Journal of Contemporary Issues in Business and Government Vol. 27, No. 2, 2021
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2021.27.02.358

Association of Dental Caries Based on Frequency of Tooth Brushing Habit - A Retrospective Study

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Abstract: Background: Tooth brushing is one of the fundamental self-care behaviors seen in an individual. It is important for one's oral health and its maintenance. Dental caries is an infectious disease that damages tooth structure and causes cavities.
Aim: The aim of this study is to evaluate the association of dental caries based on the frequency of tooth brushing in individuals.
Materials and method: Data was collected retrospectively from the dental records of patients visiting saveetha dental college. Patient gender, carious tooth, frequency of brushing and toothpaste used was collected by reviewing the case sheets. The obtained data was entered in MS excel spreadsheet and imported to spss for statistical analysis. Chi square test was applied and level of significance was set $p<0.05$.
Result:
The results proved that 76.1% of the individuals brushed once daily and 23.9% of the individuals brushed twice a day .The prevalence of usage of fluoride containing toothpaste was 46.8% .There was a significant association between frequency of tooth brushing habit and DMFT score ($p<0.05$) .Individuals who had brushed twice a day with fluoride containing toothpaste , showed lesser DMFT scores indicating the decreased incidence of dental caries.
Conclusion: Within the limits of the study, it can be concluded that individuals with the lesser frequency of brushing habit and using non-fluoridated toothpaste had increased DMFT scores.

Keywords: Dental Caries; Frequency; Fluoride ; Prevalence; Tooth Brushing Habit;Toothpaste.

INTRODUCTION

Tooth brushing is fundamental self care behavior of maintaining oral health.(Holmes, 2016). The frequency of tooth brushing has an impact on the incidence and presence of dental plaque in the oral cavity.(Ghazal, no date) The evidence base for the presence of caries in teeth is directly related to the oral habit and hygiene. The effect of infrequent brushing has an impact on the increments and incidence of caries.(Komuro, 1980) Tooth brushing is an important application to reduce the incidence of anti-caries agents. However, most patients are not able to achieve sufficient plaque removal by performing oral hygiene measures at home. Therefore, tooth brushing twice daily is recommended by most of the dentists in order to improve plaque and caries control. (Attin and Hornecker, 2005) Individuals who have lesser incidence of tooth brushing are at greater risk of dental caries in the oral cavity.(Tanaka, Miyake and Sasaki, 2010)(Ravikumar, Jeevanandan and Subramanian, 2017)
Individuals who state that they brush their teeth infrequently are at greater risk for the incidence or increment of new carious lesions than those brushing more frequently.(Borgnakke and Brignardello-Petersen, 2017) The incidence of caries in the dentition can be because of food impaction in the interdental space because of improper tooth brushing.(Calderón Larrañaga *et al.*, 2019) The incidence of dental caries in the tooth surface is mainly because of improper oral hygiene, thus the assessment of dental caries and proper investigation is required finding out the epidemiological factors for the dental caries.(Gil *et al.*, 2015) Individuals with good oral hygiene and maintenance by proper brushing habit and technique and flossing had a lower caries incidence than those with poor oral hygiene, but the differences were small. Dental caries can be prevented by efficient removal of plaque by toothbrushing and flossing.(Andlaw, 1978)
Brushing twice a day is necessary for the maintenance of proper oral hygiene and the reducing the effect of caries, periodontal diseases like periodontitis and gingivitis.(Manz *et al.*, 2019) It has been proven that there is lesser incidence of periodontitis and gingivitis in patients with a proper brushing habit and oral maintenance, but

is of very less prevalence. Specific oral health behavior regarding the timing and frequency of toothbrushing and the use of secondary oral products does not affect the prevalence of severe periodontitis.(Han and Park, 2017)
Dental caries is a disease of the hard tissues of the teeth caused by an imbalance in demineralisation and remineralisation of the tooth minerals over time, where there is demineralisation of tooth structure by organic acids formed from the interactions between cariogenic bacteria in dental plaque and carbohydrates.(Fanning *et al.*, 1968) This is maintained by the amount of fluoride which promotes this process. There are many ways fluoride delivered into the oral cavity e.g. toothpaste, fluoridated water, milk, mouthrinses, gels, varnish, etc.(Schenkel, 2019) Tooth Brushing with fluoride toothpaste is the most common form for controlling the prevalence of caries and fluoride toothpaste use is commonly used to reduce caries prevalence in many countries.(Walsh *et al.*, 2009) Individuals using non-fluoride containing toothpaste are at a higher risk of incidence of caries. Thus, the use of fluoride containing toothpaste is necessary for reducing the incidence of caries in the oral cavity.(Burkett, 1995),(Veerale Panchal, Jeevanandan and Subramanian, 2019). As there is less literature available about correlating dental caries and tooth brushing habits among the South indian population, Para1. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; V. Panchal, Jeevanandan and Subramanian, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)
this study aimed to assess the correlation of dental caries based on frequency of tooth brushing habit.

