

Knowledge and Practice of Dentists in a Dental College Regarding Toothbrush Disinfection in Mangalore City: A Cross Sectional Questionnaire Study Original Article

Dr. Nikita Patil, Dr. Kushal V.Shetty, Dr. Sowmya B, Dr. Pravallika HN, Dr. Menaka. S, Dr. Shraddha E,
Dr. Samruddhi K. Shetty
Department of Pediatric and Preventive Dentistry,
A.J Institute of Dental Sciences, Mangaluru, Karnataka, India

Abstract:-

Background: Toothbrushes play a pivotal role in the mechanical method of plaque control; they also act as reservoirs of micro organisms. Contaminated toothbrushes are likely to play an important role in many oral and systemic diseases, causing septicemia and diseases of gastrointestinal, cardiovascular, respiratory, and renal systems.

Objectives: The objectives of the study were to assess the level of Knowledge and Practices related to toothbrush disinfection among dentists from a dental college in Mangalore city.

Material and Methods: A prospective study was conducted among dentists from a dental college located in Mangalore city, a 21-item google form questionnaire was sent by means of social media (WhatsApp). The responses obtained were used to assess their knowledge and practices toward toothbrush disinfection.

Results: A majority (97.5%) of the participants responded that they did have necessary knowledge related to disinfection. Most participants (72%) reported that the microorganism capable of causing toothbrush contamination were bacteria and that sharing the same toothbrush with someone else is the most common mode of transmission of infections via toothbrush (62%). Most participants also agreed that soaking the toothbrush in antimicrobial mouth rinse is the better option (76%). Among the participants, 81% participants recommend their patients start disinfecting their toothbrushes and do it by soaking them in an antimicrobial mouth rinse.

Conclusion: The results of the study conclude that the participants have good knowledge about toothbrush disinfection and it has translated to practice, but patient knowledge and practice can be improved to encourage practice of disinfection.

Keywords:- Toothbrush, Disinfection, Bacteria, Oral cavity, Knowledge, Practice.

I. INTRODUCTION

Toothbrushes help in effective plaque removal while also preventing periodontal disease as well as dental caries [1]. As they form an important medium for maintaining good oral hygiene, and hence there arises a need to maintain and replace toothbrushes at regular intervals. Tooth brushes could also turn out to be the cause of disease transmission and increased risk of infection since they can serve as excellent reservoirs for microorganisms. Sharing or storing the toothbrushes together mostly increases the contamination [2-5].

Previously conducted studies have been shown to report that 70% of the used toothbrushes being heavily contaminated with different pathogenic microorganisms which should not come as a surprise as over 700 bacterial species, as well as fungi, viruses, and transient microorganisms, are present in the oral cavity that may or may not cause various diseases [6-8].

Bacteria that attach to, accumulate and survive on toothbrushes may be transmitted to the individual causing diseases such as dental caries, gingivitis, periodontitis, and stomatitis [9]. Toothbrushes can also be contaminated by external environment, aerosols and hands. Thus, rather than cleaning the teeth, the toothbrush could possibly be contaminating them [10].

The problem associated with toothbrush contamination was reported by Cobb as early as in 1920. In 1992, Glass observed that oral tissue injuries were aggravated by the use of contaminated tooth brushes when compared to the use of sterile toothbrushes, and may even cause bacteraemia and sometimes septicaemia after brushing. It was also reported that since toothbrushes are usually stored in bathrooms, they present with a high level of contamination considering this environment is highly contaminated, mainly by enteric bacteria dispersed by aerosols [11].

This risk of infection or re-infection can be prevented by multiple methods of decontamination such as, antimicrobial solutions (Chemicals: chlorhexidine, triclosan, cetylpyridinium chloride, Listerine, or several dentifrices; natural agents: garlic and tea tree oil extracts) as well as by using radiation (Microwave, ultraviolet rays) [12].

Although literature contains a large proportion of articles comparing the various methods of toothbrush disinfection, there are very few articles assessing the knowledge of the dental professionals relating to methods of toothbrush disinfection or the proper methods of toothbrushes. To fill this knowledge gap, the present study was conducted with the aim to assess the knowledge, attitude, and practices of dental professionals in dental college with regard to toothbrush disinfection.

