

Comparison of the Anti-Plaque Effect of Miswak (*Salvadora Persica*) and Dandasa (*Juglan Regia*) on gingival health in a Prospective Cohort Study

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ABSTRACT

Background: Anti-bacterial effect of Miswak on microorganism has already been proven in previous researches. The Dandasa is used by most women in Saudi Arabia, India and Pakistan as a toothbrush for cleaning the teeth.

Aim: This study was done for the comparison between the effect of Miswak and Dandasa in improving gingival health, as both has anti-plaque action and absence of plaque is directly proportional to gingival health.

Methods: A prospective cohort study was carried out at the Department of Periodontology, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Karachi for a period of 6 months. Total 90 patients fulfilling the inclusion criteria were included into two Groups. In group-A habitual user of miswak were taken and in group-B habitual user of dandasa were taken. The Plaque score and gingival index were made zero before the start of observation by conducting ultrasonic scaling.

Results: In Group A 57.8% participants were using miswak once a day and 42.2% twice a day. In group B 44.4% participants were using Dandasa once a day 44.2% and 55.6% twice a day. Mean post-gingival index score was 1.95 ± 0.52 in group A and 1.08 ± 0.28 in group B. Mean post plaque index score in Group A was 1.97 ± 0.69 and Group B was 1.15 ± 0.36 . The results portrayed significant discrepancy in pre and post gingival index. The conclusion also depicted prominent variability in pre-post-plaque index. Both indices showed that the dandasa was better at plaque control as compare to Miswak

Conclusion: Mean Gingival Index (GI) and Plaque Index (PI) scores in dandasa group was prominently less as compared to Miswak group.

Keywords: Gingival Index, Plaque index, Dandasa, Miswak

INTRODUCTION

The formation of Plaque begins with the formation of a glycoproteinaceous pellicle layer, composed of crevicular fluid, saliva, host and bacterial cells. The pellicle layer serves as a protective barrier, it also serves as a medium for bacterial colony formation, which invariably forms dental plaque¹.

Dental plaque is a complex biofilm that forms on enamel in the oral cavity. There has been over 500 bacterial species of plaque, colonization follows a regimented pattern with initial colonizing on enamel forming silvery pellicle followed by secondary colonization via interbacterial connection or adhesion. A variety of molecular interactions and adhesins underlie these adhesive interactions and result in plaque and ultimately to diseases such as caries and periodontal disease^{2,3}.

Currently, among the Muslim nations, the use of miswak as a chewing stick is greatly suggested as a Sunnah and was used by the Prophet Muhammad (PBUH) and his companion to achieve daily dental hygiene. Miswak is prepared from stem of Arak tree (*Salvadora persica*) and its extracts show antimicrobial, anti-inflammatory, anti-tumour activity also it reduces dental biofilm and periodontal pathogens⁴.

It is globally known, as tooth brushes tree or chew stick tree. Miswak has unique complicity and biological activity. Many previous studies have shown that Miswak is rich in minerals and phytochemical makeup such as beta-sitosterol⁵ and glucosides⁶. Miswak also contain organic and inorganic compounds like pyrrolidine pyrrole and piperidine derivative, fluorides and chloride⁷. All of these minerals shown to have significant antimicrobial activity⁸. *Salvadora persica* has also anti-microbial activity against organisms such as *Candida albicans*, *Escherichia coli*, *Lactobacillus brevis*, *Staphylococcus aureus*, *Proteus vulgaris*, *Streptococcus mutans*, *Pseudomonas aeruginosa*, *Lactobacillus*, *Aspergillus niger* and *Bacillus subtilis*^{2,3}.

While managing an oral infection, *Salvadora Persica* (*S.Persica*) and *Juglans regia* L are being conventionally used.

Acetone extract (Diluted) of *S. persica* and ethyl acetate extract of *Juglans regia* bark were tested and proved to have antibacterial and antioxidant activities against Gram +ve, Gram -ve bacteria and in different groups of *Candida*⁹.