MATERIALS AND METHOD

The study was conducted in Saveetha Dental College and Hospitals, with patients visiting for a period between september 2019 and march 2020.The data was collected by reviewing the case sheets . The study setting was approved by the Institutional ethics committee SDC/SIHEC/2020/DIASDATA/0619-0320. Two examiners were involved in the study.Total of 1500 patients' case sheets reviewed ,403 patients of above 18yrs whosoever had complete records were selected. Patient age,gender,frequency of tooth brushing ,carious tooth as per the records and toothpaste usage from the case history were collected. Telephonic and photographic cross verification of data was done by two examiners. If there was no response from the patient, the particular data was excluded.The dependent variables and independent variables were set. The obtained data was entered in Ms Excel spreadsheet and the tabulated data was subjected to statistical software IBM SPSS version 20.0. Descriptive inferential statistics were done. Chisquare test applied and the p value was set at $p<0.05$.

RESULTS

Increased DMFT scores were more prevalent in males than females. Most of the patients brushed once a day was 76.1% , whereas twice a day 23.9% ($p<0.05$). Out of this data 53.2% of the people used fluoride containing toothpaste whereas 46.8% of the patients used non-fluoride containing toothpaste.($p>0.05$). The association between frequency of tooth brushing habit and DMFT scores showed that the individuals brushing once a day showed increased DMFT scores, indicating increased incidence of carious lesion when compared to individuals brushing twice a day. There was a statistical significant difference with $p=0.00$ ($p<0.05$).The results of the study showed that patients with increased frequency of brushing i.e patients who brushed at least twice daily showed lesser DMFT scores. This proved that brushing twice a day showed lesser incidence of carious lesions in the oral cavity. The association between fluoridated toothpastes and DMFT scores showed that there were lesser DMFT scores in individuals using fluoride containing toothpastes when compared to non-fluoride containing toothpastes.There was a statistical significant difference, $p=0.001$[$p<0.05$].Hence proving that patients using fluoride containing toothpastes showed lesser incidence of caries.

DISCUSSION

The present study shows that the individuals brushing their teeth with fluoride containing toothpaste with a frequency twice a day, showed less DMFT scores indicating the lesser incidence of dental caries. This study was done as oral hygiene is important for reducing the risk for the incidence of dental caries in the oral cavity. The study setting was done in the outpatient clinical setting of Saveetha dental college with patients of different ethnic groups from chennai population.The significance of caries was based on the frequency of maintenance of oral health.(Tinanoff, 2017)(Packiri, 2017) Oral health education is an important part or education which is responsible for the reduction of the incidence of caries in the oral cavity.(Sonoda *et al.*, 2017)(Subramanyam *et al.*, 2018) This study shows that there is an increased formation of caries and its increased incidence in patients with lesser tooth brushing frequency.(Hölttä and Alaluusua, 2009)(Christabel and Linda Christabel, 2015) The study showed that most of the individuals showed incidence of brushing once a day. The study described that

the individuals brushing twice a day showed lesser incidence of carious lesions in the oral cavity. Kumar.S, et al. described that that increased incidence of carious lesions is seen in patients with reduced brushing frequency which is in accordance with our study(Kumar, Tadakamadla and Johnson, 2016) .But the increased frequency of brushing is irrelevant if there is a lack of knowledge and practice of improper brushing technique in the individual person.(Sheiham, 1984)(Jeevanandan and Govindaraju, 2018) Thus the knowledge of a proper and healthy brushing habit is necessary for reducing the incidence of caries.(Govindaraju and Gurunathan, 2017; Dos Santos, de Oliveira and Nadanovsky, 2018)

The association between brushing frequency and the DMFT score showed that lower DMFT scores were observed in the individuals brushing twice per day (Govindaraju, Jeevanandan and Subramanian, 2017b). Prasd M et al proved there was an increase in the DMFT scores with increasing age.(Prasad, 2016) It is not only the brushing habits but the increase sugar content in the food consumed is also a cause for the incidence of caries in an individuals.(Jeevanandan, 2017) Proper food habit with lesser sugar content and nutritious food is required for reducing the incidence of plaque and caries incidence in the oral cavity.(Prasai Dixit *et al.*, 2013)(Govindaraju, Jeevanandan and Subramanian, 2017a)

