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.2021.27.02.340

ASSOCIATION OF GENDER AND TOOTH LOSS DUE TO DENTAL CARIES - A RETROSPECTIVE STUDY

A.ASHWATHA PRATHA[1], ARTHI BALASUBRAMANIAM[2*], RAVINDRA KUMAR JAIN[3]

[1]Saveetha Dental College and Hospitals,Saveetha Institute of Medical and technical sciences (SIMATS) Saveetha University,Chennai, India
[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
[3]Reader,Department of Orthodontics,Saveetha Dental College and Hospitals,Saveetha Institute of Medical and technical sciences (SIMATS),Saveetha University,Chennai, India
*Corresponding Author
Email: 151501052.sdc@saveetha.com[1], arthib.sdc@saveetha.com[2], ravindrakumar@saveetha.com[3]

Abstract: The retention or loss of permanent teeth is of central importance to an individual's oral health status and to qualify for life. Prevalence of tooth loss and dental caries has been documented more among women than in men in many parts of the world. Smoking habits more performed by men had increased chance of development of dental caries progressively leading to tooth loss. Thus this study aimed to find association of gender and tooth loss. This retrospective study was conducted using records of patients visited private Dental College. A total of 644 consecutive case records of patient age ranging from 20-90 years were retrieved. Data on the number of missing teeth due to caries from their records were entered and subjected to statistical analysis. Descriptive statistics was done to present the prevalence of missing teeth. Chi-square association was performed to find the association. Among the patients 53.88% males and 38.04% females had one tooth loss due to caries. About 0.93% of patients in age group 41-60 years, 0.78% in age group 20-40 years had four missing teeth due to caries. A significant association exists between age groups and missing teeth due to caries ($p<0.05$) whereas no significant association was observed between gender and missing teeth due to caries. Within the limits of the study, prevalence of tooth loss due to caries is higher in males compared to females with insignificant association.

Keywords : age, association, caries, gender, tooth loss,

INTRODUCTION:

Tooth loss is an oral condition that leads to functional, aesthetic and social damage with impact on people's quality of life (Gerritsen et al., 2010). Tooth loss is considered the most useful indicator of general condition of oral health (Silva Junior, Batista and de Sousa, 2019). A decrease in the number of teeth might result in poor dietary habits and deterioration of the oral health related quality of life (Aida et al., 2006). Tooth loss is known to have an essential role in loss of mastication and esthetics (Sheiham and Steele, 2001). In general, various reasons for tooth loss include dental caries, periodontal diseases, socioeconomic status, malnutrition (Susin et al., 2005; Prabakar, 2018). Gender difference has played a major role in tooth loss and edentulism due to culturally mediated behavior which can be temporal or regional (Russell et al., 2013; Prabakar, John and Srisakthi, 2016).

Measures of lifestyle included dietary habits, smoking habits and physical activity. Women were found to have better lifestyles than men. This might be due to the general cultural and social norms where women are more concerned about their general and oral health than men (Baskaradoss et al., 2019). Better dental behavior among females can be attributed to their raised perception to esthetics and also their greater sensitivity towards illness and discomfort (Sakki et al., 1994). Men had worse dietary habits consuming significantly less vegetables, fruit and milk, but too much meat; they consumed more processed meat and fat-containing items within the food sub-categories; they preferred to take less amount of low-fat milk products and less wholemeal products. Men more often consumed alcohol, drank more of it and often crossed the limits hazardous for health. There were more smokers among the men, they smoked more cigarettes and the non-smokers more often indicated passive exposure to cigarette smoke. Women, as opposed to men, displayed more interest in comprehensive primary preventive medical examinations (Fiala and Brázdová, 2000).

