Essential Oil-Based Mouthwashes

Subjects: Dentistry, Oral Surgery & Medicine

Contributor: Fawad Javed

Essential oil (EO)-based mouthwashes have been used for oral health maintenance due to their antimicrobial and anti-inflammatory properties. The aim was to review clinical trials that assessed the role of EO-based mouthwashes in controlling gingivitis in patients undergoing fixed orthodontic treatment (OT).

essential oil mouthwash gingivitis

1. Introduction

Essential oils (EOs) are organic compounds that are extracted from plants with various distillation methods [1]. Historically, they have been utilized in process of manufacturing perfumes due to their strong and characteristic scent, as well as in food and beverage industries [2]. The EO-derivatives possess anti-inflammatory and antimicrobial properties and have been used in the field of clinical dentistry and related research [3]. Lavender, peppermint, cinnamon and clove oils have been shown to have an inhibitory effect on different bacteria and fungi [3]. Recently, EO-derivatives were found to be efficient in the management of orofacial pain due to their analgesic properties [4][5]. Furthermore, studies indicated that EOs are capable of the management of dental anxiety before certain surgical procedures [6][7].

Patients undergoing fixed orthodontic treatment (OT) are more prone to gingival inflammation because fixed orthodontic appliances are bulky and create a favorable environment for plaque accumulation [8][9]. Mechanical plaque removal poses a challenge for orthodontic patients and different strategies have been implemented in order to control plaque formation, prevent the development of gingivitis and maintain oral health [9]. More specifically, chemotherapeutic agents with antimicrobial properties, such as 0.12% chlorhexidine (CHX), have been proposed as an adjunct to the standard oral hygiene protocol [10]. However, prolonged use of these agents has been associated with side effects, such as hypersensitivity reactions, burning sensation and changes in taste and tooth color [11][12]. Another potential approach for the management of oral health in orthodontic patients is the use of EO-containing mouthwashes due to their antimicrobial and anti-inflammatory properties [13]. A recent study [13] investigated the effectiveness of mouthwash with 1% Matricaria chamomilla L. (MTC) in the management of gingivitis during OT, by comparing it to CHX and a placebo mouthwash. The authors concluded that the use of both CHX and MTC mouthwash significantly reduced gingival inflammation compared to the use of the placebo mouthwash [13]. Listerine ® is another EO-containing mouthwash that has been studied in the literature [14].

2. Research

A meticulous search of indexed literature revealed 63 studies. After title and abstract screening and removal of the duplicate studies, 17 studies were retrieved and evaluated in more detail. Eleven studies were excluded after full-text evaluation because they did not meet the eligibility criteria. In total, six studies (three RCTs, three non-RCTs) were included and processed for data extraction (**Figure 1**).

