ACTA SCIENTIFIC DENTAL SCIENCES

Volume 9 Issue 2 February 2025

Review Article

A Comprehensive Review on Gingival Bleeding

Vishnusripriya J[1]*, Subair K[2], Nanditha Chandran[3], Hemalatha DM[1], Aswathy Santhosh[4] and Aswana Asok[4]

[1]*Senior Lecturer, Department of Periodontics, Mahe Instituite of Dental Sciences and Hospital, India*

[2]*Professor, Department of Periodontics, Mahe Instituite of Dental Sciences and Hospital, India*

[3]*Reader, Department of Periodontics, Mahe Instituite of Dental Sciences and Hospital, India*

[4]*Fourth Year BDS Student, Department of Periodontics, Mahe Instituite of Dental Sciences and Hospital, India*

***Corresponding Author:** Vishnusripriya J, Senior Lecturer, Department of Periodontics, Mahe Instituite of Dental Sciences and Hospital, India.

DOI: 10.31080/ASDS.2025.09.1981

Received: January 23, 2025

Published: January 31, 2025

Abstract

Gingival inflammation, characterized by increased crevicular fluid production and bleeding from the gingival sulcus, is the earliest symptoms of gingivitis. This bleeding is crucial for early diagnosis and prevention of advanced gingivitis, as it indicates an inflammatory lesion in the epithelium and connective tissue. Gingival bleeding is an early sign of periodontal destruction, and its severity can be evaluated using the gingival index and bleeding on probing. Despite the lack of data on the effectiveness of periodontal personal hygiene in treating gingival bleeding, continued bleeding on probing is a reliable indicator of periodontal disintegration.

Keywords: Gingival Bleeding; Oral Hygiene; Periodontal Diseases; Smoking

Introduction

Gingival inflammation, characterized by increased crevicular fluid production and bleeding from the gingival sulcus, is the earliest symptoms of gingivitis. This bleeding, easily detectable clinically, is valuable for early diagnosis and prevention of advanced gingivitis. It indicates an inflammatory lesion in the epithelium and connective tissue, causing dilatation of blood vessels and thinning of the sulcular epithelium (figure 1).

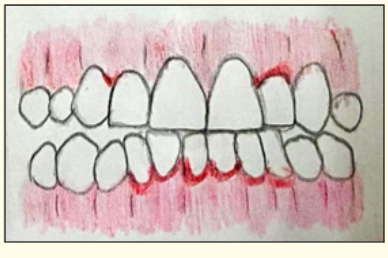

Figure 1: Bleeding Gums.

Causes of gingival bleeding

Gingival bleeding can be caused by local and systemic factors.

Local factors include Infectious diseases like ANUG (Acute Necrotizing Ulcerative Gingivitis) and AHGS (Acute Herpetic Gingiva Stomatitis), Chronic conditions like gingivitis and periodontitis, Traumatic injuries like brushing, food impaction, and tooth pick injury, Post-surgical conditions and Congenital conditions like haemangioma.

Systemic factors contributing gingival bleeding includes hemorrhagic disorders due to deficiencies of Vitamin C (scurvy), Vitamin K (liver disease), platelet disorders, deficiencies of factor II, VII, IX, X and coagulation disorders (haemophilia A and B, leukaemia, and other). Drugs used include salicylates, anticoagulants, anticonvulsants, antihypertensives, calcium channel blockers, and immunosuppressants. Hormonal replacement therapy, oral contraceptives, pregnancy, and the menstrual cycle also affect these conditions. Changes in androgenic hormones and diabetes can also cause inflammation, leading to the destruction of reticulin fibers. Gingival bleeding is a manifestation of COVID-19. Patients who did not suffer from gingival bleeding before COVID-19 infection began to show oral manifestations after testing positive for the disease. [17]. Studies show that children with higher plaque and calculus index have higher gingivitis score and resulting gingival bleeding. This can be related to the oral hygiene practice followed by the children. Adolescence is regarded as a period which is prone to periodontal diseases due to inadequate understanding of the significance of tooth brushing. This is therefore the main reason for gingival bleeding reported in adolescents. The presence of bacterial plaque with improper oral care habits lead to bleeding gums among this age group [3] (Figure 2).