In general, prevalence of tooth loss and dental caries has been documented more among women than in men in many parts of the world due to more consumption of cariogenic diet (Lukacs, 2011a). Changing hormonal levels

in women's reproductive function can cause destruction of periodontium which in turn lead to tooth loss (Lukacs, 2011b; Prabakar, John, Arumugham, Kumar and Srisakthi, 2018) Fluctuation levels of hormone during pregnancy increase oral vascular permeability, decrease host immunocompetence and alter the levels of oral bacteria thereby leading to periodontal infection (Russell and Mayberry, 2008). Gingivitis is common during pregnancy (Gürsoy et al., 2008; Pradeep Kumar and Preethi, 2017). Monthly hormonal fluctuation in menses plays a major role in gingival inflammation (Machtei et al., 2004). Compared with men, women have lower stimulated and unstimulated salivary flow rates (Kannan et al., 2017). Thus cleaning effects and buffering capacity will be decreased (Percival, Challacombe and Marsh, 1994; Kumar and Vijayalakshmi, 2017). Menopause is associated with xerostomia (Patir et al., 2008). And this leads to increased incidence of dental caries (Samuel, Acharya and Rao, 2020). 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 (Holm, 1994; Mebin George Mathew et al., 2020).

Factors related to tooth loss include smoking, diet and oral hygiene practices. Smoking is a risk factor for periodontal diseases ('DietaryGuidelines2010', 2010). Different diet intake largely attributed to different energy needs (Jimenez et al., 2009; Khatri et al., 2019). Socioeconomic status of less wealth, lower income, less education can lead to poor oral hygiene (R and Jayashri, 2019). Men with elevated bone lead levels had approximately three times the odds of having experienced an elevated degree of tooth loss compared with those participants who were in the lowest tertile of bone lead concentrations. Moreover, blood lead levels were associated with tooth loss, suggesting that bone lead concentrations are a better indicator of the risk of tooth loss posed by cumulative long-term environmental lead exposure (Arora et al., 2009). Oral health habits like brushing and flossing play an important role in oral hygiene and it was found that women appear to use floss and brush compared to men (Coda Bertea et al., 2007). Sex steroids have been found to be linked to oral bone health. Estrogen may provide protection against tooth loss in menopausal women, and testosterone may be related to periodontal health in hypogonadotropic men. Moreover, both estrogen and androgen may have direct effects on the periodontium. A variety of potential mechanisms might explain the effects of sex steroids on periodontal disease, including modulation of immunological events (Orwoll et al., 2009). With this background on gender difference in tooth loss, the present study intended to measure strength of association between gender and tooth loss due to caries.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, John, Arumugham, Kumar and Srisakthi, 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; Panchal, Jeevanandan and Subramanian, 2019; Rajendran et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma et al., 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi et al., 2020; Samuel, Acharya and Rao, 2020)

Thus, the retention or loss of permanent teeth is of central importance to an individual's oral health status and to qualify for life.This present study was contemplated to find the association between gender and tooth loss.

MATERIALS AND METHODS :

Study setting and design :

A retrospective study was conducted by reviewing 86,000 patient records of the authors University hospital for a period of nine months from June 2019 to March 2020.

Case records selection:

About 8564 consecutive case records of patients with age ranging from 20 - 90 years were sorted. 1289 case reports of patients with complete edentulism were excluded. Of 7275 patient records; 644 case records with recorded Decayed, Missing, Filled teeth Index were sorted and retrieved. No restriction was placed on gender.

Permission:

Prior permission to utilize and to analyze the data form the case records of patients from the University was obtained.

Data Collection:

Total number of teeth missing due to caries as recorded under the missing criteria of Decayed, Missing and Filled Teeth index given by Klein, Palmer, Knutson (1938) was collected from the 644 patient records. Age of the patients in the case records were categorized as 20-40 years, 41-60 years, 61-80 years and 81-100 years for statistical convenience.

Statistical analysis:

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

RESULTS AND DISCUSSION :

The final data set consisted of 644 patients of Indian origin who underwent treatment in University hospital. About 408 (63.3%) of patients were at the age between 20-40 years, 195(30.2%) belonged to the age range of 41-60 years and 39 (6.1%) were at age between 61-80 years. Among the patients 58.2% were males and 41.8% were females. The age group of 20-40 years had 36.02% males and 27.33 % females; similarly 17.08% of males and 13.20% of females were at the age range of 41-60 years. There were 4.81% males and 1.24% females belonging to the age range of 61-80 years.

