# Assessment of Management of Aphthous Stomatitis Treated in a University Setting: A Retrospective Study

# Dhanvanth M, Uma Maheswari TN<sup>\*</sup> and Deepika Rajendran

Department of Oral Medicine and Radiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India

Corresponding author: Uma Maheswari TN, Department of Oral Medicine and Radiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India, E-mail: umamaheswaritn@saveetha.com

#### Abstract

Background: Recurrent Aphthous stomatitis is immunologically mediated associated with acute multiple ulcerations of oral mucosa. Though evidence based management of Aphthous stomatitis recommends the usage of immunomodulators in refractory cases Aphthous stomatitis, use of topical antiseptics and anaesthetics is preferred by most of the clinicians as it promotes healing. Aim & Objectives: The aim of the study was to assess the various therapeutics used in management of Aphthous stomatitis treated in an university setting and the objective was to assess the therapeutic response following treatment of Aphthous stomatitis. Materials & Methods: A total of 40 cases were collected from the case documentation database of Saveetha Dental College from September 2019 to April 2020. Frequency distribution was used to analyze the prevalence of topical therapeutics such as antiseptic, anesthetic, steroids and systemic vitamin B complex used in various clinical types of Aphthous stomatitis. Pearson chi square association analysis used to analyze the association of therapeutics used in management of Aphthous stomatitis with therapeutic response following 1 week after treatment using SPSS version 26. Results: The most common prevalent therapeutic used in management of minor and major and herpetiformaphthous ulcer was topical antiseptic with higher prevalence of complete healing (57.5%). The topical anaesthetic has an equal prevalence of complete healing and 50% remission responses (44.4%). The topical steroid has higher prevalence of complete healing response (83.3%). The systemic vitamin B complex was mostly prescribed along with topical therapeutics as supportive medication and have highest prevalence of complete healing response (100%). The association between different types of therapeutics and healing response in various types of Aphthous stomatitis revealed no statistical significant association with p-value=0.206 (>0.05). Conclusion: Within the limits, the medications used commonly to treat recurrent aphthous minor, major and herpetiformaphthous ulcer was topical antiseptic and therapeutic response was complete healing in maximum number of cases.

**Keywords:** Aphthous ulcer; Aphthous minor; Aphthous major; Topical antiseptic; Topicalanesthetic

#### Introduction

Recurrent Aphthous stomatitis are a common cause for acute multiple oral ulceration, occurring only in oral mucosa with unknown etiology. <sup>[1]</sup> The occurrence is associated with precipitating factors such as stress, physical or chemical trauma, food sensitivity, and genetic predisposition. <sup>[2]</sup> Aphthous ulcer is divided into three forms such as minor, major, and herpetiform. The most common aphthous ulcer is the minor form variety. They are small in size, usually less than 5 mm in diameter and can form as a single ulcer or in a cluster.

These are less common, are generally 5 mm or larger, and form singularly or in a pair. They can be painful, especially when eating or drinking and last anywhere between two weeks and several months. <sup>[3,4]</sup> The dysphagia is associated with the site of the lesion, being more frequent in the internal mucous

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membrane of the lip, tongue, and soft palate. The herpetiform form is rare with a size of 0.1-0.2 cm and in large numbers. <sup>[5]</sup> They can be formed as a large and irregular lesion that can have a clinical course of 7-14 days.

These can occur when multiple pinpoint lesions fuse together and form large, irregularly shaped ulcers. Herpetiform ulcers are so called because of their similarity in appearance to herpes, however, herpetiform ulceration is not caused by the herpes simplex virus. <sup>[6]</sup>

Aphthous ulcers do not have a clear etiology and, sometimes, are of difficult control and treatment and produce discomfort to the patients. Recurrences due to development can be due to hereditary, psychosomatic, infectious, hormonal such as periods, pregnancy or post-menopausal factors, trauma, stress, food allergies, nutritional deficiencies iron, vitamin B12, and folic acid and hematological abnormalities. <sup>[7]</sup> The absence of biochemical and histological specific changes differentiates this type of condition and allows the diagnosis of aphthous ulcers.