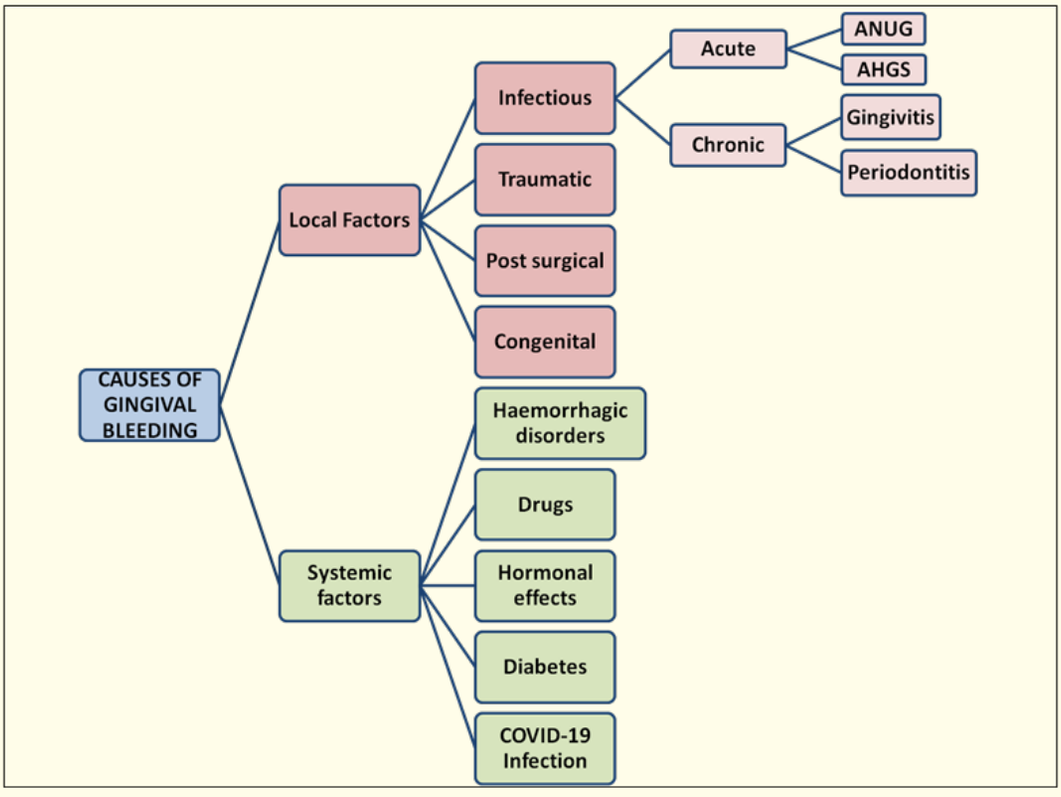

Figure 2: Causes of gingival bleeding.

Clinical evaluation of gingival bleeding

Gingival bleeding is a diagnostic tool used to assess the severity and ease of inflammation in gingival diseases. It is categorized into two types: spontaneous bleeding, which occurs spontaneously, and bleeding on provocation, which occurs during the disease progression. Spontaneous bleeding occurs in acute necrotizing ulcerative gingivitis, where engorged blood vessels are exposed by ulceration of necrotic surface epithelium. In moderate or advanced periodontitis, bleeding on probing is considered a sign of active tissue destruction. A periodontal probe or wooden interdental cleaves can be used to evaluate gingival bleeding, with any force greater than 0.25N producing bleeding in healthy tissues (figure 3 and figure 4).

