Tikrit Journal
for
Dental Sciences
http://tjds.tu.edu.iq

The Use of Arabic Gum in Treatment of Patients with Chronic Gingivitis: A Clinical Trial

Husamuldeen S. Mohammed
Department of Basic Medical Sciences, College of Nursing, Tikrit University, Iraq.

Article Info:

-Article History:
-Received: 14/12/2017
-Accepted: 9/1/2018
-Available Online: 1/12/2018

Keywords:
Periodentitis, Chronic Gingivitis, Arabic Gum, Dental Plaque.

Corresponding Author:
Name:
Husamuldeen Salim Mohammed Saeed
E-mail:
Sbc.su2000@gmail.com
Tel: 009647730101516
Affiliation:
Ass. Prof. Clinical Pharmacology,Department of Basic Medical Sciences , College of Nursing ,Tikrit University , Iraq.

Abstract

Chronic gingivitis is a well known periodontal disease. Bacterial plaque plays a key role in the pathogenic initiation and progression of periodontal disease. More attention directed toward the use of herbal drugs to treat them. Arabic or Acacia gum as mouthwash pharmaceutical preperation used in this study to manage thirty patients complaining from chronic gingivitis, age range from 20 to 45 years old with strict inclusion and exclusion criteria. The study was a randomized placebo controlled clinical trial. The patients followed at baseline, day 7th, 30th and 60th . Results show that Arabic gum mouthwash found to be effective in controlling dental plaque level and inflammation those causing periodentitis.

Introduction:

Bacterial plaque is considered to be a primary contributing agent in periodontal disease. There have been various experimental gingivitis studies that have been conducted, which have proven that the bacterial plaque plays a key role in the initiation and also progression of periodontal disease. This shows that there is a direct relationship in terms of the plaque levels and also the development of gingivitis [(1)]. Therefore, it means that if an individual who previously had a high level of plaque accumulation in his or her teeth, uses the right methods to remove the plaque, then it will lower the risk for both the initiation and progression of gingivitis. Various methods such as scaling and root planning are ideal in relation to plaque removal. However, factors such as inaccessibility or plaque retentive areas normally compromise both the clinical and microbiologic outcomes. Alternatively, the use of chemical plaque treatment can be seen to be an ideal method in relation to mechanical plaque control therapy, and therefore, the treatment of gingivitis [(1)]. There are several existing antibacterial chemicals such as chlorhexidine (CHX)

that have previously been successfully used in both the prevention and also the treatment of gingivitis. However, there are patients who have high accumulation levels of bacterial plaque in their teeth who may not prefer the use of CHX because of its associated side effects. These side effects include, discoloration of teeth, and an unpleasant (metallic) taste after using this product. Therefore, there is the need of developing or finding an effective antiplaque agent that has minimal side effects, and one that can be used as an effective adjunct to the mechanical plaque control. The unpleasant side effects from the use of artificial drugs, and inaccessibility of some of the areas where plaque has accumulated in the teeth, has made researchers to pay more attention to the use of herbal drugs to treat periodontal disease. Phytotherapy is a medical practice that has been used since the ancient times, and by people from different cultures such as the Egyptians and Arabic people [(2)]. In particular, the Egyptians used the Arabic or Acacia gum as a pain reliever, while the Arabic physicians used it to treat various ailments of the body including bleeding gums. Various plants and plants isolates have been known to produce medicinal effects that such anti-inflammatory, and immune-enhancing [(3)]. The purpose of this study is to evaluate the efficacy of Arabic Gum (Sengalia Senegal) as a mouthwash in the reduction of plaque and therefore, leading to the treatment of Chronic Periodontal disease. The Senegalia Senegal (Arabic Gum) is popularly identified by the symbol SESE16, and it is in the dicot group. Table (1), provides a detailed overview of the plant classification. Eighty five percent of the total world production of Arabic gum come from Sudan and it has the following properties, it is brittle, odorless and it is tasteless. It contains various neutral sugars, acids, calcium, and electrolytes. The molecular weight of the Arabic gum is estimated to be approximately 200,000 to 600,000 daltons. It is also very soluble in water, however, it does not dissolve in alcohol [(4)]. It has been determined that the main component of the gum is the Arabian- calcium salt of the polysaccharide Arabic acid. The chemical structure of the Arabic Gum is complex, and various researchers are still trying to determine it. However, a comprehensive analysis using various methods such as the NMR spectra show that the backbone of its chemical structure comprises of D-galactose units with the side chains of D-glucuronic acid with either L-rhamnose or L-arabinose terminal units.