The treatment modalities include the use of nutritional supplements, topical anesthetics, antiseptic, steroids, and severe cases systemic immunomodulators and corticosteroids are pharmacotherapeutic agents with varying stages of effectiveness and side effects. A diagnosis of recurrent aphthous ulceration depends mainly on history and clinical examination.<sup>[8]</sup>

The management of aphthous ulcer varies greatly among different populations and in different age groups. Patients with mild recurrent aphthous ulceration usually do not need any treatment for the lesion. However topical corticosteroid therapy may be used to reduce the frequency and severity of attacks. <sup>[9]</sup>

Previous research in association with the management of aphthous ulcer had difficulties in application to the posterior region of the oral cavity if ulcer occurs in that region and had discomfort in accessing. Another disadvantage was treating refractory and cases with frequent recurrence episodes. Previously our team has a rich experience in working on various research projects across multiple disciplines. <sup>[10–24]</sup>

The study aims to assess the management of Aphthous stomatitis treated in a University setting. The primary objective was to evaluate the frequency distribution of various therapeutics used in various clinical types of Aphthous stomatitis. The secondary objectives were to assess the association of therapeutics of Aphthous stomatitis with healing response in different clinical types of Aphthous stomatitis.

## **Methodology**

Retrospective study on assessment of management of aphthous ulcer carried out in a university setting. The case records of clinical features and treatment of aphthous stomatitis was collected from the electronic case history database of Saveetha

Dental College. The study was conducted after receiving ethical clearance from the Scientific Review Board (SDC/ SIHEC/2020/DIASDATA/0619-0320). The study population was 40. The sampling was done by collecting case records data (01/03/2020) and compiled from (01\06\2019) till systematically in an excel sheet. The demographic data of patients with Aphthous stomatitis such as patient age, gender, occupation and pain history such as duration, history of recurrence, associated prodromal symptoms was recorded from the case history database. Clinical examinations such as site, size, shape of the ulcer and therapeutic used in the management and follow up details were documented. The number of people involved in the current study were three namely the principal investigator, guide and reviewer. In this data, all the case sheets are reviewed, cross verification was done, duplicate entries were removed and photographic evidence was also used for confirmation of all cases included. There were also measures taken only to include clinically diagnosed and treated aphthous ulcer cases in the department of oral medicine and radiology.

The inclusion criteria was clinically diagnosed recurrent Aphthous stomatitis cases with proper documentation of case history such as complaint and history of present illness with prodromal symptoms, recurrence, pain history and clinical examination of ulcers and clinical type. The exclusion criteria were incomplete documentation of cases and ulcers not clinically diagnosed as Aphthous stomatitis. The inclusion and exclusion criteria were devised to ensure internal and external validity and convenience sampling method was followed to ensure proper selection of study samples. The data was transferred to excel and duplicate entries were removed. The analysis was done using SPSS software version 26. The dependent variable considered as therapeutic healing response of aphthous ulcer and independent variables are therapeutics and clinical types of aphthous ulcer. The descriptive statistics such as frequency distribution of various clinical types with different therapeutics and healing response was done. Inferential statistical tests such as Pearson chi-square analysis were conducted to evaluate the association between different types of therapeutics and healing response in minor, major and herpetiform Aphthous stomatitis.

## **Results and Observations**

The most common prevalent therapeutic used in the management of aphthous ulcer was topical antiseptic 47.5% [Graph 1]. The most common prevalent therapeutic used in management of minor aphthous ulcer was topical antiseptic 43.7% [Graph 2]. The most common prevalent therapeutic used in management of major aphthous ulcers was topical antiseptic 40% [Graph 3]. The only therapeutic used in the management of herpetiformaphthous ulcer was topical antiseptic as 100% [Graph 4]. Based on the prevalence of the healing phase during management of aphthous ulcer, complete healing observed was 57.5% [Graph 5]. High prevalence of complete healing 57.5% of ulcer using topical antiseptic was observed in management of aphthous ulcer [Graph 6]. High prevalence of complete healing 44.4% and 50% remission of

