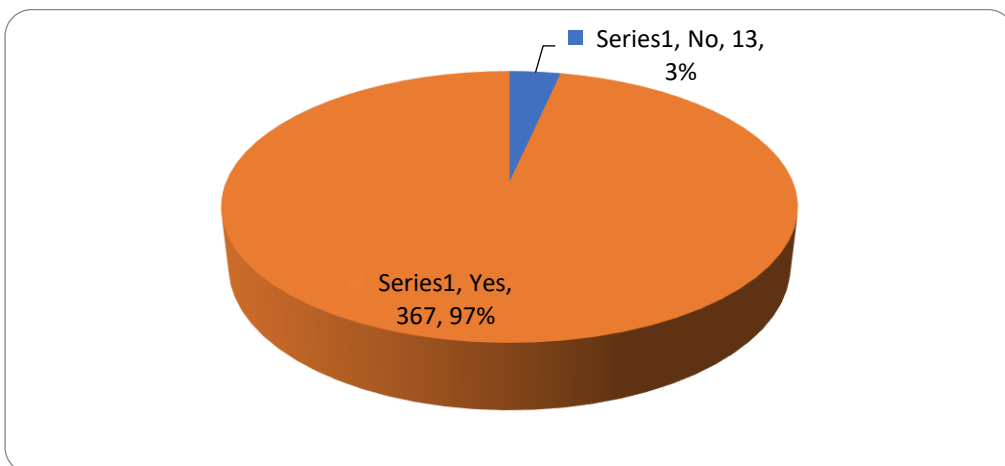


Q2. Have you been taught about sterilization and disinfection in your curriculum?		
Options	Frequency	Percent
No	18	4.7
Yes	362	95.3
Total	380	100.0

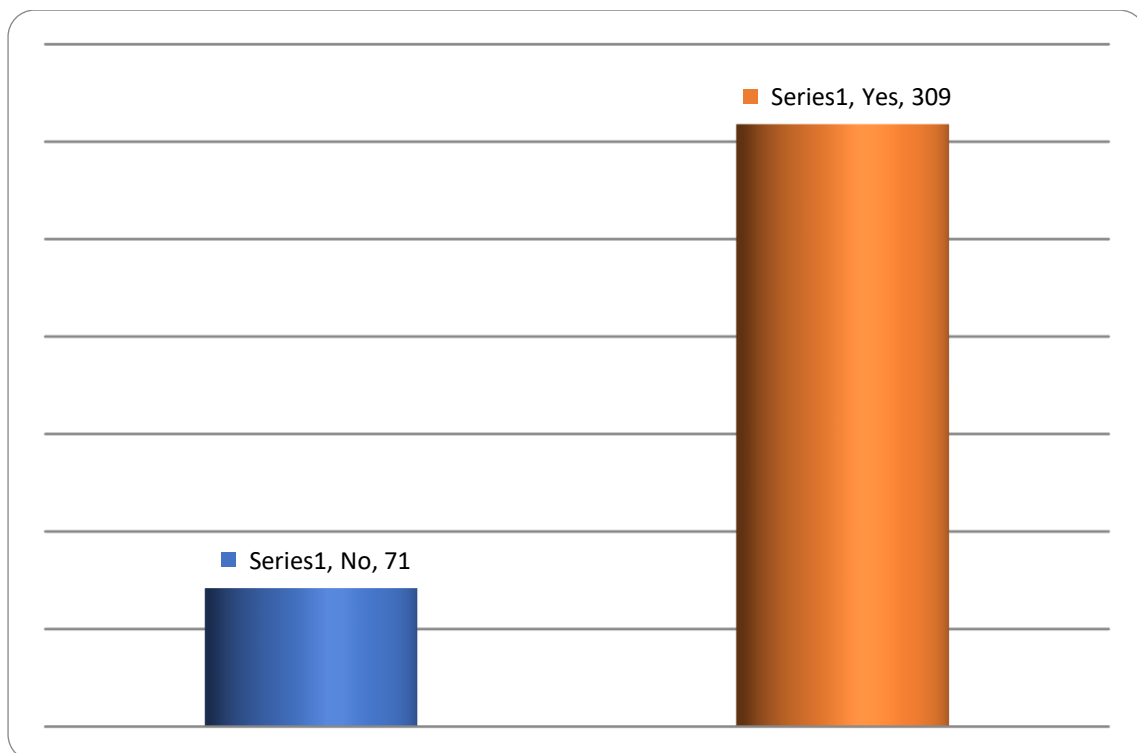


Q3. Do you know about COVID 19 and its mode of transmission?

Options	Frequency	Percent
No	13	3.4
Yes	367	96.6
Total	380	100.0



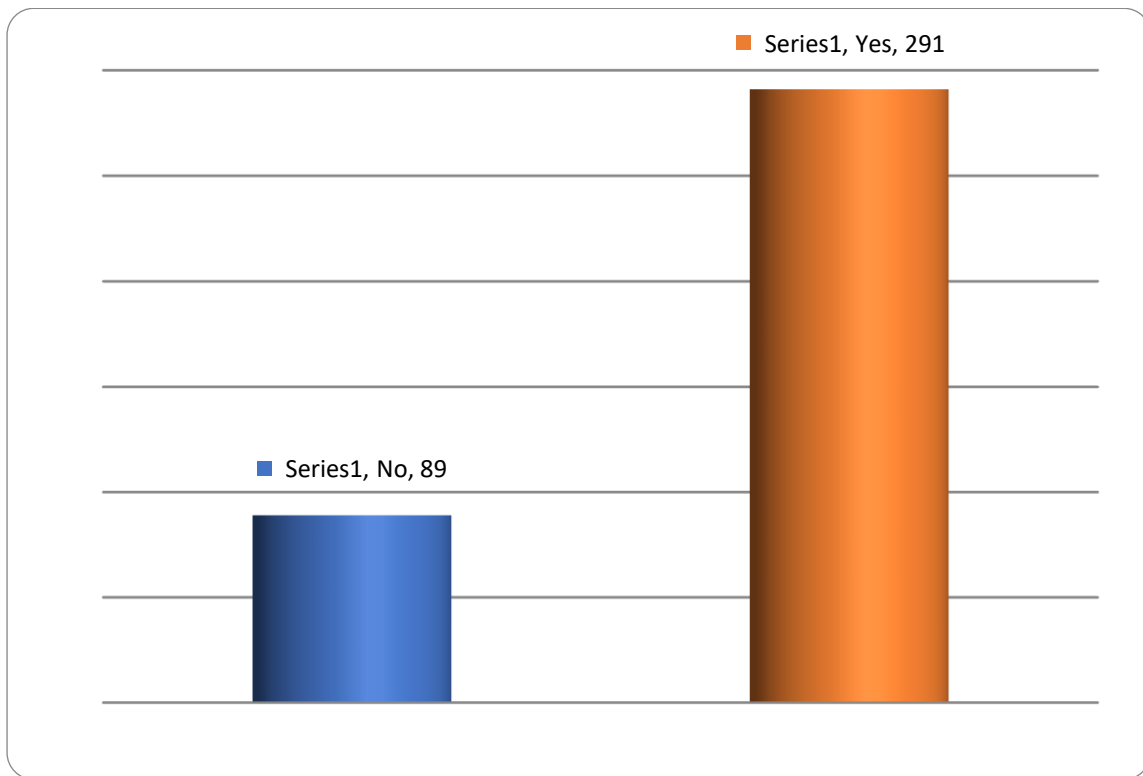
Q4. Are you aware of current CDC or WHO guidelines for cross infection regarding COVID 19?		
Options	Frequency	Percent
No	71	18.7
Yes	309	81.3
Total	380	100.0





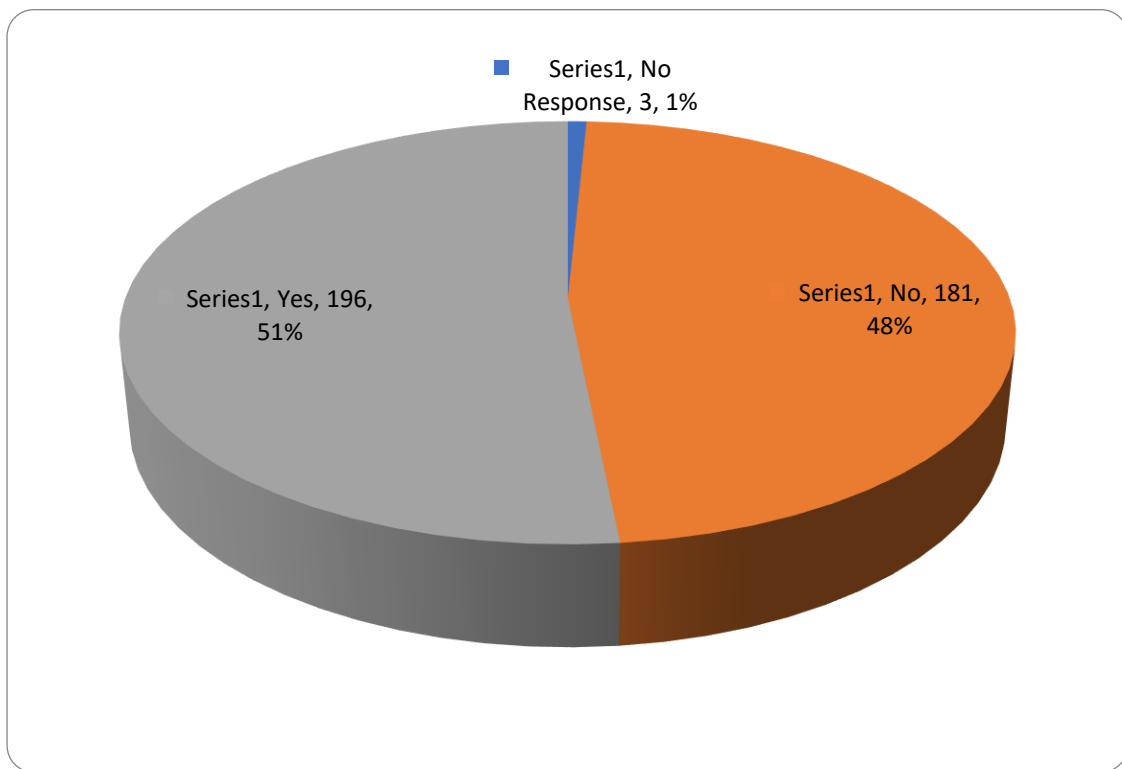
Q5. Do you update yourself regarding infection control regularly after COVID 19 pandemic?