Histopathological changes during gingival bleeding

Gingival bleeding is a condition characterized by histopathological changes, such as thinning or ulceration of the sulcular epithelium due to capillary expansion and engorgement. This bleeding is caused by harmless stimuli, and the presence of plasma cells indicates an active lesion. Bleeding is valuable as a diagnostic tool because inflammatory tissues with related histopathologic changes are more likely to hemorrhage in response to even mild probing. Probing may cause bleeding due to changes in blood vessel walls, perivascular collagen reduction, and contact with inflamed connective tissue.

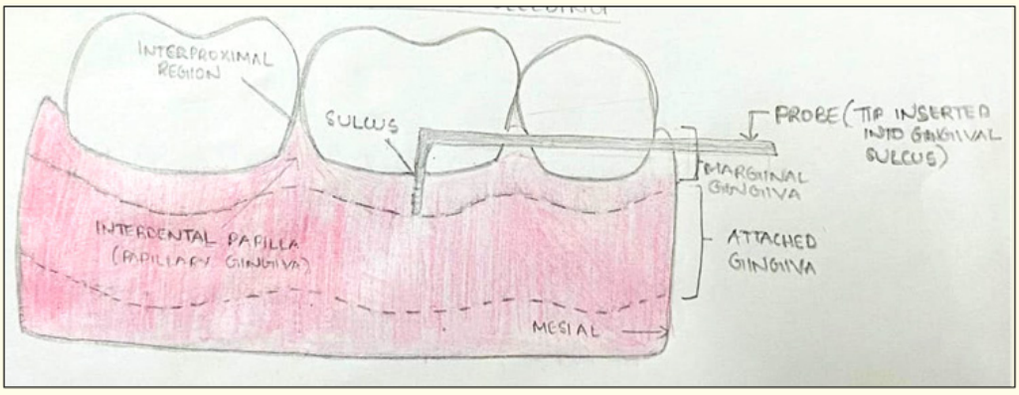

Figure 3: Elicitation of gingival bleeding.

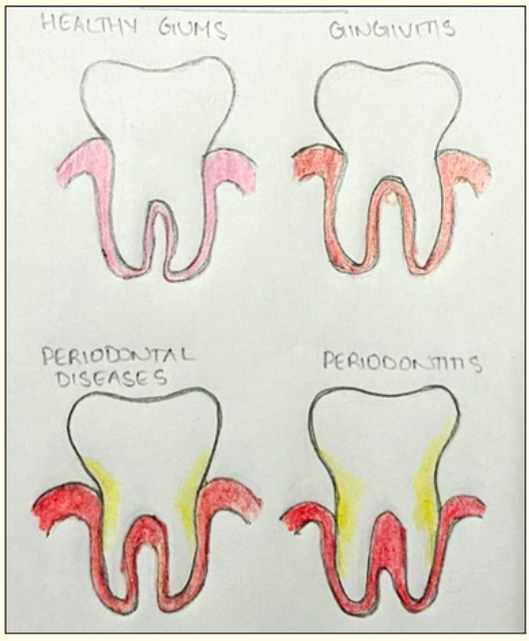

Figure 4: Gingival bleeding can lead to the following changes.

Bacteria associated with gingival bleeding

Periodontally diseased areas that bleed when probed had greater numbers of motile spirochetes such as Bacteroides gingivalis, Wolinella recta, and Fusobacterium nucleatum than healthy sites.

Association between gingival bleeding and gingival crevicular fluid

Gingival inflammation and gingival crevicular fluid (GCF) are linked; higher GCF levels are found in gingival areas that bleed when probed. This suggests that bleeding may reflect cellular, metabolic, and permeability changes caused by inflammation. Although GCF is a more accurate predictor of inflammation than bleeding, additional research is needed to completely understand its mechanisms.

Indices for measuring gingival bleeding

Gingival bleeding index gives a preview of gingival infections. There Are Many Indices Are Available For Assessment Of Gingival Bleeding [22].