ulcer 44.4% using topical anaesthetic during the management of aphthous ulcer [Graph 7]. The most prevalent healing response using topical steroid was complete healing 83.3% and 50% remission as 16.6 [Graph 8]. The only prevalent healing response using systemic vitamin B complex was complete healing 100% [Graph 9]. Association of aphthous ulcer and therapeutics reponses of topical antiseptic, topical anaesthetic, topical steroid and systemic vitamin B complex. Topical antiseptic have higher and equal prevalence of complete healing and 50% remission as 20% [Graph 10]. Association of minor aphthous ulcer and therapeutics reponses of 4 therapeutics revealed topical antiseptic have higher and equal prevalence on complete healing and 50% remission responses as 21.8% [Graph 11]. Association of major aphthous ulcer and therapeutics reponses of 4 therapeutics revealed topical steroid and systemic vitamin B complex have higher and equal prevalence of complete healing response as 20% [Graph 12].



**Graph 1:** Bar graph represents prevalence of drugs used in management of Aphthous ulcer. X axis represents therapeutics used. Y axis shows the number of aphthous ulcer patients. The most common therapeutic used in the management of aphthous ulcer was topical antiseptic (blue) as 47.5% followed by topical anaesthetic (green) as 22.5%, topical steroid (orange) as 15%, systemic vitamin B complex (grey) as 15%.



**Graph 2:** Bar graph represents prevalence of drugs used in management of minor Aphthous ulcer. X axis represents therapeutics used. Y axis shows the number of minor aphthous ulcer patients. The most common therapeutic used in the management of minor aphthous ulcer was topical antiseptic (blue) as 43.75% followed by topical anaesthetic (green) as 25%, topical steroid (orange) as 15.6%, systemic vitamin B complex (grey) as 15.6%.



**Graph 3:** Bar graph represents prevalence of drugs used in management of Major Aphthous ulcer. X axis represents therapeutics used. Y axis shows the number of major aphthous ulcer patients. The most common therapeutic used in the management of major aphthous ulcer was topical antiseptic (blue) as 40% followed by topical anaesthetic (green) as 20%, topical steroid (orange) as 20% , systemic vitamin B complex (grey) as 20%.



**Graph 4:** Bar graph represents prevalence of drugs used in management of herpetiform Aphthous ulcer. X axis represents therapeutics used. Y axis shows the number of herpetiformaphthous ulcer patients. The only therapeutic used in the management of herpetiformaphthous ulcer was topical antiseptic (blue) as 100%.



**Graph 5:** Bar graph represents prevalence of healing response in management of aphthous ulcer. X axis represents the healing response. Y axis represents the number of patients received treatment. The most prevalent healing response was complete healing as 57.5% (bottle green) followed by 32.5% of patients

had 50% remission (light green) and 10% of patients reported with no healing (light cream).

![](_page_3_Figure_2.jpeg)

**Graph 6:** Bar graph represents prevalence of healing response in management of aphthous ulcer using topical antiseptic. X axis represents the healing response of ulcer. Y axis represents the number of patients treated with topical antiseptic. The most prevalent healing response was complete healing and 50% remission as 42.1% (bottle green, light green). The least healing response was no healing 15.7% (white colour).

![](_page_3_Figure_4.jpeg)

**Graph 7:** Bar graph represents prevalence of healing response in management of aphthous ulcer using topical anaesthetic. The X axis represents the healing response of ulcer. Y axis represents the number of patients treated with topical anaesthetic. The most prevalent healing response was complete healing and 50% remission as 44.4% (bottle green, light green). The least healing response was no healing 11.1% (white colour).

![](_page_3_Figure_6.jpeg)

**Graph 8:** Bar graph represents prevalence of healing response in management of aphthous ulcer using topical steroid. X axis represents the healing response of ulcer. Y axis represents the number of patients treated with topical anaesthetic. The most prevalent healing response was complete healing 83.3% (bottle green) and 50% remission as 16.6 (light green).

