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# Prevalence of Dental Caries and Missing teeth among the Women of Reproductive age

**A.Ashwatha Pratha[1], Arthi Balasubramaniam[2*], Ravindra Kumar Jain[3]**

[1]Research Associate, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and technical sciences (SIMATS), Saveetha University, Chennai, India
Email: 151501052.sdc@saveetha.com

[2]Senior Lecturer, Department of Public Health Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical sciences (SIMATS), Saveetha University, Chennai, India
Email: arthib.sdc@saveetha.com

[3]Reader, Department of Orthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical sciences (SIMATS), Saveetha University, Chennai, India
Email: ravindrakumar@saveetha.com

**ABSTRACT**

Dental caries is a common global health problem today. There is a sharp increase in the prevalence of tooth loss following dental caries globally. The prevalence of tooth loss and dental caries was observed to be higher in women than in men in many parts of the world. Changing hormonal levels plays a vital role in causing oral diseases and in turn oral diseases may affect fertilization among women in reproductive age. This study aimed to determine the prevalence of dental caries and missing teeth among women of reproductive age. A retrospective study was conducted using records of patients visited University dental hospital. A total of 312 consecutive case records of patient age ranging from 18-40 years were retrieved. Data on the number of "D" component and the number of 'M' component of Decayed, Missing and Filled teeth Index (DMFT) and Decayed, Missing and Filled surface Index (DMFS) were entered and subjected to statistical analysis. Descriptive statistics and chi-square association test was employed to find the association. The prevalence of dental caries and missing teeth was more in the age group 26-40years. Among the age group of 26-40 years, 42.31% of women had 0-5 decayed teeth, 37.82% of the women had 0-5 missing teeth, 25.64% of the women had 0-5 decayed surfaces, and 37.5% of the women had 0-5 missing surfaces. No significant association was present between reproductive age and decayed teeth, missing teeth surface ($p>0.05$), whereas a significant association of reproductive age with number of missing teeth and decayed teeth surface was observed ($p<0.05$). Within the limits of the study, the prevalence of dental caries and tooth loss due to dental caries was high in women of reproductive age group 26-40 years.

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## INTRODUCTION

Tooth loss affects an individual's quality of life by damaging functionality, aesthetic and social domains [1]. Tooth loss helps in predicting the general condition of oral health [2]. Oral health related quality of life will be deteriorated by an increase in the number of teeth loss. [3]. Tooth loss plays a major role in loss of mastication and

* Contact: Arthi Balasubramaniam, *Senior Lecturer, Department of Public Health Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical sciences (SIMATS), Saveetha University, Chennai, India*
arthib.sdc@saveetha.com

esthetics [4]. In general, various reasons for tooth loss include dental caries, periodontal diseases, socioeconomic status, malnutrition [5]. Gender difference has significantly contributed to tooth loss causing edentulousness due to culturally mediated behavior which may be either temporal or regional [6].

Dental caries remain a global health care issue with eminent economic impact or skewed distribution across and within countries [7]. In India, with diverse food habits [8], socioeconomic and cultural variations, as well as the skewed oral health care workforce [9], the impact on dental caries incidence is found to be high [10]. Dental caries is a multifactorial disease causing destruction of susceptible dental hard tissue by acids produced from cariogenic bacteria on fermentation of dietary carbohydrates [11,12]. Epidemiological tetrad of dental caries includes four factors: host, bacteria, diet and time which is called as Keye's tetrad [13].

Lifestyle practices and behavioral habits are the modifiable factors which influence the overall health and well-being [14]. There is a marked increase in the prevalence rate of obesity globally with a high magnitude of rise in women of reproductive age. Obesity is found to affect physical, mental and oral health as well [15]. Lifestyle issues like smoking can affect general health and oral health. Smoking and chronic inflammation in women significantly decreases the chance of conception [16]. Smoking is proved to be a risk factor for periodontitis [17]. Social factors of women have been found to be a risk factor for development of caries [18]. Women are at a higher risk of osteoporosis because the protective effect of estrogen produced at the reproductive age stops at menopause and bone mass erosion increases. The risk for osteoporosis increases with irregular menstrual cycle and amenorrhea. Therefore, young women need to be aware of menopause risk factors and should be encouraged to maintain the bone mass density through performing appropriate measures such as exercise and consumption of calcium and vitamin D tablets [19]. Malnutrition, overeating, unhealthy dietary practices, smoking habit, alcohol consumption, drug abuse, stress, sleep deprivation represent unhealthy lifestyles during pregnancy [14][20].