II. MATERIALS AND METHODS

Present survey was undertaken among the dentists from a college located in Mangalore city. A simple random sample of 200 Dentists was selected out of which only 161 participated in the study. A questionnaire was prepared using google forms based on a study conducted by and sent to the participants via social media (Whatsapp). Only participants who consented to the study were included. The questionnaire had 21 questions to assess the personal details, knowledge about toothbrush disinfection and practices related to tooth brush disinfection. The questionnaire was taken from studies previously conducted by Peker I et al and Soumya KR et al [13,14].

The first part of the questionnaire included demographic details like gender, age, year of graduation, highest academic degree and area of specialty. The knowledge portion included questions about toothbrush disinfection, microorganisms that contaminate toothbrushes, common mode of contamination, sources of contamination, and ways to disinfect toothbrushes.

The practices associated with toothbrush disinfection was assessed by asking questions about the dentist's own practices related to toothbrush disinfection and recommendations that the dentist would provide to their patients. The responses obtained were subjected to statistical analysis and descriptive statistics were obtained using IBM SPSS Statistics software version 23.

III. RESULTS

Table 1 represented the demographic data of the participants and the results show that the present study involved 57% female and 43% male participants and most of the dentists involved in the study belonged to the age group between 21 to 30 years (62.9%)

Majority of the participants had finished their academic studies between 6-10 years ago (44%) followed by less than 5 years (32%), and 24% had experience of greater than 11 years (Figure 1). Of all the participants, 64% participants had received their Bachelors of Dental Surgery (BDS) degree followed by 36% having achieved their Masters of Dental Surgery (MDS) degree (Figure 2).

Table 2 depicted data on the toothbrush disinfection knowledge among the participants. When asked if they had any knowledge on the cleaning and disinfection of toothbrushes, 97.5% responded that they did have necessary knowledge. Of all participants, 97.5% agreed with the statement that contact between toothbrushes was an

important issue in toothbrush contamination. Most of the participants (72%) answered that the microorganism capable of causing toothbrush contamination were bacteria and that sharing the same toothbrush with someone else is the most common mode of transmission of infections via toothbrush (62%).

Most of the participants claimed that the most common source of toothbrush contamination was contact with another toothbrush (59%). When asked if toothbrush disinfection is necessary, all participants agreed (100%). Majority of the participants answered that toothbrush disinfection is necessary for everyone and not just special patient groups (92%). When enquiring what is the correct way to disinfect a toothbrush, most participants agreed that soaking the toothbrush in antimicrobial mouth rinse is the better option (76%).

Table 3 depicts the data assessing toothbrush disinfection related practices among participants. When asked about how to store the toothbrush to avoid contamination, most participants answered that it is to store it in a separate container which is not shared with family members (61%). Most participants answered that they store their toothbrush in the bathroom, in a closed cabinet (78%) and they do not share the toothpaste with any other individuals (88%). While travelling, most participants answered that they stored their toothbrush in the pocket of any bag/suitcase while travelling (62%).

A large majority of the participants answered that they disinfect their toothbrushes (77%), when asked if they advised their patients regarding how often they should change their toothbrushes and/or where and how their toothbrushes should be stored, they answered that they only made suggestions about the frequency of changing their toothbrushes (69%). Among the participants, 81% participants recommend their patients start disinfecting their toothbrushes and do it by soaking them in an antimicrobial mouth rinse.

IV. DISCUSSION

The need for good oral health and increased awareness among the masses for the same has placed an added emphasis on dental professional to help patients prevent problems related to the oral cavity as far as possible. The correct use of a toothbrush can be prioritized to make the work of a dentist easier as it is an essential dental aid and can aid in promoting oral health and prevent dental diseases. Commonly, after use, toothbrushes are rinsed with plain water and stored in the bathroom which leaves it with a very high chance being contaminated by bacteria that can cause dental problems, cross-infection by sharing toothbrushes or keeping them in close proximity can lead to high levels of contamination. The present study was conducted to assess the knowledge and practice among dentists with regard to toothbrush disinfection.

The demographic data showed that the study involved 57% female and 43% male participants, this was in agreement with studies conducted by Potlia I et al, Sowmya KR et al and Peker I et al which also showed a higher

female population of participants when compared to males and this can be explained by the presence of a larger number of female dental students when compared to males in colleges [11,13,14]. Age is directly associated with experience and most of the dentists involved in the study belonged to the age group between 21 to 30 years which was the same as studies conducted by Potlia I et al [11]. It is in disagreement with the results of a study by Peker I et al which showed that participants had a higher mean age of 33 ± 0.03 years [13].

