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EFFICIENCY OF CALENDULA OFFICINALIS IN THE TREATMENT OF GINGIVITIS- A SYSTEMATIC REVIEW

Avignan Mukherjee[1], D. Prabu*[1], M. Rajmohan[1], R. Sindhu[1], M. Sasikala[2], Lubna Fathima[3], Suganya[1]

[1*]Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai, Tamil Nadu, India.
[2]Department of Public Health Dentistry, S.M Dental Clinic, Tiruvallur, Tamil Nadu, India.
[3]Department of Public Health Dentistry, Madha Dental College and Hospital, Kundrathur, Tamil Nadu, India.

ABSTRACT

Aim: The aim of the study is to assess the efficiency of Calendula officinalis in the treatment of gingivitis. Calendula officinalis, an ayurvedic product, belongs to the family Asteraceae and is commonly known as pot marigold[1]. This systematic review deals with the efficiency of C.officinalis in the treatment of gingivitis by comparing it to other placebo groups of mouthwashes. It is a systematic review based on several studies attempted through randomised control trials to gather the required results. **Materials and methods:** A systematic literature review was derived using Google scholar, Pub Med, Cochrane Library, Medline, Wiley's online library, Science Direct, Scopus using terms- calendula officinalis, gingivitis, and dentistry. A total of 208 articles appeared from various sources, out of which 164 were screened, and 21 articles were related to the research questions. This review was reported according to the preferred reporting criteria for systematic review guidelines. **Results:** 5 trials were included, and they were all compared to other placebo groups of mouth rinses and dentifrices. Among the six trials, five were found to be significant in favouring the effectiveness of Calendula Officinalis. No meta-analyses were performed. **Conclusion:** In the available review, the multiple beneficial effects of Calendula officinalis were found to be effective in treating gingivitis and improving oral health.

KEYWORDS

Ayurveda, Gingivitis, Calendula Officinalis and Oral health.

Author for Correspondence:
Prabu D,
SRM Dental College,
Ramapuram, Chennai, Tamil Nadu, India.

Email: researchphdsrm@gmail.com

INTRODUCTION

Ayurveda, the ancient Indian medical system, is based on ancient literature that relies on a naturalistic and holistic approach to physical and mental health. Ayurvedic medicine is the world's oldest medical system and is one of India's oldest traditional healthcare systems. Ayurvedic treatment mainly combines products derived from plants and animals,

diet, lifestyle and physical exercises. Ayurveda is one of the oldest healing systems with a holistic approach which means a "full-body" approach[1].

The oral cavity of a human being contains a biofilm known as bacterial plaque. The excessive accumulation of this plaque results in consequence of poor oral hygiene. This bacterial plaque is formed naturally on the exposed tooth surface, and it contains complex microbial communities. The colonisation and metabolism of this bacteria biofilm along the tooth surface and the oral cavity leads to oral diseases like dental caries, gingivitis, periodontitis, peri-implant infections, stomatitis, etcetera[2].

Out of so many oral cavity diseases, gingivitis is the most common disease affecting almost every individual at one point in life. Gingivitis is the inflammation of the gums, which is usually induced by generalised biofilm[3]. Stages of gingivitis are initial lesion, early lesion and established lesion. In the first stage, the initial lesion is formed by inflammatory changes taking place in response to microbial enactment of resident leukocytes and resisting stimulation of endothelial cells. In the second stage, early lesion occurs after the initial lesion becomes inferior after one week of the start of plaque accumulation. The third stage, established lesion, is characterised by the prevalence of B lymphocytes and plasma cells and forming a small gingival pocket lined with a pocket epithelium. Gingivitis can form due to sudden onset and short duration and can creation rate and bleeding from the gingival sulcus on gentle probing[4].

Calendula officinalis belongs to the family Asteraceae and is commonly known as pot marigold cause excessive pain[5].

The earliest indications of gingival inflammation - increased gingival cervical fluid. It is a medicinal herb native to the Mediterranean area. It produces flowers of yellow or orange colours, which are used as medicine in the forms of infusion, tinctures, liquid extracts, creams and ointments etc. The calendula plant contains flavonoids, polysaccharides, triterpene alcohols, sterols, glycosides etc[6].

Calendula officinalis, the main sample in this review, is widely cultivated as a herb. It has remarkable healing properties and can also act as a homoeopathic remedy. It can be used as an anti-inflammatory agent as well as an anti-plaque agent. Various researches have demonstrated that C.officinalis have antibacterial and antimicrobial effects and exhibit wound healing and re-epithelization properties. It has anti-inflammatory and antioxidant properties as well, and it shows no contraindications and other drug interactions[7].

In this review, the purpose is to evaluate the efficiency of Calendula officinalis in treating gingivitis by comparing it to other oral medicinal solutions.