Options	Frequency	Percent
No	89	23.4
Yes	291	76.6
Total	380	100.0



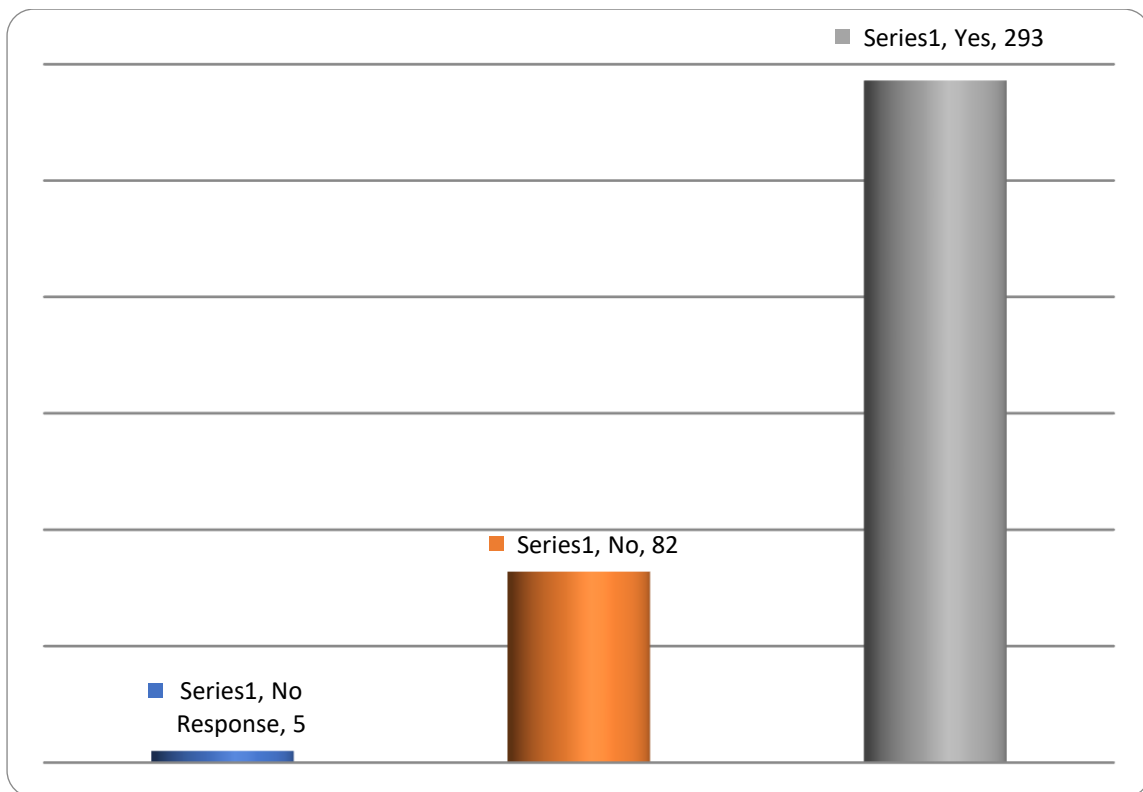
Q6. Did you practice/ knew about Teledentistry prior to/after COVID 19

pandemic?		
Options	Frequency	Percent
No Response	3	0.8
No	181	47.6
Yes	196	51.6
Total	380	100.0



Q7. Are you aware of Biosafety levels guidelines for dental clinical practice?		
Options	Frequency	Percent

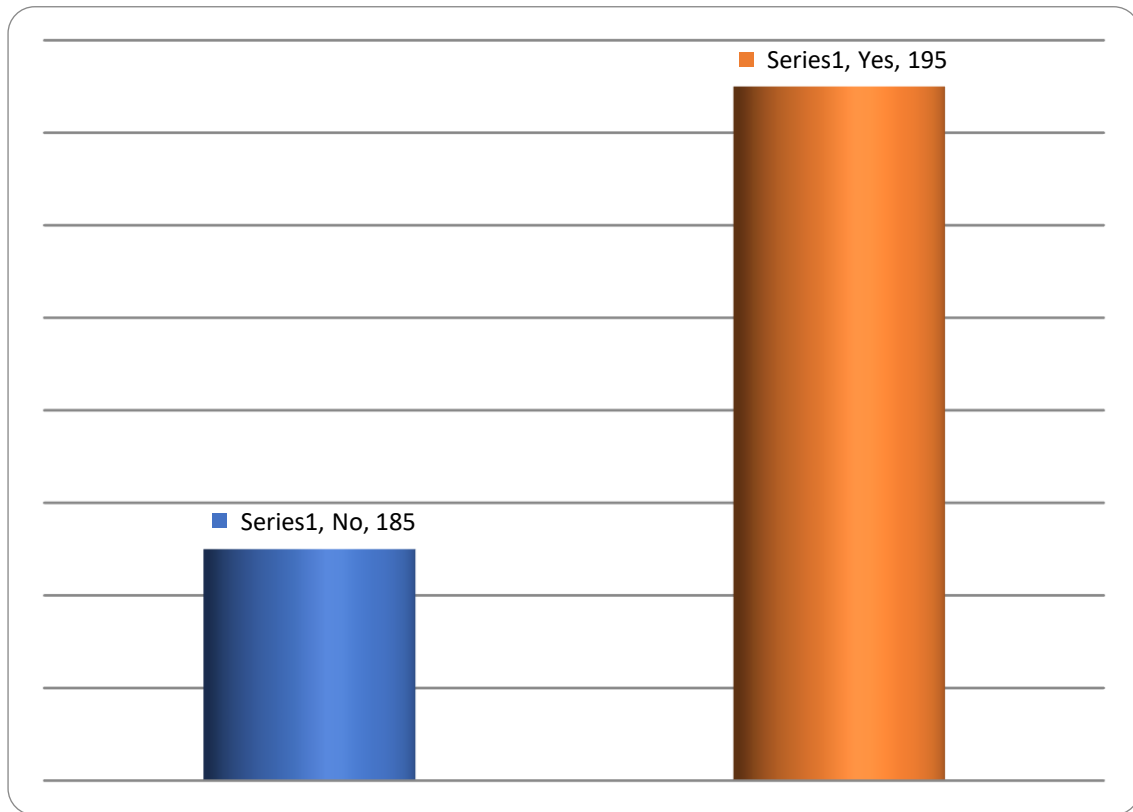
No Response	5	1.3
No	82	21.6
Yes	293	77.1
Total	380	100.0



Q8. Were you aware of doffing and donning protocol prior to COVID 19 pandemic?

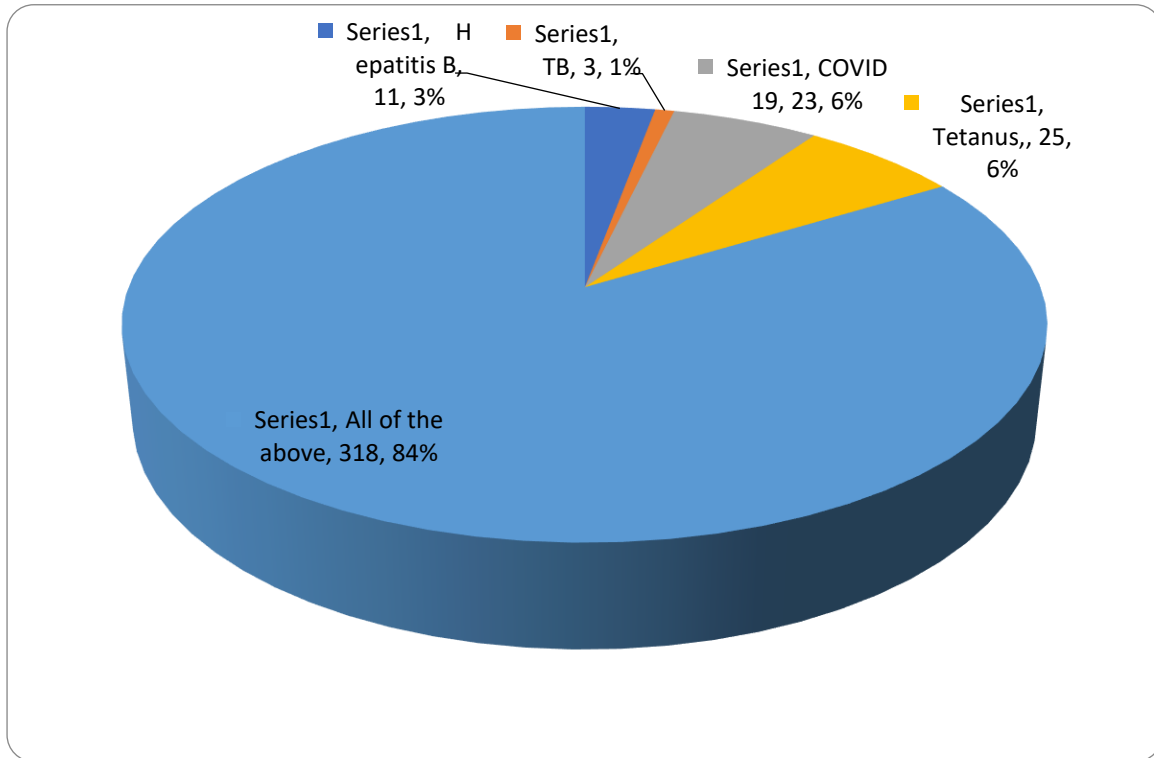
Options	Frequency	Percent
No	185	48.7

Yes	195	51.3
Total	380	100.0



Q9. Which of the following vaccines have you been vaccinated with?		
Options	Frequency	Percent
1. Hepatitis B	11	2.9
2. TB	3	0.8
3. COVID 19	23	6.1
4. Tetanus	25	6.6

