Efficacy Of Chlorhexidine, Neem, And Green Tea Mouthwashes In The Management Of Gingivitis

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Abstract

Objectives: This study compared the efficacy and anti-inflammatory effects of Chlorhexidine, Neem, and green tea mouthwashes in patients with mild to moderate gingivitis.

Methods: A randomized control trial was conducted on 123 patients, attending dental OPD, after taking a detailed history, and an initial baseline clinical examination was done, then subjects were randomly divided into three treatment groups. Group A- 0.2% Chlorhexidine, Group B- 2% Neem, Group C- 0.5% Green tea. Study participants were trained to use the provided mouthwash for 15 seconds after brushing, twice daily. Baseline data was further followed by the 4th week, 8th week, and 12th week. Any side effects and complaints were recorded using a questionnaire at every follow-up. Results were considered significant when p-value (p <0.05).

Results: Study participants range from 18 to 29 years, results show an overall reduction from the baseline scores and also marked clinical improvement was seen in the overall oral health status in all three management groups, Inter-comparison was done by using repeated ANOVA test, and the post hoc test showed that within management groups was found to be statistically significant (p = .000) that when Group A compared with both Group B (Neem) and Group C (Green tea) at the 12thweek showed significant results. All of the study participants were asked about their overall remarks for using particular mouthwashes, their accessibility, and taste alterations, and their experience of using their particular mouthwashes, which showed positive outcomes.

Conclusion: All the mouthwashes were equally effective in reducing plaque-induced gingivitis. The advantage of using natural products with no side effects and being inexpensive is that they are also non-toxic.

Keywords: Management, Gingivitis, Chlorhexidine, Neem, Green tea, Mouthwash,

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Introduction

Oral infectious diseases, affect more than half of the public worldwide, and about 80% of the population is affected by periodontal problems [1]. However, developing countries were affected most, this might be due to the lack of oral health awareness programs, and other preventive steps taken by the Health Administration, which should be based on dietary habits modifications socioeconomic conditions, and proper care and education [2], Maintaining good oral health is vital to overall well-being, as it has a significant impact on our quality of life.

This can easily be restricted with the help of effective plaque control only at home, relieving its progression. However, the use of antimicrobial agents along with mechanical plaque control is more effective[3]. Besides the medical importance of chemical agents, they also have many side effects such as taste alterations, tooth and tongue staining,

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erosions on the mucosa, and dryness of the mouth, Persistent use will lead to changes in microflora, these effects limit patient compliance[4].

To overcome these shortcomings of medicated agents, research is being conducted on the use of natural organic products. Along with developing interest and increasing knowledge about the medicinal importance of natural products, various studies have been made on natural products for people, so that they can use them, and oral diseases will be reduced leading to the pathway of true and healthy healing.

Globally, there is also vast growth in herbal medicine because of its natural origin, safety to use, easy availability, and better efficacy. Because of these positive effects and safety of usage herbal medicine received more attention nowadays[3]. The exercise of complementary herbal medicated plants and products of plants have evolved widely in the forms of mouthwashes and toothpaste, ointments. Which showed favourable effects in controlling plaque biofilms and gingival inflammation. A study conducted by AV Balappanavar and colleagues evaluated the effectiveness of neem, a type of herbal tea, in treating gingivitis and compared its efficacy to conventional treatments [5].

Pakistan is s country that is already a very rich source of natural herbal plants, these plant products can be utilized both systemically and topically for the treatment of different diseases. But so, unfortunately, the use of these herbal products is becoming very limited, this is due to modern medicated products[6]. Despite the enormous development of medical science, the use of different plants still plays an important role in the manufacturing of drugs around the world. During the last two decades the usage and reliability of herbal products have been increasing, this is due to their fewer side effects when compared with many different synthetic and chemical medicines. The neem tree is always considered an inherent tree of Pakistan and South Asian countries, it is also reflect beneficial plant so it has been declared the “Tree of the 21st Century” by the United Nations, and in various parts of our country this tree is known as “Life-giving tree,” and “Village Pharmacy[7],”

The leaves, seeds, roots, and bark, of neem trees, were applied to treat many infections and inflammations, of skin diseases and they have been also proven to be very useful for dental care. Numerous compounds in neem which include asnimbin, ninbidol, nimbidin, sodium nimbidate, and azadirachtin, have beneficial effects such as anti-inflammatory, antibacterial, antifungal, analgesic, antipyretic, antihistamine, anti-malarial, vasodilator, and also antiulcer agents[8]. Recently neem products appealing worldwide due to their medicinal importance. Neem is also widely used in Ayurveda and Homoeopathic medicine. [9]

Another medicinal herbal plant green tea (Camellia Sinensis) considered a popular drink in many countries of the world mostly eastern countries for many years. Green tea contains polyphenols in huge amounts and also includes catchiness which has properties of antioxidant, antibacterial, anti-inflammatory, antidiabetic, antimutagenic, and antiviral. This has been reported in different studies that green tea is also very effective on periodontal diseases and is also a valuable product against carcinogenic activities [10].

