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ANTIGINGIVITIS EFFECT OF POMEGRANATE EXTRACT GEL: A CLINICAL STUDY

Dental Science

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KEYWORDS

INTRODUCTION

Traditional medicine has remained as the most affordable and easily accessible source of treatment in the primary healthcare system. For thousands of years, the practice of ayurvedic medicine has alleviated illness and attributed over all positive health. The Indian subcontinent has a rich flora of various plants used in traditional medical treatments. Many plant-derived medicines used in traditional medicinal systems have been recorded in pharmacopoeia as agents used to treat infections and a number of these have been recently investigated for their efficacy against oral microbial pathogens.[4]

Various natural products like Astronium urundeuva, calendula, aloevera, Curcuma zedoaria, and other herbs that had been used effectively since ages in Ayurveda are revisited and are been tested for their effectiveness in treating oral diseases with appreciable results. Punica granatum (family Punicaceae), generally known as "pomegranate," is a shrub or small tree native to Asia where several of its parts have been used as an astringent, and for hemostatic as well as diabetic control. The fruit of this tree is used for the treatment of throat infections, coughs, and fever due to its anti-inflammatory properties.[1]

Pomegranates contain polyphenols, tannins, ellagic acid and anthocyanins which are powerful antioxidants. The red fruits' anthocyanidins (red pigment) contribute to the antioxidant activity, hence pomegranate juice has superior bioactivity compared to its purified polyphenols. Back in 1999, Israeli research on pomegranate's juice and cold pressed seed oil first showed strong antioxidant activity close to that of butylated hydroxyanisole [BHA] and green tea, and significantly greater than that of red wine. It has already been established that antioxidant activity in pomegranate juices is higher when extracted from whole pomegranates than in experimental juices obtained from the luscious red arils only. The rind of this commonly found fruit exhibits antibacterial and astringent activity. Its astringent action results in strengthened gums.[6]

Oral diseases start with plaque. Plaque is a sticky film of food, saliva and bacteria. Dental plaque is a biofilm which is comprised of a population of bacteria growing on the tooth surface enmeshed in a polysaccharide matrix. The researchers have shown that many of the above mentioned antioxidants can inhibit the formation of the plaque polysaccharide matrix, block the adherence of bacteria, prevent acid formation and reduce acid tolerance of cariogenic microorganisms. Recent studies demonstrate that pomegranates can support oral health and is a successful remedy for strengthening gums and fastening loose teeth.

Gingivitis is a chronic inflammatory process limited to gingiva. It is defined as inflammation of the gingiva in which the junctional epithelium remains attached to the tooth at its origin level. The prevention of gingivitis by daily and effective supragingival plaque control is necessary to arrest its progression into periodontitis.[7]

The interest in plants with antibacterial and anti-inflammatory activities has increased to overcome the consequence of current problems associated with the wide-scale misuse of chemotherapeutic agents that induce microbial drug resistance.[1]

In a study evaluating the effects of pomegranate on gingivitis, Pereira and Sampaio 2003[9] showed a significant reduction in gingival bleeding after using a dentifrice containing the pomegranate extract. Yet in another similar study with a control group by Salgado et al., 2006 [8] the effect of a gel with a pomegranate extract was tested on a group with experimental gingivitis which hardly mimics the naturally occurring gingivitis.

Therefore, the purpose of the present study was to compare and evaluate the efficacy of a gel containing the pomegranate extract in plaque formation in comparison to a control formulation and to evaluate the effect of the pomegranate gel on clinical parameters of naturally developed gingivitis.

MATERIAL AND METHOD

A total of 40 subjects (23 male and 17 female) diagnosed with chronic gingivitis were enrolled for this study, out of which 9 did not completed the study. The subjects were enrolled from the Department of Periodontology at People's campus (Peoples Dental Academy) Bhanpur, Bhopal (M.P). The Ethics Committee of the University previously accepted the study. All patients signed written informed consent.

INCLUSION CRITERIA:

- Atleast 24 natural teeth
- Healthy patient with clinical signs of gingivitis.

EXCLUSION CRITERIA:

- Probing depth ≥4mm in any tooth
- Antibiotic 6 month prior
- Pregnant/smoking
- Allergic to pomegranate
- History of periodontal therapy > 6 month prior

STUDY DESIGN AND CLINICAL MEASUREMENTS:

A randomized double blind placebo controlled clinical trial was done on 40 patients diagnosed with chronic periodontitis residing in People's campus (Peoples Dental Academy). Each subject were detailed about the study. The clinical data was recorded in a case history proforma which included Plaque Index (PI) (Sillness and Loe

1964), Gingival Index (GI) (Loe and Sillness 1963) and Gingival Bleeding Index (GBI) (Ainamo and Bay 1975).

