International Journal of Dentistry and Oral Science (IJDOS)
ISSN: 2377-8075

Prevalence of Tobacco Smoking/ Smokeless Tobacco in Patients with Oral Lichen Planus

Research Article

Sivesh Sangar[1], Jayanth Kumar Vadivel[2*], Visalakshi Ramanathan[3]

[1] Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077, Tamil Nadu, India.
[2] Reader, Department of Oral Medicine and Radiology, Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077, Tamil Nadu, India.
[3] Senior Lecturer, Department of Prosthodontics, Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077, Tamil Nadu, India.

Abstract

The aim of the study was to determine the prevalence of tobacco smoking/ smokeless tobacco in patients with oral lichen planus. The purpose of the study was to determine if the usage of tobacco is associated with an increase in the occurrence of oral lichen planus among the patients attending Saveetha Dental Hospital, Chennai. A hospital based cross-sectional study was conducted by collecting data by reviewing patients data and analysing the data of 86000 patients between June 2019 and March 2020. 59 patients with oral lichen planus attending Saveetha Dental Hospital, Chennai were included in the study. The data were gathered through semi- closed ended questionnaires and clinical examinations. Results showed that patients who do not consume tobacco have a higher rate of oral lichen planus compared to patients who consume tobacco (13.6%). Data analysis was done using a chi square analysis between tobacco habits with clinical variants (chi-square-3.181; df-5; p-0.023) we found the results were statistically significant ($P<0.05$) which implies that there was a higher prevalence of erosive and reticular forms of oral lichen planus. Prevalence of smoking/ smokeless tobacco in patients with oral lichen planus is significantly lower than patients who do not consume any form of tobacco.

Keywords: Oral Lichen Planus; Prevalence; Smoking; Smokeless Tobacco.

Introduction

Lichen planus (LP) is a chronic mucocutaneous disorder of the stratified squamous epithelium that affects oral and genital. Mucous membranes, skin, nails and scalp. Oral lichen planus (OLP) is the mucosal counterpart of cutaneous LP. It is derived from the Greek word "leichen" which means tree moss and Latin word "planus" means flat. Lichen planus is one of the mucocutaneous disorders in which oral involvement preceded the appearance of other symptoms or lesions at other locations [1-2]. Etiology of lichen planus as such is not known clearly, but at present it has been linked to an autoimmune disorder [3-4]. There are cases of OLP linked to poor oral hygiene [5-6]. Ironically, the usage of tobacco is not lined to the occurrence of OLP [7-8]. The lesion of OLP has six different presentation patterns viz, reticular, erosive, papular, ulcerative, plaque like and bullous forms [9].

In India, tobacco consumption is responsible for half of all the cancers in men and one- fourth of cancers in women. The World Health Organisation predicts that tobacco deaths in India may exceed 1.5 million annually by 2020 [10-11]. Tobacco use in India differs from the globe. The documented form of tobacco used globally is cigarettes; however in India only 20% of the tobacco are consumed as cigarettes, 40% is consumed as bidi, and the rest in the form of smokeless tobacco [12-13].

The malignant transformation potential of OLP depends on the clinical variant of OLP. The erosive form of OLP has a high malignant transformation potential which can go upto 20%. The oral cancers account for over 30% of all cancers in India; this difference can be attributed to regional variation in the prevalence and pattern of habits [14-15]. However, epidemiological data of the changing trends are lacking. There is inadequate data regarding the smokeless tobacco use among the population in Chennai, India.

***Corresponding Author**:
Jayanth Kumar Vadivel,
Reader, Department of Oral Medicine and Radiology, Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077, Tamil Nadu, India.
E-mail: jayanthkumar@saveetha.com

Received: July 30, 2021
Accepted: August 11, 2021
Published: August 18, 2021

Citation: Sivesh Sangar, Jayanth Kumar Vadivel, Visalakshi Ramanathan. Prevalence of Tobacco Smoking/ Smokeless Tobacco in Patients with Oral Lichen Planus. *Int J Dentistry Oral Sci.* 2021;8(8):4005-4009. doi: http://dx.doi.org/10.19070/2377-8075-21000818

The aim of this study was to investigate the prevalence of tobacco smoking/smokeless tobacco in patients with oral lichen planus visiting Saveetha Dental Hospital, Chennai. Previously our team has a rich experience in working on various research projects across multiple disciplines [16-30]. Now the growing trend in this area motivated us to pursue this project.