There is no clear understanding on the risk factors that predispose women and girls to a greater burden of dental caries due to individual variations in the factors among them. The biological plausibility behind this can be attributed to earlier tooth eruption in females which exposes teeth to the oral environment for a longer time. Also, external factors such as dietary behaviors, dental services utilization, hormonal, physiological differences and dentition characteristics play an important role [21,22], tooth enamel, or saliva [23]. Tooth loss causes inadequate mastication and loss of esthetics [4]. Several factors contribute to dental caries in women [24]. Of which decreased unstimulated and stimulated salivary flow rates due to hormonal changes in women contribute more to dental caries incidence compared to men [25,26]. Tooth loss can be due to dental caries, periodontal disease [27], and malnutrition [5]. In general, the prevalence of tooth loss and dental caries has been documented more among women than in men in many parts of the world [28]. Changing hormonal levels in women's reproductive function can cause destruction of periodontium, which in turn lead to tooth loss [29,30]. Changes in hormone levels during pregnancy increase oral vascular permeability, decrease host immune response and alter the oral microbial flora, thereby leading to periodontal infection [31]. Gingivitis is common during pregnancy [32]. Monthly hormonal fluctuation in menses plays a role in gingival inflammation [33]. Thus cleansing effects and buffering capacity of saliva will be decreased [25]. Menopause is associated with xerostomia [34]. And this leads to the increased incidence of dental caries [35]. Recent research has found that there is an association between a gene called Amelogenesis X, which is present in X-chromosome and experience of high caries [36] [37]. The protein amelogenin contributes to 90% of enamel matrix formation during amelogenesis (enamel formation). A defect in the amelogenin gene with decreased enamel protein disrupts enamel formation leading to enamel hypoplasia which inturn increases the caries susceptibility [18]. Hormonal changes during pregnancy produce several adverse effects on the oral cavity due to immune suppression, morning sickness, cravings, salivary alterations and chemical wear which predisposes to dental caries [18]. Difference in dietary intake has been largely attributed to different energy needs [38,39]. Socioeconomic status of less wealth, lower income, less education can lead to poor oral hygiene [40]. There is a link between sex hormones and oral bone health. Decrease in estrogen levels in perimenopausal women causes bone thinning which has a direct effect on periodontium. Modulation of immunological events explain the link between sex hormones and oral health [41]. Previously we have focused our research on various invitro and invivo studies. [42–61] We have currently shifted our focus to this retrospective analysis. This study was contemplated to find the prevalence of dental caries and missing teeth among women of reproductive age.

## MATERIALS AND METHODS

### Study setting and study design

A retrospective study was conducted by reviewing 86,000 patient records of the author's University

hospital for a period of nine months (June 2019 to March 2020).

**Ethical approval**

Prior approval to carry out the study was obtained from the Institutional Research Committee of the authors University (SDC/SIHEC/2020/DIASDATA/0619-0320).

**Case records selection**

About 8564 consecutive case records of female patients with age ranging from 18 - 40 years were sorted. 1289 case reports of patients with complete edentulousness were excluded. Of 7275 patient records; 312 case records with recorded Decayed, Missing, Filled teeth Index (DMFT) and Decayed, Missing, Filled surface Index (DMFS) were sorted and retrieved.

**The Data Collection**

Total number of teeth and surface missing and decayed as recorded under the missing criteria and decayed criteria of Decayed, Missing and Filled Teeth Index and Decayed, Missing and FIlled surface Index given by Klein, Palmer, Knutson (1938) was collected from the 312 patient records. The age of patients in the case records were categorized as 18-25 years, 26-40 years for statistical convenience.

**Statistical analysis**

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) Version 23.0. Descriptive statistics was performed to present the prevalence of missing teeth, decayed teeth and the missing surface, the decayed surfaces based on the age group. Chi square association test was done to find the association of age with the number of missing teeth, decayed teeth and missing surface, decayed surface. A p value <0.05 was considered to be significant.

## RESULTS AND DISCUSSION

Final data set consisted of 312 female patients of Indian origin who underwent dental treatment in the University hospital. About 145 (46.4%) of patients were at the age group between 18-25 years, 167 (53.5%) belonged to the age range of 26-40 years.

Figure 1 showed that 38.46% of the patients in the age group 18-25 years, 42.31% of patients in the age group 26-40 years had a minimum of 0-5 number of decayed teeth. About 7.69% of patients in the age group 18-25 years and 10.58% of patients in the 26-40 years had six to ten decayed teeth; 0.64% of patients in the age group 26-40 years had a maximum eleven to fifteen number of decayed teeth.

About 38.87% of patients, 6.73% of patients, 0.64% of patients and 0.32% of patients in the age group 18-25 years had 0-5 number, 6-10 number, 11-15 number and 16-20 number of missing teeth respectively. Among females in the age group 26-40 years; 37.82% of them, 10.9% of them, 2.88% of them, 1.28% of them and 0.64% had 0-5 number, 6-10 number, 11-15 number, 16-20 number and 21-25 number of missing teeth respectively [Figure 2].

Figure 3 showed among the patients in the age group of 18-25 years, 33.97% of them had 0-5 number of decayed surfaces, 8.33% had 6-10 number of decayed surfaces, 2.88% had 11-15 number of decayed surfaces, 0.64% had 16-20 number of decayed surfaces, 0.64% patients had 21-25 number of decayed surfaces. In the age group 26-40 years, 25.64% patients had 0-5 decayed surface, 16.67% patients had 6-10 decayed surface, 6.09% patients had 11-15 decayed surface, 2.24% patients had 16-20 decayed surface, 2.56% patients had 21-25 decayed surface and 0.32% had 26- 30 decayed surface.