Some of which are used were commonly are as follows:

- Gingival Index-loe and Sillness
- Sulcus Bleeding Index (Muhlemann H.R And Son.S)

- Gingival Bleeding Index (GBI) AINAMO and BAY (1975)
- Gingival Bleeding Index
- Papillary Bleeding Index
- Papillary Bleeding Score
- Modified Papillary Bleeding Index (MPBI)
- Bleeding Time Index
- Eastman Interdental Bleeding Index
- Quantitative Gingival Bleeding Index (QGBI)
- Modified Gingival Index (MGI)
- Bleeding On Interdental Brushing Index (BOIB).

Figure 5: Gingival index scoring.

Index name (authors and year)	Instrument	Site for assessment	Time Delay (s)	Graded response
PMA INDEX (Schour and Massler 1947)	Visual assessment	Each gingival unit is scored. Only labial surfaces are examined.	Not stated	P(papillary) 0=normal; no inflammation; 1=mild papillary engorgement; slight increase in size; 2=obvious increase in size of gingival papilla; hemorrhage on pressure 3=excessive increase in size with spontaneous hemorrhage 4=necrotic papilla; 5=atrophy and loss of papilla M(marginal) 0=normal; no inflammation visible; 1=engorgement; slight increase in size; no bleeding; 2=obvious engorgement; bleeding upon probing; 3=advanced periodontitis; deep pockets evident
Gingival index (Loe and Silness, 1963) (Figure 5)	Probe	It scores the marginal and interproximal (four areas for each tooth). The bleeding is assessed by probing gently along the wall of soft tissue sulcus.	Not stated	0=Normal gingiva; 1=Mild inflammation-slight change in color and slight edema but no bleeding on probing. 2=Moderate inflammation-redness, edema and glazing, bleeding on probing; 3=Severe inflammation-marked redness and edema, ulceration with tendency to bleed spontaneously.
Sulcus Bleeding Index (Muhlemann and Son 1971)	Probe	Four gingival units are scored systematically for each tooth, labial and lingual marginal gingiva (M units) and mesial and distal papillary gingival (P units).	Not stated	Score 0- healthy looking papillary and marginal gingiva no bleeding on probing; Score 1- healthy looking gingiva, bleeding on probing; Score 2- bleeding on probing, change in color, no edema; Score 3- bleeding on probing, change in color, slight edema; Score 4- bleeding on probing, change in color, obvious edema; Score 5- spontaneous bleeding, change in color, marked edema.

Gingival Bleeding Index (Carter and Barnes 1974)	Unwaxed dental floss	The mouth is divided into six segments and flossed in the following order; upper right, upper anterior, upper left, lower left, lower anterior and lower right.	Not stated; 30s is allowed for reinspection	Bleeding is recorded as present or absent.
Gingival Bleeding Index (Alnamo and Bay 1975)	Probe	Gentle probing of orifice of the gingival crevice.	10	If bleeding occurs within 10s, a positive finding is recorded.
Papillary Bleeding Index (Muhlemann 1977)	Probe	A periodontal probe is inserted into gingival sulcus at the base of papilla on mesial aspect, then moved coronally to papilla tip. This is repeated on the distal aspect of papilla.	Not stated	Score 0- no bleeding; Score 1- A slight discrete bleeding point; Score 2- Several isolated bleeding points or single line of blood appears; Score 3- The interdental triangle fills with blood shortly after probing; Score 4- Profuse bleeding occurs after probing; blood flows immediately into marginal sulcus.
Papillary Bleeding Score (Loesche 1979)	Wooden interdental cleaner	This is performed using a Stim-U-Dent, which is inserted proximally.	Not stated	0= healthy gingiva, no bleeding on insertion of Stim-U-Dent 1= edematous, reddened gingiva, no bleeding upon insertion of Stim-U-Dent interproximally; 2= bleeding, without flow, upon insertion of Slim-U-Dent 3= bleeding, with flow, along gingival margin upon insertion of Slim-U-Dent interproximally; 4= copious bleeding upon insertion of Slim-U-Dent interproximally; 5= severe inflammation, marked redness and edema, tendency to spontaneous bleeding.
Modified Papillary Bleeding Index (Barnett., *et al*. 1980)	Probe	Modified PBI Index (Muhlemannn, 1977) by stipulating that the periodontal probe should be gently placed in gingival sulcus at mesial line angel of the tooth surface to be examined and carefully swept forward into mesial papilla. The mesial papillae of all the teeth present from second molar to lateral incisor were assessed.	0-30	0= no bleeding within 30s of probing; 1= bleeding between 3 and 30s of probing; 2= bleeding within 2s of probing; 3= bleeding immediately upon probe placement.
Bleeding Time Index (Nowickl., *et al*. 1981)	Probe	Inserting a Michigan"O" probe in the sulcus until slight resistance was felt and then the gingiva was stroked back and forth once over an area of approximately 2mm.	0-15	0= no bleeding within 15s of second probing(i.e. 30s total time); 1= bleeding within 6-15s of second probing 2= bleeding within 11-15s of first probing or 5s after second probing; 3= bleeding within 10s after initial probing; 4= spontaneous bleeding.