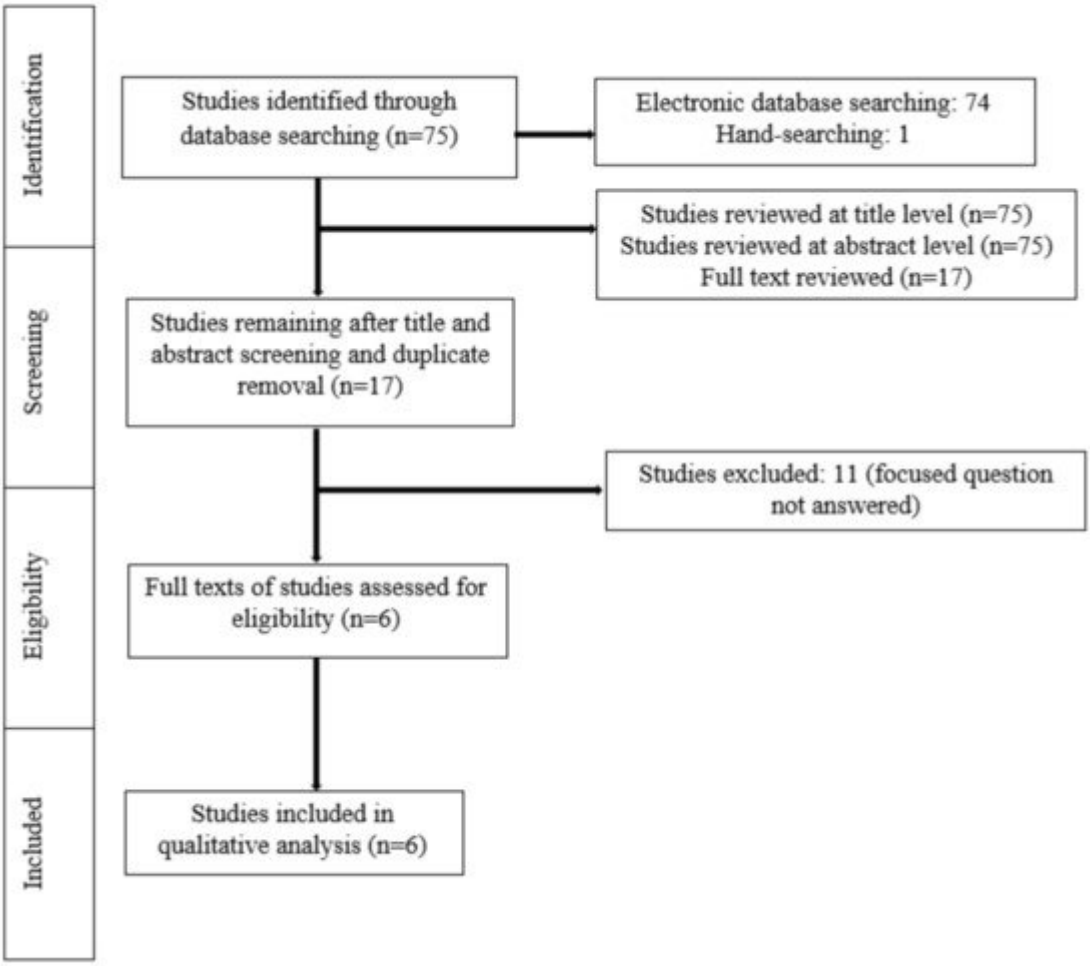

Figure 1. Study selection according to PRISMA guidelines.

Random allocation of the participants to the groups was performed in three studies [11][13][15]. In the study by Bauer Faria et al. [16], 31 patients undergoing fixed OT used 3 different mouthwashes in a random order. Initially, all the participants were instructed to use a mouthwash containing 0.5% Zingiber officinale (ZO), then 0.12% CHX and finally a placebo mouthwash [16]. Tufekci et al. (10), reported that the age and gender of the participants could play a significant role in their compliance and could therefore influence the findings of the study. As a result, patients were matched for both these variables [10]. In the study by Akbulut [17], no randomization of the participants was mentioned. In five studies [10][11][13][15][16], the number of participants ranged between 30 and 79. In the study by Akbulut [17], the groups were formed according to the number of mini screws. More specifically, 38 patients were divided into 4 groups, with each group consisting of 15 mini screws [17]. The number of males and females ranged between 4 and 20 and 17 and 27, respectively [10][13][15][17][16]. One study [11] did not report the number of male and female participants. In five studies [10][11][13][15][16], the age of the patients ranged between 10 and 64 years. In the

study by Akbulut [17], the age of the participants was not mentioned. In all studies [10][11][13][15][17][16], a variation was identified at the clinical indices used to assess the gingival status of the participants (Plaque Index, Visible Plaque Index, Modified Plaque Index, Bleeding Index, Gingival Bleeding Index, Gingival Index, and Modified Gingival Index). The duration of follow-up also varied among studies [10][11][13][15][17][16] from baseline (0 days of treatment) to 180 days of intervention (**Table 1**). All studies [10][11][13][15][17][16] included participants who used a mouthwash that contained EOs (test group) and those who either used mouthwashes that did not contain EOs or did not use any mouthwash (control group) during OT with fixed appliances. A power analysis was performed in three studies [10][11][16] (**Table 2**).

Table 1. General characteristics of the clinical trials assessed.