Figure 1 showed that 57.45%, 28.42%, 5.75% of patients of age ranging from 20-40, 41-60, 61-80 years had a minimum of one missing tooth due to caries. About 0.78%, 0.93% of patients aged 20-40, 41-60 had a maximum of 4 teeth missing due to caries. A statistical significant association on Fisher's exact test exists between age groups and number of missing teeth due to caries ($p=0.022$).

On analysing gender (Figure 2), 53.88% of males and 38.04% of females had one tooth loss due to caries. About 3.42% of males and 2.64% of females had 3 teeth loss due to caries. Among them 0.93% of females and 0.78% of males had a maximum of 4 teeth missing due to caries. No statistical significant association exhibited between gender and number of missing teeth due to caries on Fisher's exact test ($p=0.825$)

This study was based on individuals seeking treatment at University hospital. According to a study done by Saber Khazaei et.al , on tooth loss due to caries among Iranian adults, it has been proved that tooth loss is more prevalent in males (Khazaei et al., 2013; Neralla et al., 2019). Another study showed high prevalence of tooth loss among males compared to females in the Brazil population (Montandon, Zuza and Toledo, 2012). which was supporting our study. The results of the present study are in consistency with present study which shows males have more tooth loss (58.21%) compared to females (41.79%). This could be attributed to the reason of unhealthy dietary practices among males with some adverse habits such as smoking.

Studies done on medical adults found female predilection (57.9%) over tooth loss (Medina-Solís et al., 2006; Prabakar, John, Arumugham, Kumar and Sakthi, 2018). According to Desvarieux M, after age adjustment, dentate males (19.2±7.0) tended to have more teeth present than females (18.7±7.0; P=0.12) (Desvarieux et al., 2004). A couple of studies showed more high prevalence of tooth loss in females (72%) compared to males (28%) (Silva-Junior, Batista and de Sousa, 2017; Mohapatra et al., 2019). Another study by Natto ZS, a more prevalent population of tooth loss was females (55.92%) with an age group of 70-80 years (Natto et al., 2014). All these study results were in contrast to our present study. The reason for high prevalence of tooth loss due to caries might be due to the frequent consumption of more refined free sugar foods by females.

The present study showed high prevalence of tooth loss due to caries in the age group 20-40 years. According to Qulam M et.al, a Chennai based study population of 18-30 years old showed 98% of participants having low income and also DMFT scores of the low income patients are higher compared to the medium income patients (Mohamad Qulam Zaki Bin and Gheena, 2018). Socio-economic status mediated by education, occupation and income may function as a third variable for the prevalence of tooth loss due to caries. Also the food insecurity and decreased use of preventive oral health services among adults of low income might lead to more tooth loss.

Thus gender has no influence over tooth loss due to dental caries, however gender has significant influence on tooth loss due to caries. The biological plausibility being social and environmental factors more than the genetic factors which contribute to the prevalence of tooth loss due to caries (Harini G, 2019). At an individual level, an understanding of how age, gender and tooth retention affect the impact of oral health on daily activities may inform the delivery of appropriate oral health services (Steele et al., 2004). The study results cannot be extrapolated due to cultural and ethnic variation in oral hygiene practices and utilization of preventive dental services according to Black's classification. Further longitudinal prospective studies are needed to prove the hypothesis.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; M. G. Mathew et al., 2020)