Modified Gingival Index (Lobene., *et al.* 1986)	Visual assessment	Same as gingival index.	Not applicable	0= absence of inflammation; 1= mild inflammation or slight changes in color and texture but not in all portions of gingival margins or papillary; 2= mild inflammation, such as preceding criteria, all portions of gingival margin or papillary; 3= moderate, bright surface inflammation, erythema, edema, and/or hypertrophy of gingival marginal or papillary; 4= severe inflammation, erythema, edema and/or gingival marginal hypertrophy of unit or spontaneous bleeding, papillary congestion or ulceration.
Modified Gingival Index (Trombelli., *et al*. 2004)	Visual assessment	Same as gingival index but without bleeding on probing component.	Not applicable	0= Normal gingiva; 1= Mild inflammation-slight vhange in color and slight edema; 2= Moderate inflammation, redness, edema and glazing; 3= Severe inflammation- marked redness and edema, ulceration with tendency to spontaneously bleeding
Bleeding on Interdental Brush Index (Hofer., *et al*. 2011)	Interdental brush	Inserting a alight interdental brush placed buccally, just under the contact point and guided between the teeth with a jiggling motion, without force. Bleeding is scored for each interdental site.	30	Bleeding score is either present or absent.

Table 1

NIDCR criteria for assessing gingival bleeding

- Evaluates facial and mesiofacial locations of teeth in two randomly chosen quadrants.
- Uses a special probe, NIDCR probe, with graduations 2, 4, 6, 8, 10, and 12 mm.
- Drys the quadrant with air and places the periodontal probe 2mm into the sulcus from the most posterior teeth.
- Assesses bleeding on probing at each site, repeating the procedure for all quadrants.
- Determines the percentage of a person's teeth or sites bleeding.
- Ascertains the incidence of gingival bleeding for a population.

Clinical significance of gingival bleeding

- It is among the first noticeable signs of inflammation.
- It can present before any colour or visual signs of inflammation
- Bleeding on probing help us to detect whether it is an active or an inactive lesion. An inactive lesion may show little or no signs of BOP whereas active lesion may bleed profusely on probing.
- Integrity of the inflammation can be assessed.

Potential complications

Diabetic complication

BOP seems to be increased in patients with TYPE II diabetes mellitus indicating inflammation in the periodontal tissue. But studies have shown that periodontal inflammation does not fully depend on glycemia but may be due to complex pathogenesis [8].

Complication during pregnancy

During the second month of pregnancy, gingivitis begins due to hormonal changes. The gingiva is dark red due to increased vascularity and red blood cell infiltration. It bleeds easily and appears smooth with thickened margins with peudopockets. In pregnant women with good oral hygiene, BOP is not evident [9].

Smoking

In smokers, tobacco smoke induces gingival vasoconstriction. There is evidence that flow of blood through gingival vessels is reduced in smokers despite high level of inflammation in periodontal tissues [12]. Nicotine induces vasoconstriction and intervenes with healing after periodontal treatment. Morozumi., *et al*. have reported that there is an increase in gingival blood flow after discontinuing smoking for 3 days and hence it is evident that gingival bleeding increases after cessation of smoking [19,20].