5. All of the above	318	83.6
Total	380	100.0

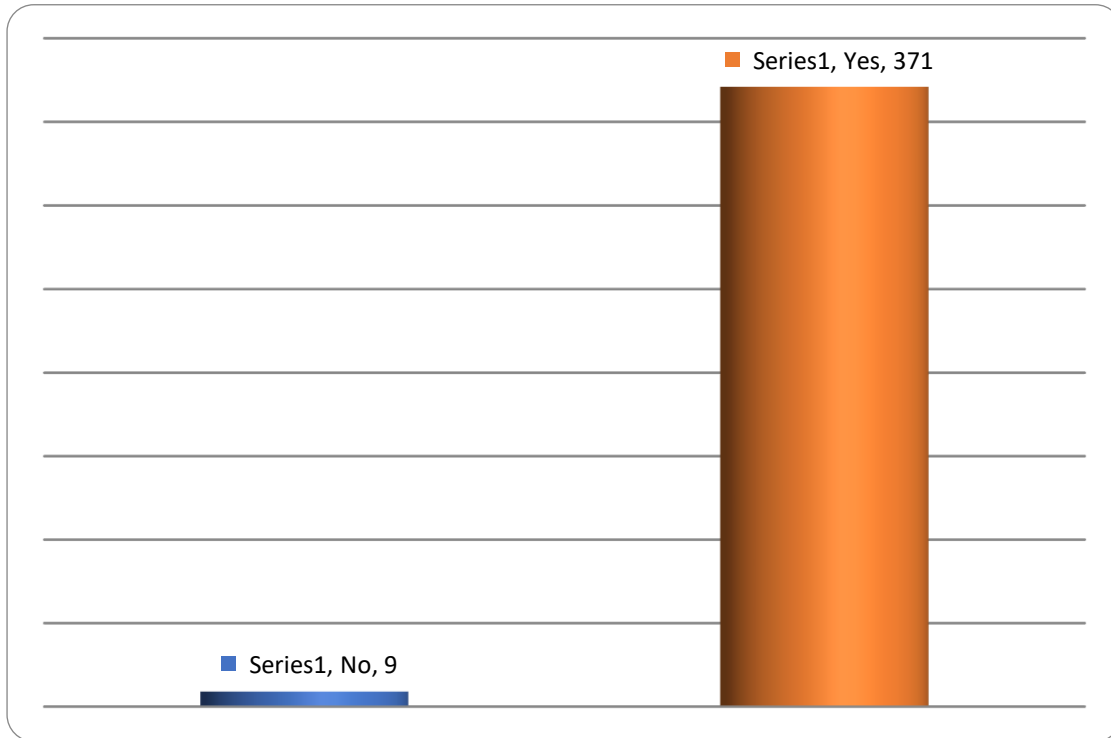


Q10. A) Are you aware of the following diseases?

1. Hepatitis
2. HIV AIDS
3. TB
4. COVID-19

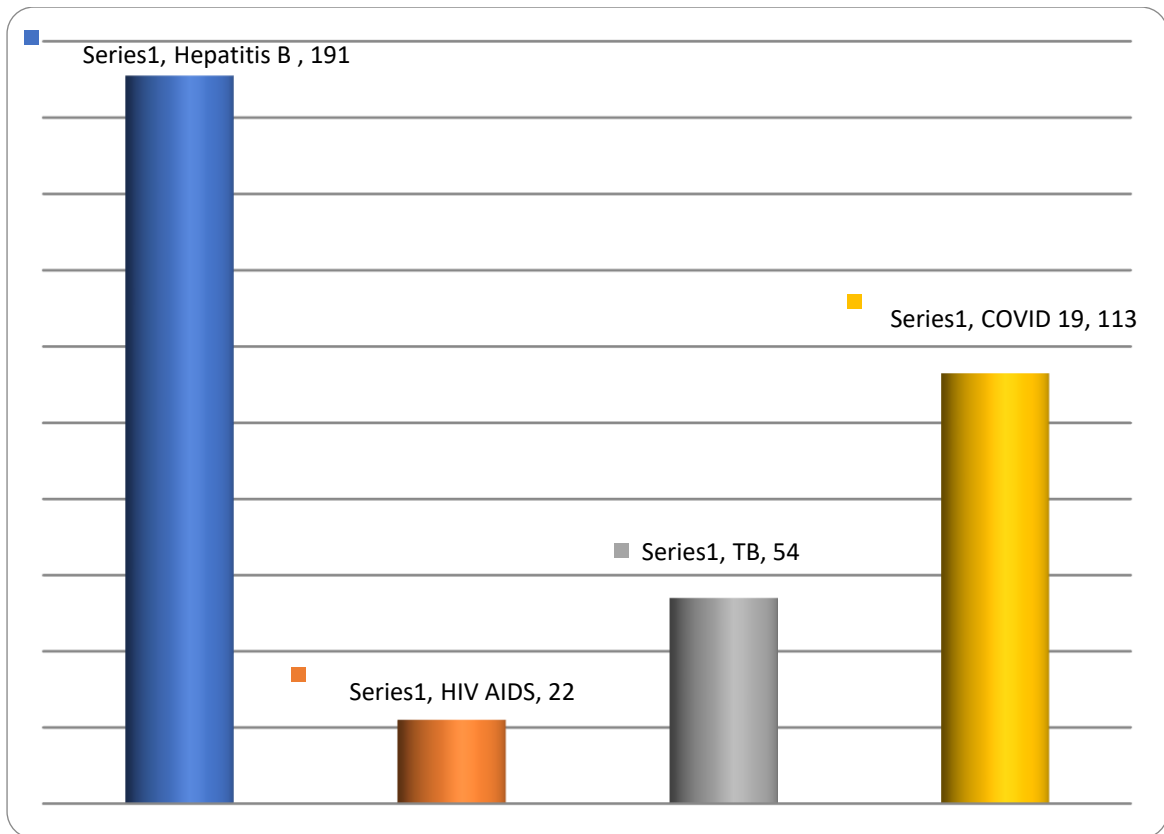
Options	Frequency	Percent
No	9	2.4

Yes	371	97.6
Total	380	100.0

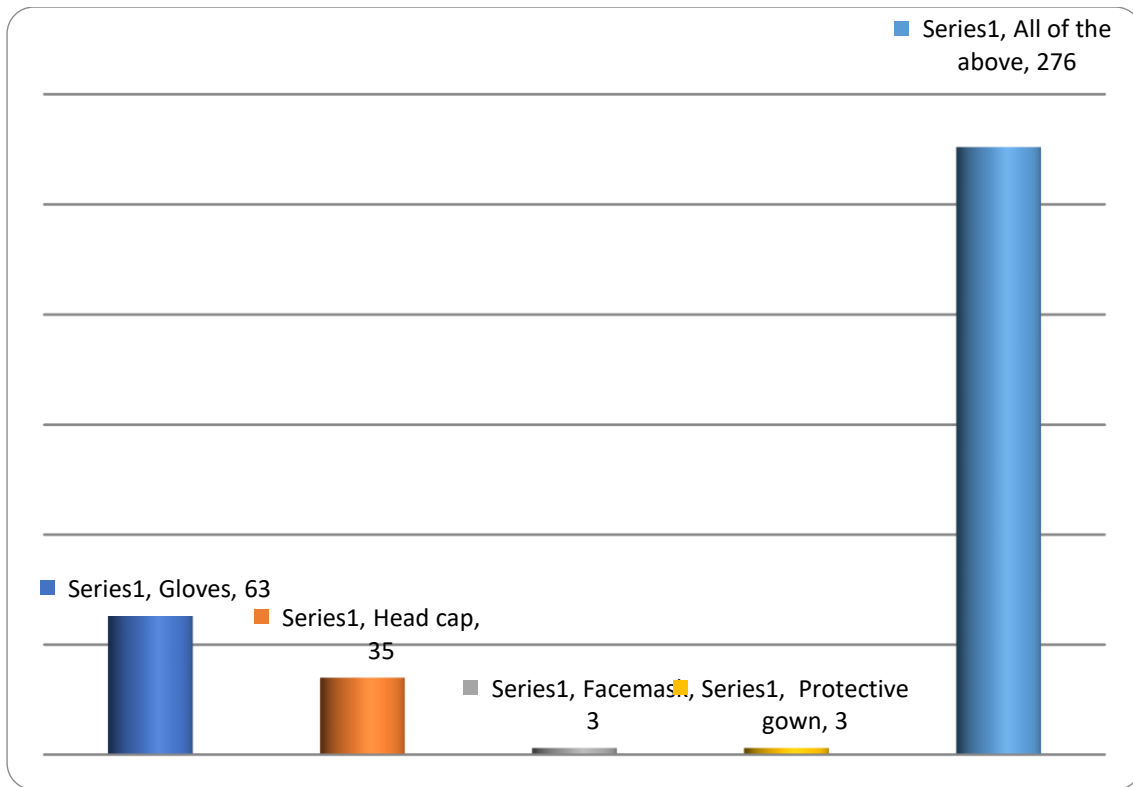


B) If Yes, which of the following has the highest rate of transmission via saliva?

Options		Frequency	Percent
1.	Hepatitis B	191	50.3
2.	HIV AIDS	22	5.8
3.	TB	54	14.2
4.	COVID 19	113	29.7
Total		380	100.0

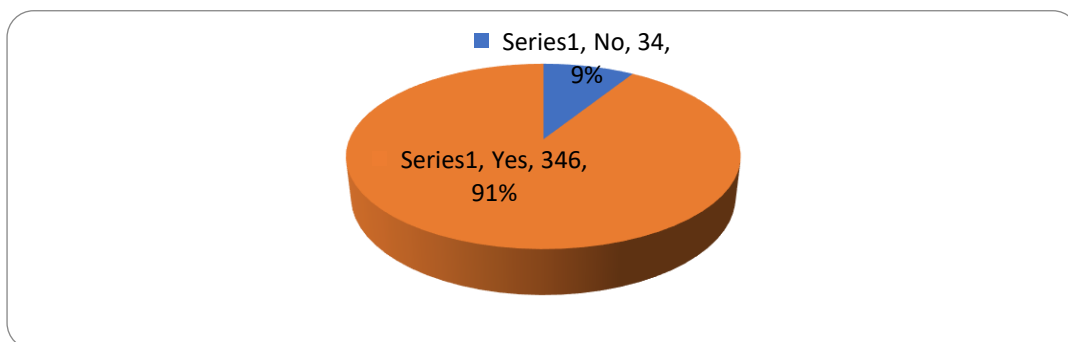


Q11. What do you wear regularly during dental procedures?			
Options		Frequency	Percent
1.	Gloves	63	16.6
2.	Head cap	35	9.2
3.	Facemask	3	0.8
4.	Protective gown	3	0.8
5.	All of the above	276	72.6
Total		380	100.0