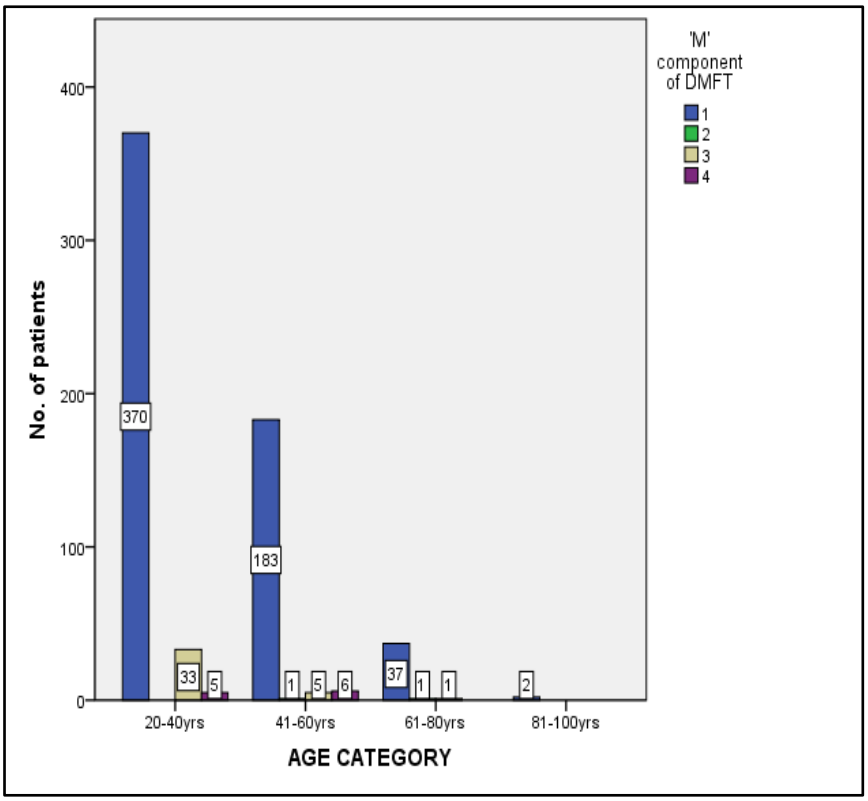

Fig.1: Bar chart showing association of "M" component of DMFT Index among different age groups. X axis shows age group in years. Y axis shows the number of patients with dental caries. Association between the missing tooth and age was done using Chi-square test and it was significant. Chi-square association test (Fisher's exact test value = 21.113; p value = 0.022 (statistically significant). Missing teeth due to dental caries was seen more in the age group of 20-40 years compared to other age groups.

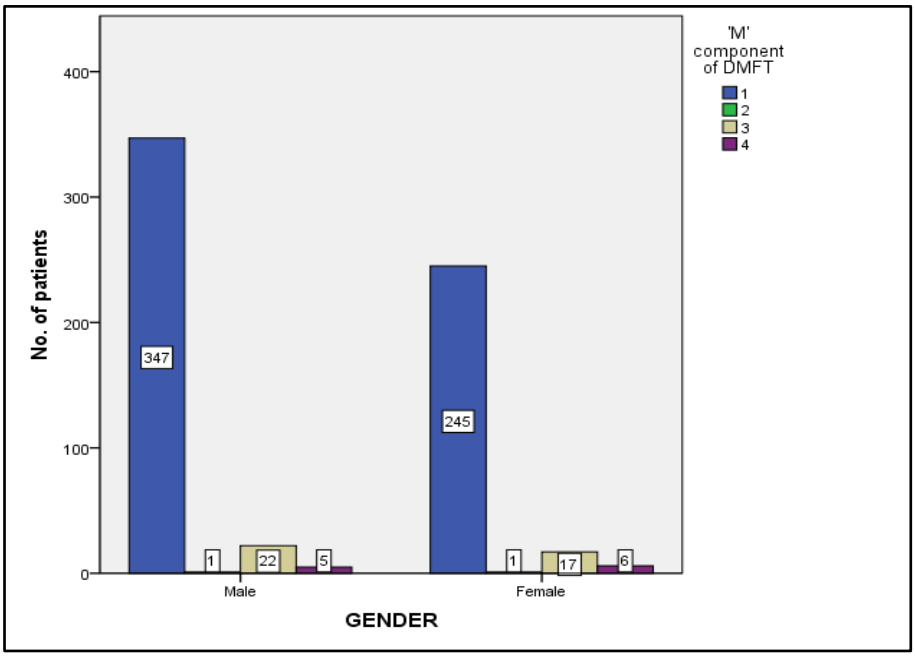

Fig.2: Bar chart shows the association of the "M" component of the DMFT Index. X axis shows gender. Y axis shows the number of patients. Association between the missing tooth and gender was done using Chi-square test and it was not significant. Chi-square association test (Fisher's exact test value = 1.230; p value = 0.825 (statistically not significant). Missing teeth due to dental caries was more among males compared to females.