Materials and Methods

This retrospective study was conducted under a hospital based university setting. The study was done among the 86000 cases records of patients visiting the out patient department of Saveetha Dental College. The case records of the patients were analysed and 59 patients with OLP were recorded. Ethical approval for this study was obtained from the institutional ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320).

The upside of this study is the presence of validated data as all the data were already recorded into the system. The downside of the study is the geographic restriction as the study was only conducted in one specific area/ region that is in and around Chennai, India.

They were 2 reviewers involved in the study with data taken from patients visiting Saveetha Dental Hospital from June 2019 to March 2020. Cross checking of data is done by random verification. Patients with incomplete follow ups are called on the telephone. Random verification is done for 10% of the patient samples.

The internal validity is done by creating a study design followed by complete data collection and validation of data. The external validity is done by creating a study design followed by setting up a clinical setup and creation of duplicatable data. Data collection was done by the SPSS software system with independent variables such as smoking and oral lichen planus. Dependent variables present are age and gender. Data analysis was done using a chi square analysis between tobacco habits with clinical variants (chi-square-3.181;df-5;p-0.023) we found the results were statistically significant($P<0.05$) which implies that there was a higher prevalence of erosive and reticular forms of oral lichen planus.

Results & Discussion

A total of 59 patients belonging to the age group of 20 to 73 years of age with a mean age of 46.1 years. The data plotted as a histogram with a normal curve shows a near normal distribution of cases. Fig 1. The gender distribution when analysed shows 35 (59.32%) of the patients were females and 24 (40.67%) of the patients were males. Fig 2.

In this sample of 59 patients only 8(13.55%) of patients had the habit of tobacco consumption. We could observe that there were no significant differences between the gender population which shows that Oral lichen planus does not have a predilection of gender. When compared among smokers or those who consume tobacco, only one out of the 35 females consumed tobacco whereas for the males there were 7 smokers out of the 24 patients diagnosed with oral lichen planus. The comparison of gender with tobacco consumption predilection were analysed and charted into a comparative bar chart. Fig 3.

Figure 1: The histogram depicts the age distribution of the pulpitis patients. X-axis shows the age of the patients and Y-axis shows the percentage of patients with oral lichen planus. The mean age was 46.1 years.

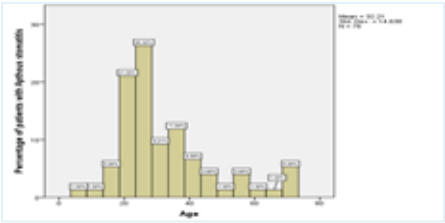


Figure 2: The pie chart shows the gender distribution. Males(blue) account for 24 cases and females account for 35 cases.

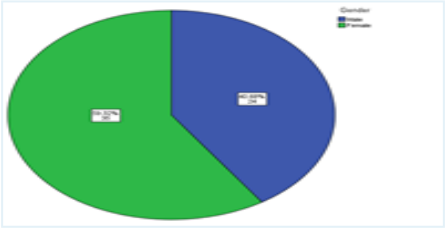


Figure 3: This is a clustered bar graph showing the relationship between gender with tobacco habits. X axis gives the tobacco habits and Y axis gives the percentage. The prevalence rate of oral lichen planus is higher in non-tobacco users. On a chi square analysis between gender with prevalence of recurrent oral lichen planus (chi-square-8.408;df-1;p-0.004) we found the results were statistically significant($P<0.05$) which implies that there were higher prevalence of recurrent oral lichen planus.

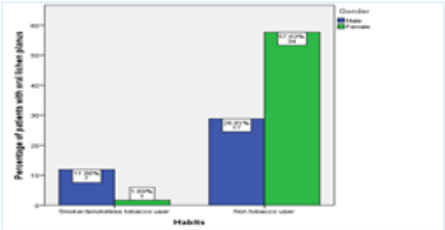
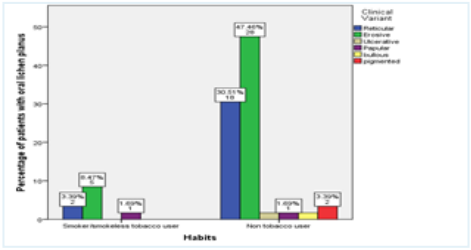


Figure 4: The clustered bar graph showing the relationship between tobacco habits with clinical variants. X axis gives the tobacco habits and Y axis gives the percentage. The prevalence rate of oral lichen planus is higher in non-smokers with the highest form of clinical variants being erosive forms. On a chi square analysis between tobacco habits with clinical variants (chi-square-3.181;df-5;p-0.023), the results were statistically significant(P<0.05) which implies that there was a higher prevalence of erosive and reticular forms of oral lichen planus.



