Original Article

EFFICACY OF MISWAK AS AN ADJUNCT TO TOOTH BRUSHING FOR GINGIVAL HEALTH: A CLINICAL STUDY IN QASSIM

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ABSTRACT

***Context*:**There has been increasing incidences of oral diseases globally requiring,need for oral hygiene methods with use of products which are safe, effective, economical and easily available. Many plant sticks were used in the form of tooth brush since long time. Salvadora persica commonly known as Miswak is the most used plant for this practice.

Aim: This study evaluates the efficacy of Miswak as an adjunct to tooth brushing in improving gingival health among male patients in Qassim

Material and Methodology: This case control clinical study was carried out at Qassim University Medical City Dental Hospital at Alrass on 30 male patients. These patients used only tooth brushing for 14 days followed by 14 days of tooth brushing along with use of Miswak. Plaque and Gingival scores were recorded atT0,TB14 .TB+M.***Result***: Result for Plaque Index showed that there was significant difference in Plaque index score (p=0.01214) between Day 1 initial visit and tooth brushing along with use of Miswak similar result was found with Gingival Index (p=0.011062813). The Plaque index score between T0 and TB+M 14 days differed statistically significantly, with a P(T<=t) two-tail value of 0.004525, according to the results of the post-hoc t test. Gingival Index score differs significantly with a P(T<=t) two-tail value of 0.00553982, the results of the post-hoc t test indicated a statistically significant

difference in the Gingival index score between T0 and TB+M 14 days.

Conclusion: Within limitation of the study it can be concluded that tooth brushing along with Miswak improves the Plaque and Gingival status.

KEYWORDS: Adjunct, miswak, gingival health, tooth brushing

INTRODUCTION

For overall health and a high quality of life, dental health is crucial. Poor oral health has been linked to a number of systemic disorders. Globally, the prevalence of oral diseases is rising, necessitating the use of safe, affordable, and conveniently accessible items in oral hygiene practices. [1]

More than 75% of people worldwide suffer from plaque-induced gingivitis, the most prevalent kind of periodontal disease, which is regarded as the second most common oral illness after dental caries.Gingivitis typically starts in early childhood and gets worse and more common as people mature.According to epidemiological research, dentate people of all ages frequently get plaque-induced gingivitis.Inflammation limited to the gingiva is a hallmark of plaque-induced gingivitis.After eliminating these contributing elements, it has been demonstrated to be reversible. [2] Hence oral hygiene mainatance with tooth brushing and use of mouth washes are recommended.

The most widely used oral hygiene technique worldwide is the use of a toothbrush and toothpaste. The earliest examples of the contemporary toothbrush may be found in Babylonian chewing sticks, which date back to 3500 BC, and toothpicks, which were chewed to assist, clean the mouth and teeth and were mentioned in Greek and Roman literature.[1]Around the world, about 182 different plant species are utilised as chewing sticks. The most popular plant for

this activity is Salvadora persica, also referred to as miswak.[3]Salvadora persica is commonly referred in Arabic word as miswak, which means tooth washing stick. [4] Traditionally, it is a pencilled stick that is 15–20 cm long and has a diameter of 1–1.5 cm. The act of chewing is designed to shred it into brush for an emotive functioning. It stops oral bacteria and dental plaque from growing in addition to mechanically eliminating the bacterial plaque. Additionally, it has antibacterial properties that stop tooth decay and prevent the growth of a number of cariogenic germs. Chewing sticks have remained popular in modern times because to its accessibility, affordability, ease of use, and religious and/or cultural connotations. According to the 2000 World Health Organisation (WHO) Consensus Report on Oral cleanliness (WHO, 2000), chewing sticks may contribute to the promotion of oral cleanliness, and additional research is necessary to determine their efficacy. One of the most popular oral hygiene practices in Saudi Arabia is miswak, which has religious and traditional connotations.[3, 4, 5]

Herbal toothpastes have been shown in clinical research to be helpful in lowering gingival and plaque scores, showing a significant decrease in gingivitis from 5.20% to 70.6% and a reduction in plaque from 7.17% to 61.2%. Herbal toothpastes work well to lessen gingivitis and plaque.[6]

Although there is abundance of literature available regarding review on the uses of Miswak and also some invitro studies about the chemical composition of Miswak and its use .But there are very few clinical studies regarding the efficacy of proper method of using miswak stick as an adjunct to use of tooth brushing method in improving gingival health. Hence this study was designed to evaluate the efficacy of the Miswak as an adjunct to tooth brushing method in improving the gingival health amongst Qassim population. The null hypothesis for our study was that there

is no difference in Plaque and Gingival index score when Miswak is used as adjunct to tooth brushing.