CONCLUSION :

Within the limitations of this study, it was found that the prevalence of tooth loss seems to be higher in males compared to females. Middle aged adults had more tooth loss due to caries. This suggests the need to spread awareness among people about the necessary oral hygiene practices to be taken and use of preventive dental health services to prevent tooth loss at its earlier stage.

Author's 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.

ACKNOWLEDGEMENT:

We take pleasure to express our sincere gratitude to the University for granting us permission to utilize the data from patient records for the study

CONFLICT OF INTEREST:

None

REFERENCES:

1. Aida, J. et al. (2006) 'Reasons for permanent tooth extractions in Japan', Journal of epidemiology / Japan Epidemiological Association, 16(5), pp. 214–219.
2. Arora, M. et al. (2009) 'Cumulative lead exposure and tooth loss in men: the normative aging study', Environmental health perspectives, 117(10), pp. 1531–1534.
3. Baskaradoss, J. K. et al. (2019) 'Influence of Lifestyle on Dental Health Behavior', Journal of lifestyle medicine, 9(2), pp. 119–124.
4. Coda Bertea, P. et al. (2007) 'Female gender is associated with dental care and dental hygiene, but not with complete dentition in the Swiss adult population', Journal of public health, 15(5), pp. 361–367.
5. Deogade, S., Gupta, P. and Ariga, P. (2018) 'Effect of monopoly-coating agent on the surface roughness of a tissue conditioner subjected to cleansing and disinfection: A Contact Profilometric In vitro study', Contemporary Clinical Dentistry, p. 122. doi: 10.4103/ccd.ccd_112_18.
6. Desvarieux, M. et al. (2004) 'Gender differences in the relationship between periodontal disease, tooth loss, and atherosclerosis', Stroke; a journal of cerebral circulation, 35(9), pp. 2029–2035.
7. 'DietaryGuidelines2010' (2010) US Department of agriculture. Available at: https://health.gov/sites/default/files/2020-01/DietaryGuidelines2010.pdf.
8. Dua, K. et al. (2019) 'The potential of siRNA based drug delivery in respiratory disorders: Recent advances and progress', Drug development research, 80(6), pp. 714–730.
9. Duraisamy, R. et al. (2019) 'Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments', Implant dentistry, 28(3), pp. 289–295.
10. Ezhilarasan, D. (2018) 'Oxidative stress is bane in chronic liver diseases: Clinical and experimental perspective', Arab journal of gastroenterology: the official publication of the Pan-Arab Association of Gastroenterology, 19(2), pp. 56–64.
11. Ezhilarasan, D., Apoorva, V. S. and Ashok Vardhan, N. (2019) 'Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells', Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology, 48(2), pp. 115–121.
12. Ezhilarasan, D., Sokal, E. and Najimi, M. (2018) 'Hepatic fibrosis: It is time to go with hepatic stellate cell-specific therapeutic targets', Hepatobiliary & pancreatic diseases international: HBPD INT, 17(3), pp. 192–197.
13. Fiala, J. and Brázdová, Z. (2000) 'A comparison between the lifestyles of men and women--parents of school age children', Central European journal of public health, 8(2), pp. 94–100.
14. Gerritsen, A. E. et al. (2010) 'Tooth loss and oral health-related quality of life: a systematic review and meta-analysis', Health and quality of life outcomes, 8, p. 126.
15. Gheena, S. and Ezhilarasan, D. (2019) 'Syringic acid triggers reactive oxygen species-mediated cytotoxicity in HepG2 cells', Human & experimental toxicology, 38(6), pp. 694–702.
16. Gomathi, A. C. et al. (2020) 'Anticancer activity of silver nanoparticles synthesized using aqueous fruit shell extract of Tamarindus indica on MCF-7 human breast cancer cell line', Journal of Drug Delivery Science and Technology, p. 101376. doi: 10.1016/j.jddst.2019.101376.

