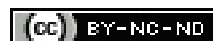


Assessment of Knowledge, Attitudes, and Practices of Rubber Dam Usage among Dental Practitioners in Tamil Nadu after COVID-19: A Questionnaire-based Cross-sectional Study

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ABSTRACT

Introduction: The rubber dam plays an important role in isolation of teeth during dental procedures and helps prevent contamination risks. The usage of rubber dam in day-to-day clinical practice has become crucial during the pandemic.

Aim: To assess the knowledge, attitudes, and practices of rubber dam usage among dental practitioners in India during and after the Coronavirus Disease 2019 (COVID-19) pandemic.

Materials and Methods: This was a cross-sectional survey-based examination. A pretested 15-item questionnaire was administered to 300 dental practitioners in Tamil Nadu, India, using Google Forms. The questions were categorised into three parameters: knowledge, attitude, and practice. The study population included dentists of all types who were performing restorative and endodontic procedures. Information was collected regarding age, gender, educational qualification, and the use of rubber dam. The questionnaire contained leading

questions designed to assess the opinions and attitudes of dentists toward the use of rubber dam. The responses received were statistically analysed using the Chi-square test.

Results: Out of the respondents, 257 (85.66%) reported being taught about rubber dam placement, while 43 (14.33%) were unaware of its usage. Prior to the pandemic, 181 (61.35%) of respondents were utilising rubber dam for conservative and endodontic procedures. Only 151 (50.84%) of practitioners believed that rubber dam placement prevents aerosol transmission. Additionally, 266 (89.26%) of respondents expressed willingness to learn and gain knowledge about rubber dam.

Conclusion: The study concluded that dental practitioners exhibited a positive attitude towards incorporating rubber dam usage in their practice and showed willingness to update their knowledge about rubber dam, regardless of age, due to the pandemic.

Keywords: Aerosol transmission, Coronavirus disease 2019, Isolation, Pandemic

INTRODUCTION

The World Health Organisation (WHO) announced the serious and intense respiratory distress condition due to Coronavirus Disease 2019 (COVID-19) as a pandemic [1]. The contagious nature of COVID-19 has significantly challenged the healthcare system, including dentistry. Dental professionals are at a higher risk of exposure to COVID-19 disease due to the potential transmission of airborne particles through dental aerosol procedures [2]. A recent study shows that the coronavirus exists in the salivary gland enzymes, the epithelial cells of the tongue, gingiva, buccal mucosa, and other oral cavity surfaces, which have been shown to express high levels of Angiotensin-converting Enzyme 2 (ACE 2) [3]. This indicates that the oral cavity mucosa may be a potential route for the spread of COVID-19, and aerosols from high-speed handpieces act as the main route of entry for dental surgeons.

Studies have shown that rubber dam usage during dental aerosol procedures can effectively reduce the spread of spatter by 33% [4-6]. Moreover, it reduces surface contamination with bacteria by 80-99% at a distance of up to one metre in the dental office [7]. Rubber dam, which is used for isolation during operative and endodontic procedures, plays a pivotal role in the success of long-lasting restorations [8]. It has several advantages, including providing visibility and access, protection and retraction of soft tissues, prevention inhalation of foreign materials, and most importantly,

aiding in moisture control to prevent cross-infection [9]. In response to the pandemic, rubber dam isolation has become mandatory during dental procedures as a means to reduce the chance of contamination and to contribute to keeping dental office teams and patients safe and protected from COVID-19 exposure [10]. Although rubber dam usage is considered mandatory, it is still not favoured among dentists due to time consumption, uncooperative patients, inadequate knowledge of application, and difficulties in handling [11].

There is limited literature [7] on factors affecting the use of rubber dam in day-to-day dental practice during the COVID-19 emergency. Therefore, present study aimed to assess the knowledge, attitudes, and practices of rubber dam usage among dentists in India after the pandemic situation.

MATERIALS AND METHODS

It was a cross-sectional, questionnaire-based survey conducted using an online platform among dentists in Tamil Nadu, India. The study was approved by the scientific Ethical Committee with the number SRMU/M&HS/SRMDC/2020/S/021.