About 36.54% of women had 0-20 number of missing teeth surfaces, 5.13% of women had 21-40 number of missing teeth surfaces, 2.88% of women had 41-60 number of missing teeth surfaces, 0.64% of women had 61-80 number of missing teeth surfaces, 0.64% of women had 81-100 number of missing teeth surfaces and 0.64% of women had 101-120 number of missing teeth surfaces in the age group 18-25 years. Among the age group of 26-40 years, 37.5% women had 0-20 missing surface, 11.54% women had 21-40 missing surface, 2.88% women had 41-60 missing surface, 0.64% women had 61-80 missing surface, 0.64% women had 81-100 missing surface and 0.32% women had 101-120 missing surface [Figure 4].

This study was based on individuals seeking treatment at the University hospital. The Prevalence of dental caries and tooth loss is high among women of the age group of 26-40 years. Our study was similar to a study which showed a high prevalence of decayed teeth in women of the age group 35-44years [62,63]. Literatures had shown that the caries prevalence was found to be high (85.6%) in women aged 18-25yrs [64,65], and this was contradictory to the present study results. Another study showed that the utilization of dental health care services is high among women compared to men [23]. A study among pregnant women showed that women of the age group 15-24 years with <100 percent family income had a significantly lower prevalence of dental caries compared to women of age group 35–44 years with family income ≥200 percent [66]. Our study in contrast to a study done among women of Saudi Arabia found higher prevalence of caries in women aged 18-25 years [64]

Pregnant women had 2.2 times risk for dental caries and 1.94 times risk for gingivitis compared to non pregnant women. The prevalence of dental caries was significantly high in pregnant women above 25 years of age [67] which was found to be in agreement with our study. The increased consumption of carbohydrates, increased acid in the mouth due to vomiting, and reduced salivary production and/or increased acidity of saliva contribute to increased risk for dental caries in pregnant women [68].

A study conducted in Chennai reported a high number of tooth loss in women of the age group 35-44 years [69,70]. Patil et al showed that rate of dental caries (63.3%) and gingivitis (71.9%) was significantly higher in pregnant women than in non pregnant women (dental caries 44.5% and gingivitis 60.5%)[67]. Thus gingivitis if untreated leads to periodontitis further causing tooth loss. One study in consistency with the present study reported that 56.5% of women in the age group 18-25 years in Saudi Arabia had missing teeth surface [71]. There was no significant association between the decayed teeth and the missing tooth surface among women of reproductive age. However, a significant association exists between missing teeth, decayed teeth surface among women of reproductive age with a high prevalence in 26-40 years of age group. The study results cannot be extrapolated due to cultural and ethnic variation in oral hygiene practices and utilization of preventive dental services. Further longitudinal prospective studies are needed to prove the hypothesis.

## CONCLUSION

Within the limitations of this study, the prevalence of tooth loss and dental caries was high in women of reproductive age 26-40years compared to women in the age group of 18-25 years. Thus the women of reproductive age are more prone to dental caries and tooth loss. This suggests the need to spread awareness among women of reproductive age insisting the role of hormonal changes in oral health. Also health education on oral hygiene practices and use of preventive dental health services to prevent early tooth loss is essential.

## Authors contribution

First author A.Ashwatha Pratha performed data collection, analysis, and interpretation and wrote the manuscript.

Second author Arthi Balasubramaniam contributed to conception, study design, analysis, interpretation and critically revised the manuscript

Third author (Jain) contributed to review the manuscript.

All the authors have discussed the results and contributed to the final manuscript.

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## CONFLICT OF INTEREST

Authors declare no conflict of interest

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Self

## Ethical Clearance

It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number-SDC/SIHEC/2020/DIASDATA/0619-0320)

## REFERENCES

1. Gerritsen AE, Allen PF, Witter DJ, Bronkhorst EM, Creugers NHJ. Tooth loss and oral health-related quality of life: a systematic review and meta-analysis. Health Qual Life Outcomes. 2010 Nov 5;8:126.
2. Silva Junior MF, Batista MJ, de Sousa M da LR. Risk factors for tooth loss in adults: A population-based prospective cohort study. PLoS One. 2019 Jul 22;14(7):e0219240.
3. Aida J, Ando Y, Akhter R, Aoyama H, Masui M, Morita M. Reasons for permanent tooth extractions in Japan. J Epidemiol. 2006 Sep;16(5):214–9.
4. Sheiham A, Steele J. Does the condition of the mouth and teeth affect the ability to eat certain foods, nutrient and dietary intake and nutritional status amongst older people? Public Health Nutr. 2001 Jun;4(3):797–803.
5. Susin C, Oppermann RV, Haugejorden O, Albandar JM. Tooth loss and associated risk indicators in an adult urban population from south Brazil. Acta Odontol Scand. 2005 Apr;63(2):85–93.
6. Russell SL, Gordon S, Lukacs JR, Kaste LM. Sex/Gender differences in tooth loss and edentulism: historical perspectives, biological factors, and sociologic reasons. Dent Clin North Am. 2013 Apr;57(2):317–37.
7. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJL, Marcenes W. Global burden of untreated caries: a systematic review and metaregression. J Dent Res. 2015 May;94(5):650–8.
8. Pratha AA, Prabakar J. Comparing the effect of Carbonated and energy drinks on salivary pH-In Vivo Randomized Controlled Trial. J Pharm Res [Internet]. 2019; Available from: http://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=12&issue=10&article=019
9. Prabakar J, John J, Srisakthi D. Prevalence of