Objective

The objective is to assess the efficiency of Calendula officinalis in the treatment of gingivitis.

MATERIAL AND METHODS

Inclusion criteria

Original articles

Randomized control trials

Gingival indices, plaque indices and oral hygiene indices

Articles on the efficacy of Calendula officinalis in treating gingivitis

Exclusion criteria

Review articles

Articles without open access

Duplicates

Studies done on other subjects

Studies were done on a combination of C.officinalis with other herbs.

Search strategy

Published literature on the advancements in assessing the efficacy of C.officinalis in treating gingivitis, which includes original research articles and papers in databases such as Pubmed, Google Scholar, Cochrane Library, Medline, Wiley's online library, Science Direct, and Scopus, were taken into study for this systematic review. A literature search to collect relevant data was performed using the terms calendula officinalis, gingivitis and dentistry. A total of 208 articles appeared from the sources, out of which 164 were screened and 21 articles were related to the research topic. Out of these, a total of 5 articles were retrieved for the review.

Search engine
Pubmed
Cochrane library
Google Scholar
Medline
Wiley's online library
Sciencedirect

RESULTS AND DISCUSSION

The database search produced a total of 208 articles, out of which 21 articles were independently assessed. Five articles out of the 21 were included in making this systematic review. Figure No.1 shows the flow chart of the identified articles, duplicates removed, screened, assessed for eligibility and included in this review.

Table No.1 shows the characteristics of the interventions in the selected articles/studies. In all five articles, there is a comparison of calendula products with other oral products. Still, they differed individually based on several samples, age groups, and duration of the procedure. All the trials were performed on individuals within the age group of 20 to 45 years. In 4 of the trials, they used C.officinalis mouth wash compared to other placebo mouth washes (mostly chlorhexidine). In 1 trial, they have compared C.officinalis toothpaste with other control placebo dentifrice.

Table No.2 shows the outcome results and data of gingivitis in the included studies. There is a significant reduction in plaque and gingival indices when the calendula officinalis group is compared with other groups, with a statistically significant 'P' value. Table No.3 shows the risk of bias in the included studies. None of the studies had a low risk of bias.

Discussion

In recent times, calendula officinalis is being effectively used in the prevention of gingivitis and for its treatment. In recent studies, calendula officinalis have been compared to other placebo mouth rinses. They have been statistically proven to significantly affect the treatment and reduction in the onset of gingivitis. Our search yielded four results on the effectiveness of calendula officinalis, which was found to be equal to gold standard placebo mouth rinses. However, one study showed no significant difference other than a difference in taste perception. In addition, studies have shown the anti-inflammatory, antimicrobial, and anti-plaque effects of Calendula officinalis against gingival enlargement.

Siva Ramy Reddy *et al*[3], reported a statistically significant reduction in the calendula officinalis group compared to the Plantagothe major group in the mean value of the differences in the PI, GI, SBI, and OHIS scores from the baseline to the six-month scores ($P<0.05$). This study was a randomized trial with proper blinding.

Erry Mochamad *et al*[2], reported not much significant difference was noticed in the plaque scores ($p<\_0.23$), but mouthwash containing 0.64% of C.officinalis is more effective in inhibiting plaque formation when compared to 0.12% chlorhexidine, and it also has a better taste perception.

Amoian B *et al*[8], reported a significant decrease in PI(1.63 vs 1.42), GI(1.23 vs 0.66), and BOP(1.29 vs 0.64) was noticed in Group 2 patients (C.officinalis toothpaste) when compared to Group 1(control toothpaste). In addition, the study reported that this calendula officinalis treatment could be used as an adjunctive treatment for gingivitis.

Saman Mahyari *et al*[9], reported no significant difference in plaque and gingival indices was noticed from baseline till the end of 2 weeks. Still, there was no adverse effect, so C.officinalis containing mouthwash is equally effective in treating gingivitis, and its efficacy was comparable to that of chlorhexidine mouthwash. This study was a randomized, double-blind placebo-controlled trial. Again, there was a significant difference but no adverse effects, so C.officinalis containing mouthwash could be used to treat gingivitis, and its efficiency was comparable to that of chlorhexidine mouthwash.

Mayur Sudhakar *et al*[6], reported the test group (group 1) using C.officinalis showed a statistically significant reduction in the scores of PI, GI, SBI ($p<0.5$) in comparison to the control group (group 2) when the baseline scores were compared to the 3 rd month score and 6 th month scores. Thus, this study

concluded that calendula officinalis mouthwash is effective against dental plaque and gingivitis and can be used as an adjunctive to scaling.

From all the studies, one shows no significant difference from gold standard chlorhexidine mouthwash but is comparable to it as it has no adverse effect. One other study also shows better taste perception in the calendula officinalis group even if not many significant differences are noticed, so it is comparable to the gold standard placebo mouthrinse. In all the studies, calendula officinalis is compared with other placebo mouthwashes and toothpaste and has shown a significant difference with plaque and gingival index scores.