An online semistructured questionnaire was prepared using Google Forms, with a consent form attached to it. The survey was directed and circulated among dental specialists, postgraduates, and undergraduates across Tamil Nadu, India, between September 2021 and December 2021.

Inclusion and Exclusion criteria: The inclusion criteria were clinicians, including all practicing dentists and postgraduates who agreed to participate in the questionnaire survey. The exclusion criteria were dentists who ceased their professional activities more than one year ago and dentists who did not answer atleast 50% of the questions.

A convenience sampling technique was used, considering all the questionnaires answered within three to four months by clinicians who met the inclusion criteria of the study. A total sample size of 300 participants was included in the study.

Study Procedure

Overall, the survey was sent to 350 potential participants, out of which 300 responses were promptly received. The questionnaire was devised with inputs from all the authors and was also based on references from similar survey studies [5]. Initially, it was subjected to a pilot study among 30 dentists for validity and reliability scores. Good comprehension was reported among respondents. Test reliability was assessed using the intraclass correlation coefficient, with a score of 0.83, indicating good reliability, and accordingly, the questionnaire was simplified. The questionnaire contained queries related to rubber dam awareness, sources of knowledge about rubber dam usage, attitudes toward the use of rubber dam during operative and endodontic procedures, and rubber dam practices in their clinics during the pandemic [Table/Fig-1]. Two questions were open-ended, while others were closed-ended [Annexure]. Information from the completed surveys was entered into an electronic database (Microsoft excel 2007), and the collected data was statistically analysed. Frequencies were determined, and cross-organisations were performed. In cases where the survey was not completed in its entirety, those questions were left for evaluation.

| Knowledge | | | | |
|----------------------|--|--|--|--------------|
| Present role | 2. Have you been taught about rubber dam in your curriculum? | | | p-value no |
| | No | Yes | Total | |
| Academician | 19 (18.62%) | 83 (81.37%) | 102 (34%) | 0.27 |
| Postgraduate student | 4 (7.27%) | 51 (92.72%) | 55 (18.33%) | |
| Private practitioner | 19 (14.28%) | 114 (85.71%) | 133 (44.33%) | |
| Speciality | 1 (10%) | 9 (90%) | 10 (3.33%) | |
| Total | 43 (14.33%) | 257 (85.66%) | 300 | |
| Present role | 5. What in your opinion is the greatest advantage offered by the rubber dam? | | | Total |
| | Prevention of ingestion of irrigants | Prevention of swallowing or aspirating instruments | Provision of isolation and an aseptic working area | |
| Academician | 6 (5.94%) | 27 (26.73%) | 68 (67.32%) | 101 (33.89%) |
| Postgraduate student | 4 (7.27%) | 18 (32.72%) | 33 (60%) | 55 (18.45%) |
| Private practitioner | 11 (8.33%) | 39 (29.54%) | 82 (62.12%) | 132 (44.29%) |
| Speciality | 2 (20%) | 4 (40%) | 4 (40%) | 10 (3.35%) |
| Total | 23 (7.71%) | 88 (29.53%) | 187 (62.75%) | 298 |
| p-value=0.608 | | | | |
| Present role | 9. Do you think rubber dam prevents aerosol transmission? | | | p-value |
| | No | Yes | Total | |
| Academician | 55 (54.45%) | 46 (45.54%) | 101 (34.23%) | 0.035 |
| Postgraduate student | 19 (35.18%) | 35 (64.81%) | 54 (17.62%) | |
| Private practitioner | 70 (52.63%) | 63 (47.36%) | 133 (45.08%) | |
| Speciality | 2 (22%) | 7 (77.77%) | 9 (3.05%) | |
| Total | 146 (49.15%) | 151 (50.84%) | 297 | |