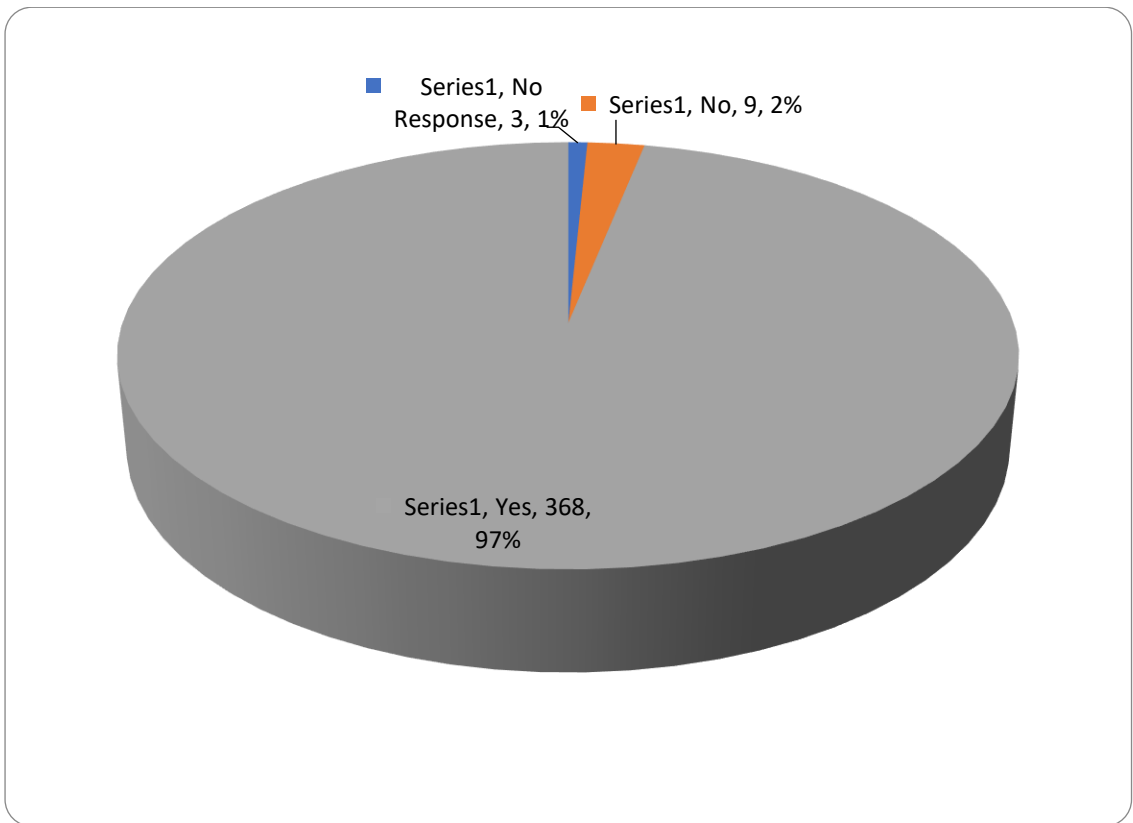
Q12. Do you wash hands before and after using gloves?

Options	Frequency	Percent
No	34	8.9
Yes	346	91.1
Total	380	100.0



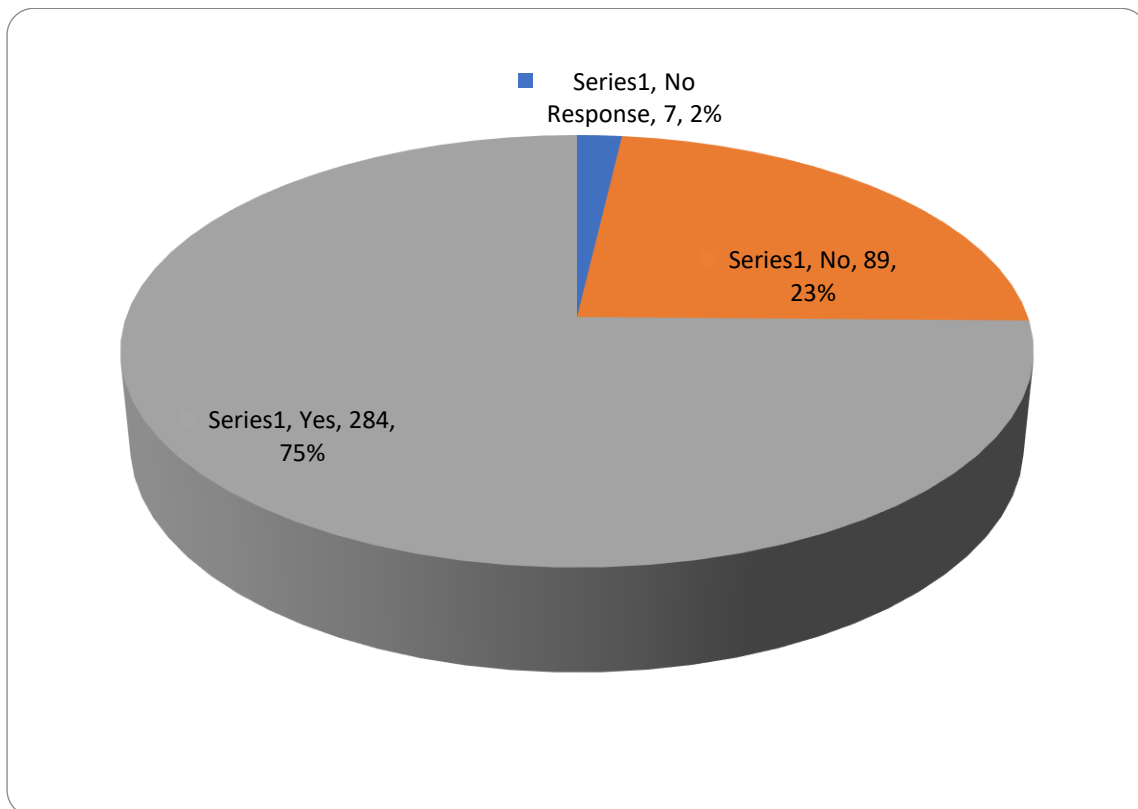


Q13. Do you wash your hands in case of accidental contact with blood, saliva and contaminated items had?		
Options	Frequency	Percent
No Response	3	0.8
No	9	2.4
Yes	368	96.8
Total	380	100.0



Q14. Do you wear protective eye wear to protect eyes during procedures that are likely to generate splashes or sprays of blood and saliva?

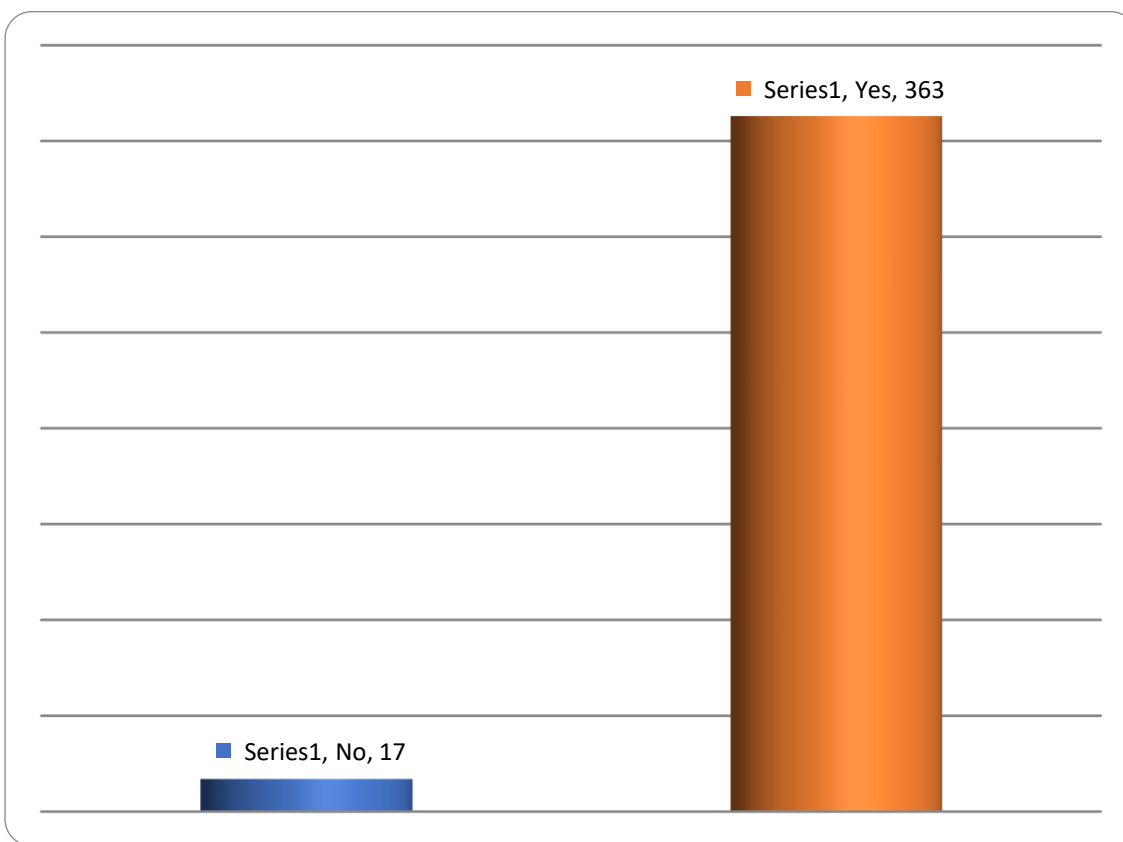
Options	Frequency	Percent
No Response	7	1.8
No	89	23.4
Yes	284	74.7
Total	380	100.0



Q15. Do you think disinfection of the following items is important?