Anti-pathogenic agents are generally included into health products for the prevention and treatment of gingivitis & bio film which is plaque. *S.persica* can be used in the form of toothpaste and mouthwash also because of its anti plaque and anti halitosis activity¹⁰. However besides all the oral health benefits, improper use of miswak can cause gingival trauma, clinical attachment loss and gingival recession¹¹.

Dandasa (*Juglan regia*) plant which is found in Himalayan states of India is known to have antioxidant capability and antibacterial properties. The Miswak is also known to have antibiotic elements as well as anti-inflammatory. Its essence is being available to the general public as a toothpaste. The Dandasa (*Juglan regia*) is used as a toothbrush by most females in Saudi Arabia and in few regions of India and Pakistan for cleaning teeth¹². *In vitro* studies have been carried out on dandasa which showed that dandasa has antiplaque effect¹³.

In vitro studies have proven that dandasa has anti-plaque effect. However no study has proven the anti-plaque effect of dandasa *in vivo*. This study was conducted for the anti-plaque effect of Dandasa *in vivo* and also to compare with that of miswak.

This study was done for the comparison between the effect of Miswak and Dandasa in improving gingival health as both has anti-plaque action which was measured by using two indices gingival index and plaque index.

METHODOLOGY

Characteristics of Participants: The study was a prospective cohort study. It was conducted in Periodontology Dept, of Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Science, Karachi. Patients included in study were in the age range of 24 yr to 35 yr and were habitual dandasa and miswak users for their oral hygiene. Gingival Index and plaque index was maintained 0 and mandibular teeth of such patients were used. Exclusion criteria involved maxillary teeth, any systemic disease involvement,

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patients with periodontitis, teeth fully crowned, mobile teeth and tobacco users and removable partial denture wearers.

Sampling Size: Using PASS version 11 two independent sample T-test with 99% confidence interval 99% power of the test mean \pm SD of plaque mean standard deviation of miswak in post treatment 1.36 ± 0.44 post treatment 2.24 ± 0.68 calculated sample size was of 23 per group which was increased to 45 per group. So total sample size was 90 subjects. These were divided into 2 groups A and B by computer randomization method¹⁴.

Data Collection Procedure: Habitual Dandasa and Miswak users who came to the OPD and falling in the inclusion criteria were chosen for this prospective cohort study. They were distributed into two groups, Group "A" and Group "B", 45 each. In group A, habitual user of miswak (peelo)(fig 1) were taken who used only miswak for maintaining of their oral hygiene and in group B, habitual user of dandasa (dried form) (fig 2) were taken, who were using only dandasa as a tool for their oral hygiene maintenance.

Clinical Procedure: Each participant of the two groups underwent scaling and polishing to reduce the plaque score to zero before the start of the research. Most of them belong to ethnic group of pathans and saraiki, scaling of the lower quadrant was conducted only and the upper was done at the end of research to prevent loss to follow. The scaling of the patient was done free to the patient. The Plaque score and gingival index was made zero before the start of observation and baseline scoring was done of plaque index taken as per Turesky Quigley Hein Plaque index¹⁵ and Gingival index according to Loe and Silness gingival index¹⁶.

A blind examiner recorded baseline reading after a week (Fig. 3). The participants of the groups were instructed how to use the appropriate tool. Both group A and group B patients were guided regarding the preparation method of working end of miswak and dandasa, and its proper usage method. They were instructed to prepare a new working end every day and cleaning twice daily for 2 minutes in a horizontal swipe motion. Both the groups were instructed the same way. The unprepared sticks were refrigerated. Patients were contacted after every week by the principal investigator and were asked about their brushing habit till their next visit. The participants of the two groups were recalled after a month. During their visit, the participants were advised, to follow the instructions as instructed above. After a month gingival status was recorded according to Silness, J. and H. Loe¹⁶ gingival index, using Quigley, G.A. and J.W. Hein¹⁵.

Plaque Index: Final readings were recorded by same examiner who had recorded the baseline reading using gingival and plaque index.

Statistical Analysis: SPSS version 21 was used for data entry and analysis. Descriptive statistical analysis was reported for PI and GI for each group. For comparison non-parametric test "Kruskal Wallis" was used and for pair comparison "Mann Whitney" test was used. For within group comparison "Wilcoxon Signed" test was used. P-value of 0.05 or less was measured as significant.