![](_page_3_Figure_9.jpeg)

**Graph 9:** Bar graph represents prevalence of healing response in management of aphthous ulcer using systemic vitamin B complex. The X axis represents the healing response of ulcer. Y axis represents the number of patients treated with systemic vitamin B complex. The only prevalent healing response was complete healing 100% (bottle green).

![](_page_3_Figure_11.jpeg)

**Graph 10:** Bar graph represents association between aphthous ulcer and therapeutics responses of 4 therapeutics in management of aphthous ulcers. X axis represents therapeutic responses of 4 therapeutics. Y axis represents the number of patients with aphthous ulcers. Pearson chi square analysis (7.655) reveals no statistical significant association with p value 0.206 (>0.05). Topical antiseptic have higher and equal prevalence of complete healing and 50% remission responses.

![](_page_3_Figure_13.jpeg)

**Graph 11:** Bar graph represents association between minor aphthous ulcer and therapeutic responses of 4 therapeutics in management of minor Aphthous stomatitis. X axis represents therapeutic responses of 4 therapeutics. Y axis represents the

number of patients with minor aphthous ulcers. Pearson chi square analysis (4.840) reveals no statistical significant association with p value 0.189 (>0.05). Topical antiseptic have higher and equal prevalence of complete healing and 50% remission responses.

![](_page_4_Figure_2.jpeg)

**Graph 12:** Bar graph represents association between major aphthous ulcer and therapeutic responses of 4 therapeutics in management of major aphthous ulcer. X axis represents therapeutic responses of 4 therapeutics. Y axis represents the number of patients with major aphthous ulcers. Pearson chi square analysis (6.547) reveals no statistical significant association with p value 1.000 (>0.05). The topical steroid and systemic vitamin B complex have higher and equal prevalence of complete healing response.

#### Discussion

In this study, the most common prevalent therapeutic used in the management of aphthous ulcer was topical antiseptic 47.5%. (27.3%) in the age group of 20-30 years. In agreement with this study, aphthous ulcers had a higher prevalence of therapeutics used in management as topical antiseptic. <sup>[25]</sup> In contrast to this study, aphthous ulcer proposed to be higher in topical steroids. <sup>[26–28]</sup> Overall Consensus showed that the prevalence of aphthous ulcer was higher in topical antiseptic. In this study, the most common prevalent therapeutic used in management of minor aphthous ulcer was topical antiseptic 43.7%. In agreement with this study aphthous showed higher prevalence topical antiseptic. <sup>[29]</sup> On contrary to this study Santhosh et al. showed a higher prevalence in topical anaesthetic. Overall consensus was found to be prevalent in topical antiseptic. <sup>[30]</sup> The most common prevalent therapeutic used in management of major aphthous ulcer is topical antiseptic 40%. In agreement with this study it had a higher efficacy on the topical antiseptic. <sup>[31]</sup> On contrary to this study higher efficacy was topical anaesthetic. <sup>[32]</sup> Overall consensus about the management of major aphthous ulcer was topical antiseptic. Based on the prevalence of the healing phase during management of aphthous ulcer, complete healing observed was 57.5%. In agreement with this study, higher efficacy on topical antiseptic. <sup>[33]</sup> On contrary to this study there was higher efficacy on topical steroid. <sup>[34-42]</sup> The overall consensus showed most studies with respect to healing are topical antiseptic. The limitations of this study includes a small number of sample sizes as the study was conducted in a single university setting and many case dropouts were there due to

incomplete documentation of case records, treatments and follow up.

### Conclusion

Within the limits of the study, the medications used commonly to treat minor , major and herpetiformaphthous ulcers was topical antiseptic (47.5%) followed by topical anaesthetic (22.5%), topical steroids (15%) and systemic vitamin B complex (15%). Pearson chi square analysis reveals no statistical significant association with p value 0.206 (>0.05) between therapeutics and healing response of Aphthous stomatitis.

Future prospective studies should focus on multicentric hospital or university settings involving larger sample size with evidence based therapeutics such as immunomodulators in management of refractory and high recurrence rate in Aphthous stomatitis.