1) Rubber bowl 2) Alginate mixing spatula 3) Face bow 4) Shade guide 5) Hand piece 6) Glass slab

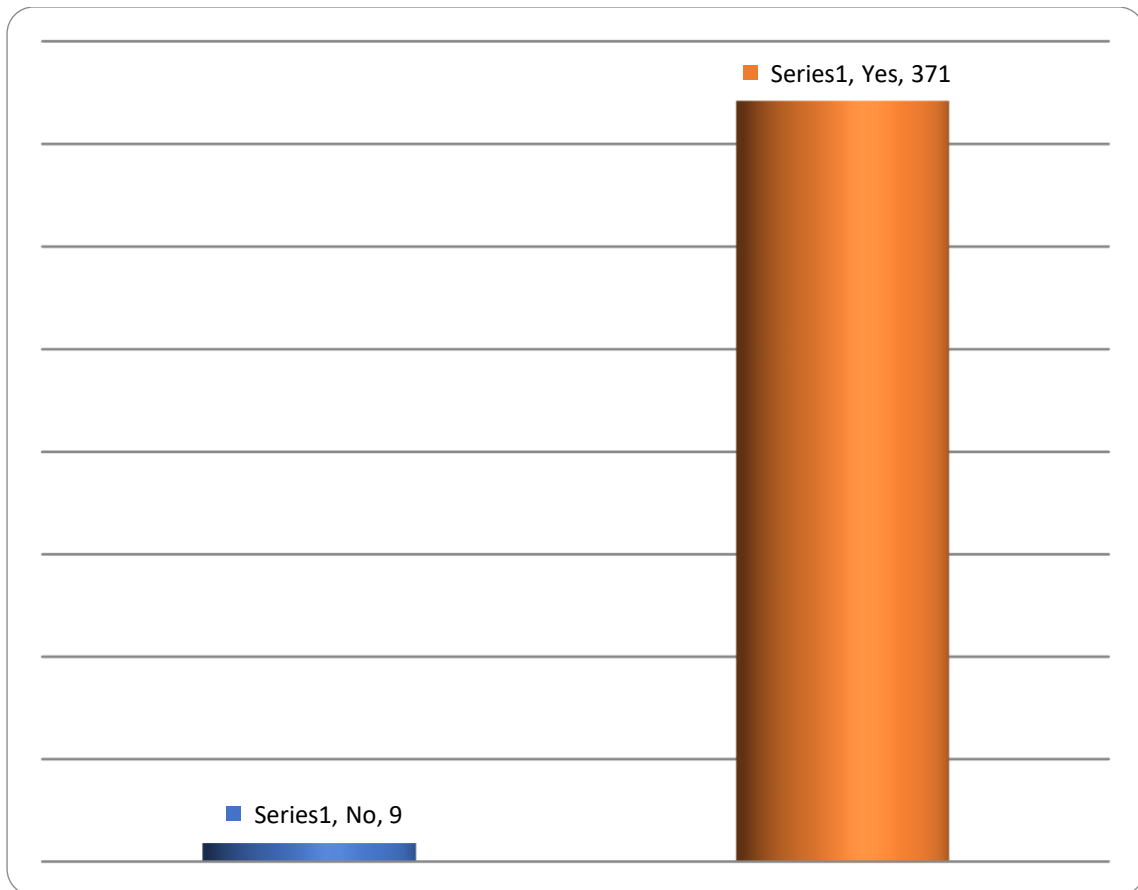
Options	Frequency	Percent
No	17	4.5
Yes	363	95.5
Total	380	100.0



Q16. Do you think disinfection of impression trays before and after impression making is important?

Options	Frequency	Percent
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No	9	2.4
Yes	371	97.6
Total	380	100.0



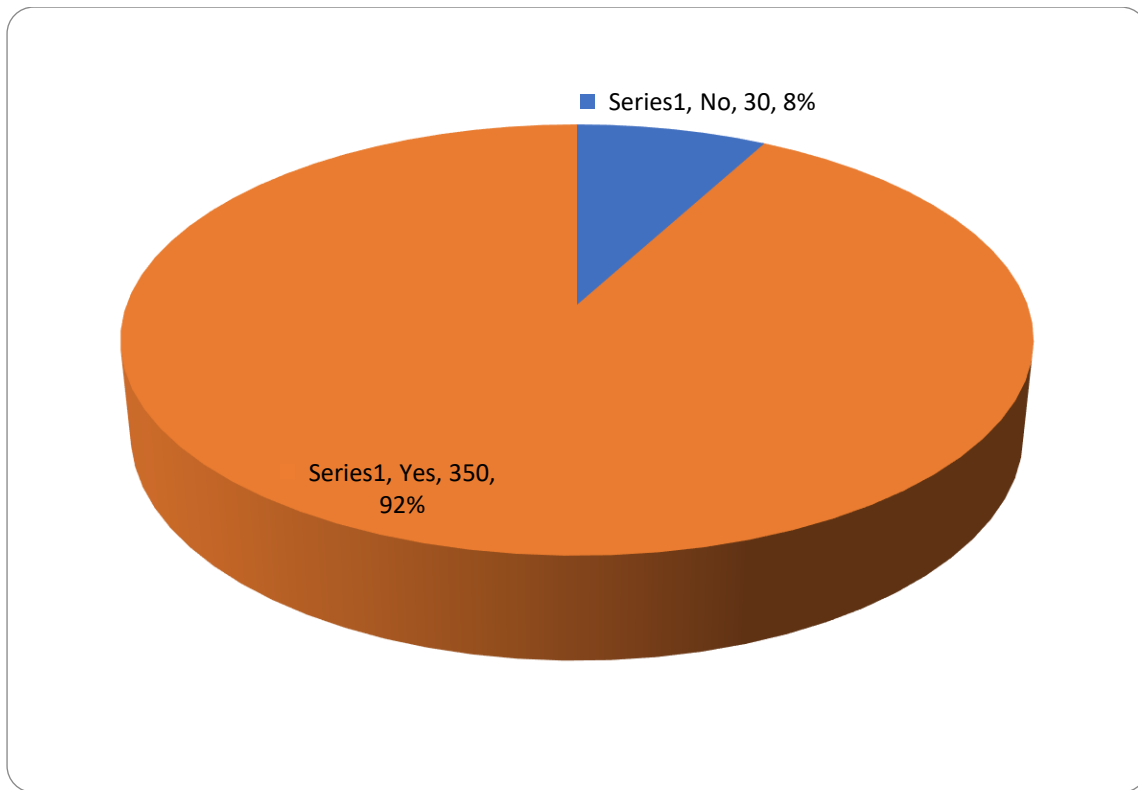
Q17. Do you think rinsing of impression under running water immediately after being removed from patient mouth is important?