| Attitude | | | | |
|----------------------|---|-------------------------------------|---------------------|----------------|
| Present role | 3. Do you think rubber dam should be used in all restorative and endodontic procedures? | | | p-value |
| | No | Yes | Total | |
| Academician | 46 (45.54%) | 55 (54.45%) | 101 (34%) | <0.001 |
| Postgraduate student | 36 (66.66%) | 18 (33.33%) | 54 (18.18%) | |
| Private practitioner | 104 (78.78%) | 28 (21.21%) | 132 (44.44%) | |
| Speciality | 9 (90%) | 1 (10%) | 10 (3.36%) | |
| Total | 195 (65.65%) | 102 (34.34%) | 297 | |
| Present role | 12. Do you think placement of rubber dam is time consuming? | | | p-value |
| | No | Yes | Total | |
| Academician | 27 (26.47%) | 75 (73.52%) | 102 (34.11%) | 0.027 |
| Postgraduate student | 9 (16.66%) | 45 (83.33%) | 54 (18.06%) | |
| Private practitioner | 30 (22.55%) | 103 (77.44%) | 133 (44.48%) | |
| Speciality | 60 (60%) | 4 (40%) | 10 (3.34%) | |
| Total | 27 (26.47%) | 75 (73.52%) | 102 (34.11%) | |
| Present role | 13. Reasons you think rubber dam not used by many? | | | |
| | Difficult to place | Knowledge and skill of the operator | Patient discomfort | Time consuming |
| Academician | 25 (24.75%) | 19 (18.81%) | 38 (37.62%) | 19 (18.81%) |
| Postgraduate student | 10 (18.51%) | 13 (24.07%) | 20 (37.03%) | 11 (20.37%) |
| Private practitioner | 40 (30.07%) | 24 (18.04%) | 45 (33.83%) | 24 (18.04%) |
| Speciality | 1 (10%) | 1 (10%) | 4 (40%) | 4 (40%) |
| Total | 76 | 57 | 107 | 58 |
| p-value=0.641 | | | | |
| Present role | 15. Would you like to learn the placement of rubber dam? | | | p-value |
| | No | Yes | Total | |
| Academician | 2 (2%) | 100 (98.03%) | 102 (34.22%) | <0.001 |
| Postgraduate student | 1 (1.85%) | 53 (98.14%) | 54 (18.12%) | |
| Private practitioner | 26 (19.69%) | 106 (80.3%) | 132 (44.29%) | |
| Speciality | 3 (30%) | 7 (70%) | 10 (3.35%) | |
| Total | 32 (10.73%) | 266 (89.26%) | 298 | |
| Practice | | | | |
| Present role | 1. Are you doing restorative and endodontic work? | | | p-value |
| | No | Yes | Total | |
| Academician | 48 (47.05%) | 54 (52.94%) | 102 (34%) | <0.001 |
| Postgraduate student | 13 (24.07%) | 41 (75.92%) | 54 (18.06%) | |
| Private practitioner | 28 (21.05%) | 105 (78.94%) | 133 (44.48%) | |
| Speciality | 1 (10%) | 9 (90%) | 10 (3.34%) | |
| Total | 90 (30.10%) | 209 (69.89%) | 299 | |
| Present role | 6. Are you comfortable using rubber dam? | | | p-value |
| | No | Yes | Total | |
| Academician | 48 (48%) | 52 (52%) | 100 (33.78%) | 0.006 |
| Postgraduate student | 35 (66.03%) | 18 (33.96%) | 53 (17.9%) | |
| Private practitioner | 75 (56.39%) | 58 (43.6%) | 133 (44.93%) | |
| Speciality | 1 (10%) | 9 (90%) | 10 (3.37%) | |
| Total | 159 (53.71%) | 137 (46.28%) | 296 | |