#### 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;20:474-9.
- 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 metaanalysis. J Clin Diagn Res. 2017;11:ZE06-9.
- Subashri A, Maheshwari TN. Knowledge and attitude of oral hygiene practice among dental students. Research Journal of Pharmacy and Technology. 2016;9:1840-2.
- Maheswari TNU, Venugopal A, Sureshbabu NM, Ramani P. Salivary micro RNA as a potential biomarker in oral potentially malignant disorders: A systematic review. Tzu Chi Med J. 2018; 30: 55-60.
- 5. Misra SR, Shankar YU, Rastogi V, Maragathavalli G. Metastatic hepatocellular carcinoma in the maxilla and mandible, an extremely rare presentation. Contemp Clin Dent. 2015;6:S117-21.
- Steele JC, Clark HJ, Hong CHL, 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;120:143-51.e7.
- 7. Muthukrishnan A, Warnakulasuriya S. Oral health consequences of smokeless tobacco use. Indian J Med Res. 2018;148:35-40.
- 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 ClinIntegr. 2018;18:4133.
- 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;10:119-25.
- 10. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. Toxicol Mech Methods. 2019;29:276-90.
- 11. 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;24:3275-80.

- 12. Subramaniam N, Muthukrishnan A. Oral mucositis and microbial colonization in oral cancer patients undergoing radiotherapy and chemotherapy: A prospective analysis in a tertiary care dental hospital. J Investig Clin Dent. 2019;10:e12454.
- 13. Girija ASS, Shankar EM, Larsson M. Could SARS-CoV-2-Induced hyperinflammation magnify the severity of coronavirus disease (CoViD-19) leading to acute respiratory distress syndrome? Front Immunol. 2020;11:1206.
- 14. Dinesh S, Kumaran P, Mohanamurugan S, Vijay R, Singaravelu DL, Vinod A, et al. Influence of wood dust fillers on the mechanical, thermal, water absorption and biodegradation characteristics of jute fiber epoxy composites. J Polym Res. 2020;27.
- 15. Thanikodi S, Singaravelu D Kumar, Devarajan C, Venkatraman V, Rathinavelu V. Teaching learning optimization and neural network for the effective prediction of heat transfer rates in tube heat exchangers. Therm Sci. 2020;24:575-81.
- 16. Murugan MA, Jayaseelan V, Jayabalakrishnan D, Maridurai T, Kumar SS, Ramesh G, et al. Low velocity impact and mechanical behaviour of shot blasted SiC wire-mesh and silane-treated aloevera/hemp/flax-reinforced SiC whisker modified epoxy resin composites. Silicon Chem. 2020;12:1847-56.
- Vadivel JK, Govindarajan M, Somasundaram E, Muthukrishnan A. Mast cell expression in oral lichen planus: A systematic review. J Investig Clin Dent. 2019;10:e12457.
- 18. Chen F, Tang Y, Sun Y, Veeraraghavan VP, Mohan SK, Cui C. 6shogaol, an active constiuents of ginger prevents UVB radiation mediated inflammation and oxidative stress through modulating NrF2 signaling in human epidermal keratinocytes (HaCaT cells). J Photochem Photobiol B. 2019;197:111518.
- 19. Manickam A, Devarasan E, Manogaran G, Priyan MK, Varatharajan R, Hsu C-H, et al. Score level based latent fingerprint enhancement and matching using SIFT feature. Multimed Tools Appl. 2019;78:3065-85.
- 20. Wu F, Zhu J, Li G, Wang J, Veeraraghavan VP, Krishna Mohan S, et al. Biologically synthesized green gold nanoparticles from induce growth-inhibitory effect on melanoma cells (B16). Artif Cells Nanomed Biotechnol. 2019;47:3297-305.
- 21. Ma Y, Karunakaran T, Veeraraghavan VP, Mohan SK, Li S. Sesame inhibits cell proliferation and induces apoptosis through inhibition of STAT-3 translocation in thyroid cancer cell lines (FTC-133). Biotechnol Bioprocess Eng. 2019;24:646-52.
- 22. Ponnanikajamideen M, Rajeshkumar S, Vanaja M, Annadurai G. In vivo type 2 diabetes and wound-healing effects of antioxidant gold nanoparticles synthesized using the insulin plant Chamaecostus cuspidatus in albino rats. Can J Diabetes. 2019;43:82-9.e6.
- 23. Vairavel M, Devaraj E, Shanmugam R. An eco-friendly synthesis of Enterococcus sp.-mediated gold nanoparticle induces cytotoxicity in human colorectal cancer cells. Environ Sci Pollut Res Int. 2020;27:8166-75.
- 24. Paramasivam A, Priyadharsini VJ, Raghunandhakumar S. N6adenosine methylation (m6A): a promising new molecular target in hypertension and cardiovascular diseases. Hypertens Res. 2020;43:153-4.
- 25. Abdullah MJ. Prevalence of recurrent aphthous ulceration experience in patients attending Piramird dental speciality in Sulaimani City. J ClinExp Dent. 2013;5:e89-94.
- 26. Rohini S, Kumar VJ. Incidence of dental caries and pericoronitis associated with impacted mandibular third molar-A radiographic