Materials and methods:

A total of thirty patients that had previously been diagnosed with Chronic Periodontal disease were recruited in this study using a simple randomized control clinical trial (tossing a coin) from the Al-Ebtessama clinic of periodontics in Tikrit city - Iraq. There was also a written agreement and signed informed consent form from all the participants that were recruited in this study.

Inclusion Criteria

During the recruitment period, the participants background check was conducted, and after their medical history was determined. In addition to that a clinical and radiological examination, patients who satisfied the following criteria were selected. Only healthy patients of the ages of 20 to 45 years were considered for this study. They had to have a minimum of 20 teeth present in the dentition, and no visible signs of untreated caries. Also, the clinical parameters for inclusion purposes included: a gingival index that is greater than1, pocket probing depth of less than or equal to 3 mm, and a clinical attachment loss of 0 [(5)]. The participants were not supposed to display any evidence of radiographic bone loss, and this was assessed by ensuring that the distance between the Cemento enamel junction and crestal bone was less than or equal to 1 mm. In addition to that, the participants that were considered for this study needed not to have received any periodontal therapy for the past six months.

Exclusion Criteria

The participants who were excluded from this study included, people who were

taking any form of medicinal drugs such as antibiotics for the past three months. Pregnant women or even lactating mothers were also excluded from this study [6]. Also, upon medical examination, patients who were found to have a certain medical condition such as diabetes or heart disease were not included in the study. In addition smokers, alcoholics, patients with orthodontic appliances, and the ones who have a known history of allergic reactions to chemical or herbal products were excluded from this study.

Study Design and Treatment Protocol

The design of the current study was a randomized, placebo controlled clinical trial. There were a total of 75 individuals that were assessed for eligibility purpose, and out of this, only 30 individuals met the criteria that had been set. Due to the small number of participants for this study, a coin toss was used by the researcher in order to assign the participants to one of the two groups of this study. The characteristics of the two groups has been shown below:

- Group 1- 15 participants (8 males and 7 females, mean age 30.7 +/- 6.1 years). They are undergoing scaling and prescribed to use Placebo mouthwash.
- Group 2- 15 individuals (9 females and 6 males, mean age 32.5 +/-6.3 years) undergoing scaling and prescribed Arabic Gum solution mouthwash.

Preparation and Usage of the Arabic Gum Mouthwash

In this study, Arabic gum prepared as a 6% Arabic Gum mouthwash. This was achieved by dissolving 60 grams of Arabic Gum powder in a 1 L distilled water. In order to ensure that the participants complied with the instructions that they were provided within terms of the number of times they were supposed to use the mouthwash; a 2 ml of glycerine (a sweetening agent), and 1 ml of Pudin Hara (flavoring agent) were added to this solution. This solution was then boiled for 15 minutes, left to cool, and it was then filtered. A placebo mouthwash was prepared by using distilled water, Glycerine, and Pudin Hara. The medications were then put in brown colored opaque bottles, which were market distinctively in accordance to the two participating groups in this study. It is important to point out that a baseline examination was conducted to the 30 participants of this study. During the examination, each participant was provided with the instructions to refrain from any type of oral hygiene for a period of 8 hours. The different clinical parameters such as Plaque Index (PI), gingival index (GI), oral hygiene index-simplified (OHI-S) were recorded. After the examination, all the participants received scaling and polishing to remove plaque, calculus and extrinsic stains. The brown colored opaque bottles were then distributed to all the participants of the study in relation to their group number. The participants were provided with the instructions to use 15 ml mouthwash twice on a daily basis- at morning before they had their breakfast, and at night before they went to sleep. It is also important to point that during this study, all the participants were instructed against using any forms of oral hygiene aids including chewing gums and dental floss. As it was pointed out before, examination and recordings were conducted at the baseline. Other periods when the participants were examined and their data recorded (plaque level) was on days 7, 30 and 60 respectively. There was also subject evaluation, which was performed through a written questionnaire in order to assess whether the participants had any adverse effects in relation to their mouthwashes.