There are various clinical variants present in oral lichen planus, they are; reticular, erosive papular, pigmented, ulcerative and bullous. We made a correlation of the patients with these clinical variants and found that the majority of the patients had erosive and reticular lichen planus with it being 27 and 24 patients respectively. Other variants had less than 3 patients each. The findings for both tobacco and non- tobacco users were similar with its majority being erosive followed by reticular but a tobacco user had a papular variant as well. This has been tabulated in Fig 4.

Tobacco consumption in multiple forms is an emerging, significant and growing threat to health. More than 7000 different chemicals have been found in tobacco and tobacco smoke. Among these more than 60 are considered as carcinogenic. Smokeless form of tobacco is practiced more commonly than smoking in India. Among the smokeless forms of tobacco, commercially available sachets are becoming common, especially among teenagers and young adults than in the older age groups. A definite association has been recorded between tobacco habits and oral mucosal lesions such as pre malignant diseases and oral cancer. [11, 31, 32].

Oral lichen planus affects about one to two percent of the adult population. It usually affects adults around 50- 60 years of age, although they do agency younger adults and children as well. It is more common in women than in men (1.4: 1). A history of lichen planus in family members is sometimes present [33]. The clinical features alone may be sufficiently diagnostic, particularly in the reticular variant. The evidence regarding the need and value of biopsy for histological confirmation of the diagnosis is not definitive [6]. Studies have shown variability in both interobserver and intraobserver reliability in the clinicopathological assessment of OLP [34].

In lieu of the elimination of precipitating or provoking factors is the initial step in the management of oral lichen planus[35]. Patient education and the undertaking of active measures to resolve or minimize mechanical trauma from dental procedures, sharp cusps, rough dental restorations, and ill-fitting prosthesis, or chemical trauma from acidic, spicy, or strongly flavored foods and beverages should be encouraged and can lead to symptomatic improvement, or, more rarely, resolution of the disease [36]. The accumulation of bacterial plaque, often as a result of discomfort associated with oral hygiene procedures in patients with gingival involvement, may also exacerbate the condition [37].

In comparing the oral habits such as smoking and tobacco usage with oral lichen planus, it was noticed that the prevalence of oral habit was found to be much higher in males than in females in this study and similar findings are reported by other authors [38, 39]. Moreover, the habit was highly prevalent at the earlier age group among earlier age groups. These findings are similar to the earliest studies reported by Mehrota et al., [40, 41]. Prevalence of oral habits in India reported by various authors in different geographical areas are as follows at Chennai region 6.99%, Belgium region 21.8%, Allahabad 21% and Bangalore region 7.53% [42, 43].

13.6% of patients with oral lichen planus had used some form of tobacco in the past based on our study. Kaveri Hallikeri et al, the prevalence of lichen planus among patients who have a habit of tobacco usage is 5.5% [44]. In a study done by Prashant Patil [45], the prevalence of oral lichen planus amongst patients with the habit of smoking/smokeless tobacco is 0.9%. The difference in prevalence rate is duly caused by the difference in sample sizes taken up for this study.

The clinical variants of oral lichen planus are divided into 6 categories, they are erosive, reticular, popular, bullous, pigmented and ulcerative. In tobacco users, the highest clinical variant found is erosive followed by reticular and papular. In non-tobacco users, erosive clinical variant is the highest followed by reticular and pigmented.

The limitations found in the study are geographic restrictions as the patients are from around the same region. Besides, there was only a single ethnicity as the group of people are from the same ethnicity group. A number of patients were excluded as they did no report for follow up appointments as they failed to adhere to their appointments dates.

The future scope of exploration in regards to oral lichen planus with a more widely carried out study in different regions of the world and not confined to a single geographical location. An additional scope which involves the types of tobacco consumption in the aspect of both smoking form of tobacco as well as smokeless forms of tobacco. Our institution is passionate about high quality evidence based research and has excelled in various fields [46-56]. We hope this study adds to this rich legacy.