dental caries and treatment needs among school going children of Chandigarh. Indian J Dent Res. 2016 Sep;27(5):547–52.
10. Balaji SM. Need for more research on burden of oral diseases in India. Indian J Dent Res. 2017 Nov;28(6):594.
11. Selwitz RH, Ismail AI, Pitts NB. Dental caries. Lancet. 2007 Jan 6;369(9555):51–9.
12. Prabakar J, John J, Arumugham IM, Kumar RP, Sakthi DS. Comparative Evaluation of the Viscosity and Length of Resin Tags of Conventional and Hydrophilic Pit and Fissure Sealants on Permanent Molars: An In vitro Study. Contemp Clin Dent. 2018 Jul;9(3):388–94.
13. Yadav K, Prakash S. Dental Caries: A Review. 2016 Jan 1;06(53):01–7.
14. Sharma R, Biedenharn KR, Fedor JM, Agarwal A. Lifestyle factors and reproductive health: taking control of your fertility. Reprod Biol Endocrinol. 2013 Jul 16;11:66.
15. van Dammen L, Wekker V, de Rooij SR, Groen H, Hoek A, Roseboom TJ. A systematic review and meta-analysis of lifestyle interventions in women of reproductive age with overweight or obesity: the effects on symptoms of depression and anxiety. Obes Rev. 2018 Dec;19(12):1679–87.
16. Hughes EG, Brennan BG. Does cigarette smoking impair natural or assisted fecundity? Fertil Steril. 1996 Nov;66(5):679–89.
17. Department of Health and Human Services, U.S. Department of Agriculture. Dietary Guidelines for Americans 2015-2020. Simon and Schuster; 2017. 146 p.
18. Ferraro M, Vieira AR. Explaining gender differences in caries: a multifactorial approach to a multifactorial disease. Int J Dent. 2010 Mar 16;2010:649643.
19. Yekefallah L, Dehghankar L, Aliakbari M, Mafi M. Lifestyle and Preventive Behaviors of Osteoporosis among Women of Reproductive Age in Qazvin-Iran: A Cross Sectional Study. J Health Soc Behav. 2019 Apr 1;2(2):70.
20. Prabakar J, John J, Arumugham IM, Kumar RP, Srisakthi D. Comparative Evaluation of Retention, Cariostatic Effect and Discoloration of Conventional and Hydrophilic Sealants - A Single Blinded Randomized Split Mouth Clinical Trial. Contemp Clin Dent. 2018 Sep;9(Suppl 2):S233–9.
21. Lawal F, Alade O. Dental caries experience and treatment needs of an adult female population in Nigeria. Afr Health Sci. 2017 Sep;17(3):905–11.
22. Neralla M, Jayabalan J, George R, Rajan J, P SKM, Haque AE, et al. Role of nutrition in rehabilitation of patients following surgery for oral squamous cell carcinoma. IJRPS. 2019 Oct 16;10(4):3197–203.
23. Shaffer JR, Leslie EJ, Feingold E, Govil M, McNeil DW, Crout RJ, et al. Caries Experience Differs between Females and Males across Age Groups in Northern Appalachia. Int J Dent. 2015 May 27;2015:938213.
24. Kumar RP, Vijayalakshmi B. Assessment of fluoride concentration in ground water in Madurai district, Tamil Nadu, India. J Pharm Res [Internet]. 2017; Available from: http://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=10&issue=1&article=063
25. Percival RS, Challacombe SJ, Marsh PD. Flow rates of resting whole and stimulated parotid saliva in relation to age and gender. J Dent Res. 1994 Aug;73(8):1416–20.
26. Kannan SSD, Kumar VS, Rathinavelu PK, Indiran MA. AWARENESS AND ATTITUDE TOWARDS MASS DISASTER AND ITS MANAGEMENT AMONG HOUSE SURGEONS IN A DENTAL COLLEGE AND HOSPITAL IN CHENNAI, INDIA [Internet]. Disaster Management and Human Health Risk V. 2017. Available from: http://dx.doi.org/10.2495/dman170121
27. Kumar RP, Pradeep Kumar R, Preethi R. Assessment of Water Quality and Pollution of Porur, Chembarambakkam and Puzhal Lake [Internet]. Vol. 10, Research Journal of Pharmacy and Technology. 2017. p. 2157. Available from: http://dx.doi.org/10.5958/0974-360x.2017.00380.8
28. Lukacs JR. Gender differences in oral health in South Asia: metadata imply multifactorial biological and cultural causes. Am J Hum Biol. 2011 May;23(3):398–411.
29. Lukacs JR. Sex differences in dental caries experience: clinical evidence, complex etiology. Clin Oral Investig. 2011 Oct;15(5):649–56.
30. Samuel SR, Acharya S, Rao JC. School Interventions–based Prevention of Early-Childhood Caries among 3–5-year-old children from very low socioeconomic status: Two-year randomized trial. J Public Health Dent. 2020 Jan 10;80(1):51–60.
31. Russell SL, Mayberry LJ. Pregnancy and oral health: a review and recommendations to reduce gaps in practice and research. MCN Am J Matern Child Nurs. 2008 Jan;33(1):32–7.
32. Gürsoy M, Pajukanta R, Sorsa T, Könönen E. Clinical changes in periodontium during pregnancy and post-partum. J Clin Periodontol. 2008 Jul;35(7):576–83.
33. Machtei EE, Mahler D, Sanduri H, Peled M. The effect of menstrual cycle on periodontal