study. Research Journal of Pharmacy and Technology. 2017;10: 1081-4.

- Dharman S, Muthukrishnan A. Oral mucous membrane pemphigoid -Two case reports with varied clinical presentation. J Indian Soc Periodont. 2016;20:630.
- Patil S, Reddy SN, Maheshwari S, Khandelwal S, Shruthi D, Doni B. Prevalence of recurrent aphthous ulceration in the Indian population. J Clin Exp Dent. 2014;6:e36-40.
- 29. Okoh M, Ikechukwu O. Presentation of recurrent aphthous ulcer among patients in a tertiary hospital. African Journal of Oral Health. 2019;8.
- 30. Muthukrishnan A, Bijai Kumar L, Ramalingam G. Medicationrelated osteonecrosis of the jaw: a dentist's nightmare. BMJ Case Rep. 2016.
- Shrivastava K, Naidu G, Deshpande A. Comparative evaluation of the efficacy of topical amlexanox 5% oral paste and triamcinolone acetonide 0.1% oral paste in the treatment of Recurrent Aphthous Stomatitis (RAS). J Indian Acad Oral Med Radiol. 2018;30:235-240.
- 32. Wolf D, Otto J. Efficacy and safety of a lidocaine gel in patients from 6 months up to 8 years with acute painful sites in the oral cavity: A randomized, placebo-controlled, double-blind, comparative study. Int J Pediatr. 2015;141767.
- 33. Sharma R, Pallagatti S, Aggarwal A, Sheikh S, Singh R, Gupta D. A randomized, double-blind, placebo-controlled trial on clinical efficacy of topical agents in reducing pain and frequency of recurrent aphthous ulcers. Open Dent J. 2018;12:700-13.
- 34. Subha M, Arvind M. Role of magnetic resonance imaging in evaluation of trigeminal neuralgia with its anatomical correlation. Biomed Pharma J. 2019;12:289-96.
- 35. Descroix V, Coudert AE, Vige A, Durand J-P, Toupenay S, Molla M, et al. Efficacy of topical 1% lidocaine in the symptomatic treatment of pain associated with oral mucosal trauma or minor oral aphthous ulcer: a randomized, double-blind, placebo-controlled, parallel-group, single-dose study. J Orofac Pain. 2011;25:327-32.
- 36. VijayashreePriyadharsini J. In silico validation of the nonantibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. J Periodontol. 2019;90: 1441-8.
- 37. 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;48:115-21.
- 38. 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;89:1241-8.
- 39. 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;24:3275-3280.
- 40. 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;48:299-306.
- 41. Pc J, Marimuthu T, Devadoss P. Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study. Clin Implant Dent Relat Res. 2018;20:531-534.
- 42. Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJL. Effectiveness of 2% articaine as an anesthetic agent in children: Randomized controlled trial. Clin Oral Investig. 2019;23:3543-50.