17. Gürsoy, M. et al. (2008) 'Clinical changes in periodontium during pregnancy and post-partum', Journal of clinical periodontology, 35(7), pp. 576–583.
18. Harini G, L. L. (2019) 'Nicotine Replacement Therapy for Smoking Cessation - An overview', Indian Journal of Public Health Research and Development, 10(11). Available at: 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 (Accessed: 11 June 2020).
19. Holm, G. (1994) 'Smoking as an additional risk for tooth loss', Journal of periodontology, 65(11), pp. 996–1001.
20. Jeevanandan, G. and Govindaraju, L. (2018) 'Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial', European Archives of Paediatric Dentistry, pp. 273–278. doi: 10.1007/s40368-018-0356-6.
21. Jimenez, M. et al. (2009) 'Racial/ethnic variations in associations between socioeconomic factors and tooth loss', Community dentistry and oral epidemiology, 37(3), pp. 267–275.
22. J, P. C. et al. (2018) 'Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study', Clinical implant dentistry and related research, 20(4), pp. 531–534.
23. Kannan, S. S. D. et al. (2017) AWARENESS AND ATTITUDE TOWARDS MASS DISASTER AND ITS MANAGEMENT AMONG HOUSE SURGEONS IN A DENTAL COLLEGE AND HOSPITAL IN CHENNAI, INDIA. WIT Press, pp. 121–129.
24. Khatri, S. G. et al. (2019) 'Retention of moisture-tolerant fluoride-releasing sealant and amorphous calcium phosphate-containing sealant in 6-9-year-old children: A randomized controlled trial', Journal of the Indian Society of Pedodontics and Preventive Dentistry, 37(1), pp. 92–98.
25. Khazaei, S. et al. (2013) 'Epidemiology and risk factors of tooth loss among Iranian adults: findings from a large community-based study', BioMed research international, 2013, p. 786462.
26. Kumar, R. P. and Vijayalakshmi, B. (2017) 'Assessment of Fluoride Concentration in Ground Water in Madurai District, Tamil Nadu, India', Journal of advanced pharmaceutical technology & research, 10(1), p. 309.
27. Lukacs, J. R. (2011a) 'Gender differences in oral health in South Asia: metadata imply multifactorial biological and cultural causes', American journal of human biology: the official journal of the Human Biology Council, 23(3), pp. 398–411.
28. Lukacs, J. R. (2011b) 'Sex differences in dental caries experience: clinical evidence, complex etiology', Clinical oral investigations, 15(5), pp. 649–656.
29. Machtei, E. E. et al. (2004) 'The effect of menstrual cycle on periodontal health', Journal of periodontology, 75(3), pp. 408–412.
30. Malli Sureshbabu, N. et al. (2019) 'Concentrated Growth Factors as an Ingenious Biomaterial in Regeneration of Bony Defects after Periapical Surgery: A Report of Two Cases', Case reports in dentistry, 2019, p. 7046203.
31. Mathew, M. G. et al. (2020) 'Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary …', Clinical oral investigations. Available at: https://link.springer.com/article/10.1007/s00784-020-03204-9.
32. Mathew, M. G. et al. (2020) 'Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial', Clinical oral investigations. doi: 10.1007/s00784-020-03204-9.
33. Medina-Solís, C. E. et al. (2006) 'Edentulism among Mexican adults aged 35 years and older and associated factors', American journal of public health, 96(9), pp. 1578–1581.
34. Mehta, M. et al. (2019) 'Oligonucleotide therapy: An emerging focus area for drug delivery in chronic inflammatory respiratory diseases', Chemico-biological interactions, 308, pp. 206–215.
35. Menon, S. et al. (2018) 'Selenium nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism', Colloids and Surfaces B: Biointerfaces, pp. 280–292. doi: 10.1016/j.colsurfb.2018.06.006.
36. Mohamad Qulam Zaki Bin and Gheena, S. (2018) 'The Prevalence of Dental Caries in 18 To 30 Years Individual Associated with Socio-Economic Status in an Outpatient Population Visiting A Hospital in Chennai', Biomedical and Pharmacology Journal, 11(3), pp. 1295–1300.
37. Mohapatra, S. et al. (2019) '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 Public Health Research & Development, 10(10), pp. 375–380.
38. Montandon, A., Zuza, E. and Toledo, B. E. (2012) 'Prevalence and reasons for tooth loss in a sample from a dental clinic in Brazil', International journal of dentistry, 2012, p. 719750.
39. Natto, Z. S. et al. (2014) 'Factors contributing to tooth loss among the elderly: A cross sectional study', Singapore dental journal, 35, pp. 17–22.
40. Neralla, M. et al. (2019) 'Role of nutrition in rehabilitation of patients following surgery for oral squamous