Majority of the participants had finished their academic studies between 6-10 years ago (44%) followed by less than 5 years (32%), and 24% had experience of greater than 11 years (Figure 1). The result is in disagreement with the results of a study conducted by Peker I et al which had more participants graduating from dental school 0-5 years ago [13]. With regard to academic level, of all the participants, most participants had received their Bachelors of Dental Surgery (BDS) degree which can be explained by most participants being interns or post graduates students who were yet to graduate.

Knowledge related to toothbrush disinfection was assessed and the results showed that when asked if they had any knowledge on the cleaning and disinfection of toothbrushes, a vast majority of the participants responded that they did have necessary knowledge. This can be explained by dental students being aware of the contamination that can occur by means of a toothbrush and being educated on the importance of disinfection of toothbrushes. However, this result is in disagreement with the results of a study by Peker I et al which had more participants which did not report knowledge about toothbrush cleaning and disinfection [13]. A study conducted by Altindal D et al which assessed patients presenting to dental clinics stated that most participants did not have any knowledge related to toothbrush disinfection [15]. This can be expected with not all dentists being made well aware of the need for toothbrush disinfection. A previously conducted studies by Peker I et al and Potlia I et al had reported that most included participants believed that contact between toothbrushes was an important issue in toothbrush contamination [11,13]. Stored of toothbrushes in close contact can result in a high level of contamination and this has been proven in multiple studies [16].

Participants were quizzed if they knew which type of microorganism are commonly seen in cases of toothbrush contamination and most of the participants answered that the microorganism capable of causing toothbrush contamination were bacteria and that is in agreement with the results of a study conducted by Sowmya KR et al [14]. Prolonged use of the toothbrush facilitates contamination by various microorganisms such as Streptococcus, Staphylococcus, Lactobacilli, Pseudomonas, Klebsiella, Escherichia coli and Candida [17].

Sharing of toothbrushes can cause direct contamination by directly transferring of microorganisms from the oral cavity of one individual to another and this was reflected in the results of the present study with

participants reporting that sharing a toothbrush with someone else is the most common mode of transmission of infections via toothbrush and this is in agreement with the results of a study conducted by Sowmya KR et al [14]. Another avenue of toothbrush contamination can be placing toothbrushes in contact with another being the outer environment and both these practices favours harbouring of millions of microorganisms and dispersal of enteric bacteria through aerosols from toilet flushing or from contaminated fingers and skin commensals and pseudomonas from the bathroom and other wet areas which subsequently results in toothbrush contamination [18]. Most of the participants in the present study claimed that the most common source of toothbrush contamination was contact with another toothbrush with contamination from the external environment being a close second and this was in complete agreement with the results of a study conducted by Sowmya KR et al [14].

When asked if toothbrush disinfection is necessary, all participants included in the present study agreed and this result was in agreement with the results of a study conducted by Peker I et al as well as the results of a study conducted by Rajabzadeh M et al which was conducted among dental students [13,19]. However, a study conducted by Sowmya KR et al reported that 50%-53% participants did not feel that the practice of toothbrush disinfection was necessary which contrasts with the results of the present study [14]. This could be explained by more awareness being spread on the topic of toothbrush disinfection among dental students, especially when they realise the number of microorganisms that the oral cavity harbours during their studies.

Toothbrush disinfection is still a new concept and is usually only recommended to patients with periodontal problems to avoid disease progression making it something practiced by an exclusive group of people. Most participants in the present study reported that toothbrush disinfection is necessary for everyone and not just special patient groups (92%) and this resonates with the results of a study conducted by Potlia I et al [11]. However, This result was in disagreement with the results of a study conducted by Rajabzadeh M et al which reported that participants believed that certain groups of people required toothbrush disinfection more, and this opinion is also valid as it is essentially observed more by patients who are recommended to follow it as part of a treatment regimen [19].

Toothbrush disinfection can be done by various methods like soaking in alcohol, disinfecting solution, antimicrobial rinses, or washing toothbrush in the dishwasher, using a microwave oven, and ultraviolet light as well as drying in sun, using table salt to absorb moisture and placing the brush in a closed cabinet containing formaldehyde gas. In the present study, when enquiring on the correct way to disinfect a toothbrush, most participants agreed that soaking the toothbrush in an antimicrobial mouth rinse is the better option and this was in agreement with a study conducted by Potlia I et al [11]. The American Dental Association (ADA) also recommends that antimicrobial mouth rinse be used for disinfection of toothbrushes of high-risk patients by soaking. However, they do not provide

standard disinfection recommendations for healthy individuals [11].

