

Anti-plaque efficacy of *Siwak* as a mechanical tooth stick

Research Article

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Abstract

Introduction: Dental plaque removal is an important goal in oral hygiene program. The public interest in herbal medicine and natural products has grown in the past few years. *Siwak* (*Salvadora persica* L. (kharajal)) is an ancient tooth stick that has preventive and therapeutic effects on oral cavity. The aim of the present study is to evaluate the effect of siwak chewing sticks on plaque accumulation on tooth surface. **Materials and Methods:** In this randomized clinical trial study 80 volunteer was selected randomly for complete the study chart. They were enrolled in the study for being in the one of the four study groups: active siwak, inactive siwak, usual tooth brush and no-oral hygiene. The participants wanted to use their instruction for 6 days. Base line (PI-1) and 3-day (PI-2) and 6-day (PI-3) plaque indexes was recorded by Sillness and Loe method. Data evaluation was done using SPSS-22 and Kruskal Wallis Test, Chi-Square Tests. **Results:** There was a significant reduction of the plaque index in PI-3 ($p=0.029$). But in the others, there was no significant difference in the change of plaque index between groups ($p>0.05$). **Conclusion:** It is concluded that siwak were able to reduce dental plaque as a mechanical tooth brush and if it uses in active form (fresh plant), the reduction of plaque accumulation is more prominent and effective.

Key Words: *Siwak*, *Salvadora persica* L., Tooth brush, Chewing stick, Dental plaque.

Introduction

Salvadora persica L. is a traditional tooth brush, used as chewing stick and oriented from "ARAK" tree which is growing in many countries such as Iran, Iraq, India, Egypt, Africa,...(1-5) The history of its use for oral hygiene came from ancient civilization (6-8). Developing Islamic culture cause the oral and dental care to be more prominent in Muslim countries (2,9-11). Prophet Mohammad (peace be upon him) have been focused on dental care as a daily sunnah and recommended the *Salvadora persica* L. as an oral cleaning tool (9,11-13). *Salvadora persica* L. (SP) named with several words such as Miswak, Siwak, Koyoji, Qisa, Qesam (3,7,9).

Availability, to be economical, Easy to use and Historical background made siwak as an acceptable and appropriate tool for brushing the teeth (4,8,9,14).

Nowadays, increasing the oral disease and global need to preventive and less aggressive treatment plans, lead to return the people to much more safe and conservative methods (4,6,9,15,16).

SP contains several components that each other have essential effect on body and oral health; Sulfur in SP have bactericidal effects (9,17,18), Vitamin C lead the tissues to be healed and cause gingival vessels to be reinforced (3,9,19). Silica role as an abrasive part for remove stains from the tooth surfaces (3,6,9). Tannin content inhibits the glucosyltransferase activity that lead to reduce gingival diseases and reduce plaque accumulation (3,9,19). Resin in SP form a thin layer on enamel that can prevent dental caries (1,9). High concentration of chloride interacts to form dental plaque and help to remove dental stains (3,9). SP have 1.0 $\mu\text{g/g}$ fluoride that could motivate anticariogenic activity in dental tissues (9,20,21). Mildly bitter taste of the chewing sticks could stimulate the saliva and have buffering effects (9,11).

The major and most important etiology for dental and gingival diseases is dental plaque (2). Dental plaque form on the tooth surfaces continuously and should be removed daily by good oral hygiene (10,22). Mechanical removal of the plaque is an essential goal that is a target attempt in many studies (12,20,22).

This study aimed to evaluate the effects of siwak chewing sticks on dental plaque and gingival health.

Material and Methods

Eighty regular dental patients (40 Male and 40 female) at Dental faculty of Qazvin University of Medical Sciences were accepted to participate in the study. All of them inform about the principles of the

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study and consent to be in study steps by signing the form voluntary. For inclusion, the patients have to be ≥ 18 years of age and have at least 24 teeth of dentition except 3rd molars. Exclusion criteria were pregnancy or breast feeding for women, long term medication, antibiotics during the last 2 months and systemic diseases. Participants with fixed or removable orthodontic appliances were excluded and also gingival pocket more than 5 millimeter were omitted from the study. The principles of the study were confirmed by the Research Ethics Committee in Qazvin University of Medical Sciences (Registration Number: IR.QUMS.REC.1395.2).

The study was designed as a randomized clinical trial. The participants were randomized by assigning a random table number into 4 groups that each group had 20 persons. Group 1 and 2 used active and inactive siwak based on verbal and documented education of use, group 3 use usual tooth brush (Oral- B, Malaysia) by modified bass technique, group 4 have no mechanical and chemical oral hygiene activity during the period of the study.

The siwak (prepared from *Salvadora persica L.* (kharijal)) were bought fresh from the local market in Kerman city, Iran. The inactive siwak intended for use as negative group by boiling the sticks in water for 2 h. deactivation of the sticks was confirmed by in vitro antibacterial testing on *Haemophilus influenza* (based on sofrata's study) (22).

Two weeks before study starts, all the participants received intraoral examination, scaling and professional tooth cleaning and were instructed to continue their usual oral hygiene routines.