cell carcinoma', International Journal of Research in Pharmaceutical Sciences, 10(4), pp. 3197–3203.
41. Orwoll, E. S. et al. (2009) 'Sex steroids, periodontal health, and tooth loss in older men', Journal of dental research, 88(8), pp. 704–708.
42. Panchal, V., Jeevanandan, G. and Subramanian, E. M. G. (2019) 'Comparison of post-operative pain after root canal instrumentation with hand K-files, H-files and rotary Kedo-S files in primary teeth: a randomised clinical trial', European archives of paediatric dentistry: official journal of the European Academy of Paediatric Dentistry, 20(5), pp. 467–472.
43. Patir, A. et al. (2008) 'Enamel formation genes are associated with high caries experience in Turkish children', Caries research, 42(5), pp. 394–400.
44. Pc, J., Marimuthu, T. and Devadoss, P. (2018) 'Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study', Clinical implant dentistry and related research. Available at: https://europepmc.org/article/med/29624863.
45. Percival, R. S., Challacombe, S. J. and Marsh, P. D. (1994) 'Flow rates of resting whole and stimulated parotid saliva in relation to age and gender', Journal of dental research, 73(8), pp. 1416–1420.
46. Prabakar, J., John, J., Arumugham, I. M., Kumar, R. P. and Srisakthi, D. (2018) 'Comparative Evaluation of Retention, Cariostatic Effect and Discoloration of Conventional and Hydrophilic Sealants - A Single Blinded Randomized Split Mouth Clinical Trial', Contemporary clinical dentistry, 9(Suppl 2), pp. S233–S239.
47. Prabakar, J. (2018) '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', Contemporary clinical dentistry, 9(3), p. 388.
48. Prabakar, J., John, J., Arumugham, I. M., Kumar, R. P. and Sakthi, D. S. (2018) 'Comparing the Effectiveness of Probiotic, Green Tea, and Chlorhexidine- and Fluoride-containing Dentifrices on Oral Microbial Flora: A Double-blind, Randomized Clinical Trial', Contemporary clinical dentistry, 9(4), pp. 560–569.
49. Prabakar, J., John, J. and Srisakthi, D. (2016) 'Prevalence of dental caries and treatment needs among school going children of Chandigarh', Indian journal of dental research: official publication of Indian Society for Dental Research, 27(5), pp. 547–552.
50. Pradeep Kumar, R. and Preethi, R. (2017) 'Assessment of Water Quality and Pollution of Porur, Chembarambakkam and Puzhal Lake', Research Journal of Pharmacy and Technology, 10(7), pp. 2157–2159.
51. Rajendran, R. et al. (2019) 'Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study', Pesquisa Brasileira em Odontopediatria e Clínica Integrada, pp. 1–10. doi: 10.4034/pboci.2019.191.61.
52. Rajeshkumar, S. et al. (2018) 'Biosynthesis of zinc oxide nanoparticles usingMangifera indica leaves and evaluation of their antioxidant and cytotoxic properties in lung cancer (A549) cells', Enzyme and microbial technology, 117, pp. 91–95.
53. Rajeshkumar, S. et al. (2019) 'Antibacterial and antioxidant potential of biosynthesized copper nanoparticles mediated through Cissus arnotiana plant extract', Journal of photochemistry and photobiology. B, Biology, 197, p. 111531.
54. Ramadurai, N. et al. (2019) 'Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial', Clinical oral investigations, 23(9), pp. 3543–3550.
55. Ramakrishnan, M., Dhanalakshmi, R. and Subramanian, E. M. G. (2019) 'Survival rate of different fixed posterior space maintainers used in Paediatric Dentistry - A systematic review', The Saudi dental journal, 31(2), pp. 165–172.
56. Ramesh, A. et al. (2018) 'Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study', Journal of periodontology, 89(10), pp. 1241–1248.
57. R, P. P. and Jayashri, P. (2019) 'Influence of Naturally Occurring Phytochemicals on Oral Health', Research Journal of Pharmacy and Technology, 12(8), pp. 3979–3983.
58. Russell, S. L. et al. (2013) 'Sex/Gender differences in tooth loss and edentulism: historical perspectives, biological factors, and sociologic reasons', Dental clinics of North America, 57(2), pp. 317–337.
59. Russell, S. L. and Mayberry, L. J. (2008) 'Pregnancy and oral health: a review and recommendations to reduce gaps in practice and research', MCN. The American journal of maternal child nursing, 33(1), pp. 32–37.
60. Sakki, T. K. et al. (1994) 'Lifestyle, dental caries and number of teeth', Community dentistry and oral epidemiology, 22(5 Pt 1), pp. 298–302.
61. Samuel, S. R., Acharya, S. and Rao, J. C. (2020) 'School Interventions-based Prevention of Early-Childhood Caries among 3-5-year-old children from very low socioeconomic status: Two-year randomized trial', Journal of public health dentistry, 80(1), pp. 51–60.