Conclusion

Within the limits of the study, patients who have been diagnosed with oral lichen planus are mostly non- tobacco users when compared to tobacco users.

References

[1]. Venugopal A, Uma Maheswari TN. Expression of matrix metalloproteinase-9

in oral potentially malignant disorders: A systematic review. J Oral Maxillofac Pathol. 2016 Sep-Dec;20(3):474-479.Pubmed PMID: 27721614.
[2]. Sinha DN, Gupta PC, Pednekar MS. Tobacco use in a rural area of Bihar, India. Indian J Community Med. 2003 Oct 1;28(4):167-70.
[3]. Aruna DS, Prasad KV, Shavi GR, Ariga J, Rajesh G, Krishna M. Retrospective study on risk habits among oral cancer patients in Karnataka Cancer Therapy and Research Institute, Hubli, India. Asian Pac J Cancer Prev. 2011;12(6):1561-6.Pubmed PMID: 22126499.
[4]. Chaitanya NC, Muthukrishnan A, Babu DBG, Kumari CS, Lakshmi MA, Palat G, et al. Role of Vitamin E and Vitamin A in Oral Mucositis Induced by Cancer Chemo/Radiotherapy- A Meta-analysis. J Clin Diagn Res. 2017 May;11(5):ZE06-ZE09.Pubmed PMID: 28658926.
[5]. Maheswari TNU, Venugopal A, Sureshbabu NM, Ramani P. Salivary micro RNA as a potential biomarker in oral potentially malignant disorders: A systematic review. Ci Ji Yi Xue Za Zhi. 2018 Apr-Jun;30(2):55-60.Pubmed PMID: 29875583.
[6]. Rohini S, Kumar VJ. Incidence of dental caries and pericoronitis associated with impacted mandibular third molar-A radiographic study. Res J Pharm Technol. 2017;10(4):1081-4.
[7]. Muthukrishnan A, Warnakulasuriya S. Oral health consequences of smokeless tobacco use. Indian J Med Res. 2018 Jul;148(1):35.
[8]. Patil SR, Maragathavalli G, Araki K, Al-Zoubi IA, Sghaireen MG, Gudipaneni RK, et al. Three-rooted mandibular first molars in a Saudi Arabian population: A CBCT study. Pesqui Bras Odontopediatria Clin Integr. 2018 Aug 27;18(1):4133.
[9]. Chaitanya NC, Muthukrishnan A, Krishnaprasad CMS, Sanjuprasanna G, Pillay P, Mounika B. An Insight and Update on the Analgesic Properties of Vitamin C. J Pharm Bioallied Sci. 2018 Jul-Sep;10(3):119-125.Pubmed PMID: 30237682.
[10]. Misra SR, Shankar YU, Rastogi V, Maragathavalli G. Metastatic hepatocellular carcinoma in the maxilla and mandible, an extremely rare presentation. Contemp Clin Dent. 2015 Mar;6(Suppl 1):S117-21.
[11]. Steele JC, Clark HJ, Hong CH, Jurge S, Muthukrishnan A, Kerr AR, et al. World Workshop on Oral Medicine VI: an international validation study of clinical competencies for advanced training in oral medicine. Oral Surg Oral Med Oral Pathol Oral Radiol. 2015 Aug;120(2):143-51.e7.Pubmed PMID: 25861956.
[12]. Dharman S, Muthukrishnan A. Oral mucous membrane pemphigoid - Two case reports with varied clinical presentation. J Indian Soc Periodontol. 2016 Nov-Dec;20(6):630-634.Pubmed PMID: 29238145.
[13]. Johnson NW, Bain CA. Tobacco and oral disease. EU-Working Group on Tobacco and Oral Health. Br Dent J. 2000 Aug 26;189(4):200-6.Pubmed PMID: 11036748.
[14]. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006 Nov 28;3(11):e442.
[15]. Celentano A, Glurich I, Borgnakke WS, Farah CS. World Workshop on Oral Medicine VII: Prognostic biomarkers in oral leukoplakia and proliferative verrucous leukoplakia-A systematic review of retrospective studies. Oral Dis. 2021 May;27(4):848-880.Pubmed PMID: 32306449.
[16]. Jain AR. Prevalence of partial edentulousness and treatment needs in rural population of South India. World J Dent. 2017 Jun;8(3):213-7.
[17]. Varghese SS, Ramesh A, Veeraiyan DN. Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. J Dent Educ. 2019 Apr;83(4):445-450.Pubmed PMID: 30745352.
[18]. Ashok V, Ganapathy D. A geometrical method to classify face forms. J Oral Biol Craniofac Res. 2019 Jul 1;9(3):232-5.
[19]. Padavala S, Sukumaran G. Molar incisor hypomineralization and its prevalence. Contemp Clin Dent. 2018 Sep;9(Suppl 2):S246-50.
[20]. Ke Y, Al Aboody MS, Alturaiki W, Alsagaby SA, Alfaiz FA, Veeraraghavan VP, et al. Photosynthesized gold nanoparticles from Catharanthus roseus induces caspase-mediated apoptosis in cervical cancer cells (HeLa). Artif Cells Nanomed Biotechnol. 2019 Dec;47(1):1938-1946.Pubmed PMID: 31099261.
[21]. Ezhilarasan D. Oxidative stress is bane in chronic liver diseases: Clinical and experimental perspective. Arab J Gastroenterol. 2018 Jun;19(2):56-64.Pubmed PMID: 29853428.
[22]. Krishnan RP, Ramani P, Sherlin HJ, Sukumaran G, Ramasubramanian A, Jayaraj G, et al. Surgical Specimen Handover from Operation Theater to Laboratory: A Survey. Ann Maxillofac Surg. 2018 Jul-Dec;8(2):234-238. Pubmed PMID: 30693238.
[23]. Ezhilarasan D, Sokal E, Najimi M. Hepatic fibrosis: It is time to go with hepatic stellate cell-specific therapeutic targets. Hepatobiliary Pancreat Dis Int. 2018 Jun;17(3):192-197.Pubmed PMID: 29709350.