Patients under anti-platelet drug

Patients under anticoagulant and antiplatelet medications are under high risk for thrombus formation. Vitamin K inhibitors, or VKAs, are antiplatelet drugs like acetylsalicylic acid and traditional anticoagulants like warfarin [7]. Careful planning and precautions must be taken to prevent bleeding complications due to altered use of medications leading to significant cardiovascular risks.

Respiratory infections

It has been found in a large population the significant association of gingival bleeding with asthma symptoms. Since the oral cavity is continuous with the airway, the oral pathogens may be transported through the airway into the lungs and cause respiratory distress [10].

Patients under local anesthetics

Patients under local anesthesia may experience profuse gingival bleeding in rare cases after a few hours of treatment. This may be caused due to vasoconstrictor effect of local anesthetic agents. The wearing away of the anesthetic effects lead to vasodilation followed by profuse gingival bleeding [11].

Treatment and management

Oral health awareness

Dental hygienists educate patients about bleeding effects in the oral cavity, highlighting tooth brushing as a low-cost and effective tool against gingivitis. Increased brushing frequency will decrease gingival bleeding, proving brushing's importance. Oral health awareness programs in schools can lower plaque and gingivitis rates for up to six months [1].

Intake of nutrients

Nutrients are crucial for oral tissue formation, development, and repair. Adequate intake of vitamins and minerals, such as vitamin C and D, is essential for maintaining oral health and preventing oral manifestations like scurvy and gingival bleeding [24].

Oral hygiene habits

Along with manual toothbrushing the daily use of a dental floss or an oral irrigator, either with prototype or standard jet tip, is significantly more effective in reducing gingival bleeding scores. In the case of deep unscaled pockets, oral washing two times a day with bleach solution (0.25% sodium hypochlorite) significantly reduced bleeding upon probing. When it comes to periodontal self-care, sodium hypochlorite is an invaluable antimicrobial. Strong antimicrobial as well as antibacterial properties of sodium hypochlorite may eradicate infectious agents that are difficult to eliminate [11].

Professional dental cleaning

Hand scaling to remove supra gingival and subgingival plaque and calculus to maintain good oral hygiene can decrease gingival bleeding. When weighed against debridement by itself, it has been demonstrated that the supplementary administration of systemic antibiotics, regional antibacterial medications and systemic sub-antimicrobial low-dose doxycycline delivers little extra advantage compared with mechanical therapy such as ultrasonic instruments or scaling and root planning [28].

Avoid smoking

Gingival bleeding in smoking individuals was reduced significantly by non-surgical therapy by using hand instruments to eliminate supragingival as well as subgingival debris. Patients should be advised to stop the use of tobacco as it acts as a vasoconstrictor and reduces gingival bleeding [12].

Local hemostatic agents (Styptics)

In the case of patients taking anti-coagulant drugs, hypovolemic shock appears to have an uncommon consequence. Hence, it is necessary for the clinician to have access to local hemostatic agents. Microfibrillar collagen, absorbable collagen hemostat sponge, Act-Cel and Gelitacel, thrombin, Floseal, fibrosealant, albumin-derived hemostats are some of the hemostatic agents [33]. Non-surgical periodontal treatment under anti-platelet medication may lead to uncontrolled bleeding post treatment leading to hypovolemic shock. Some of the anti-fibrinolytic agents used in dentistry are Aprotinin, tranexamic acid and epsilon aminocaproic acid [33]. Ferric chloride and Ferric sulphate are examples of styptics, both of which are strong astringents that induce both superficial and local coagulation (figure 6).