Primary and Secondary Outcome Measures

The primary outcome variable was determined by the difference between the mean GI from the different examination days i.e. baseline day, 7^{th}, 30^{th}, and 60^{th} days. The secondary outcome measures were obtained by the difference in terms of the mean reduction in the PI, OHI-S and reduction in microbiological colony count from the start to the end of the study.

Statistical Analysis

The analysis of the data collected was carried out by the latest version of the Statistical Package for Social Sciences (SPSS) software. The values of the different parameters that were collected were expressed as mean, and standard deviation. ANOVA tests were also conducted in order to make a comparison of the differences in the two groups that were involved in the study. The purpose of this was to assess the changes in the identified parameters at all the time intervals, and determine the level of effect.

Results:

Table (2) of this study presents the demographic data of the study population, and it showed that there was no statistically significant differences in relation to mean age and gender of the individuals in the two groups of study. Table (3) of this study illustrates the mean, standard deviation values of the GI, PI and OHI-S at the different time intervals when the participants were examined. Based on the results of that have been presented in Table (2) above, it can be seen that there was a gradual decrease, within the first seven days after the baseline examination. There was a slight increase in the subsequent examination days or periods to the conclusion of the study. However, an important point to note is that the level in these three parameters was lower in both groups at the end of the study, as compared at the start period. In particular, there was a significant difference in terms of the reduction in the PI, GI and OHI-S in Group 1 as compared to the results presented for similar parameters in Group 2. Table (4) shows that there was a significant difference in the microbial counts for the two groups that were being examined in this study. Table (5), shows the results of the repeated ANOVA. There were various parameters that were assessed such as PI, GI, OHI, and micro colony count at the scheduled time intervals. The statistical difference in this case was ($P<0.001$). The results in the table above shows the change in the different parameters such as PI, GI, OHI-S, and total microbiology count for the participants used the Arabic gum and placebo mouthwash. The data of each participant was collected during the scheduled period: baseline day, after 7, 30 and 60 days, and then an ANOVA test was conducted in order to determine the changes in these assessed parameters as the participants continued to use the mouthwash.

Discussion:

This study was used to determine the effectiveness of the Arabic Gum mouthwash in the treatment of Chronic Periodontal disease. This was to be achieved by the mouthwash being able to effectively reduce the plaque scores, gingival inflammation and also bacterial counts for the participants of this study. The Arabic gum mouthwash was seen to be effective in terms of achieving these objectives in comparison to the placebo mouthwash [(7)]. A study that was conducted by Loe et al. (1965) clearly showed that the accumulated levels of microbial plaque, led to the development of gingivitis and subsequently periodontal disease. In particular, there are various colonies of bacteria that are associated with this disease such as S. Sangui, S. oralis, A.viscosus, and A. naeslundii [(8)]. Therefore, the reduction of the level of these species in the teeth will result in the reduction of gingival inflammation. Over the years, chemical agents have been considered as an adjunct to the mechanical oral hygiene practices. For instance, Chlorhexidine Mouthwash (CHX) is an effective mouthwash for reducing and controlling the levels of plaque in patients who have periodontal disease [(9)]. However, most of the people who have been diagnosed by periodontal disease may not use these chemical mouthwash to remove the plaque in their teeth due to the various side effects such as a metallic after taste after using these products and discoloration of teeth normally limits its long term use. This has led to various researchers and studies being formulated in order to assess the viability, and effectiveness of herbal agents in terms of