Authors	Type of Study	Participants	Gender	Age in Years (Range)	Clinical Indices	Duration of Follow-Up
Tufekci et al. (2008) [10]	Non-RCT	47	20 M 27 F	16.6 years * (10–64)	PI, BI and MGI	90 and 180 days
Chen et al. (2013) [11]	RCT	79	NR	17.7 ± 3.9 years	PI, BI and MGI	90 and 180 days
Goes et al. (2016) [13]	RCT	30	4 M 26 F	28.8 ± 3.28 years (10–40)	VPI and GBI	15 days
Alves et al. (2010) [15]	RCT	30	10 M 20 F	12–21 years	VPI and GI	60 days
Akbulut ** (2020) [17]	Non-RCT	38 (60 mini screws)	18 M 20 F	NR	MPI and MGI	21 days
Bauer Faria et al. (2021) [16]	Non-RCT	31	14 M 17 F	19.96 years (12–35)	GBI	7 days

Table 2. Test and control groups and power analysis.

Authors (Year)	Test Group (*n* = Number of Patients)	Control Group (*n* = Number of Patients)	Power Analysis
Tufekci et al. (2008) [10]	EO-based MW (*n* = 24)	No MW (*n* = 23)	Yes
Chen et al. (2013) [11]	EO-based MW 1 (*n* = 28) EO-based MW 2 (*n* = 25)	No MW (*n* = 26)	Yes
Goes et al. (2016) [13]	EO-based MW (*n* = 10)	CHX (*n* = 10) Placebo MW (*n* = 10)	No
Alves et al. (2010) [15]	EO-based MW (*n* = 10)	Placebo MW (*n* = 10)	No

Authors (Year)	Test Group (*n* = Number of Patients)	Control Group (*n* = Number of Patients)	Power Analysis
		No MW (*n* = 10)	
Akbulut (2020) [17]	EO-based MW (*n* = NR)	CHX (*n* = NR) Povidone-iodine MW (*n* = NR) No MW (*n* = NR)	No
Bauer Faria et al. (2021) [16]	EO-based MW (*n* = 31)	CHX (*n* = 31) Placebo MW (*n* = 31)	Yes

The participants in the test group used a variation of mouthwashes that contained EOs, including Listerine ® [10][11][15][17] , 1% MTC [13], 0.5% ZO [16] and 2.5% Fructus mume (FM) [11]. Moreover, different mouthwashes were used by subjects in the control group, including 0.12% CHX [13][17][16], 7.5% povidone-iodine [17] and placebo [13][15][16]. In four studies [10][11][15][17], the participants in the control group were instructed to brush and floss, but not use any mouthwash. In four studies [10][11][13][15] the mouthwashes were used twice daily. However, two studies did not report a specific protocol regarding the daily frequency of usage of the mouthwashes [17][16] (**Table 3**).

Table 3. Type, concentration and daily frequency of mouthwash usage.

Authors (Year)	Type of MW		Concentration of MW		Daily Frequency of Usage	
	Test-Group	Control-Group	Test-Group	Control-Group	Test-Group	Control-Group
Tufekci et al. (2008) [10]	Listerine®	No MW	NR	NA	2× daily	NA
Chen et al. (2013) [11]	Listerine® Fructus mume	No MW	NR 2.5%	NA	2× daily 2× daily	NA
Goes et al. (2016) [13]	Matricaria chamomilla L.	CHX Placebo	1%	0.12% NR	2× daily	2× daily 2× daily
Alves et al. (2010) [15]	Listerine®	Placebo No MW	NR	NR NA	2× daily	2× daily NA
Akbulut (2020) [17]	Listerine®	CHX Povidone iodine No MW	NR	0.12% 7.5% NA	NR	NR NR NA
Bauer Faria et al. (2021) [16]	*Zingiber officinale*	CHX Distilled water	0.5%	0.12% NA	NR	NR NA

In the study by Tufekci et al. [10], all clinical indices were significantly higher in the group that did not use a mouthwash compared with the Listerine ® group after 90 and 180 days. It was concluded that Listerine ® is

efficient in controlling plaque accumulation and gingivitis in patients undergoing fixed OT [10]. In the study by Alves et al. [15], Listerine ® was also found to be more successful in controlling gingivitis compared with a placebo mouthwash. Chen et al. [11] reported that the use of both Listerine ® and FM mouthwashes resulted in a significant reduction in bleeding of gingival tissue compared with the use of no mouthwash. Furthermore, Listerine ® and FM mouthwashes were found to be equally efficient in promoting oral health [11]. In another study [17], the use of both Listerine ® and CHX significantly improved the oral hygiene status of patients with orthodontic mini screws compared with the use of povidone iodine or no mouthwash. Goes et al. [13] reported that both CHX and MTC mouthwashes were more effective in controlling plaque accumulation and gingival bleeding compared with a placebo mouthwash. Moreover, there were no differences when CHX was compared with the MTC mouthwash [13]. In the study by Bauer Faria et al. [16], ZO mouthwash had higher efficiency in controlling gingival inflammation compared with CHX and a placebo mouthwash (**Table 4**).