The subjects were equally divided into 2 groups namely A and B and were randomly assigned test gel or control gel to massage onto their gums.

GROUP A- Test gel (pomegranate gel)
GROUP B-Control gel (placebo gel)

Subjects were asked to refrain from routine oral hygiene procedures during this 21 days experimental period. On 21st day clinical parameters were recorded again and evaluated for results.

PREPARATION OF THE POMEGRANATE EXTRACT GEL

Fresh pomegranates were obtained and their seeds were separated and ground into fine juice in an electric grinder. The concentrated extract was obtained through direct percolation by filtering the juice in a Buckner funnel through a filter paper. At this stage, a control gel was prepared by dissolving 5g of carboxymethyl cellulose in 100 ml of distilled water and stirring it gently for 15 min until a gel of consistency (0.05%) convenient for usage, as the orabase gel, is obtained [Figure 1 (b)] . Similarly, the test gel was prepared by dissolving 5g of carboxymethyl cellulose in 100ml of the concentrated extract of pomegranate juice [Figure 1 (a)]. A very small amount of methyl paraben (2 mg) was added as a preservative to both test and control gels. The control gel had the same formulation except for the pomegranate extract.

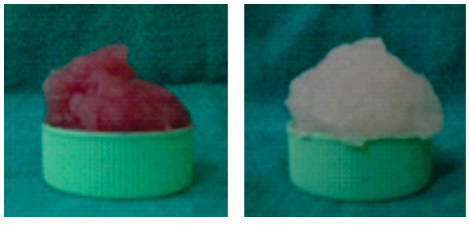

Figure 1. Test gel (a) & Control gel (b)

Control and Test gels were formulated and packed into small plastic containers for delivery to patients and it was made sure that volunteers were unaware about the content of the gel [Figure 2 (a) & (b)]. All volunteers were delivered fresh samples of gels sufficient for the 21-day usage on their periodic recall visits. The volunteers were instructed to massage the provided gel onto their gums twice daily, morning and night, for 3–5 minutes. No other oral hygiene instructions were given to the volunteers and they were asked to follow their routine oral hygiene method.

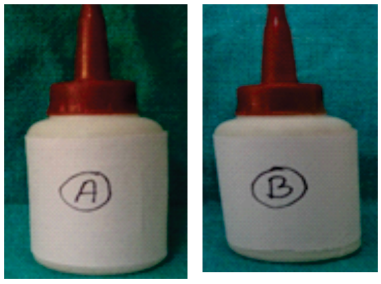

Figure 2 (a) & (b) showing the containers in which Test gel and Control gel are dispensed

STATISTICAL ANALYSIS

For the recorded Plaque Index(PI) (Silness and Loe), Gingival Index(GI) (Loe and Silness) and Gingival Bleeding Index(GBI) (Ainamo and Bay), intragroup comparisons were done using paired t-test between baseline and 21 day, and for inter group comparison "t" test was applied. Total 40 subjects were enrolled in this study out of which 31 subjects completed it. For inter group comparison "t" test was applied and for intragroup comparison "paired t" test was applied. For all the tests, a P value of 0.05 or less was considered for statistical significance.

RESULT

All 40 patients completed the clinical trial. The experimental gel had good acceptance and did not show adverse effects, such as ulceration or allergic reactions. On the baseline, all group individuals had significantly higher plaque scores. Statistically significant results were shown in intragroup comparison but for intergroup comparison it was not significant in Plaque Index [Table 1] and Gingival Index [Table 2] as the patient was restricted from using any oral hygiene aids. But for the Gingival Bleeding Index [Table 3] test group showed more significant reduction when compared to control group.

Table 1: Mean Plaque Index (PI) among Group 'A' & 'B' at baseline and after 21 days

GROUPS	PLAQUE INDEX(PI)					Paired 't' Test value	P Value
	BASELINE		AFTER 21 DAY		Mean Diff.		
	Mean	SD	Mean	SD			
GROUP A (N=16)	1.756	0.39	2.025	0.39	0.269	2.585	0.021(S)
GROUP B (N=15)	1.520	0.27	2.020	0.33	0.50	5.098	0.001(HS)
Unpaired 't' Test value	1.908		0.038				
P Value	0.066(NS)		0.970(NS)				

Table 2: Mean Gingival Index (GI) among Group 'A' & 'B' at baseline and after 21 days