health. J Periodontol. 2004 Mar;75(3):408–12.
34. Patir A, Seymen F, Yildirim M, Deeley K, Cooper ME, Marazita ML, et al. Enamel formation genes are associated with high caries experience in Turkish children. Caries Res. 2008 Sep 10;42(5):394–400.
35. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary …. Clin Oral Investig [Internet]. 2020; Available from: https://link.springer.com/article/10.1007/s00784-020-03204-9
36. Khatri S, Madan K, Srinivasan S, Acharya S. Retention of moisture-tolerant fluoride-releasing sealant and amorphous calcium phosphate-containing sealant in 6–9-year-old children: A randomized controlled trial [Internet]. Vol. 37, Journal of Indian Society of Pedodontics and Preventive Dentistry. 2019. p. 92. Available from: http://dx.doi.org/10.4103/jisppd.jisppd_173_18
37. Holm G. Smoking as an additional risk for tooth loss. J Periodontol. 1994 Nov;65(11):996–1001.
38. Jimenez M, Dietrich T, Shih M-C, Li Y, Joshipura KJ. Racial/ethnic variations in associations between socioeconomic factors and tooth loss. Community Dent Oral Epidemiol. 2009 Jun;37(3):267–75.
39. Pavithra RP, Preethi Pavithra R, Jayashri P. Influence of Naturally Occurring Phytochemicals on Oral Health [Internet]. Vol. 12, Research Journal of Pharmacy and Technology. 2019. p. 3979. Available from: http://dx.doi.org/10.5958/0974-360x.2019.00685.1
40. Coda Bertea P, Staehelin K, Dratva J, Zemp Stutz E. Female gender is associated with dental care and dental hygiene, but not with complete dentition in the Swiss adult population. J Public Health . 2007;15(5):361–7.
41. Orwoll ES, Chan BKS, Lambert LC, Marshall LM, Lewis C, Phipps KR. Sex steroids, periodontal health, and tooth loss in older men. J Dent Res. 2009 Aug;88(8):704–8.
42. Rajeshkumar S, Kumar SV, Ramaiah A, Agarwal H, Lakshmi T, Roopan SM. Biosynthesis of zinc oxide nanoparticles usingMangifera indica leaves and evaluation of their antioxidant and cytotoxic properties in lung cancer (A549) cells. Enzyme Microb Technol. 2018 Oct;117:91–5.
43. Kavitha M, Subramanian R, Narayanan R, Udhayabanu V. Solution combustion synthesis and characterization of strontium substituted hydroxyapatite nanocrystals [Internet]. Vol. 253, Powder Technology. 2014. p. 129–37. Available from: http://dx.doi.org/10.1016/j.powtec.2013.10.045
44. Vijayakumar GNS, Nixon Samuel Vijayakumar G, Devashankar S, Rathnakumari M, Sureshkumar P. Synthesis of electrospun ZnO/CuO nanocomposite fibers and their dielectric and non-linear optic studies [Internet]. Vol. 507, Journal of Alloys and Compounds. 2010. p. 225–9. Available from: http://dx.doi.org/10.1016/j.jallcom.2010.07.161
45. Danda AK. Comparison of a single noncompression miniplate versus 2 noncompression miniplates in the treatment of mandibular angle fractures: a prospective, randomized clinical trial. J Oral Maxillofac Surg. 2010 Jul;68(7):1565–7.
46. Lekha L, Kanmani Raja K, Rajagopal G, Easwaramoorthy D. Synthesis, spectroscopic characterization and antibacterial studies of lanthanide(III) Schiff base complexes containing N, O donor atoms [Internet]. Vols. 1056-1057, Journal of Molecular Structure. 2014. p. 307–13. Available from: http://dx.doi.org/10.1016/j.molstruc.2013.10.014
47. Putchala MC, Ramani P, Herald J. Sherlin, Premkumar P, Natesan A. Ascorbic acid and its pro-oxidant activity as a therapy for tumours of oral cavity – A systematic review [Internet]. Vol. 58, Archives of Oral Biology. 2013. p. 563–74. Available from: http://dx.doi.org/10.1016/j.archoralbio.2013.01.016
48. Devi VS, Subathra Devi V, Gnanavel BK. Properties of Concrete Manufactured Using Steel Slag [Internet]. Vol. 97, Procedia Engineering. 2014. p. 95–104. Available from: http://dx.doi.org/10.1016/j.proeng.2014.12.229
49. Dhinesh B, Niruban Bharathi R, Isaac JoshuaRamesh Lalvani J, Parthasarathy M, Annamalai K. An experimental analysis on the influence of fuel borne additives on the single cylinder diesel engine powered by Cymbopogon flexuosus biofuel [Internet]. Vol. 90, Journal of the Energy Institute. 2017. p. 634–45. Available from: http://dx.doi.org/10.1016/j.joei.2016.04.010
50. Danda AK, Tatiparthi MK, Narayanan V, Siddareddi A. Influence of Primary and Secondary Closure of Surgical Wound After Impacted Mandibular Third Molar Removal on Postoperative Pain and Swelling—A Comparative and Split Mouth Study