62. Sharma, P. et al. (2019) 'Emerging trends in the novel drug delivery approaches for the treatment of lung cancer', Chemico-biological interactions, 309, p. 108720.
63. Sheiham, A. and Steele, J. (2001) '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 nutrition, 4(3), pp. 797–803.
64. Silva-Junior, M. F., Batista, M. J. and de Sousa, M. da L. R. (2017) 'Incidence of Tooth Loss in Adults: A 4-Year Population-Based Prospective Cohort Study', International journal of dentistry, 2017, p. 6074703.
65. Silva Junior, M. F., Batista, M. J. and de Sousa, M. da L. R. (2019) 'Risk factors for tooth loss in adults: A population-based prospective cohort study', PloS one, 14(7), p. e0219240.
66. Sridharan, G. et al. (2019) 'Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma', Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology, 48(4), pp. 299–306.
67. Steele, J. G. et al. (2004) 'How do age and tooth loss affect oral health impacts and quality of life? A study comparing two national samples', Community dentistry and oral epidemiology, 32(2), pp. 107–114.
68. Susin, C. et al. (2005) 'Tooth loss and associated risk indicators in an adult urban population from south Brazil', Acta odontologica Scandinavica, 63(2), pp. 85–93.
69. Varghese, S. S., Ramesh, A. and Veeraiyan, D. N. (2019) 'Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students', Journal of dental education, 83(4), pp. 445–450.
70. Vijayashree Priyadharsini, J. (2019) 'In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens', Journal of periodontology, 90(12), pp. 1441–1448.
71. Vishnu Prasad, S. et al. (2018) 'Report on oral health status and treatment needs of 5-15 years old children with sensory deficits in Chennai, India', Special care in dentistry: official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry, 38(1), pp. 58–59.
72. Wahab, P. U. A. et al. (2018) 'Scalpel Versus Diathermy in Wound Healing After Mucosal Incisions: A Split-Mouth Study', Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons, 76(6), pp. 1160–1164.