Ethical Considerations: Patients coming to the OPD who were habitual user of miswak or dandasa were taken. There was no harmful effect of using either miswak or dandasa.

Figure 1 Miswak (Salvadora Persica)



Figure 2 Dandasa (juglan resin)



Figure 3: Base line measurement of Probing Depths



RESULTS

The mean age of patients in Group A and B was 29.93 ± 3.06 years and 30.35 ± 2.82 years respectively. Table-1 shows the descriptive statistics of age in both groups.

Table 1: Descriptive statistics of age (years) in Group A and group B (n=45)

Group	Mean	SD	Median	Min.	Max.	Range
A	29.93	3.06	30	25	35	10
B	30.35	2.82	30	26	35	9

Table 2: Gingival index and plaque index comparison according to study group pre reading and post reading

Gingival Index	Study Group (Pre)		Study group (Post)		PValue
	Group A	Group B	Group A	Group B	
Mean(SD)	2.80(2.10)	2.20(2.35)	1.95(0.52)	1.08(0.28)	0.000*
Median(IQR)	3(0.00)	2(0.00)	2.00(0.00)	1.00(0.00)	
Plaque Index					
Mean(SD)	4.20(3.00)	3.05(2.26)	1.97(0.69)	1.15(0.36)	0.000*
Median(IQR)	4.00(0.50)	3.00(0.00)	2.00(0.50)	1.00(0.00)	

Table 3: Gingival index and plaque index comparison according to study group for patient using once and twice daily

Gingival Index Comparison			
Patient Using Hygiene tool Once a day			
	Group A	Group B	P Value
Mean (SD)	2.03 (0.52)	1.15 (0.36)	0.000*
Median (IQR)	2.00 (0.00)	1.00 (0.00)	
Patients Using Hygiene tool twice a day			
Mean (SD)	1.84 (0.50)	1.04 (0.20)	0.000*
Median (IQR)	2.00 (0.00)	1.00 (0.00)	
Plaque Index Comparison			
Patient Using Hygiene tool Once a day			
Mean (SD)	1.92 (0.68)	1.10 (0.30)	0.000*
Median (IQR)	2.00 (1.00)	1.00 (0.00)	
Patients Using Hygiene tool twice a day			
Mean (SD)	2.05 (0.70)	1.20 (0.40)	0.000*
Median (IQR)	2.00 (1.00)	1.00 (0.00)	

The results showed significant difference in post gingival index (pre and post op) according to the two study group (p=0.00) and significant difference in plaque index comparison among two study group (pre and post op)(p=0.00) (Table 2).

The results showed significant difference in post gingival index according to the two study group (p=0.00) for patient using the hygiene tool once and significant difference was seen in post gingival index according to the two study group (p=0.00) for patient using twice. Significant difference in plaque index between two study group (p=0.00) for patients using once and significant difference in plaque index comparison among two study group (p=0.00) for patients using twice, as presented in Table-3.

The results showed significant difference in post gingival index according to the two study group (p=0.00) for patient with age 25-30 years and significant difference in post gingival index according to the two study group (p=0.00) for patient with age 31-35 years.

The results also showed significant difference in plaque index comparison among two study group (p=0.00) for patients age 25-30 years and significant difference were seen in plaque index between two study group (p=0.00) for patients age 31-35 years, as presented in Table-4

Table 4: Gingival Index and Plaque Index comparison according to study group for patient with age 25-30 and 31-35 years

Age Range		Study Group			Study Group		P-Value	
		Group A	Group B		Group A	Group B		
25-30	Gingival Index	Mean	2.08	1.13	Plaque Index	1.96	1.17	0.000*
		(SD)	-0.49	-0.34		-0.67	-0.38	
		Median	2	1		2	1	
		(IQR)	0	0		-0.5	0	
		Mean	1.8	1.04		2	1.13	
31-35	Gingival Index	(SD)	-0.52	-0.21	Plaque Index	-0.72	-0.35	0.000*
		Median	2	1		2	1	
		(IQR)	-0.75	0		-1.5	0	

DISCUSSION

This study was conducted to evaluate the comparative efficacy of two oral hygiene aids that is, miswak and dandasa on dental plaque eradication and gingival wellbeing. On average our study population was aged around 30 years and most of them were below 30 years. Most of the study subjects used to use misvak and dandasa once in a day. The mean GI score was significantly high in Group A (misvak) as compared to Group B (dandasa). The mean PI score in Group A (misvak) was also found significantly high as compared to Group B (dandasa).