Antibacterial therapy

Gingival inflammation can be decreased, and repair encouraged by washing two times daily for one month using a solution com-

Topical hemostatic		Commercial name
Passive or Mechanical Agents	Gelatins	Surgifoam®, Gelfoam®, Gelfilm®, Gelitaspon®, Geli putty®
	Collagen	Instat®, Helitene®, Helistat®
	Cellulose-based products: oxidized regenerated cellulose	Surgicel Original®, Surgicel Nu-Knit®, Oxycel®, Surgicel Fibrillar®, Interceed®, Gelitacel®
	Cellulose-based products: oxidized cellulose	ActCel®, Gelitacel®
	Polyssacharide hemospheres	Arista™AH
	Adhesives	BioGlue®
Active Agents	Topical thrombin	Thrombin-JMI®, Evithrom®, Recothrom®
	Fibrin sealants	Tisseel®, Evicel®, Crosseal™
Flowable agents	Porcine gelatin + thrombin Bovine collagen + thrombin	Surgiflo®, Floseal®

Figure 5: Local Haemostatic agents.

prising sea salt, xylitol, and lysozyme for half a minute each time. Periodontal and other oral-related conditions, individuals with alveolar osteitis, and postsurgical usage, primarily following tooth extractions have all historically been advised to utilize saltwater washes [14].

Conclusion

Gingival bleeding is an early sign of periodontal destruction. Several local and systemic factors contribute to gingival bleeding. The severity of gingival inflammation can be clinically evaluated by the gingival index as well as bleeding on probing [5]. Since there is no data on the effectiveness of periodontal personal hygiene in treating gingival bleeding, continued bleeding on probing is among the most reliable indicators of periodontal disintegration. While not entirely reliable, the lack of bleeding from the gums appeared to be a good sign of infection control [7].

Bibliography

1. Alasqah M., *et al*. "The effect of gingival bleeding on oral home care practices in Saudi Arabia". *Journal of Family Medicine and Primary Care* 8.8 (2019): 2696-2698.

2. Asikainen S., *et al*. "Gingival bleeding after chlorhexidine rinses with or without mechanical oral hygiene". *Journal of Clinical Periodontology* 11.2 (1984): 87-94.

3. Bertelsen RJ., *et al*. "Association of oral bacteria with oral hygiene habits and self-reported gingival bleeding". *Journal of Clinical Periodontology* 49.8 (2022): 768-781.

4. Butera A., *et al*. "Management of Gingival Bleeding in Periodontal Patients with Domiciliary Use of Toothpastes Containing Hyaluronic Acid, Lactoferrin, or Paraprobiotics: A Randomized Controlled Clinical Trial". *Applied Science* 11 (2021): 8586.

5. Caton J., *et al*. "Associations between bleeding and visual signs of interdental gingival inflammation". *Journal of Periodontology* 59.11 (1988): 722-727.

6. Chaves ES., *et al*. "Relationship of "bleeding on probing" and "gingival index bleeding" as clinical parameters of gingival inflammation". *Journal of Clinical Periodontology* 20.2 (1993): 139-143.

7. Elad S., *et al*. "A critically severe gingival bleeding following non-surgical periodontal treatment in patients medicated with anti-platelet". *Journal of Clinical Periodontology* 35.4 (2008): 342-345.

8. Ervasti T., *et al*. "Relation between control of diabetes and gingival bleeding". *Journal of Periodontology* 56.3 (1985): 154-157.

9. Figuero E., *et al*. "Effect of pregnancy on gingival inflammation in systemically healthy women: a systematic review". *Journal of Clinical Periodontology* 40.5 (2013): 457-473.

10. Gómez Real F., *et al*. "The Association of Gum Bleeding with Respiratory Health in a Population Based Study from Northern Europe". *PLoS One* 11.1 (2016): e0147518.

11. Gonzalez S., *et al*. "Gingival bleeding on probing: relationship to change in periodontal pocket depth and effect of sodium hypochlorite oral rinse". *Journal of Periodontal Research* 50.3 (2015): 397-402.

12. Handschel J., *et al*. "Complications after oral surgery in patients with congenital or drug-induced bleeding disorders". *In Vivo* 25.2 (2011): 283-286.