[Internet]. Vol. 68, Journal of Oral and Maxillofacial Surgery. 2010. p. 309–12. Available from: http://dx.doi.org/10.1016/j.joms.2009.04.060

51. Gopalakannan S, Senthilvelan T, Ranganathan S. Modeling and Optimization of EDM Process Parameters on Machining of Al 7075-B4C MMC Using RSM [Internet]. Vol. 38, Procedia Engineering. 2012. p. 685–90. Available from: http://dx.doi.org/10.1016/j.proeng.2012.06.086
52. Venu H, Dhana Raju V, Subramani L. Combined effect of influence of nano additives, combustion chamber geometry and injection timing in a DI diesel engine fuelled with ternary (diesel-biodiesel-ethanol) blends [Internet]. Vol. 174, Energy. 2019. p. 386–406. Available from: http://dx.doi.org/10.1016/j.energy.2019.02.163
53. Adalarasan R, Santhanakumar M, Rajmohan M. Application of Grey Taguchi-based response surface methodology (GT-RSM) for optimizing the plasma arc cutting parameters of 304L stainless steel [Internet]. Vol. 78, The International Journal of Advanced Manufacturing Technology. 2015. p. 1161–70. Available from: http://dx.doi.org/10.1007/s00170-014-6744-0
54. Parthasarathy M, Isaac JoshuaRamesh Lalvani J, Dhinesh B, Annamalai K. Effect of hydrogen on ethanol-biodiesel blend on performance and emission characteristics of a direct injection diesel engine. Ecotoxicol Environ Saf. 2016 Dec;134(Pt 2):433–9.
55. Neelakantan P, Cheng CQ, Mohanraj R, Sriraman P, Subbarao C, Sharma S. Antibiofilm activity of three irrigation protocols activated by ultrasonic, diode laser or Er:YAG laserin vitro [Internet]. Vol. 48, International Endodontic Journal. 2015. p. 602–10. Available from: http://dx.doi.org/10.1111/iej.12354
56. Sajan D, Udaya Lakshmi K, Erdogdu Y, Joe IH. Molecular structure and vibrational spectra of 2,6-bis(benzylidene)cyclohexanone: a density functional theoretical study. Spectrochim Acta A Mol Biomol Spectrosc. 2011 Jan;78(1):113–21.
57. Sharma P, Mehta M, Dhanjal DS, Kaur S, Gupta G, Singh H, et al. Emerging trends in the novel drug delivery approaches for the treatment of lung cancer. Chem Biol Interact. 2019 Aug 25;309:108720.
58. Ranganathan H, Ganapathy DM, Jain AR. Cervical and Incisal Marginal Discrepancy in Ceramic Laminate Veneering Materials: A SEM Analysis. Contemp Clin Dent. 2017 Apr;8(2):272–8.
59. Lekha L, Kanmani Raja K, Rajagopal G, Easwaramoorthy D. Schiff base complexes of rare earth metal ions: Synthesis, characterization and catalytic activity for the oxidation of aniline and substituted anilines [Internet]. Vol. 753, Journal of Organometallic Chemistry. 2014. p. 72–80. Available from: http://dx.doi.org/10.1016/j.jorganchem.2013.12.014
60. Neelakantan P, Grotra D, Sharma S. Retreatability of 2 mineral trioxide aggregate-based root canal sealers: a cone-beam computed tomography analysis. J Endod. 2013 Jul;39(7):893–6.
61. PradeepKumar AR, Shemesh H, Jothilatha S, Vijayabharathi R, Jayalakshmi S, Kishen A. Diagnosis of Vertical Root Fractures in Restored Endodontically Treated Teeth: A Time-dependent Retrospective Cohort Study. J Endod. 2016 Aug;42(8):1175–80.
62. Kahar P. Patterns of oral hygiene behaviors, daily habits, and caries prevalence in India and dominican republic: A comparative study. Indian J Dent Res. 2019 Jan;30(1):87–93.
63. Harini G LL. Nicotine Replacement Therapy for smoking Cessation- An Overview. Indian Journal of Public Health Research and Development [Internet]. 2019 [cited 2020 Jun 10];10(11). Available from: http://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=09760245&AN=141274498&h=gYL53P0RTDuihXfEOqLsBmolOVY%2Fn1jwd7eokhNcHN%2F5g8CVaYKbt1wU4UOsqeCY51fRbe6Ner1I6TkeG%2FuwDg%3D%3D&crl=c
64. Alghamdi B, El-Khateeb SM, Jaber S, Jaafar A, Dar-Odeh N. Prevalence of Dental Caries among Young Women in Central Western Region of Saudi Arabia, 2015. IOSR Journal of Dental and Medical Sciences [Internet]. 2015 May 22 [cited 2020 Jun 10]; Available from: http://dx.doi.org/
65. Prabakar J, John J, Arumugham IM, Kumar RP, Sakthi DS. Comparing the Effectiveness of Probiotic, Green Tea, and Chlorhexidine- and Fluoride-containing Dentifrices on Oral Microbial Flora: A Double-blind, Randomized Clinical Trial. Contemp Clin Dent. 2018 Oct;9(4):560–9.
66. Azofeifa A, Yeung LF, Alverson CJ, Beltrán-Aguilar E. Dental caries and periodontal disease among U.S. pregnant women and nonpregnant women of reproductive age, National Health and Nutrition Examination Survey, 1999-2004. J Public Health Dent. 2016 Sep;76(4):320–9.