Sheila Jones, et al stated that 67% of the individuals from that study used fluoridated toothpaste for brushing their teeth and there was a 40% drop in the incidence of caries in the individuals using fluoridated toothpastes (Jones *et al.*, 2005)which is in accordance with our study. The prevalence of dental caries lesions drops 20–30% in populations using fluoridated toothpaste. The use of fluoride containing toothpaste helps in the reduction of the incidence of caries in an individual. The patients using fluoride containing toothpastes have shown to exhibit lower DMFT scores proving the lesser incidence of carious lesions in the oral cavity.(Priyadarshini *et al.*, 2020) The use of fluoride containing toothpaste and mouthwash is administered to reduce the incidence of caries in the oral cavity.(Levy, 1994)(Nair *et al.*, 2018) The use of fluoride containing toothpastes and rinses reduced the incidence of caries by 23-26%.(Marinho *et al.*, 2003)

This study showed that 53.1% of the individuals used fluoride containing toothpaste and these patients showed lesser incidence of caries exhibiting lower DMFT scores.(Benson *et al.*, 2019) Increased fluoride use can lead to discoloration of the tooth surface, but there is very less differential complaints and unwanted effects such as soft tissue damage and tooth staining were minimal for the use of fluoride over 1000ppm.(Rasines, 2010)(Gurunathan and Shanmugaavel, 2016). Somasundaram et al proved that the use of non-fluoride containing toothpastes showed increased incidence of caries which exhibited a higher DMFT score by 47.1%.(Somasundaram *et al.*, 2015) ('Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018) which is in accordance to our study.The association between use of fluoride containing toothpaste showed lower DMFT score proving lesser incidence of caries.This shows that the use of a fluoride containing toothpaste has lesser incidence of carious lesions.(Twetman, 2009) Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Mathew *et al.*, 2020)

This study shows and exhibits various oral health education techniques with room for improvement. Education of the importance of oral health and its various techniques are to be introduced in the general clinical education of patients on oral health to thereby decrease the prevalence of carious lesions. Thus, the education of the patients of proper maintenance of oral health and a proper brushing technique knowledge is necessary to reduce the incidence of carious lesions in the oral cavity.

CONCLUSION

Within the limits of the study, it is proven that there is a strong association between the frequency of tooth brushing with the DMFT index. The study proved that increased frequency of tooth brushing shows lower incidence of caries and the use of fluoride containing toothpaste reduces caries in the adult population.

ACKNOWLEDGEMENTS

Thanks to Saveetha Dental College for allowing me to review the records of the patient

Author Contribution

Baala vignesh.A,,contributed in concept, acquisition of data analysis ,interpretation of data and also drafting the article and revising it critically for important intellectual content .

Dr.Jessy,contributed in study design,correction ,alignment and supervision

Dr. Ravindra Kumar Jain, contributed to alignment and formatting and final approval of the submitted version of the manuscript

CONFLICT OF INTEREST

Nil

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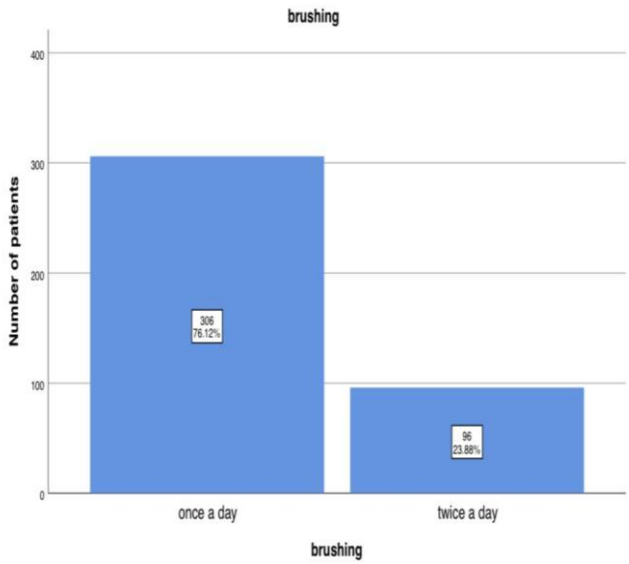

Fig 1: Describes the percentage distribution of Frequency of brushing among the collected data. X axis describes the frequency of brushing. Y axis describes the frequency of individuals brushing once a day and individuals brushing twice a day. Study showed that 76.1% of the individuals brushed their teeth once and 23.9% of the individuals brushed their teeth twice a day.