Although currently available mouthwashes are effective, their high cost and potential side effects have raised concerns, particularly in Pakistan. This study aimed to investigate the efficacy of Neem and Green tea mouthwashes in managing plaque-induced gingivitis, providing a natural, cost-effective, and safer alternative for oral health care. Through this study, came up with an idea of natural and cost-effective mouthwashes with minimum side effects, making an attractive option for people seeking a natural and healthy solution for oral diseases, paving the way for a new approach to oral health care.”

Methodology

One hundred and twenty-three (123) study participants, were selected by simple random sampling, calculated by Open EPI software at 4% marginal error, 95% confidence level. The study

was carried out by the recommendations of the Institute of Research Ethical Committee of Dow University of Medical and Health Sciences (Ref:/ IRB-2590/DUHS/Approval/2022). This study was done in Dow International Dental College, of DUHS Karachi Sindh (Pakistan) between January 2022 to July 2023 The inclusion criteria with an age range of 18 to 30 years for both genders were selected. Smokers and non-smokers, having a minimum of 20 teeth, were selected and on the clinical index with a score of about e"1 or more. They also had plaque index (PI) e"0.9 or more. Mild to moderate gingivitis with no clinical attachment loss. Those with previous use of tea and neem-based products, those who are allergic to these products, or individuals with orthodontic and prosthetic appliances that might interfere with evaluation were excluded. All of the eligible volunteers were given oral and written information regarding products in local languages after that they were asked to sign an informed consent to the Declaration of Helsinki. This experimental study was designed, as a randomized double-blind trial, for 6 months. Study subjects were randomly divided into three groups, by a computer-generated random table (Orsini et al., 2013). Before the delivery of three different mouthwashes among all of the study participants, Baseline scores were recorded in the following clinical parameters: PI, GI, and bleeding index, these were recorded by the principal investigator of the research.

Group A- Participants were given commercially available mouthwash which is 0.2% chlorhexidine gluconate.

Group B- Participants were given neem mouthwash wash which contains 2% neem.

Group C- Participants were given green tea mouth wash which contains 0.5% green tea.

All of the mouth rinses were packaged into disposable opaque bottles, which were also covered with blue paper, and no labelling was given to bottles, only groups (A B, and C) were mentioned by a dental assistant

The study participants were trained to use the provided mouthwash of about 15 ml and were rinsed into the oral cavity for 15 seconds after each brushing, twice a day. Baseline scoring data was further followed by the 4th week, 8th week, and 12th week for measuring and assessment of gingiva and plaque status. Any side effects and complaints on the acceptability of herbal mouthwashes were also recorded with the support of a questionnaire

Preparation of Herbal Mouthwashes: Neem Mouthwash:- 100g neem sticks were taken from university trees, cut into pieces, blended into powder then soaked in filtered water for (2-3 hours), Heated with distilled water (1/10th), Cooled, filtered, and dissolved in 1000mL distilled water (2% solution)Green Tea Mouthwash: 7 tea bags (7 tbsp) in 4 cups filtered water, steeped for 30 minutes, cooled, discarded loose particles, then mixed with 1000mL distilled water (0.5% solution).