Table 4. Main study outcomes.

Authors (Year)	Main Outcomes	Side-Effects/Complications	Conclusion
Tufekci et al. (2008) [10]	BI, MGI and PI were significantly higher in the group that did not use a mouthwash compared with the Listerine® group after 90 and 180 days.	N/R	Listerine® is effective in decreasing plaque accumulation and gingival bleeding in orthodontic patients.
Chen et al. (2013) [11]	• BI was significantly lower in Listerine® and FM groups compared with the group that did not use a mouthwash after 180 days. • MGI significantly decreased in both FM and Listerine® groups after 90 days. • There was no significant difference in PI, BI and MGI in patients that used Listerine® and FM	No complications were mentioned by the patients.	Listerine® and FM mouthwashes lead to decreased bleeding of gingival tissue in patients undergoing fixed orthodontic treatment.
Goes et al. (2016) [13]	• GBI and VPI were significantly higher in the	• In the CHX group, five patients reported burning or	• MTC and CHX are effective in reducing

Authors (Year)	Main Outcomes	Side-Effects/Complications	Conclusion
	placebo group compared with the MTC and CHX groups. • No significant difference in GBI and VPI in patients that used MTC and CHX.	alterations in taste after 14 days. • In the placebo group, one patient reported tongue numbness on day 1.	gingival bleeding and oral biofilm accumulation in patients with gingivitis. • Anti-inflammatory efficacy of MTC and CHX are comparable.
Alves et al. (2010) [15]	• GI significantly decreased in the Listerine® group compared with the placebo mouthwash group. • GI and VPI significantly decreased in the Listerine® group compared with the group that did not use a mouthwash.	N/R	Listerine® is an effective adjunct to oral hygiene in patients undergoing orthodontic treatment.
Akbulut (2020) [17]	• MPI and MGI significantly decreased in CHX and Listerine® groups after 3 weeks. • MPI and MGI were significantly lower in CHX, Listerine® and povidone-iodine groups compared with the group that did not use a mouthwash.	N/R	CHX, Listerine® and povidone-iodine are effective in promoting oral health in patients with orthodontic mini screws.
Bauer Faria et al. (2021) [16]	GBI was significantly higher in the CHX group compared with the ZO group after 7 days.	ZO and CHX have a low taste tolerance.	ZO reduces gingival bleeding and oral biofilm accumulation.

3. Conclusions

Based upon the limited evidence available, EO-based mouthwashes seem to be effective for the management of gingivitis among patients undergoing fixed OT. Further well-designed and power-adjusted clinical trials are needed.