Thus, it is relevant that calendula officinalis is comparable and equally effective to gold standard placebo mouthwashes in treating gingivitis and improving oral health.

In addition, the anti-plaque, antimicrobial effects of Calendula officinalis is an effective alternative for reducing gingival problems.

The limitations of this review include; a total of 208 articles appeared from various sources, out of which 164 were screened and 21 articles were related to the research questions. Out of that, five articles were included as they were randomized control trials, and they were all compared to other placebo groups of mouth rinses and dentifrices. They all varied according to the age of the population, duration of the trial, and sample size.

Table No.1: Characteristics of the interventions in the included studies

S.No	Study	Sample size	Patient characteristics	Duration of treatment	Dose	n(case/control)
1	Siva RamyReddy *et al*, 2020	30	25 to 45 years of age from the outpatient department	Six months	Subjects rinsed with 2 ml mouthwash diluted with 7 ml of distilled water	Group 1- 15 individuals-Plantago mouthwash Group 2- 15 individuals-Calendula mouthwash
2	Erry Mochamad *et al*, 2020[2]	16 (12 males and 4 females)	Mean age of 23 to 45 years	Two weeks	Subjects rinsed 30 ml of allocated rinse three times daily for 30 seconds after brushing teeth.	First 3 days- Mouthrinse A containing 0.12% chlorhexidine Four days washout period Next three days- Mouthrinse B containing 0.64% C.officinalis
3	American B. *et al*, 2010[8]	40(21 males and 19 females)	Mean age of 28 to 35 years	Four weeks	Subjects brushed with allocated dentifrice three times daily	Group 1- 20 individuals-control toothpaste Group 2 - 20 individuals-C.officinalis extract toothpaste
4	Saman Mahyari *et al*, 2015[9]	60	Mean age of 25 to 35 years	Two weeks	Subjects rinsed with allocated mouth rinse twice a day for 30 secs	Group 1- 30 individuals-placebo mouthwash(chlorhexidine) Group 2- 30 individuals-C.officinalis mouthwash
5	Mayur Sudhakar *et al*, 2013[6]	240	The age group of 20 to 40 years	Six months	Subjects were rinsed with 2 ml of mouthwash diluted with 6 ml of water twice daily.	Group 1- 120 individuals-test group(C.officinalis) Group 2- 120 individuals-control group(placebo)

Table No.2: Gingivitis outcome data as reported in the included studies

S.No	Study	Sample size	Patient characteristics	Duration of treatment	Dose	Result
1	Siva Ramy Reddy *et al*, 2020[3]	30	25 to 45 years of age from the outpatient department	Six months	Subjects rinsed with 2ml mouth wash diluted with 7ml of distilled water	The statistical result showed that the calendula officinalis group (group 2) have a more significant reduction compared to Plantago major (group 1) group in the mean value of the differences in the PI, GI, SBI, and OHIS scores from the baseline to the six-month scores (P<0.05).
2	Erry Mochamad *et al*, 2020[2]	16(12 males and 4 females)	Mean age of 23 to 45 years	Two weeks	Subjects rinsed 30 ml of allocated rinse three times daily for 30 seconds after brushing teeth.	Not much significant difference was noticed in the plaque scores (p<_0.23), but mouthwash containing 0.64% of C.officinalis is more effective in inhibiting plaque formation when compared to 0.12% chlorhexidine also has a better taste perception.
3	American B. *et al*, 2010[8]	40(21 males and 19 females)	Mean age of 28 to 35 years	Four weeks	Subjects brushed with allocated dentifrice three times daily	A significant decrease in PI(1.63 vs 1.42), GI(1.23 vs 0.66), and BOP(1.29 vs 0.64) was noticed in Group 2 patients(C.officinalis toothpaste)
4	Saman Mahyari *et al*, 2015[9]	60	Mean age of 25 to 35 years	Two weeks	Subjects rinsed with allocated mouth rinse twice a day for 30 secs	No significant difference in plaque and gingival indices was noticed from baseline till the end of 2 weeks. Still, there was no adverse effect, so C.officinalis containing mouthwash is equally effective in treating gingivitis, and its efficacy was comparable to that of chlorhexidine mouthwash.
5	Mayur Sudhakar *et al*, 2013[6]	240	The age group of 20 to 40 years	Six months	Subjects were rinsed with 2 ml of mouthwash diluted with 6 ml of water twice daily.	The test group (group 1) using C.officinalis showed a statistically significant reduction in the scores of PI, GI, SBI (p<0.5) in comparison to the control group(group 2) when the baseline scores were compared to the 3 rd score and 6 th month scores.