Practices related to toothbrush disinfection were also assessed as and when asked about how the participants would store their toothbrush to avoid contamination, most participants answered that they would store it in a separate container which is not shared with family members and this was in agreement with the results of a study conducted by Potlia I et al as well as one conducted by Peker I et al [11,13]. However, previously conducted studies have reported that the extent of bacterial contamination is higher in toothbrushes that are stored in closed containers compared to those left open to air. The use of a toothbrush cap has also been reported to increase bacterial survival on toothbrushes thus making regular disinfection a necessity to ensure no bacterial contamination [13].

A previously conducted study by Peker I et al reported that most of the participants stored their toothbrush in a closed cabinet in the bathroom, while the present study results showed that most participants stored their toothbrushes in open contact with the bathroom environment [13]. This can be very detrimental as placing of toothbrushes in an open environment can result in exposure to a multitude of microorganisms by aerosols, fingers and wet surfaces [14].

While travelling, most participants in the present study reported that they stored their toothbrush in the pocket of any bag/suitcase. This was in disagreement with the results of a study conducted by Potlia et al which stated that participants stored their toothbrushes in a separate pouch which would be the more hygienic option as the toothbrush does not come in contact with any other items that could harbour microorganisms [11].

With regard to the practice of disinfection, the results of a previously conducted study conducted by Peker I et al reported that they do not disinfect their toothbrushes and this was in disagreement with the results of the present study where results have shown that more participants do disinfect their toothbrushes [13].

With regard to the recommendations provided by the included dentists, when asked if participants advised their patients regarding their frequency of changing toothbrushes and/or where and how their toothbrushes should be stored, they answered that they only made suggestions about the frequency of changing their toothbrushes, this result aligned with the results of a previously present study with most participants suggested the same [13]. A majority of the included participants reported that they would recommend their patients to start disinfecting their toothbrushes and do it by soaking them in an antimicrobial mouth rinse and this would be highly beneficial to both patient and dentist is the long run.

The limitations of the present study included the sample size involved and the conduction of the study in the single dental school. The broader implications of the study are that it shows a good level of knowledge among the participating dentists regarding toothbrush disinfection and

this is being translated to practice by dentists. A previously conducted study concluded that sterilization using 2% glutaraldehyde and 3% hydrogen peroxide solutions resulted in a significant reduction in the mean bacterial count and percentage reduction in the total bacterial count and their use can be indoctrinated in dentist as well as patient practice [20]. Certain aspects such as storage of the toothbrushes can be worked upon and patients other than those undergoing some sort of treatment can be advised to start disinfecting their toothbrush.

V. CONCLUSION

The results of the present study help us in concluding that the included dentists possess a good level of knowledge related to toothbrush disinfection and this has resulted in changes in practice from the traditional methods. However, this knowledge has to be transferred to patients to ensure that they can also start incorporating toothbrush disinfection into their daily routine.

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TABLES

Table 1: Demographic details of participants

Age	
a) 21 – 30 years	58.9%
b) 31 – 40 years	24.1%
c) 41 – 50 years	10.1%
d) 51 – 60 years	6.9%
Sex	
a) Male	43%
b) Female	57%
When did you graduate from the dental school?	
a) 0–5 years ago	32%
b) 6–10 years ago	44%
c) 11+ years ago	24%
Which is the highest degree you have achieved?	
a) Bachelors of Dental Surgery	64%
b) Masters of Dental Surgery	36%