References

1. Wińska, K.; Mączka, W.; Łyczko, J.; Grabarczyk, M.; Czubaszek, A.; Szumny, A. Essential Oils as Antimicrobial Agents—Myth or Real Alternative? Molecules 2019, 24, 2130.
2. Elshafie, H.S.; Camele, I. An Overview of the Biological Effects of Some Mediterranean Essential Oils on Human Health. BioMed Res. Int. 2017, 2017, 1–14.
3. Dagli, N.; Dagli, R.J.; Mahmoud, R.S.; Baroudi, K. Essential oils, their therapeutic properties, and implication in dentistry: A review. J. Int. Soc. Prev. Community Dent. 2015, 5, 335–340.
4. Quintans, J.S.; Brito, R.G.; Aquino, P.G.; França, P.H.; Siqueira-Lima, P.S.; Santana, A.E.; Ribeiro, E.A.; Salvador, M.J.; Araújo-Júnior, J.X.; Quintans-Júnior, L.J. Antinociceptive activity of Syzygium cumini leaves ethanol extract on orofacial nociception protocols in rodents. Pharm. Biol. 2014, 52, 762–766.
5. Bonjardim, L.R.; Silva, A.M.; Oliveira, M.G.B.; Guimarães, A.G.; Antoniolli, A.R.; Santana, M.F.; Serafini, M.R.; Santos, R.C.; Araújo, A.A.S.; Estevam, C.S.; et al. Sida cordifolia Leaf Extract Reduces the Orofacial Nociceptive Response in Mice. Phytotherapy Res. 2011, 25, 1236–1241.
6. Zabirunnisa, M.; Gadagi, J.S.; Gadde, P.; Koneru, J.; Myla, N.; Thatimatla, C. Dental patient anxiety: Possible deal with Lavender fragrance. J. Res. Pharm. Pract. 2014, 3, 100–103.
7. Hasheminia, D.; Motamedi, M.R.K.; Ahmadabadi, F.K.; Hashemzehi, H.; Haghighat, A. Can Ambient Orange Fragrance Reduce Patient Anxiety During Surgical Removal of Impacted Mandibular Third Molars? J. Oral Maxillofac. Surg. 2014, 72, 1671–1676.
8. Martin, B.J.; Campbell, P.M.; Rees, T.D.; Buschang, P.H. A randomized controlled trial evaluating antioxidant–essential oil gel as a treatment for gingivitis in orthodontic patients. Angle Orthod. 2016, 86, 407–412.
9. Santamaria, M.; Petermann, K.D.; Vedovello, S.A.S.; Degan, V.; Lucato, A.; Franzini, C.M. Antimicrobial effect of Melaleuca alternifolia dental gel in orthodontic patients. Am. J. Orthod. Dentofac. Orthop. 2014, 145, 198–202.
10. Tufekci, E.; Casagrande, Z.A.; Lindauer, S.J.; Fowler, C.E.; Williams, K.T. Effectiveness of an Essential Oil Mouthrinse in Improving Oral Health in Orthodontic Patients. Angle Orthod. 2008, 78, 294–298.
11. Chen, Y.; Wong, R.W.K.; Seneviratne, C.J.; Hagg, U.; McGrath, C.P.J.; Samaranayake, L.P. The effects of natural compounds-containing mouthrinses on patients with fixed orthodontic appliance

treatment: Clinical and microbiological outcomes. Int. J. Paediatr. Dent. 2012, 23, 452–459.

12. Kotsailidi, E.A.; Kalogirou, E.-M.; Michelogiannakis, D.; Vlachodimitropoulos, D.; Tosios, K.I. Hypersensitivity reaction of the gingiva to chlorhexidine: Case report and literature review. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. 2020, 130, 156–160.
13. Goes, P.; Dutra, C.S.; Lisboa, M.R.P.; Gondim, D.V.; Leitão, R.; Brito, G.A.C.; Rego, R.O. Clinical efficacy of a 1% Matricaria chamomile L. mouthwash and 0.12% chlorhexidine for gingivitis control in patients undergoing orthodontic treatment with fixed appliances. J. Oral Sci. 2016, 58, 569–574.
14. Vlachojannis, C.; Chrubasik-Hausmann, S.; Hellwig, E.; Al-Ahmad, A. A Preliminary Investigation on the Antimicrobial Activity of Listerine®, Its Components, and of Mixtures Thereof. Phytother. Res. 2015, 29, 1590–1594.
15. Zenóbio, E.; Alves, K.M.; Goursand, D.; Cruz, R.A. Effectiveness of Procedures for the Chemical-Mechanical Control of Dental Biofilm in Orthodontic Patients. J. Contemp. Dent. Pract. 2010, 11, 41–48.
16. Bauer Faria, T.R.; Furletti-Goes, V.F.; Franzini, C.M.; de Aro, A.A.; de Andrade, T.A.M.; Sartoratto, A.; de Menezes, C.C. Anti-inflammatory and antimicrobial effects of Zingiber officinale mouthwash on patients with fixed orthodontic appliances. Am. J. Orthod. Dentofac. Orthop. 2021, 159, 21–29.
17. Akbulut, Y. The effects of different antiseptic mouthwash on microbiota around orthodontic mini-screw. Niger. J. Clin. Pract. 2020, 23, 1507–1513.

Retrieved from https://encyclopedia.pub/entry/history/show/36874