67. Patil S, Ranka R, Chaudhary M, Hande A, Sharma P. Prevalence of dental caries and gingivitis among pregnant and nonpregnant women. Journal of Datta Meghe Institute of Medical Sciences University. 2018 Jan 1;13(1):44.
68. Cucó G, Fernández-Ballart J, Sala J, Viladrich C, Iranzo R, Vila J, et al. Dietary patterns and associated lifestyles in preconception, pregnancy and postpartum. Eur J Clin Nutr. 2006 Mar;60(3):364–71.
69. George B, John J, Saravanan S, Arumugham IM. Prevalence of permanent tooth loss among children and adults in a suburban area of Chennai. Indian J Dent Res. 2011 Mar;22(2):364.
70. Mohapatra S, Kumar RP, Arumugham IM. Assessment of Microhardness of Enamel Carious Like Lesions After Treatment with Nova Min, Bio Min and Remin Pro Containing Toothpastes: An in Vitro Study. Indian Journal of [Internet]. 2019; Available from: http://www.indianjournals.com/ijor.aspx?target=ijor:ijphrd&volume=10&issue=10&article=076
71. El-Khateeb SM, Jaber S, Hemdan B, Gafar A, Dar-Odeh N. Prevalence of dental caries among young women in central western region of Saudi Arabia. 2015 Jan 1;2015(2):46–9.

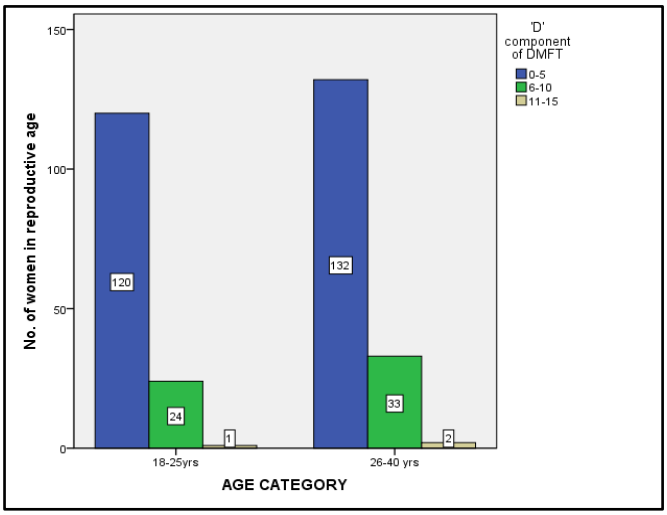


**Figure 1: The bar chart showing association between age and decayed teeth (the D component of DMFT) in women of reproductive age. X axis shows age groups in years. Y axis shows the number of women of reproductive age. Association between the decayed tooth and age was done using Chi-square test and was not significant. Pearson Chi-square test, p value= 0.678 (statistically not significant). Women of 26-40 years had more decayed teeth.**