PI: Plaque index, GI: Gingival index

Table No.3: Assessment of the risk of bias in the included studies

Study	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data addressed (attrition bias)	Selective reporting (reporting bias)	Diagnosis reliability (misclassification bias)	Baseline balance (selection bias)
Siva RamyReddy *et al*, 2020[3]	+	+	+	?	+	?	-	-
Erry Mochamad *et al*, 2020[2]	-	+	+	+	-	?	+	?
American B. *et al*, 2010[8]	+	+	+	+	+	?	-	?
Saman Mahyari *et al*, 2015[9]	**?**	+	+	+	**?**	-	**?**	**?**
Mayur Sudhakar *et al*, 2013[6]	-	+	+	**?**	+	**?**	-	+

+: low risk of bias, -: high risk of bias, ?: unclear risk of bias.

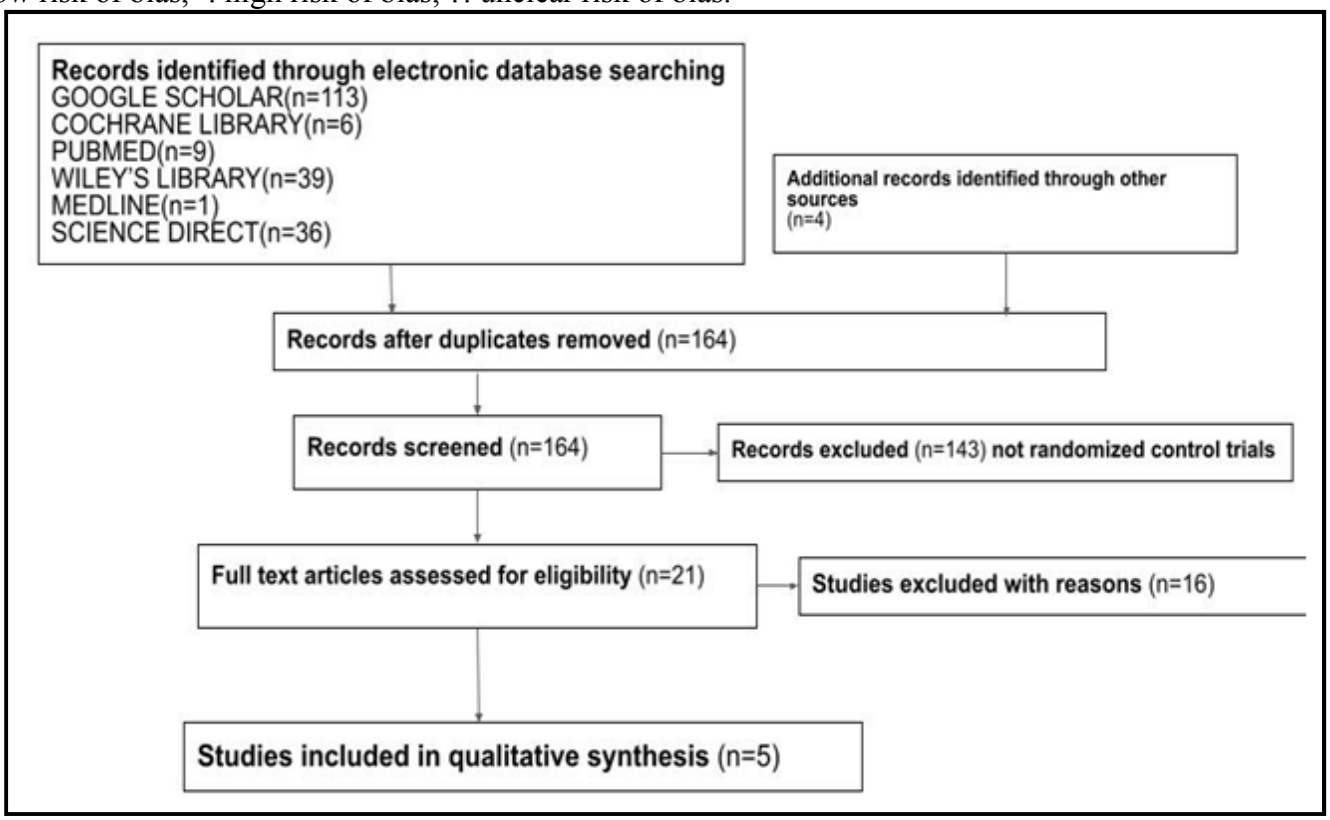

Figure No.1: Flow diagram showing the number of articles identified, screened, assessed for eligibility, excluded and included in the systematic review

CONCLUSION

From all the studies, there is strong conclusive evidence that calendula officinalis can be used as an effective measure for the treatment of gingivitis and also can be used as an alternative to the commercial mouth rinses and dentifrices.

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CONFLICTS OF INTEREST

There is no conflict of interest.

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