reducing the plaque scores in the teeth, while ensuring that the patients will experience minimal disadvantages. It is important to point out that herbal drugs are beginning to be widely used in the treatment of a variety of diseases, and they are replacing chemical drugs [10]. This is inclusive of the periodontal disease due to the potential of the drug in achieving its purpose, while ensuring that the patients are exposed to less side effects as compared to the chemical drugs. There are oral rinses, which have been made from herbal agents that are used for periodontal therapy in order to reduce gum bleeding and also reduce inflammation. There are various herbs that have been studied that have medicinal benefits. Bibhitaka (T.bellerica) is one of the ingredients that is used for the Ayurvedic compound triphala for various medicinal purposes such as being a laxative, treatment of skin diseases and respiratory diseases. Nagavalli (P.betle) has antioxidant, anti-inflammatory, and anti-microbial properties. Pilu (S.persica) is a herb that has antioxidant properties [11]. Ela can be used to prevent bad odor from people who may have oral cavities and other dental ailments. An individual will have to gargle it in order to reduce or prevent bad odor. The herbs that are primarily used for periodontal therapy include, chamomile, green tea, peppermint, clove, sage, myrhh, and Echinacea. The Kamillosan liquid, which contains chamomile is mainly used in the treatment of the periodontal disease. In this study, the reduction of both the GI and PI scores, and also the microbial colony counts by the Arabic gum was significantly higher, as compared to the placebo group. This was due to the antibacterial, antiseptic, and anti-inflammatory actions of the Arabic gum. In the placebo group, there was significant reductions of in terms of both the PI and GI scores, and this can be attributed to the Hawthorne effect [12]. This is when people become more oriented in the maintenance of their oral hygiene due to the fact that they are part of a clinical trial. The use of the herbal options in the treatment of periodontal disease and also in other diseases is increasing. The study revealed that the Arabic gum mouthwash is highly effective, and it does not present noticeable side effects on the patients when they are using it in their periodontal therapy [11]. The Arabic gum contains various antiseptic agents such as salicylic acid, cinnamonic acid, and sulfur, which have inhibitory action on bacteria. It is important to point out that the Arabic gum also acts as an anti-inflammatory agent, and it will lead to the inhibition of the cyclooxygenase pathway reducing the likelihood of inflammation of the gums [11, 13]. However, there is the need for further studies to be conducted in future that will use larger sample sizes in order to confirm the findings of this clinical trial.

Conclusions:

As have been noted before bacterial plaque plays an essential role in both the initiation and progression of the periodontal disease. Studies have established that there is a direct relationship between high plaque levels and the development of gingivitis. There are different methods such as scaling and root planning that can be used to remove the amount of plaque in an individual's teeth, and therefore minimize his or her chances of developing periodontal disease. However, different factors such as inaccessibility or plaque retentive areas normally negatively impact these plaque removal techniques. The use of the chemical plaque treatment has also been seen to be an ideal method in relation to mechanical plaque control therapy, and ultimately in the treatment of periodontal disease. Antibacterial chemicals such as chlorhexidine (CHX) have been used in both the prevention and treatment of periodontal disease. The problem of these existing antibacterial chemicals is that they are associated with various side effects such as discoloration of teeth and an unpleasant metallic taste. Therefore, scientific researchers have been investigating to come up with an effective adjunct to the mechanical plaque control. Within the limitations of this study, it was seen that the Arabic Gum mouthwash was found to be effective in terms of controlling the plaque levels and also

inflammation, leading to periodontal therapy. Therefore, it can be considered to be a natural mouthwash for patients who may want to avoid alcohol containing preparations, and artificial preservatives. There is the need for more clinical and in vitro studies in order to provide a better understanding of the role of this herbal mouthwash in the treatment of chronic periodontal disease.

Table (1): Plant Classification of Arabic Gum.

Rank	Scientific Name
Kingdom	Plantae
Sub-Kingdom	Tracheobionta
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Sub-Class	Rosidae
Order	Fabales
Family	Fabaceae
Genus	Sengalia Raf.
Species	Senegalia senegal

Table (2): Demographic Data of the Study Population.