Options	Frequency	Percent
No Response	3	0.8
No	19	5.0

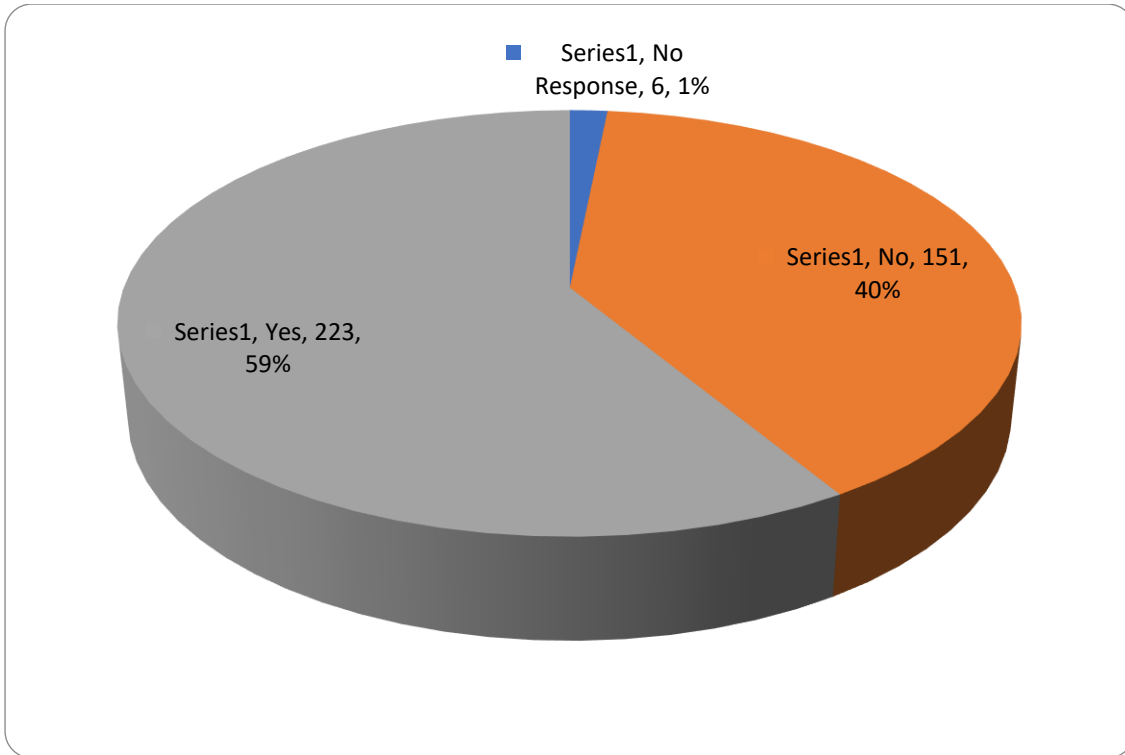
Yes	358	94.2
Total	380	100.0



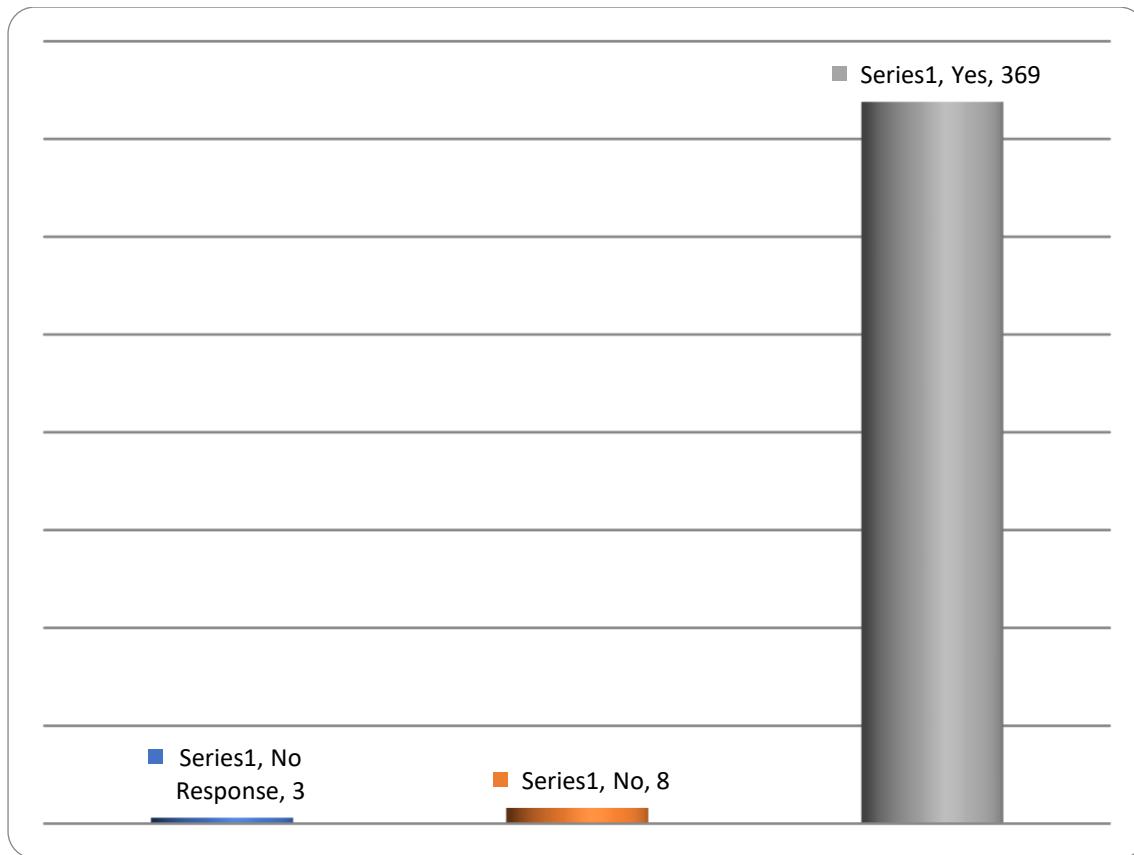
Q18. Do you find disinfection of impression is required?		
Options	Frequency	Percent
No	30	7.9
Yes	350	92.1
Total	380	100.0



Q19. Do you apply disinfectant on impression after being rinsed with water?		
Options	Frequency	Percent
No Response	6	1.6
No	151	39.7
Yes	223	58.7
Total	380	100.0

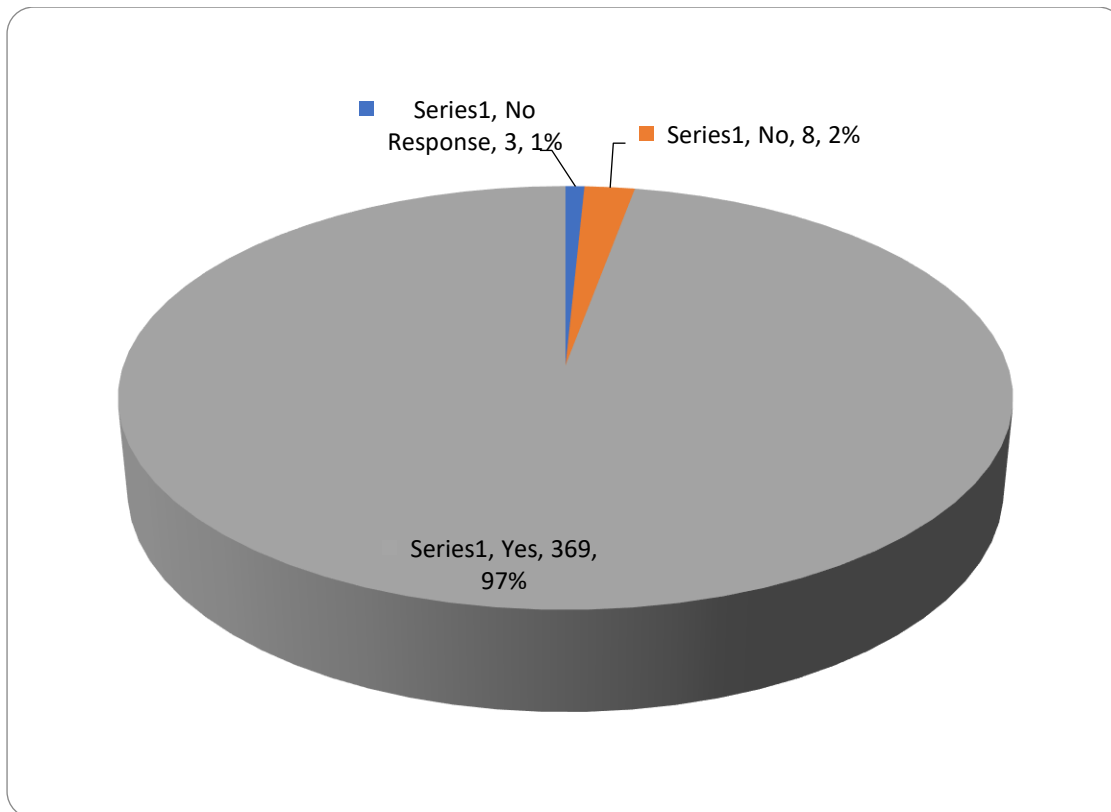


Q20. Do you think disinfection procedure like cleaning and disinfection of dental chair is important?		
Options	Frequency	Percent
No Response	3	0.8
No	8	2.1
Yes	369	97.1
Total	380	100.0

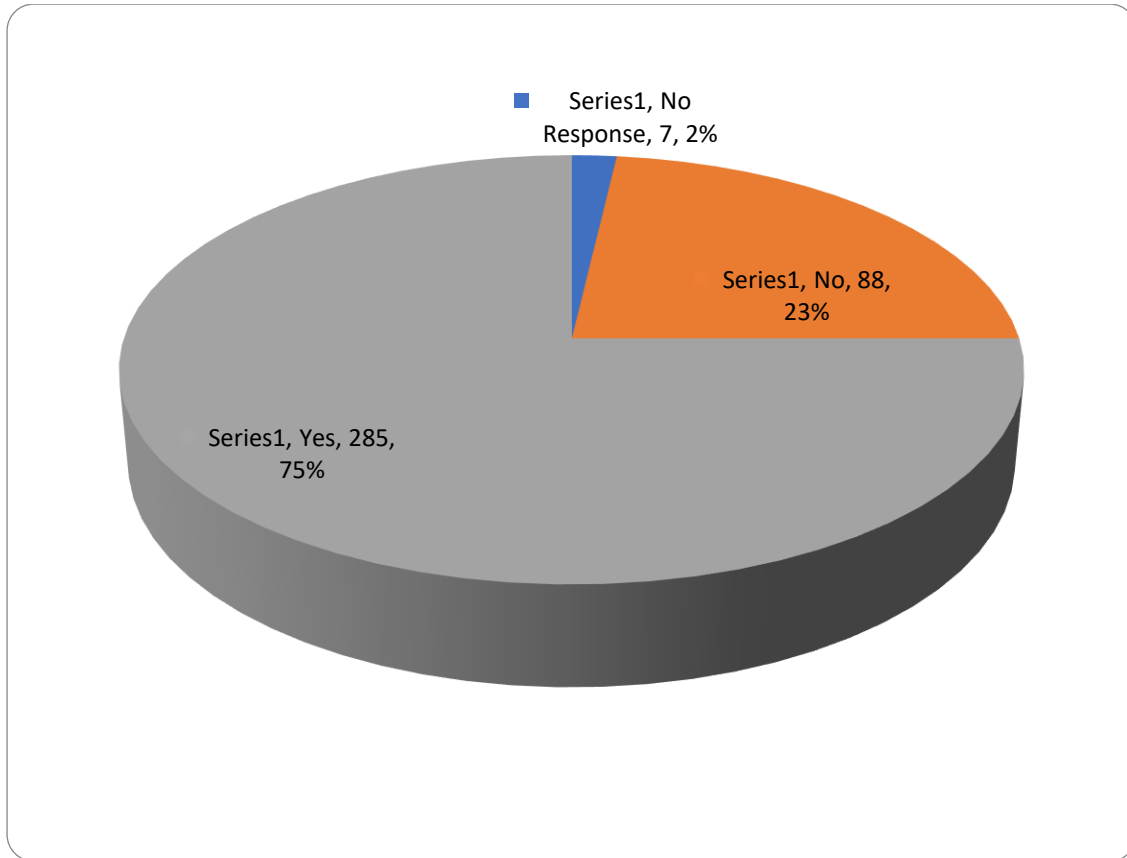


Q21. Do you think infection control is important while dealing with removable prosthesis or fixed prosthesis?		
Options	Frequency	Percent
No Response	3	.8
No	8	2.1
Yes	369	97.1
Total	380	100.0