Table 2: Participant response to knowledge related questions

Do you have any knowledge about toothbrush cleaning and disinfection?	
a) No	2.5%
b) Yes	97.5%
Is contact between toothbrushes an important issue in toothbrush contamination?	
a) No	1.8%
b) Yes	98.2%
Which are the microorganisms capable of causing toothbrush contamination?	
a) Bacteria	72%
b) Fungi	10.3%
c) Virus	15.1%
d) Do not know	2.6%
Which is the common mode of transmission of infection from toothbrush	
a) Sharing the toothbrush	62%
b) Sharing the same toothbrush holder	15.3%
c) Sharing the tooth paste	12.1%
d) Use of frayed bristled toothbrush	10.6%
Which is the most common source of toothbrush contamination	
a) Oral cavity	13.7%
b) Skin contacts	15.6%
c) External environment	11%
d) Contact with another toothbrush	59.7%
Is toothbrush disinfection necessary?	
a) No	0.0%
b) Yes	100%
For whom is toothbrush disinfection necessary?	
a) Everybody	92%
b) Special patient groups	8%
What is the correct way to disinfect a toothbrush?	
a) Soak toothbrushes in antimicrobial mouth rinse	76.3%
b) Using normal tap water	20.9%
c) Using distilled water	2.8%
d) Any other	0.0%

Table 3: Participant response to practice related questions

How do you store your toothbrush?	
a) In a toothbrush holder shared with other family members	26%
b) In a separate container not shared with family members	61%
c) Covering the brush with a cap	10%
d) Any other	3%
Where do you store your toothbrush?	
a) In the bathroom, in open contact with the environment	22%
b) In the bathroom, in a closed cabinet	78%
Do you share your toothpaste with other individuals?	
c) No	88%
d) Yes	12%
How do you carry your toothbrush while traveling?	
a) In a separate pouch	31.5%
b) In the pocket of any bag/ suitcase	62%
c) Do not carry/ brush with fingers	6.5%
Do you disinfect your own toothbrush?	
e) No	23%
f) Yes	77%
Do you advise your patients regarding how often they should change their toothbrushes and/or where and how their toothbrushes should be stored?	
a) I only make suggestions about the frequency of changing their toothbrushes	69.5%
b) Yes	27.5%
c) No	3%
Would you recommend your patients to start disinfecting their toothbrush?	
a) No	19%
b) Yes	81%
How would you recommend your patients to disinfect their toothbrush?	
a) Soak toothbrushes in antimicrobial mouth rinse	81%
b) Using normal tap water	9.2%
c) Using distilled water	9.8%
d) Any other	0.0%