Parameter	Placebo (n=15)	Acacia Gum mouthwash (n=15)
Mean Age +/- SD (years)	30.7 +/- 6.1	32.5+/-6.3
Age Range	27-40	25-40
Male/Female	8/7	9/6

Table (3): Mean and SD Values for the PI, GI and OHI-S at Different Time Intervals

Parameter		Placebo	Arabic Gum	p-value
PI	Baseline	4.257; 0.48	4.342;0.18	
	7 days	2.237 ;0.18	0.68; 0.24	<0.0001*
	30 days	2.853; 0.37	1.275;0.12	
	60 days	3.481; 0.30	1.402;0.48	
GI	Baseline	2.732;0.18	2.683; 0.22	
	7 days	1.528;0.10	0.863; 0.14	<0.001*
	30 days	1.763;0.12	0.542; 0.16	
	60 days	1.847;0.15	0.728;0.12	
OHI-S	Baseline	2.68;0.24	2.75; 0.14	
	7 days	0.97;0.13	0.75; 0.07	<0.0001*
	30 days	1.657;0.11	1.461; 0.15	
	60 days	2.213;0.16	1.617; 0.08	

Table (4): Microbial Counts.

Examination Period	Placebo	Arabic Gum Mouthwash	P-Value
Baseline period	31.87; 1.63	32.25; 0.87	
7 days	31.14; 1.47	26.75; 1.63	<0.0001**
30 days	30.59; 1.09	17.89; 1.64	
60 days	31.27;1.21	12.83; 1.47	

Table (5): The results of the repeated ANOVA.

Source	Type III Sum of Squares	Df	Mean Square	F Value	P Value
PI					
Test of Within Individuals Effect					
Time	683.427	3	221.145	10348.465	<0.00001**
Time x Group	8.473	4	1.574	67.128	<0.0001**
Error (Time)	4.453	247	0.019		
Test of Between Individual Effects					
Group	16.654	2	7.427	55.086	<0.001**
Error	11.126	76	0.137		
GI					
Test of Within Individual Effect					
Time	184.325	3	54.126	10365.546	<0.00001**
Time x Group	10.147	5	1.845	243.259	<0.001**
Error (Time)	1.325	265	0.005		
Test of Between Individual Effects					
Group	4.562	2	2.251	37.569	<0.0001
Error	4.236	74	0.046		
OHI-S					
Test of Within Individual Effect					
Time	163.451	3	47.546	7256.376	<0.0001**
Time x Group	5.473	5	1.064	134.125	<0.0001**
Error (Time)	1.672	254	0.005		
Test of Between Individual Effects					
Group	5.352	2	2.351	42.149	<0.0001**
Error	4.872	76	0.042		
Total Microbiology colony count					
Test of Within Individual Effect					
Time	6623.413	3	1876.216	2872.534	<0.0001**
Time x Group	2871.154	6	512.415	761.287	<0.0001**
Error (Time)	176.542	242	0.687		
Test of Between Individual Effects					
Group	8763.252	2	4456.325	825.127	<0.0001**
Error	387.242	84	4.287		

References:

1-Chatterjee, Anirban, Nidhi Singh, Mini Saluja, and Abhishek Kandwal. "To evaluate the antigingivitis and antipalque effect of an Azadirachta indica (neem) mouthrinse on plaque induced gingivitis: A double-blind, randomized, controlled trial." Journal of Indian Society of Periodontology 15, no. 4 (2011), 398. doi:10.4103/0972-124x.92578.

2-Dalirsani, Z., M. Aghazadeh, M. Adibpour, M. Amirchaghm, A. Pakfetrat, P. M. Mozaffari, M. Mehdipour, and A. T. Zenooz. "In vitro Comparison of the Antimicrobial Activity of Ten Herbal Extracts Against Streptococcus mutans with Chlorhexidine." Journal of Applied Sciences 11, no. 5 (2011), 878-882. doi:10.3923/jas.2011.878.882.