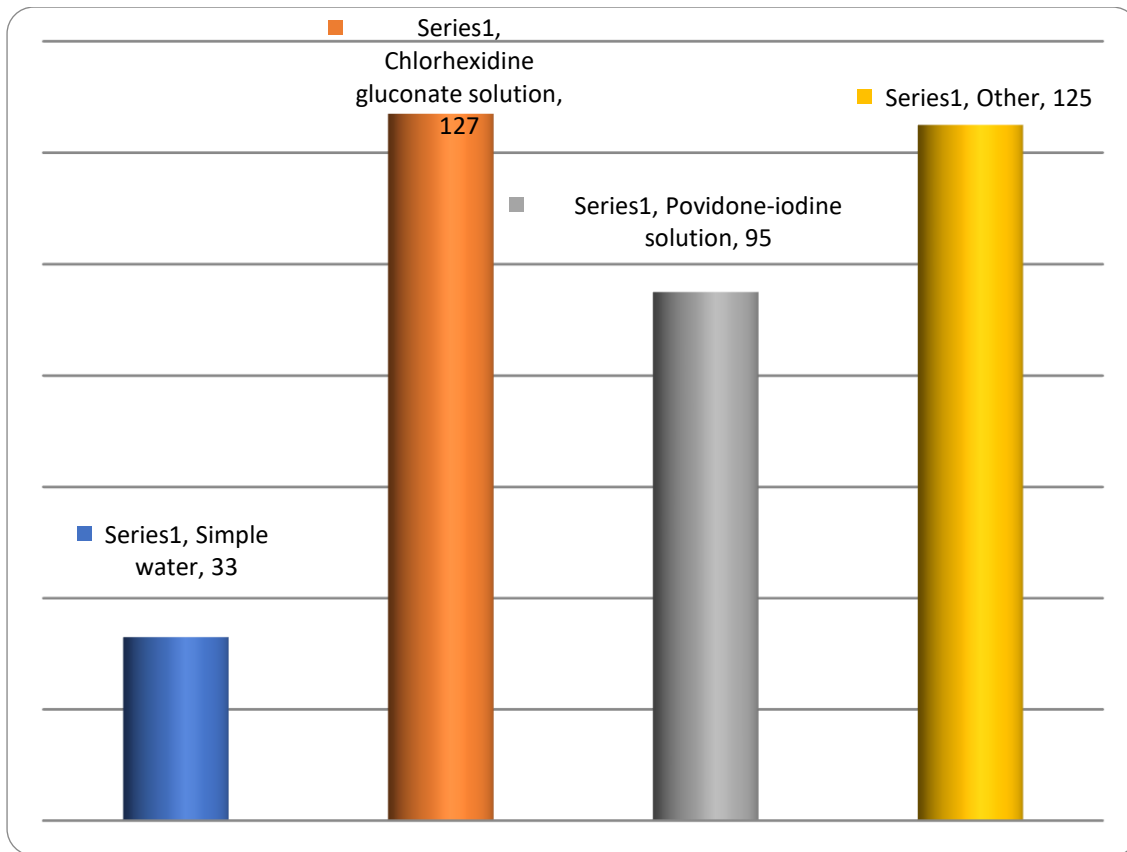




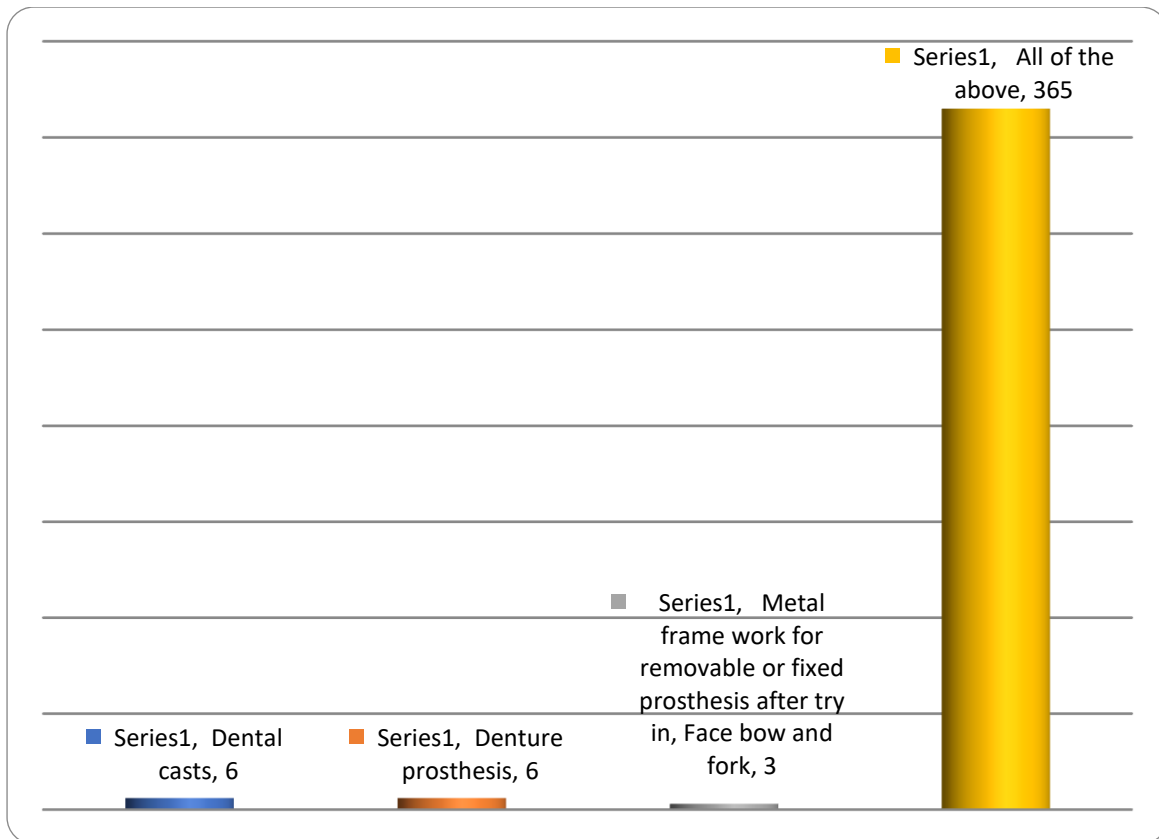
Q22. A) Do you use Pre-procedural mouth rinses for the patients		
Options	Frequency	Percent
No Response	7	1.8
No	88	23.2
Yes	285	75.0
Total	380	100.0



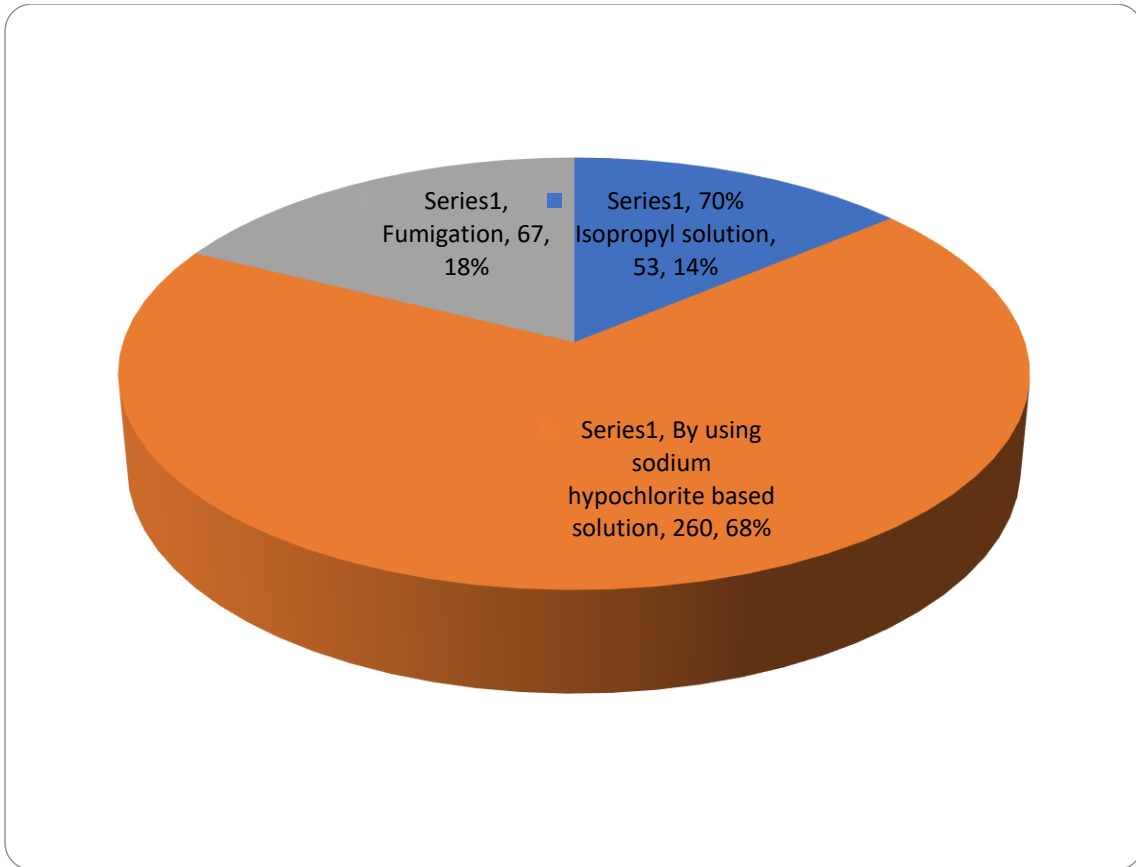
B) If yes, which of the following is used?		
Options	Frequency	Percent
Simple water	33	8.7
Chlorhexidine gluconate solution	127	33.4
Povidone-iodine solution	95	25.0
Other	125	32.9
Total	380	100.0



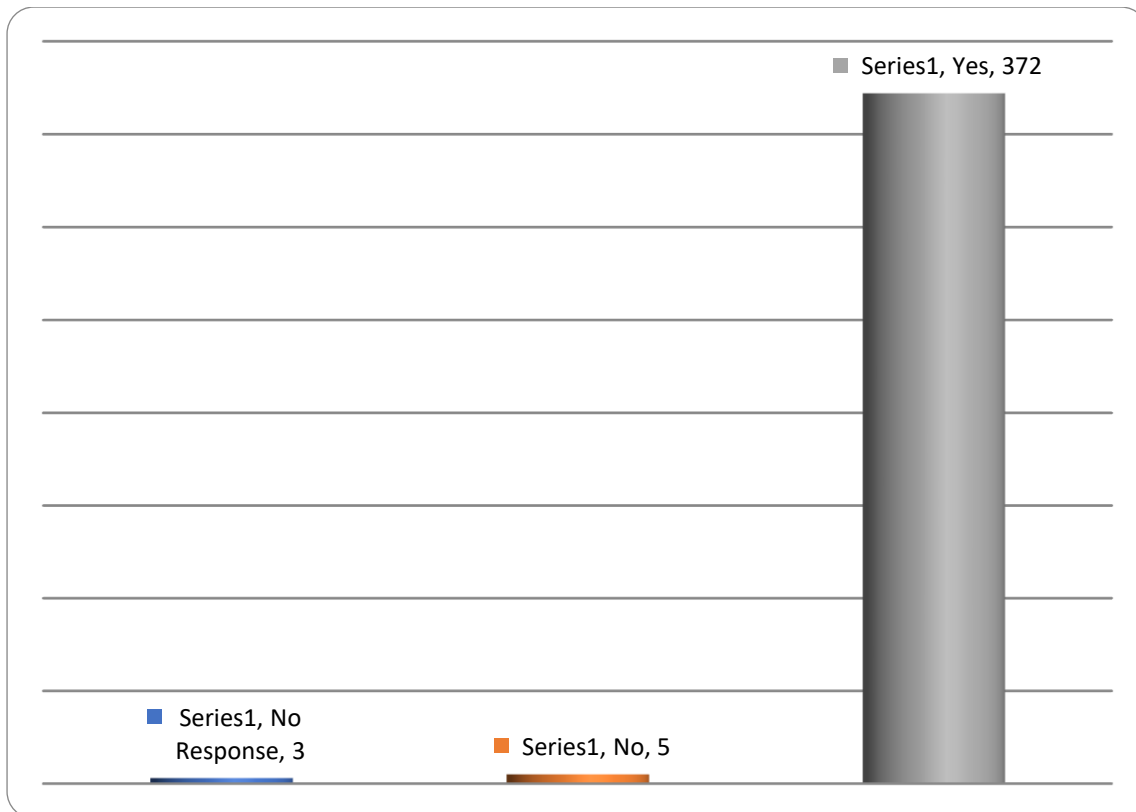
Q23. Do you regularly disinfect the following before sending it to dental laboratory?		
Options	Frequency	Percent
Dental casts	6	1.6
Denture prosthesis	6	1.6
Metal frame work for removable or fixed prosthesis after try in, Face bow and fork	3	0.8
All of the above	365	96.0
Total	380	100.0