13. Holde GE., *et al*. "To what extent does smoking affect gingival bleeding response to supragingival plaque? Site-specific analyses in a population-based study". *Journal of Periodontal Research* 55.2 (2020): 277-286.

14. Kumar Santhosh. "Local hemostatic agents in the management of bleeding in oral surgery". *Asian Journal of Pharmaceutical and Clinical Research* 9 (2016).

15. Lal S., *et al*. "Gingival bleeding in 6- to 13-year-old children with diabetes mellitus". *Pediatric Dentistry* 29.5 (2007): 426-430.

16. Lang NP., *et al*. "Gingivitis as a risk factor in periodontal disease". *Journal of Clinical Periodontology* 36 (2006): 3-8.

17. Manzalawi R., *et al*. "Gingival bleeding associated with COVID-19 infection". *Clinical Case Report* 9.1 (2020): 294-297.

18. Maroneze MC., *et al*. "Edema and gingival bleeding in anterior region have a negative influence on quality of life of adolescents". *Brazilian Oral Research* 32 (2018): e112.

19. Mittal S., *et al*. "Gingival bleeding and pocket depth among smokers and the related changes after short-term smoking cessation". *Acta Odontologica Scandinavica* 80.4 (2022): 258-263.

20. Morozumi T., *et al*. "Smoking cessation increases gingival blood flow and gingival crevicular fluid". *Journal of Clinical Periodontology* 31.4 (2004): 267-272.

21. Murakami S., *et al*. "Dental plaque-induced gingival conditions". *Journal of Periodontology* 89 (2018): S17-S27.

22. Newbrun E. "Indices to measure gingival bleeding". *Journal of Periodontology* 67.6 (1996): 555-561.

23. Pesce P., *et al*. "Effect of different anticoagulants and antiplatelets on intraoral bleeding time during professional oral hygiene session". *BMC Oral Health* 24.1 (2024): 957.

24. Pflipsen M and Zenchenko Y. "Nutrition for oral health and oral manifestations of poor nutrition and unhealthy habits". *Genetic Dentistry* 65.6 (2017): 36-43.

25. Preber H and Bergström J. "Effect of non-surgical treatment on gingival bleeding in smokers and non-smokers". *Acta Odontologica Scandinavica* 44.2 (1986): 85-89.

26. Ramsay EI., *et al*. "Honey in oral health and care: A mini review". *Journal of Oral Bioscience* 61.1 (2019): 32-36.

27. Ramseier CA., *et al*. "Effect of Age on Bleeding on Probing (BOP) as an Indicator of Periodontal Inflammation in Patients Enrolled in Supportive Periodontal Therapy". *Oral Health Prevention Dentistry* 19 (2021): 43-50.

28. Rosema NA., *et al*. "The effect of different interdental cleaning devices on gingival bleeding". *Journal of the International Academy of Periodontology* 13.1 (2011): 2-10.

29. Schenkein HA and Loos BG. "Inflammatory mechanisms linking periodontal diseases to cardiovascular diseases". *Journal of Clinical Periodontology* 40.14 (2014): S51-69.

30. Taani DQ and Alhaija ES. "Self-assessed bleeding as an indicator of gingival health among 12-14-year-old children". *Journal of Oral Rehabilitation* 30.1 (2003): 78-81.

31. Tada A and Miura H. "The Relationship between Vitamin C and Periodontal Diseases: A Systematic Review". *International Journal of Environmental Research and Public Health* 16.14 (2019): 2472.

32. Tarighi P and Khoroushi M. "A review on common chemical hemostatic agents in restorative dentistry". *Dental Research Journal (Isfahan)* 11.4 (2014): 423-428.

33. van Galen KP., *et al*. "Antifibrinolytic therapy for preventing oral bleeding in patients with haemophilia or Von Willebrand disease undergoing minor oral surgery or dental extractions". *Cochrane Database System Review* 12 (2015): CD011385.

34. Watanabe T., *et al*. "Septic pulmonary embolism associated with periodontal disease: a case report and literature review". *BMC Infectious Disease* 19.1 (2019): 74.