3- Freires, Irlan D., Livia A. Alves, Gabriela L. Ferreira, Vanessa D. Jovito, Ricardo D. Castro, and Alessandro L. Cavalcanti. "A Randomized Clinical Trial of Schinus terebinthifolius Mouthwash to Treat Biofilm-Induced Gingivitis." Evidence-Based Complementary and Alternative Medicine 2013 (2013), 1-8. doi:10.1155/2013/873907.

4-Jagan Rao, N., K.R. Subash, and K. Sandeep Ku. "Role of Phytotherapy in Gingivitis: A Review." International Journal of Pharmacology 8, no. 1 (2012), 1-5. doi:10.3923/ijp.2012.1.5.

5- J, Kirsten, and Alison M. "Gingivitis Control." Gingival Diseases - Their Aetiology, Prevention and Treatment, 2011. doi:10.5772/24813.

6-Jayakumar, Avula, Anumala Naveen, Kalakonda Butchibabu, PathakotaKrishnanjaneya Reddy, Tupili Muralikrishna, and Bathini Chandrahas. "A randomized, double-blind clinical study to assess the antiplaque and antigingivitis efficacy of Aloe vera mouth rinse." Journal of Indian Society of Periodontology 16, no. 4 (2012), 543. doi:10.4103/0972-124x.106905.

7-Kothiwale, ShailaV., Vivek Patwardhan, Megha Gandhi, Rahul Sohoni, and Ajay Kumar. "A comparative study of antiplaque and antigingivitis effects of herbal mouthrinse containing tea tree oil, clove, Acacia and basil with commercially available essential oil mouthrinse." Journal of Indian Society of Periodontology 18, no. 3 (2014), 316. doi:10.4103/0972-124x.134568.

8-Patel, Rajiv M., and Zainab Malaki. "The effect of a mouthrinse containing essential oils on dental plaque and gingivitis." Evidence-Based Dentistry 9, no. 1 (2008), 18-19. doi:10.1038/sj.ebd.6400566.

9-Prabhakar, J., S. Balagopal, MS Priya, S. Selvi, and M. Senthilkumar. "Evaluation of antimicrobial efficacy of Triphala (an Indian Ayurvedic herbal formulation) and 0.2% chlorhexidine against Streptococcus mutans biofilm formed on tooth substrate: An in vitro study." Indian Journal of Dental Research 25, no. 4 (2014), 475. doi:10.4103/0970-9290.142539.

10- Raslan, Suzane A., Jose R. Cortelli, Fernando O. Costa, Davi R. Aquino, Gilson C. Franco, Luis O. Cota, Antonio Gargioni-Filho, and Sheila C. Cortelli. "Clinical, Microbial, and Immune Responses Observed in Patients With Diabetes After Treatment for Gingivitis: A Three-Month Randomized Clinical Trial." Journal of Periodontology 86, no. 4 (2015), 516-526. doi:10.1902/jop.2014.140197.

11-SH.M. Fage, Aisha, Naima E.S. Ali, Amir M. Elkarim, and Abdelazeem A.M. Nour. "Physicochemical Characteristics of Some Acacia Gums." International Journal of Agricultural Research 7, no. 8 (2012), 406-413. doi:10.3923/ijar.2012.406.413.

12-Shim, Jae-Yong, Sung-Bin Yim, Jin-Hyung Chung, and Ki S. Hong. "Antiplaque and antigingivitis effects of a mouthrinse containing cetylpyridinium chloride, triclosan and dipotassium glycyrrhizinate." Journal of Periodontal & Implant Science 42, no. 2 (2012), 33. doi:10.5051/jpis.2012.42.2.33.

13-Srinagesh, Jyotsna, Pushpanjali Krishnappa, and ShivarajN Somanna. "Antibacterial efficacy of triphala against oral streptococci: An in vivo study." Indian Journal of Dental Research 23, no. 5 (2012), 696. doi:10.4103/0970-9290.107423.