In the studies by Dahya¹⁷ and Halawani¹⁸ participant of habitual users of miswak group, were individually taught the recommended method. The proper preparation, maintenance, and technique to use the chewing sticks were demonstrated to the members of habitual users of dandasa group to prevent the gingival trauma. Professional management as curettage, scaling, or high-fluoride applications were strictly restricted during the study period¹⁷. This was in comparison with our study as no professional cleaning measures were done during the study period.

This study¹⁷ was conducted for at least 30-day duration with measurements taken at baseline (prior to the study) and at 30th day. The reason for keeping the span for 01 month between takings of these measurements was that approximately 9 to 21 days are needed to properly appreciate excessive plaque deposition and mild gingivitis in the oral cavity. The present study followed the same criteria for the measurement intervals. Azadirachta indica sticks obtained from Neem tree, were used as an alternative as they have similar properties to that of Arak plant. Also a study in India, Neem tree sticks were found to be equally effective in plaque removal as modern toothbrushes¹⁸. The twigs, stems and roots, of Salvadora persica sticks have been utilized in use as oral cleaning agents for centuries¹⁹.

There are no trials reported that have compared the anti-plaque effect of miswak and dandasa²⁰⁻²³. The current trial followed Consolidated Standards of Reporting Trials guidelines (CONSORT). Study by Ezzodini displayed no difference in the gingival scores in the dandasa & miswak utilizers²¹. However, prominent reduction in the plaque scores were observed in the miswak utilizers in comparison to the toothbrush utilizers. Bhambal et al²⁰ reported no important difference in plaque and gingival scores between the miswak and toothbrush users. Study reported superior cleaning ability of chewing stick when compared to nylon

toothbrush especially for interproximal surfaces²². The current study showed significant difference in PI score & GI score among miswak and dandasa users.

As for antimicrobial actions of chewing stick is concerned, the risk of dental caries was 9.35 times higher in toothbrush users in comparison to those who used chewing sticks²⁴. Neem and Arak miswak sticks have also been reported to have lower incidence of dental caries²⁵. This trial excluded dental caries from consideration. Another study was male exclusive (experimental part). It has been shown that gender did not have any notable difference in the subgingival microbiota between males and females from different ethnic groups²⁶.

A study by Riham al Rawi supported the use of dandasa as teeth whitener and anti microbial product²⁷. Another study by Palwasha Khattak emphasized the benefits of Juglanregia (Walnut Tree) as a antimicrobial, anti biofilm, anti fungal and anti viral properties. Although it removes stains but it may leave red stains on gingiva after use²⁸.

CONCLUSION

Dandasa is more efficient in reducing Gingival index and Plaque index as compared to Miswak. Mean Gingival Index (GI) and Plaque Index (PI) scores in dandasa group was prominently less as compared to Miswak group.

Recommendation: In the future more studies need to be carried out to check the effects of Dandasa as very few studies are available on this subject.

Ethics approval and consent to participate: The study was approved by the ethical board IRB-1227/DUHS/Approval/2019/56 after being approved by the scientific committee and the research board of the institution. Informed consent was taken from the study participants.

Conflict of Interest and Funding: There was no conflict of interest in this study and no funding was supported for this study.

Authors' contributions: HP was the principal investigator, contributed to the design and drafting of the manuscript, SA reviewed the manuscript design and analysis critically, FK has contributed to data acquisition and manuscript grammatical corrections, SR has contributed to data analysis and revision, SS has contributed to interpretation of the results and critically reviewed the manuscript., AH has contributed to data collection. All authors have jointly given final approval and agreed to be responsible for all aspects of the work

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