GROUPS	GINGIVAL INDEX(GI)					Paired 't' Test value	P Value
	BASELINE		AFTER 21 DAY		Mean Diff.		
	Mean	SD	Mean	SD			
GROUP A	1.694	.3065	1.419	.2738	0.2750	4.855	0.001(HS)
GROUP B	1.553	.2066	1.360	.1765	0.193	6.123	0.001(HS)
Unpaired 't' Test value	1.485		0.705				
P Value	0.148(NS)		0.487(NS)				

Table 3: Mean Gingival Bleeding Index (GBI) among Group 'A' & 'B' at baseline and after 21 days

GROUPS	GINGIVAL BLEEDING INDEX(GBI)					Paired 't' Test value	P Value
	BASELINE		AFTER 21 DAY		Mean Diff		
	Mean	SD	Mean	SD			
GROUP A	49.438	14.1478	26.987	9.2064	22.45	12.761	0.001(HS)
GROUP B	48.767	10.3802	36.873	7.5983	11.893	8.094	0.001(HS)
Unpaired 't' Test value	0.150		3.248				
P Value	0.882(NS)		0.003(HS)				

DISCUSSION

Plaque is the main agent responsible for the breakdown of periodontal tissues leading to periodontal disease. The removal of this plaque regularly is of paramount importance in the prevention of periodontal disease. The inability of the adult population to perform adequate mechanical tooth cleaning has stimulated the search for chemotherapeutic agents added to dentifrices to improve plaque control and prevent gingivitis. So various means have been established and search is going on to reduce the bacterial load.[1]

There has been a recent resurgence of interest in the use of natural products and their effect on oral health. Their potential antibacterial effect could be of use in the prevention and treatment of oral diseases.[2]

Various studies have already shown that pomegranate's active components, including polyphenolic flavanoids like punicalagins and ellagic acid are believed to prevent gingivitis through a number of mechanisms including reduction of oxidative stress in oral cavity, direct anti-oxidant activity anti-inflammatory effects, antibacterial activity and direct removal of plaque from the teeth. When used regularly in combination with toothpaste that has been reinforced with bioactive botanical extracts, pomegranate containing mouthwash may fight dental plaque and tartar formation by inhibiting the activities of the microorganisms that cause plaque. Additionally, pomegranate compounds possess anti-inflammatory properties that may help soothe irritated tissues. Pomegranate extract suppresses the ability of these microorganisms to adhere to the surface of the tooth. Plaque may involve four or more different microorganisms combining forces to colonize the surface of the teeth. Remarkably, nature's own pomegranate fights the organisms' ability to adhere by interfering with production of the very chemicals the bacteria use for adhesion.[3]

In the present study, the pomegranate extract gel did not avoid plaque formation during the trial, as suggested by Kakiuchi et al.1986 [11] and Pereira et al.2001 [10] but there was a significant reduction in the plaque score compared to the group which used the placebo gel. Possible explanation for this effect is the antibacterial agents present in pomegranate – hydrolysable tannins – that form complexes of a high molecular weight with soluble proteins, increase bacterial lysis, and moreover interfere with bacterial adherence mechanisms on tooth surfaces.[1]

This study showed a significant difference in PBIs between experimental and control groups. These results are consistent with those reported by Pereira and Sampanio, 2003 who showed a significant reduction in gingivitis using the dentifrice containing the pomegranate extract. Nevertheless, it is noteworthy that a control group was not included in that study, which had not allowed the assessment of the actual gingivitis reduction rate related exclusively to mechanical plaque control.

The use of carboxymethyl cellulose as the carrier for the pomegranate extract has proved to be efficient in improving the gingival condition as carboxymethyl which is a commonly used orabase gel has significant sustainability on the oral tissues.

Though the difference between the groups with the pomegranate extract with respect to the GI and PI is not statistically significant, clinical conditions showed considerable difference from the groups which used the control gel.[1]

This study showed statistically significant difference between the groups which used pomegranate and control gel showing that the pomegranate extract on itself would not be so very effective in treating gingival disease without the basic therapy. So the basic therapy remains the gold standard for the treatment of the periodontal therapy.

Further researches on large sample size is to be needed to identify the real benefits of pomegranate on gingivitis. It may be because of small sample size and further research will be needed to identify the real benefits of pomegranate as a therapeutic and preventive agent for gingivitis, in addition to its common use in popular medicine. Hence, our study showed that Pomegranate gel was efficient in treating gingivitis.

CONCLUSION

Within the limits of this clinical study, it can be concluded that the gel containing pomegranate extract was efficient in treating gingivitis when used along with mechanical cleaning in controlling plaque and gingivitis.

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