| Present role | 8. Were you using rubber dam for restorative and endodontic procedures before the COVID-19 spread? | | | p-value |
|----------------------|--|--------------|--------------|--------------|
| | No | Yes | Total | |
| Academician | 41 (41.41%) | 58 (58.58%) | 99 (33.55%) | 0.076 |
| Postgraduate student | 15 (27.77%) | 39 (72.22%) | 54 (18.30%) | |
| Private practitioner | 57 (42.85%) | 76 (57.14%) | 133 (45.08%) | |
| Speciality | 1 (11.11%) | 8 (88.88%) | 9 (3.05%) | |
| Total | 114 (38.64%) | 181 (61.35%) | 295 | |
| | | | | |
| Present role | 10. Are you practising during the pandemic? | | | p-value |
| | No | Yes | Total | |
| Academician | 88 (87.12%) | 13 (12.87%) | 101 (34.23%) | <0.001 |
| Postgraduate student | 17 (32.69%) | 35 (67.3%) | 52 (17.62%) | |
| Private practitioner | 48 (36.09%) | 85 (63.9%) | 133 (45.08%) | |
| Speciality | 0 | 9 (100%) | 9 (3.05%) | |
| Total | 153 (51.86%) | 142 (48.13%) | 295 | |
| | | | | |
| Present role | 11. Have you started using rubber dam after the COVID-19 spread? | | | p-value |
| | No | Yes | Total | |
| Academician | 80 (80.8%) | 19 (19.19%) | 99 (33.55%) | <0.001 |
| Postgraduate student | 13 (24.07%) | 41 (75.92%) | 54 (18.30%) | |
| Private practitioner | 43 (32.57%) | 89 (67.42%) | 132 (44.74%) | |
| Speciality | 1 (10%) | 9 (90%) | 10 (3.38%) | |
| Total | 137 (46.44%) | 158 (53.55%) | 295 | |
| | | | | |
| Present role | 14. Do you prefer winged or wingless clamps for rubber dam? | | | Total |
| | Both | Either | None | |
| Academician | 53 (52.47%) | 23 (22.77%) | 25 (24.75%) | 101 (33.89%) |
| Postgraduate student | 46 (85.18%) | 8 (14.81%) | 0 | 54 (18.12%) |
| Private practitioner | 116 (87.21%) | 17 (12.78%) | 0 | 133 (44.63%) |
| Speciality | 10 (100%) | 0 | 0 | 10 (3.35%) |
| Total | 225 (75.5%) | 48 (16.1%) | 25 (8.38%) | 298 |
| | | | | |
| p-value <0.001 | | | | |

[Table/Fig-1]: Questionnaire and the result values pertaining to each question.

STATISTICAL ANALYSIS

The data was tabulated and analysed descriptively. The results were statistically analysed using descriptive statistics for the research variables, followed by the Chi-square test after calculating frequencies and percentages. The data were analysed using International Business Machine Statistical Package for Social Sciences (IBM SPSS) Statistics for Windows 18.0 (IBM Corp., Armonk, NY, USA) software, and the p-value level was set at 0.05.

RESULTS

A total of 300 practicing dentists participated in the study. Among them, 60.33% (181) were males and 39.66% (119) were females, with ages ranging from 25 to 60 years. Among the respondents, 44.33% (133) were private practitioners, 34% (102) were academicians, 18.33% (55) were postgraduates, and 3.33% (10) were specialists. They had work experience ranging from 1 to 30 years [Table/Fig-2].

Regarding knowledge, 257 (85.66%) of the respondents had been taught about rubber dam placement in their curriculum, while only 43 (14.33%) of them did not know about rubber dam placement. The majority of practitioners acknowledged the main advantage of

| Gender | Frequency | Percentage |
|---------------------------|-----------|------------|
| Male | 181 | 60.33 |
| Female | 119 | 39.66 |
| Qualification academician | 102 | 34 |
| Postgraduate student | 55 | 18.33 |
| Private practitioner | 133 | 44.33 |
| Speciality | 10 | 3.33 |
| Total | 300 | 100 |

[Table/Fig-2]: Distribution of study population according to gender and qualification.

rubber dam to be isolation and the provision of a clear working area. However, only 151 (50.84%) of practitioners believed that rubber dam placement prevents aerosol transmission.

In the open-ended questions, most practitioners stated that the isolation of teeth is the main advantage of using rubber dam in restorative procedures. Some also mentioned advantages such as retraction of soft tissues, control of salivary contamination, and prevention of instrument aspiration. The most common difficulties faced in implementing rubber dam in restorative procedures were patient acceptance and discomfort, time consumption during emergency case management, and clamp selection.

Based on the attitude towards the usage of rubber dam, 195 (65.65%) did not support the idea that rubber dam should be used for all restorative and endodontic procedures. However, despite perceiving rubber dam usage as time-consuming, 266 (89.26%) of the respondents were willing to learn and gain knowledge about rubber dam.