Q24. How do you control infection at laboratory area in Prosthodontic clinic?		
Options	Frequency	Percent
70% Isopropyl solution	53	13.9
By using sodium hypochlorite based solution	260	68.5
Fumigation	67	17.6
Total	380	100.0



Q25. Are you aware of Biomedical waste and its management?		
Options	Frequency	Percent
No Response	3	.8
No	5	1.3
Yes	372	97.9
Total	380	100.0



## **DISSCUSSION**

The challenging times of COVID-19 pandemic is over but has left us with many valuable lessons specially pertaining to the transmission of various diseases. Oral cavity in particular is a house to many organisms and we the dental professionals are at a greater risk to many such infections. Awareness is a key to prevention and it is very important for any dental professional to be aware of various infection control measures.

Education plays an important role in emphasizing and re-emphasizing various things which with repeated practice becomes a habit. Infection control should be a habit and not just a procedure associated with surgery only. Educating and encouraging dental students and making them aware is essential to adopt attitudes and behaviours learned on infection control measures in their early years of education till the students become professional dentists. To assess the knowledge and awareness of dental students towards the importance of infection control before and after the COVID 19 outbreak and to assess the

various preventive measures taken by them, a questionnaire study was conducted in the Prosthodontic Department. According to the results of this questionnaire, 92.9% of students answered very well when asked about standard protocols and infection control measures. Standard precautions are meant to reduce, if not completely eliminate, the risk of infection transmission, especially that which is brought on by viruses and bloodborne pathogens. Standard protocols at work practices are necessary to achieve a basic level of infection control.

As a crucial component of infection control, sterilization and disinfection of instruments and materials are essential for preventing cross-contamination between patients and operators as well as for maintaining a safe sterile practice. It was very satisfying to know that 95% of students had excellent knowledge about sterilization and disinfection as a part of their curriculum, which also evaluated their education and allowed them to evaluate their own understanding of the application of infection control procedures especially in the Prosthodontic clinic. The data makes it abundantly evident that dental students are well-versed in conventional infection control techniques and their implementation.

On March 11, 2020, the World Health Organization proclaimed SARS-CoV-2 to be a pandemic and acknowledged it as a public health issue<sup>14</sup>. There are essentially two ways that COVID-19 might spread: direct and indirect. The direct mechanism consists of three different body fluids and secretions, such as feces, saliva, urine, semen, and tears; (2) transmission via aerosols generated during surgical and dental operations and/or in the form of respiratory droplet nuclei; and (3) mother-to-child. SARS-CoV-2 is believed to typically spread through respiratory droplets released by an infected individual when they talk, cough, or sneeze<sup>14</sup>. Due to the necessity for dental patients to spit or gargle following oral treatments such as extraction, drilling, and drainage of tooth

abscess, dental professionals are more vulnerable to exposure. Thus, wearing the proper safety gear is crucial during such aerosol-producing activities. Remarkably, 97% of students were aware of COVID-19 and how it spreads, whereas only 3% were unaware.

The CDC advises people with infectious COVID-19 to isolate themselves from others and stay at home for at least five days. During these initial five days, a person is most contagious. If you must be among people, both at home and in public, wear a high-quality mask. Eighty-one percent of students demonstrated a high level of awareness regarding the guidelines for cross-infection related to COVID-19. These guidelines emphasize the critical need to minimize human-to-human contact, disinfect everyday objects, and practice good self-hygiene, which includes frequent hand washing, using face masks, coughing, and sneezing with technique.

The survey also discovered that 76% of students regularly keep up with COVID-19-related information, demonstrating the ongoing significance of preserving and improving infection and control (IPC) protocols for patients. The media and relevant authorities like the WHO and DCI have been instrumental in educating the public about COVID-19 symptoms, transmission, and preventive measures. They have also been proactive in updating guidelines regarding the critical steps that dentists must take during routine dental practice, which is assisting the Indian dental community in combating this new pathogen.

The practice of providing healthcare over geographic distances by use of information-based technology and communications networks is known as "telemedicine." When participants are far apart, it uses electronic information and communication technology to give and support healthcare<sup>12</sup>. One area of telemedicine science that focuses on dentistry is called "Teledentistry." Because



COVID-19 spreads continuously from person to person during the incubation phase (0–24 days) through contact with known COVID-19 patients and asymptomatic carriers, Teledentistry (TD) has offered significant benefits in patient dental management without posing concerns during pandemic with significant social and economic ramifications<sup>16</sup>. Telecommunications-dentistry (TD) facilitates interchange of clinical data, including pictures, over long distances for treatment planning and consultation. By connecting with dentists, patients can also save time as well as money. From the survey it was found that only 51% of students were aware of teledental care, indicating a lack of awareness among them.

Guidelines for the biosafety level guarantee that a high-quality, biologically safe workplace supports the efficient and successful provision of clinical and laboratory services to patients. Staff members can work in difficult laboratory procedures with a certain degree of trust that they won't get sick or infected. By implementing biosafety protocols, it is possible to stop the transmission of infectious pathogens from healthcare facilities to patients, other healthcare personnel, and the general public<sup>5</sup>. About 77% of students demonstrated a high degree of awareness regarding the different biosafety level criteria.

In order to give the required protection and lower the danger of exposure, donning refers to properly donning and using PPE. Removing personal protective equipment (PPE) without getting contaminated is known as doffing. Only 51% of students knew that donning and doffing essential clothing requires putting it on before patient contact and that it must be done in the following order: gloves, hand hygiene, gown, mask, eye or facial protection, and eye protection. When putting on a gown, mask, eye or facial protection, and gloves, one must first complete hand hygiene before putting on the next item. This may require further strengthening of the knowledge about the concept of donning and doffing.

Regarding the vaccination, over 90% of the dentistry students were found to have received an HBV vaccination. Increasing the number of vaccinated students can be linked to setting a positive example for other students to follow understanding the importance of vaccination in preventing infections. Most students and interns in the Prosthodontic clinic are concerned about infection management, as seen by their attitudes toward protective barriers such as gloves, face masks, head caps, and gowns.

A small number of the questionnaire's questions addressed disinfecting supplies that the dental laboratory sends or receives, and the results are encouraging because more than 90% of respondents follow the recommended protocol for infection control between the dental office and laboratory. Several methods for preventing infection in dental offices and labs were offered by The Centers for Disease Control and Prevention's Guideline for Infection Control in Dental Health-Care Settings in 2003<sup>11</sup>. It has been established that laboratory technicians are susceptible to contracting blood- or saliva-borne illnesses like HBV and vice-versa. Therefore, before being delivered to the dental laboratory, things including bite registration, dental casts, impressions, denture prosthesis, metal framework for detachable or fixed prosthesis, and wax rims must be disinfected. 95% students disinfect these things since the prosthodontic clinic constantly teaches, emphasizes and supervises disinfection at every step particularly in the wake of COVID-19. In this study, the majority of students send their impressions to the dental laboratory after rinsing and disinfecting them. The questionnaire did not, however, specify the kind of disinfection technique or solution that was employed.

More than 90% of the dental students in this study reported frequently washing their hands both before and after wearing gloves, providing strong evidence that a notably higher number of bacteria have been isolated from under watches and rings. In a separate study, it was also demonstrated that health care workers

without rings can achieve a greater reduction in the number of colonies after handwashing. This bolsters the advice to take off watches and jewellery before having any dental work done. Enough hand washing can interrupt the respiratory illness transmission cycle and lower the chance of transmission by 6 to 14%, according to several studies<sup>5,15</sup>.

The correct handling, storage, transportation, treatment, and disposal of waste produced by medical facilities, research facilities, and other establishments that perform biological or medical activities is known as Biomedical waste management<sup>13</sup>. To safeguard the environment, the general public, and healthcare personnel' health, biological waste management must be done correctly. Approximately 97% of students demonstrated a high level of awareness regarding biomedical waste management. This is because proper handling of biomedical waste can prevent the spread of infectious diseases, contaminate the environment, and expose workers to hazardous materials. Moreover, a high-quality and biologically safe work environment promotes the efficient and effective provision of laboratory and clinical services for patients.

After the COVID-19 epidemic, the study revealed that the majority of dental students are taking the necessary precautions to ensure that their workplace is free of contaminants and safe for both doctors and patients. Despite the fact that infection control procedures have always been crucial in hospital settings, after COVID-19, healthcare systems all over the world have increased their efforts to prevent and control infections in order to stop the infection from spreading. In order to prepare dental practitioners for any comparable future outbreaks, this study has assisted in assessing the degree of understanding and identifying the knowledge gaps in their expertise.

## **CONCLUSION**

The findings of my research demonstrate that dental undergraduates and graduate students have a sufficient understanding of infection prevention, particularly with regard to the process involved in prosthodontic practice. The students' responses indicated that they had learned enough to support infection control protocols during their academic curriculum and how well they had adhered to the regulation. Also the Covid times have taught them more the importance and significance of maintaining infection control measures. However, the supervision by the senior staff and reinforcement at every level should be a continuous teaching till it is adopted absolutely and becomes a routine. Also this can help in minimizing the spread of other infectious diseases as well like spread of common cold, other viruses or any other future variant of Covid. This will assist the hospital care systems in implementing and reinforcing infection prevention and control (IPC) policies and measures.

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