On the day of starting the study, baseline clinical examinations were done. Basic Plaque index (PI-1) was recorded according to the Loe and Silness technique which was assessed at 4 sites (mesiobuccal, mid-buccal, distobuccal, and lingual) on 6 teeth (maxillary right first molar, maxillary right lateral incisor, maxillary left first premolar, mandibular right first premolar, mandibular left lateral incisor, and mandibular left first molar). Then the participants in each group issued with their method instructions, so the group 1 gave fresh active siwak, group 2 had inactive siwak, group 3 received a standard tooth brush (Oral-B, Malaysia) and group 4 instructed to use no mechanical or chemical oral hygiene method for the last 3 days. They were recommended to use siwak (active or inactive) and tooth brush for 2 times a day.

After 3 days, follow up examination was done and plaque index of each other were recorded as PI-2 in the same manner as at baseline. All the participants continue to use their group principles until 3 days again and after 3 days plaque index of each one were recorded (PI-3).

Changes in plaque indexes was calculated for evaluate the effects of each method and for analyze this factor "N" means to have no change, "G" related to have positive effects that means reduction in plaque index and "W" convey having negative effect by increasing the dental plaque.

The results of the study were recorded to SPSS V.22 and then analyzed by Kruskal Wallis Test, Chi-Square Tests, etc.

Results

There were 20 participants in each groups of the study and all subjects completed this study. Among 80 people that had completed the study steps, there were 40 men and 40 women. The average age of the participants was 36.79 ± 8.76 . There was no statistically difference between groups for age and gender (P-value > 0.05). It means the groups were similar by these factors.

Table1 shows the overall mean plaque index at baseline (PI-1), day 3(PI-2) and day 6 (PI-3) for each group. It shows that there was a significant reduction of the plaque indexes in PI-3 ($p= 0.029$). But in the others, there was no significant difference in the change of plaque index between groups ($p>0.05$).

Table 1. Mean Plaque Index for each group

Groups	PI-1	PI-2	PI-3
Group 1	1.50	1.35	1.10
Group 2	1.40	1.25	1.15
Group 3	1.40	1.25	1.35
Group 4	1.50	1.50	1.85
p-value	0.944	0.596	0.029

Table 2 reports the changes in plaque index in each group that it means the difference between basic plaque index as PI-1 and final plaque index as PI-3. "N" means to have no change, "G" related to have positive effects that means reduction in plaque index and "W" convey having negative effect by increasing the dental plaque. Data evaluation shows that there is a significant difference between groups in changes of plaque indexes ($p=0.007$). Groups 1& 2 show more positive effect than others and Group 4 shows more negative effect on plaque index.

Table 2. changes in plaque index for each group

Groups	N	G	W
Group 1	11	8	1
Group 2	9	8	3
Group 3	15	3	2
Group 4	11	1	8

Discussion

Daily use of herbal-based oral hygiene tools, especially with a beneficial effect on oral and dental health is increasing among the population. Dental plaque control is an important goal in basic and review studies (4,12). Traditional background, being non-chemical and non-synthetic, availability and easy to use cause to attract much more attention to use siwak in many populations (4,9).

Though in our study siwak was superior to custom dental hygiene habit (usual standard toothbrush), by removing dental plaque. The efficacy of siwak for removing the dental plaque is compared with

a positive and negative control group to evaluate the basic activity of chewing sticks and its components.

A significant decrease of dental plaque is disclosed by the study in the active siwak group. Fresh siwak in comparison by other groups (inactive siwak, usual tooth brush and no hygiene group) was more effective in plaque control. This finding is also confirmed by Sofrata (22) that reported in a study in 2011 that fresh siwak could be better in reducing the gingival inflammation.

The findings of the present study confirmed with previous studies. Gazi (23) and Darout (24) were reported that clinical periodontal status in habitual siwak users was better than habitual tooth brush users. These findings were also confirmed by the others, Al-Otaibi (25), Chaurasia (17), Aumeeruddy (1) were also reported by their study that chewing stick is more effective in reducing plaque and gingivitis.

We decided to use inactive siwak in our study in order to compare mechanical properties of siwak tooth sticks and usual tooth brush. Data analyses shows that inactive siwak was a little more effective than tooth brush. This finding is also coinciding by the results of sofrata, Khalil and Rusminah (18,20,22). And on the other hand, antibacterial effects of siwak demonstrated in our study by comparing active and inactive siwak, as it shows that active siwak chewing sticks was better than inactive form by reducing the dental plaque. Al-Otaibi et al (25) have shown that tooth stick is as or more effective than toothbrush on proximal plaque control.

Some studies driven by other authors focus on the other forms of the siwak for evaluation of its effect on plaque accumulation: Poureslami (19), Varma (3), Rusminah (21) and Gupta (15) tested the tooth paste form of siwak for their studies and reported that the dentifrices containing siwak were more effective than the other tooth pastes, also in the studies done by Rieuwpassa (5) and Rajabalian (26) siwak presented in mouthwash form and had beneficial properties. In the present study we use siwak as its natural form (chewing sticks) instead of other types such as toothpaste or mouthwash. Nowadays, there was a clear dedication to use herbal medicine and natural form of the plants in the population, so we decided to use it as natural form and much more closest to the reality of its consumption.

It is concluded that siwak were able to reduce dental plaque as a mechanical tooth brush and if it uses in active form (fresh plant), the reduction of plaque accumulation is more prominent and effective. This herbal toothbrush could be used as an alternative and suitable tool of oral hygiene for people interested.

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