Regarding practice, 181 (61.35%) of the respondents were utilising rubber dam for their conservative and endodontic procedures before the pandemic, and 142 (48.13%) of the professionals started using rubber dam during the pandemic. Only 137 (46.28%) felt comfortable using rubber dam during treatment procedures. There was a significantly higher number of postgraduates and private practitioners who started using rubber dam after the pandemic ($p < 0.001$).

The authors categorised 15 questions under three Parameters:

Based on knowledge:

- Have you been taught about rubber dam in your curriculum?
- What do you think is the advantage of using rubber dam in restorative procedures?
- What, in your opinion, is the greatest advantage of using rubber dam?
- Do you think rubber dam prevents aerosol transmission?

Based on attitude:

- Do you think rubber dam should be used in all restorative and endodontic procedures?
- Do you think the placement of rubber dam is time-consuming?
- Why do you think rubber dam is not used by many?
- Would you like to learn the placement of rubber dam?
- What difficulties do you face in implementing rubber dam in restorative procedures?

Based on practice:

- Do you perform restorative and endodontic work?
- Are you comfortable using rubber dam?
- Were you using rubber dam for restorative and endodontic procedures before the COVID-19 spread?
- Are you practicing during the pandemic?
- Do you prefer winged or wingless clamps for rubber dam?
- Have you started using rubber dam after the COVID-19 spread?

DISCUSSION

Rubber dam is considered an ideal method of tooth isolation during restorative and endodontic procedures. Its usage has been shown to increase the durability of direct restorations and contribute to the success of root canal treatment [12]. However, the practice of rubber dam usage varies across different regions and countries [13]. In developing countries like India, rubber dam is not commonly used by most dentists, despite its numerous advantages [14].

Studies conducted in India before the COVID-19 pandemic have reported low prevalence of rubber dam usage among dentists [5,15]. However, with the outbreak of COVID-19, the mandatory use of rubber dam for infection prevention and control has become imperative. Various COVID-19 protection protocols have emphasised the compulsory usage of rubber dam to prevent the spread of the virus [16]. The utilisation of rubber dam has been found to significantly reduce aerosol contamination during endodontic treatment [14].

Present study aimed to evaluate the impact of COVID-19 on the improvement of rubber dam practice. An online questionnaire survey was conducted among participants, as it allowed for the collection of a large amount of data in a relatively short period of time during the pandemic. The questionnaire assessed the attitudes, perceptions, and knowledge of dentists in India regarding the usage of rubber dam. The respondents included individuals from different age groups, similar to studies conducted by Turhan ZG et al., and Soldani F and Foley J [17,18]. The majority of respondents (60.3%) were male, indicating that male dentists were more willing to continue their dental practice despite the COVID-19 exposure, while female dentists were more cautious and refrained from practice during and after the pandemic. The study population included undergraduate and postgraduate students, private practitioners, and specialists. The highest rubber dam usage response was reported among private practitioners (44.3%), followed by postgraduates, suggesting that these practitioners were more persistent and cautious in their practice, respectively.

Around 85% of the respondents in present survey had been taught about the application of rubber dam in their learning curriculum. This highlights the fact that the current teaching protocol emphasises the importance of rubber dam usage. Most of the respondents had good knowledge about the purpose and importance of rubber dam usage, recognising its ability to provide good isolation and create an aseptic environment. The survey also revealed that respondents started practicing rubber dam usage primarily to prevent contamination through aerosol transmission during the pandemic. Several studies have shown a reduction of aerosol particles by 70% with the use of rubber dam, greatly reducing the risk of cross-infection [19,20].

However, according to the study results, only 46.28% of the participants felt comfortable using rubber dam, and there was a significant decrease in its usage after the pandemic. This could be attributed to the overall decrease in the number of practitioners during the pandemic and the difficulty experienced by experienced dentists in adapting to the regular use of rubber dam during the COVID-19 outbreak, compared to younger dentists [17].