[24]. Pandian KS, Krishnan S, Kumar SA. Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults. Indian J Dent Res. 2018 Mar 1;29(2):137-43.
[25]. Ramamurthy JA, Mg V. Comparison of effect of Hiora mouthwash versus Chlorhexidine mouthwash in gingivitis patients: A clinical trial. Asian J Pharm Clin Res. 2018 Jul 7;11(7):84-8.
[26]. Gupta P, Ariga P, Deogade SC. Effect of Monopoly-coating Agent on the Surface Roughness of a Tissue Conditioner Subjected to Cleansing and Disinfection: A Contact Profilometric In vitro Study. Contemp Clin Dent. 2018 Jun;9(Suppl 1):S122-S126.Pubmed PMID: 29962776.
[27]. Vikram NR, Prabhakar R, Kumar SA, Karthikeyan MK, Saravanan R. Ball Headed Mini Implant. J Clin Diagn Res. 2017 Jan;11(1):ZL02-3.
[28]. Paramasivam A, Vijayashree Priyadharsini J, Raghunandhakumar S. N6-adenosine methylation (m6A): a promising new molecular target in hypertension and cardiovascular diseases. Hypertens Res. 2020 Feb;43(2):153-154.Pubmed PMID: 31578458.
[29]. Palati S, Ramani P, Shrelin HJ, Sukumaran G, Ramasubramanian A, Don KR, et al. Knowledge, Attitude and practice survey on the perspective of oral lesions and dental health in geriatric patients residing in old age homes. Indian J Dent Res. 2020 Jan-Feb;31(1):22-25.Pubmed PMID: 32246676.
[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;80(1):51-60.Pubmed PMID: 31710096.
[31]. Muthukrishnan A, Kumar LB. Actinic cheilosis: early intervention prevents malignant transformation [Internet]. BMJ Case Rep. 2017;2017:bcr2016218654.
[32]. Subashri A, Maheshwari TN. Knowledge and attitude of oral hygiene practice among dental students. Res J Pharm Technol. 2016;9(11):1840-2.
[33]. Planus OL. A burning sensation in the mouth. Cleve Clin J Med [Internet]. 2017;84(5). Available from:
[34]. Lodi G, Scully C, Carrozzo M, Griffiths M, Sugerman PB, Thongprasom K. Current controversies in oral lichen planus: report of an international consensus meeting. Part 1. Viral infections and etiopathogenesis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2005 Jul;100(1):40-51.Pubmed PMID: 15953916.
[35]. van der Meij EH, van der Waal I. Lack of clinicopathologic correlation in the diagnosis of oral lichen planus based on the presently available diagnostic criteria and suggestions for modifications. J Oral Pathol Med. 2003 Oct;32(9):507-12.Pubmed PMID: 12969224.
[36]. Eisenberg E. Oral lichen planus: a benign lesion. J Oral Maxillofac Surg. 2000 Nov 1;58(11):1278-85.
[37]. Eisen D, Carrozzo M, Bagan Sebastian JV, Thongprasom K. Number V Oral lichen planus: clinical features and management. Oral Dis. 2005 Nov;11(6):338-49.Pubmed PMID: 16269024.
[38]. Muthukrishnan A, Bijai Kumar L, Ramalingam G. Medication-related osteonecrosis of the jaw: a dentist's nightmare. BMJ Case Rep. 2016 Apr 6;2016:bcr2016214626.Pubmed PMID: 27053542.
[39]. Subha M, Arvind M. Role of magnetic resonance imaging in evaluation of trigeminal neuralgia with its anatomical correlation. Biomed. Pharmacol. J. 2019 Mar 25;12(1):289-96.
[40]. Mehrotra R, Thomas S, Nair P, Pandya S, Singh M, Nigam NS, et al. Prevalence of oral soft tissue lesions in Vidisha. BMC Res Notes. 2010 Jan 25;3:23.Pubmed PMID: 20181008.
[41]. Choudhury P, Panigrahi RG, Maragathavalli, Panigrahi A, Patra PC. Vanishing roots: first case report of idiopathic multiple cervico-apical external root resorption. J Clin Diagn Res. 2015 Mar;9(3):ZD17-9.Pubmed PMID: 25954713.
[42]. Gupta PC. Mouth cancer in India: a new epidemic?. J Indian Med Assoc. 1999 Sep 1;97(9):370-3.
[43]. Saraswathi TR, Ranganathan K, Shanmugam S, Sowmya R, Narasimhan PD, Gunaseelan R. Prevalence of oral lesions in relation to habits: Cross-sectional study in South India. Indian J. Dent. Res. 2006 Jul 1;17(3):121.
[44]. Hallikeri K, Naikmasur V, Guttal K, Shodan M, Chennappa NK. Prevalence of oral mucosal lesions among smokeless tobacco usage: A cross-sectional study. Indian J Cancer. 2018 Oct 1;55(4):404-9.
[45]. Patil PB, Bathi R, Chaudhari S. Prevalence of oral mucosal lesions in dental patients with tobacco smoking, chewing, and mixed habits: A cross-sectional study in South India. J Family Community Med. 2013 May;20(2):130-5. Pubmed PMID: 23983566.
[46]. Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. J Periodontol. 2019 Dec;90(12):1441-1448.Pubmed PMID: 31257588.
[47]. Pc J, Marimuthu T, Devadoss P, Kumar SM. Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study. Clin Implant Dent Relat Res. 2018 Apr 6;20(4):531-4.
[48]. Ramesh A, Varghese S, Jayakumar ND, Malaiappan S. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. J Periodontol. 2018 Oct;89(10):1241-1248.Pubmed