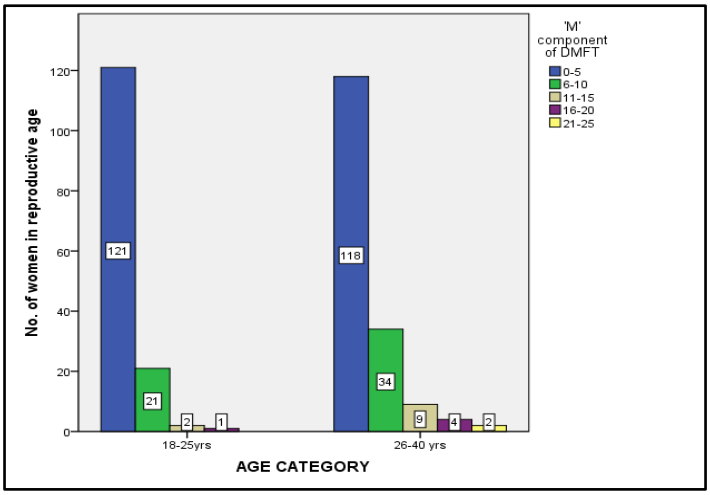


**Figure 2: The bar chart showing association between age and missing teeth (M component of DMFT). X axis shows age groups in years. Y axis shows the number of women in reproductive age. Association between the missing tooth and age was done using Chi-square test and was significant. Pearson Chi-square test, p value= 0.041 (statistically significant).The age group of 26-40 years had more missing teeth due to caries.**

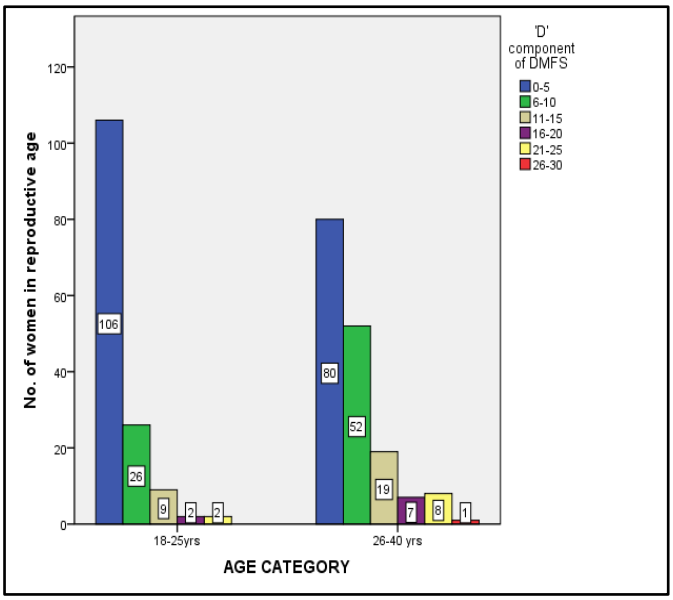


**Figure 3: The bar chart showing association between age and decayed tooth surface (D component of DMFS) among women of reproductive age. X axis shows age groups in years. Y axis shows the number of women in reproductive age. Association between the decayed tooth surface and age was done using Chi-square test and was significant. Pearson Chi-square test, p value= 0.000 (statistically significant). The age group of 26-40 years women had more decayed teeth surface.**

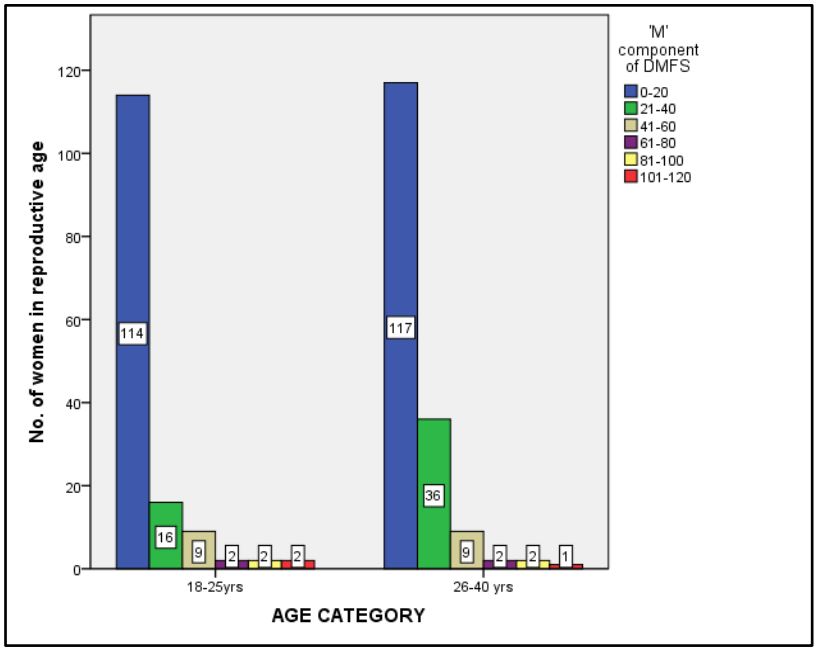


**Figure 4: The bar chart showing association between age and the missing teeth surface (the M component of DMFS ) among women of reproductive age. X axis shows age groups in years. Y axis shows the number of women in reproductive age. Association between the missing tooth surface and age was done using Chi-square test, p value= 0.257 (statistically not significant).Women of age group 26-40 years had more missing teeth surfaces.**