Previous Indian studies have reported that while 94% of participants knew how to use rubber dam, only 30% actually used it during root canal treatment [21]. In a Brazilian study with only endodontists participating, 99% of participants used rubber dam [22]. In the present study, over 61.35% of specialists were utilising rubber dam in all restorative and endodontic procedures for isolation, easy accessibility, and improved visibility as primary criteria. Some participants (35.90%) cited patient discomfort as the main reason for not using rubber dam, which has also been reported in previous studies [23-25]. Other reasons given by participants for non usage were difficulty in placement (25.33%), time-consuming (19.33%),

and lack of knowledge and skill among operators (19.12%). Madarati AA reported that dentists who did not use rubber dam preferred other isolation methods such as preprocedural mouth rinse and disinfection protocols [26]. However, the most commonly cited reasons for not using rubber dam are insufficient training and lack of confidence among dentists.

The results of the attitude assessment revealed that the majority of dentists (89.26%) were willing to learn the placement of rubber dam as they were aware of its importance in reducing aerosol contamination [26]. Most practitioners who typically perform endodontic work under rubber dam were also willing to continue using it. This practice can significantly reduce exposure to salivary fluids in aerosols, thereby reducing the suspension of microorganisms in the environment [27].

To improve the practice of rubber dam usage, it is important to educate patients about the advantages of rubber dam before starting root canal therapy. Additionally, enhancing the skills of operators in applying rubber dam can help reduce overall treatment time. Therefore, the use of rubber dam during endodontic and operative procedures should be emphasised to both dentists and patients in the current times.

Interestingly, findings in the present study suggest that the impact of rubber dam usage during and after the pandemic is more strongly influenced by the attitude of practitioners rather than their knowledge. This observation was consistent across different practitioner specialties and levels of education. Regardless of their educational background and Speciality practice, the shift towards a more positive attitude towards using rubber dam occurred after the COVID-19 pandemic.

Limitation(s)

One limitation of the study is the unequal distribution of the questionnaire among the groups.

CONCLUSION(S)

The survey indicated that the prevalence of rubber dam usage in India is still low, even after the pandemic. Although practitioners have good knowledge of the uses of the rubber dam, this knowledge is not reflected in their practice. However, about 89.26% of practitioners expressed readiness to receive training on rubber dam application procedures to enhance their clinical skills. This demonstrates the positive attitude of dental practitioners towards utilising the rubber dam in their dental practice. It is recommended to place better emphasis on rubber dam practice through various continuous dental education programs to meet the high willingness of dental practitioners to learn about rubber dam application through training.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Mar 23, 2023
- Manual Googling: Oct 04, 2023
- iThenticate Software: Oct 04, 2023 (14%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Mar 20, 2023**

Date of Peer Review: **May 01, 2023**

Date of Acceptance: **Oct 06, 2023**

Date of Publishing: **Dec 01, 2023**

ANNEXURE

1. Are you doing restorative and endodontic work? Yes/No
2. Have you been taught about rubber dam in your curriculum? Yes/No
3. Do you think rubber dam should be used in all restorative and endodontic procedures? Yes/No
4. What do you think is the advantage of using rubber dam in restorative procedures?
5. What in your opinion is the greatest advantage offered by the rubber dam?
 - a) Provision of isolation and an aseptic working area
 - b) Prevention of swallowing or aspirating instruments
 - c) Prevention of ingestion of irrigants
6. Are you comfortable using rubber dam? Yes/No
7. What are the difficulty faced in implementing rubber dam in restorative procedures?
8. Were you using rubber dam for restorative and endodontic procedures before the covid-19 spread? Yes/No
9. Do you think rubber dam Prevents aerosol transmission? Yes/No
10. Are you practising during the pandemic? Yes/No
11. Have you started using rubber dam after the covid-19 spread? Yes/No
12. Do you think placement of rubber dam is time consuming? Yes/No
13. Reasons you think rubber dam not used by many?
 - a. Knowledge and skill of the operator
 - b. Patient discomfort
 - c. Time consuming
 - d. Difficult to place
14. Do you prefer winged or wingless clamps for rubber dam? Both/Neither/None
15. Would you like to learn the placement of rubber dam? Yes/No