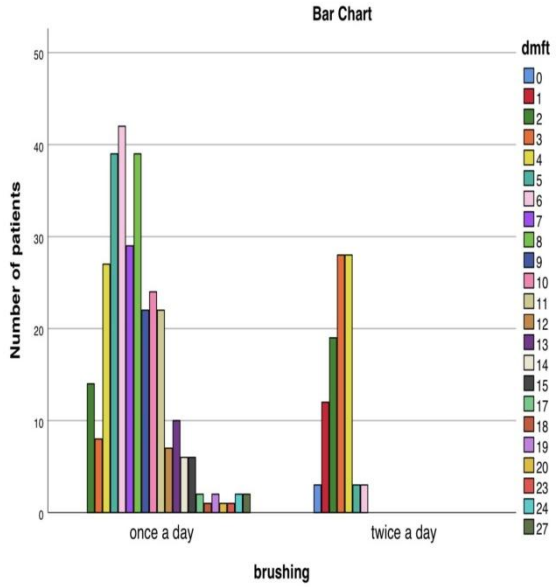

Fig 2: Describes the relationship between brushing frequency and DMFT score. X axis shows the frequency of tooth brushing. Y axis describes the respective frequency of individuals brushing once a day and twice a day. Various DMFT scores were represented with the coloured bar graphs and the frequency of individuals with the particular score was displayed. Chi square test was applied which showed significant association between type of tooth brushing frequency and DMFT score. Pearson chi square= 217.08, p=0.00 (<0.05) which is statistically significant. Therefore results proved that higher DMFT scores shown by individuals brushing once a day when compared to the individuals brushing their teeth twice a day.

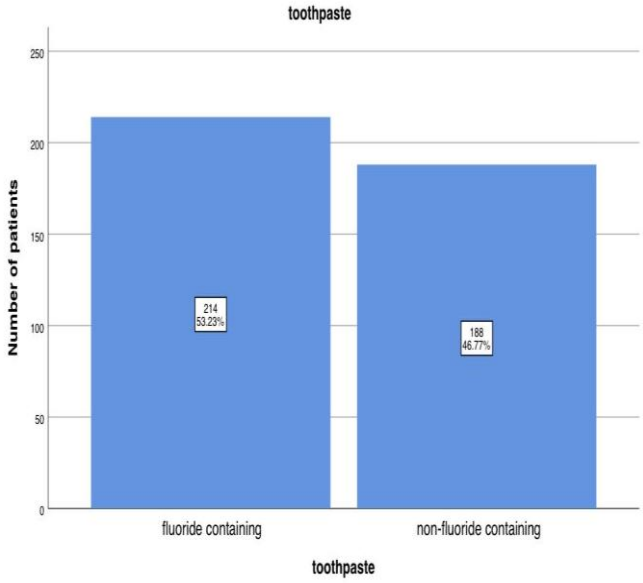

Fig 3: Describes the percentage distribution of fluoridated and non-fluoridated toothpaste among the collected data. X axis shows the type of toothpaste used. Y axis shows the frequency of individuals using fluoride containing toothpaste and non fluoride containing toothpaste. The study showed that 53.2% of the individuals use fluoride containing toothpaste and 46.8% of the individuals use non fluoride containing toothpaste.

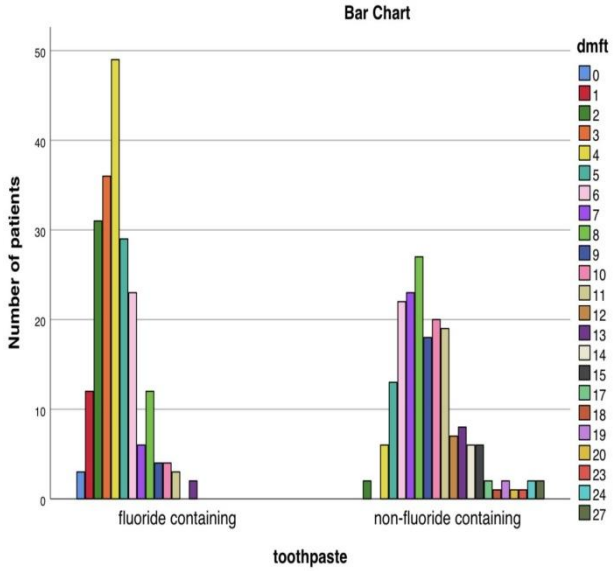

Fig 4: Relationship between type of toothpaste and DMFT score. X axis shows the type of toothpaste used . Y axis describes the respective frequency of individuals using fluoride containing toothpaste and non-fluoride containing toothpaste. Various DMFT scores were represented with the coloured bar graphs and the frequency of individuals with the particular score was displayed. Chi square test was done which showed significant association between type of tooth paste and DMFT score. Pearson chi square= 195.09, p=0.001 (<0.05) which is statistically significant. Therefore results proved that higher DMFT scores shown by individuals using non-fluoride toothpaste when compared to the individuals using fluoride containing toothpaste.