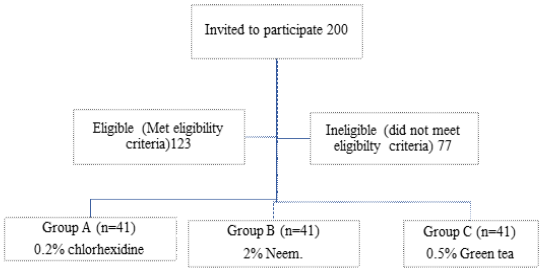

Fig 1. Consort flow chart N number of the subject

Results

All participants completed the study without any dropouts, age range of 21.69 ± (SD= 2.639), neither age nor gender showed any statistically significant difference between the treatment groups or within the group, their outcomes were recorded by follow-ups and compared by the baseline scores. The status of the bleeding gingiva and plaque, when compared with the baseline at time intervals of the 4th week, 8th week and 12th week, where the results of group B (neem) were found statistically better at all of the follow-ups, as shown in graph# 01. The mean score of gingival and plaque status concluded at the end of the week 2nd, the overall scores of treatment groups were improved, statically the lowest of all in the gingival score was recorded in Group B neem mouthwash this was (2.168 ± 0.3574) and the lowest plaque score value was seen in the management Group A chlorhexidine this was (1.393 ± 0.4174). Group A participants showed overall good oral hygiene by showing a very low plaque score. The week 4ththe score of the gingival index was very low in the Group B participants and this was (1.241 ± 0.3025) it was considered highly significant, and at the same time, the plaque score observed in the participants of Group B was (2.168 ± 0.2494) which was reduced when compared with the before that was the week 2nd. Over the 8th week, both the Gingival and the plaque scores were reduced as also improved oral health status of the study participants in all of our three management groups, well over all the lowest gingival scores were seen in the management Group B (1.061 ± 0.0737) and lowest plaque score were also observed in the management Group B (1.066 ± 0.0693). as shown in table no: 1.

The inter-comparison within the three different management groups was done by using repeated ANOVA test, the post hoc test showed that there were statically significant differences between the gingival score as well as in plaque score of three different groups, the p-value showed that when chlorhexidine compared with both Group B (neem) and Group C (green tea) was found to be statistically significant (p = .000) respectively. When neem was compared with chlorhexidine and green tea, chlorhexidine was significant (p=0.00) and green tea was found to be non-significant (p=.503). And when green tea was compared with chlorhexidine and neem, chlorhexidine was significant p=.000 and neem showed non-significant (p=.503) as during the 2nd, and 4th-week neem and green tea showed non-significant results, at the 8thweek all the included groups showed significant results (p=.000). No statistical difference was observed within as well as between group as shown in the table no: 2. At the end of the whole study period all of the study participants were asked about their overall remarks for using particular mouthwashes, their accessibility for the mouthwashes, any taste alterations, their experience of using their particular mouthwashes, showed positive outcomes.

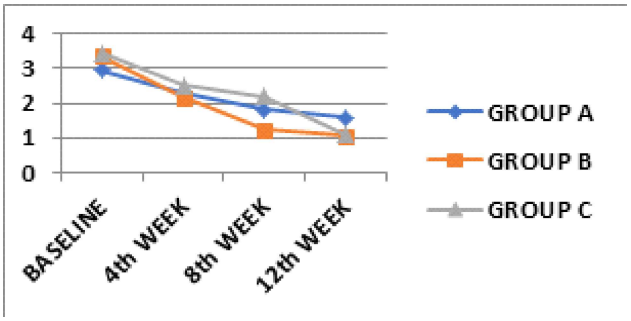

Fig 2. Changing trends of the Gingival status week-to-week comparison revealed significant improvement

Table 1. Comparison of mean score of Gingival and Plaque of three different mouthwash groups at Baseline, 4nd,8th, and 12th week of study

	CHLOROHEXIDINE		NEEM		GREEN TEA	
	GI Mean ± SD	PI Mean ± SD	GI Mean ± SD	PI Mean ± SD	GI Mean ± SD	PI Mean ±SD
Baseline	2.968± 0.3053	3.224± 0.4048	3.366± 0.2946	3.315± 0.3087	3.446± 0.3295	3.395± 0.3420
4th week	2.310± 0.6685	2.865± 0.4035	2.168± 0.3574	2.798± 0.3650	2.505± 0.3674	2.851± 0.4273
8th week	1.805± 0.5482	2.488± 0.3621	1.241± 0.3025	2.180± 0.2532	2.210± 0.2211	2.215± 0.2424
12th week	1.583± 0.5221	2.161± 0.3105	1.061± 0.0737	1.093± 0.1752	1.100± 0.1000	1.071± 0.0873

Table 2. The inter comparison within the management groups was done by using repeated ANOVA test, by post hoc test).

Dependent Variable	Management Groups	Management Groups	Mean Difference	P Value.
	Chlorhexidine	Neem	.3976*	.000
		Green Tea	.4780*	.000
4th Week	Neem	Chlorhexidine	.3976*	.000
		Green Tea	.0805	.503
	Green Tea	Chlorhexidine	.4780*	.000
		Neem	.0805	.503
8th week	Chlorhexidine	Neem	.1415	.423
		Green Tea -	.1951	.196
	Neem	Chlorhexidine	-.1415	.423
		Green Tea -	.3366*	.009
	Green Tea	Chlorhexidine	.1951	.196
		Neem	.3366*	.009
12th week	Chlorhexidine	Neem	.5634*	.000
		Green Tea -	.4049*	.000
	Neem	Chlorhexidine	-.5634*	.000
		Green Tea -	.9683*	.000
	Green Tea	Chlorhexidine	.4049*	.000
		Neem	.9683*	.000