PMID: 30044495.
[49]. Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJ. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. Clin Oral Investig. 2019 Sep;23(9):3543-50.
[50]. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. J Oral Pathol Med. 2019 Apr;48(4):299-306.
[51]. Ezhilarasan D, Apoorva VS, Ashok Vardhan N. Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells. J Oral Pathol Med. 2019 Feb;48(2):115-121.Pubmed PMID: 30451321.
[52]. 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 molars: randomized controlled trial. Clin Oral Investig. 2020 Sep;24(9):1-6.Pubmed PMID: 31955271.
[53]. Samuel SR. Can 5-year-olds sensibly self-report the impact of developmental enamel defects on their quality of life? Int J Paediatr Dent. 2021 Mar;31(2):285-286.Pubmed PMID: 32416620.
[54]. R H, Ramani P, Ramanathan A, R JM, S G, Ramasubramanian A, et al. CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene. Oral Surg Oral Med Oral Pathol Oral Radiol. 2020 Sep;130(3):306-312.Pubmed PMID: 32773350.
[55]. Chandrasekar R, Chandrasekhar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. Prog Orthod. 2020 Oct 12;21(1):38.Pubmed PMID: 33043408.
[56]. Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen A. baumannii and related species. Arch Oral Biol. 2018 Oct;94:93-98.Pubmed PMID: 30015217.