FIGURES

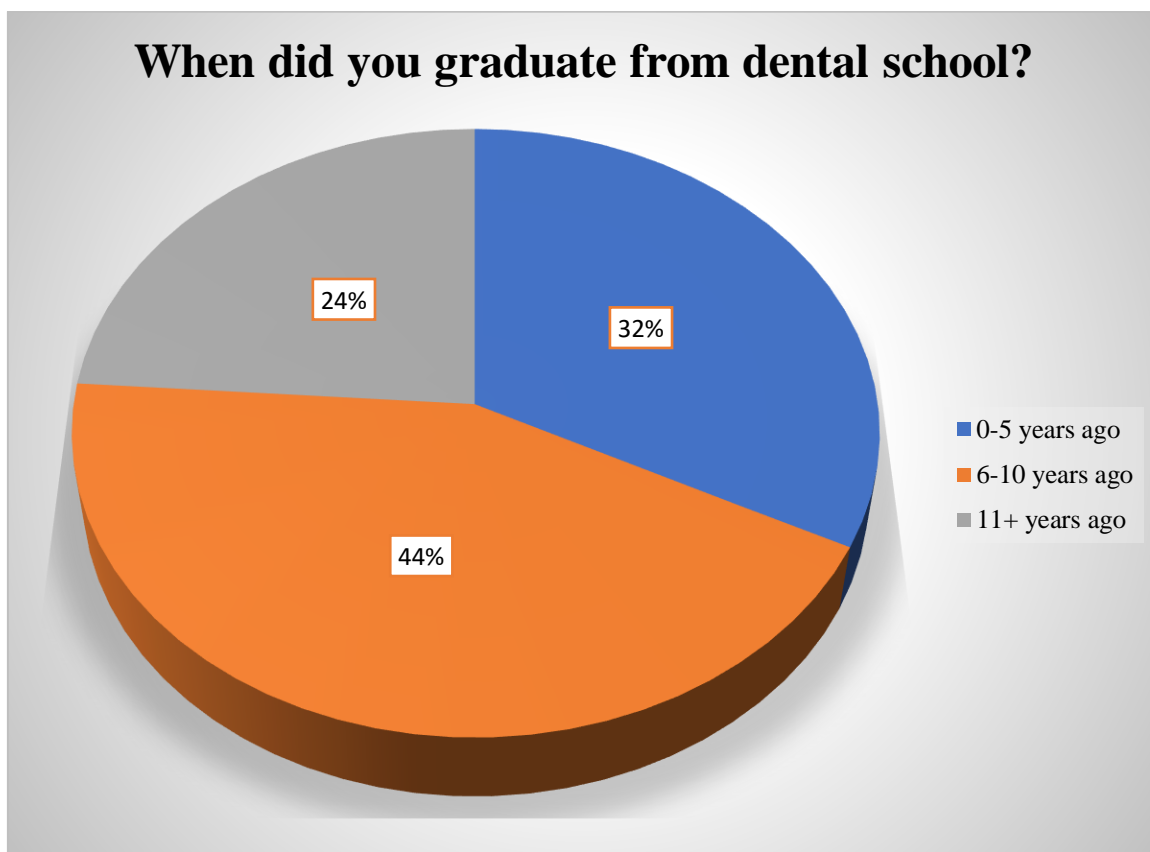


Fig. 1: Pie chart depicting when the participants graduated from dental school

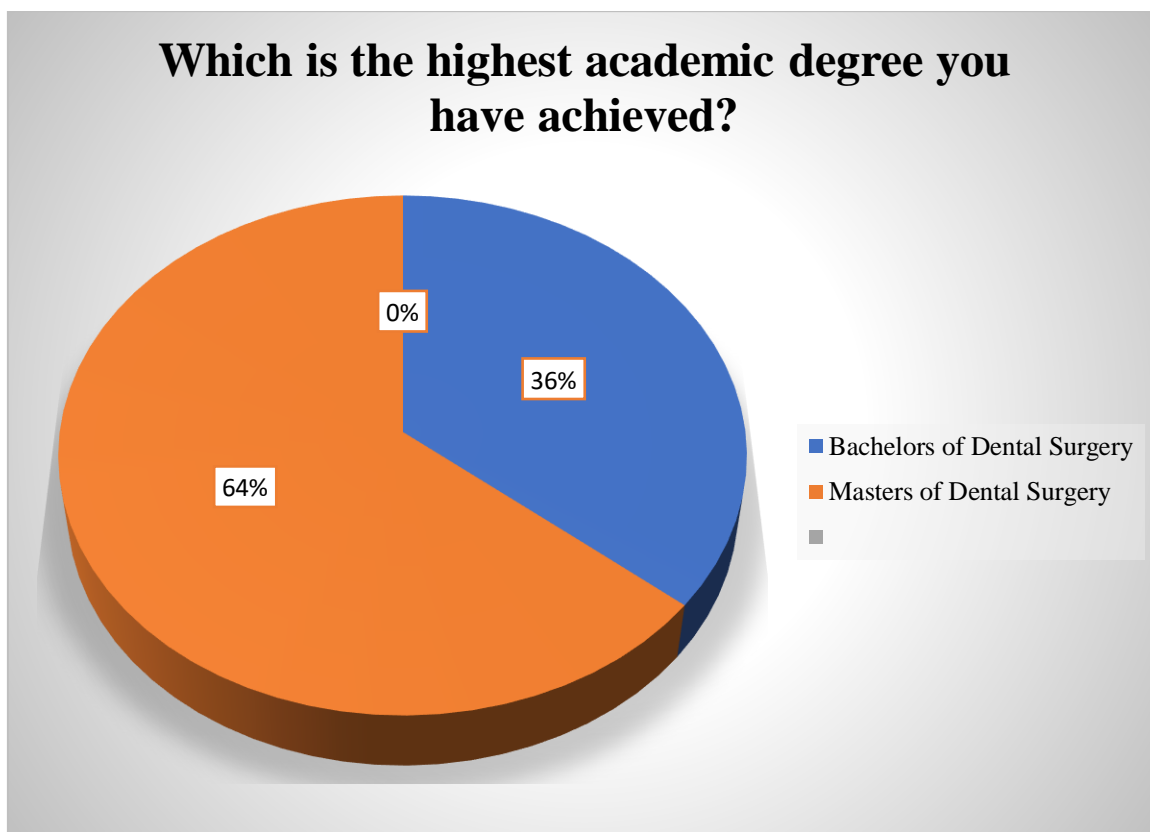


Fig. 2: Pie chart depicting data on the highest academic degree achieved by the participants.