Table 3. Experience of using mouthwash

	Experience mouthwashes	Remarks
Good	107(87)	75(61)
Bad	16(13)	19(15.4)
Neutral	-	29(23.6)
Total	123	123

Discussion

This study clinical trial was carried out at Dow International Dental College, DUHS Karachi. This was done to reveal the real efficacy of medicated mouthwash versus herbal natural mouthwashes and also to identified, is these herbal mouthwashes can be suitable for use for therapeutic purposes, and prevention of the disease. The efficacy of plant-extracted natural products is evidenced by several studies of their use in the treatment of oral diseases[6]. This study was conducted as a randomized, controlled trial to know the effectiveness of two natural plant extracts compared with gold standard mouthwash available in the market in patients with gingival inflammation. Despite all of the facts, this topic is still controversial, as other studies don't use standardized methodology or sufficient follow-ups, and the area which was selected for the study where the participants represented different remote areas of Pakistan, this study criteria was fair enough for them to get maximum benefits of this research activity to a group of those people who needed it and also try to give them significant improvements in overall oral health status with a small intervention.

The age group that was selected for this study was 18 to 30 years. The major reason behind this age group, as this group is mostly vulnerable to gingival problems is due to the lifestyle and dietary habits[11]. Giving them instructions for oral health care can enable them to establish a disease-free mouth for the rest of their life. This study focused on two specific types of mouthwashes Chlorhexidine mouth rinse and herbal mouth rinses (neem and green tea) as their antibacterial and anti-inflammatory action, in the treatment and prevention of gingivitis. Neem and Green tea have been consumed by Asians traditionally to clean their teeth and gums and have also shown effective results in many of researches[12]. This got the participants' trust and compliance towards the use of the mouth rinses of neem and green tea in this study.

Research done in the past, where green tea was used on plaque-induced gingivitis[13,] their results showed a significant decrease in plaque index, and gingival index, however, other research also conducted on green tea-containing mouthwash is equally effective in reducing the gingival inflammation and plaque to chlorhexidine[14]. In another study done by MN Ganvir et al. [15,] as they used neem-containing products, there was no statistically significant difference was found in both groups using neem and chlorhexidine mouthwash based on clinical parameters. A few other conclusions also came that neem can be used as an alternative therapy in the management of periodontal problems[16]. Therefore, there is strong valuable evidence for

both of the individual plant extracts in the tested mouthwash; however, no evidence exists for the use of the combination of plant, and formulate mouthwashes. This might be due to the quality maintained also its delicate production process. In the present study, all of the results are very encouraging; in both groups, there was a significant reduction of inflammation confirming what is well described in the literature: In this present study it was concluded that the mean value of GI and PI were significantly reduced in all of the three treatment groups, from the very first follow up. The results of this study are in contrast with other studies done before where investigation of anti-plaque and anti-gingival effects with commercially available mouthwash in individuals with and without periodontal disease showed positive results. However, those mouthwashes showed some side effects, mainly taste alteration and a mild mouth-burning sensation[1)17] Another study was done where a combination of all-natural herbal mouthwashes did not prove any discomfort or adverse events[18].

This research study demonstrated the superior effectiveness of the tested herbal mouthwash, without any side effects, along with having considerable properties in controlling plaque-induced gingivitis. In this regard, a recent comparative study demonstrated that chlorhexidine is- the most effective and gold standard in controlling mouth diseases[19]. However, this has many unwanted effects that should be considered when prescribing these mouthwashes.

Indeed, there is a need to develop an alternative, effective solutions are highly needed therefore, in this study comparison of the “gold standard” chlorhexidine mouthwash with natural ingredients has to be kept in greatest attention.

Herbal mouth rinses used in this study were found to be easy, and less in the price when compared to commercially available mouthwashes, and the people of Pakistan were already well aware of these products so it attracted them. Neem and Green tea mouthwashes were proven to be safer alternatives to chlorhexidine mouthwash in conditions, mostly such as pregnancy, children, gingival inflammation elderly patients or handicapped [20].

The use of different herbal plants is very common in our country Pakistan. Here we tried to promote the existing resources, to gain the confidence of our local people as well as efforts towards maintenance and promotion of oral health care for the common people of Pakistan. From this research, it was also confirmed the use of natural products as a treatment option showed better therapeutic effects while also having no side effects than the commercially available products. Further studies in future will be planned on other natural mouthwashes for proven efficacy.

Conclusion

All the mouthwash was equally effective in reducing plaque-induced gingivitis with having the advantage of using natural products with no side effects and being inexpensive.

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