MATERIALS AND METHODOLOGY

This case control clinical study was carried out at Qassim University Medical City Dental Hospital at Alrass. The ethical approval for the study was obtained from Institutional review Board Qassim University.

Sample size estimation

G*Power 3.1 was used to calculate the sample size. Plaque and gingival scores showed a standard mean difference of 0.28 and 0.29, respectively, in line with previous research. A sample size of 30 participants was calculated, taking into consideration a 10% a 0.10% margin of error and a 95% confidence interval.

The study was done in accordance to Rifaey et al [7] who usedsample size of 10 per group. The patients for this clinical study were arbitrarilyincluded from male patients visiting the Qassim university Medical city Dental Hospital Alrass. The inclusion criteria for the study was; 18-30 aged Males, Patients from Qassim region, Healthy and medically fit patients, Patient with no history of using of Miswak, and Patient using tooth brush and tooth paste as Oral hygiene method. The exclusion criteria were; patients not willing to participate, Patients with prosthesis, Female patients and Patient with oral habits like smoking.

The study included 30 male participants who met the inclusion criteria and provided consent. The patients were explained about the purpose of the study, study duration and an informed consent was taken from them as per the IRB Qassim university guidelines. During the 1st visit, each patient's demographic record like Age, Occupation, present oral hygiene habits, other habits were recorded using a structured questionnaire. The patients were then evaluated for Plaque index using

Silness -Loe Plaque index and Gingival index Gingival index by Loe & Silness on their first visit as (baseline-TB0). The indices were recorded by only one dentist under the supervision of Periodontist.

The study includes double blinding procedure. The study was done by trained investigator. The third investigator assessed the result of the study. The use of content of material in the study was not disclosed to primary investigator or to the participants. To avoid bias in recording indices was doubleblinded about the stages T0,TB 14 and TB+Miswak.

All patients were provided with soft tooth brush (Oral B cross action soft tooth brush) and were taught about correct brushing technique. They were advised to brush twice a day using tooth ≤brush and dentifrices and were instructed not to use any other oral hygiene aid during this period. The patients were recalled after 14 days of brushing after instructions. The Plaque and Gingival index were recorded using same method after 14 days of proper brushing and the readings were recorded as TB14. After recording the Plaque and Gingival index readings patients were provided with Miswak stick and were taught how to correctly use Miswak along with tooth brushing twice a day. The patients were recalled after 14 days of use of tooth brushing and Miswak. The Plaque and Gingival index was recorded as before and the readings were recorded as (TB + M).

The null hypothesis for our study was that there is no difference in Plaque and Gingival index score when Miswak is used as adjunct to tooth brushing ie T0=TB=TB+M. The Plaque and Gingival index for all 30 patients were recorded at T0(1^{st} visit) ,TB14(14 days after proper tooth brushing) and TB+M(14 days after using tooth brushing and Miswak) all the readings were tabulated ,Single ANOVA test was used for both Plaque and Gingival index readings to find the difference between T0,TB and TB+M at 5%level of significance($p \leq 0.05$).To find out between

which group the difference is significant Post Hoc t test with Bonferroni correction was used. The obtained data was statistically analysed using SPSS software version 23.0 with one way ANOVA test to correlate the results at different time duration among the groups.

RESULT

The study was carried out of 30 male patients. The average age of patients was 23 years. Most of these patients were students except 1 patient who was working. The structured questionnaire analysis showed that Out of 30 patients 20 patient brushed twice daily(66.66%) whereas 10 patients brushed once daily(33.33%) before the study. The Null hypothesis was that there is no difference in Plaque and Gingival index score after 14 days of proper brushing and after 14 days of brushing with use of Miswak.

The average Plaque index score at T0(1^{st} day), TB14 (Tooth Brushing 14 days) and TB+M(Tooth brushing with Miswak 14 days) was 1.296,1.129 and1.057 respectively.The average Gingival index score at T0(1^{st} day) , TB14 (Tooth Brushing 14 days) and TB+M(Tooth brushing with Miswak 14 days) was 1.296,1.129 and1.057 respectively.

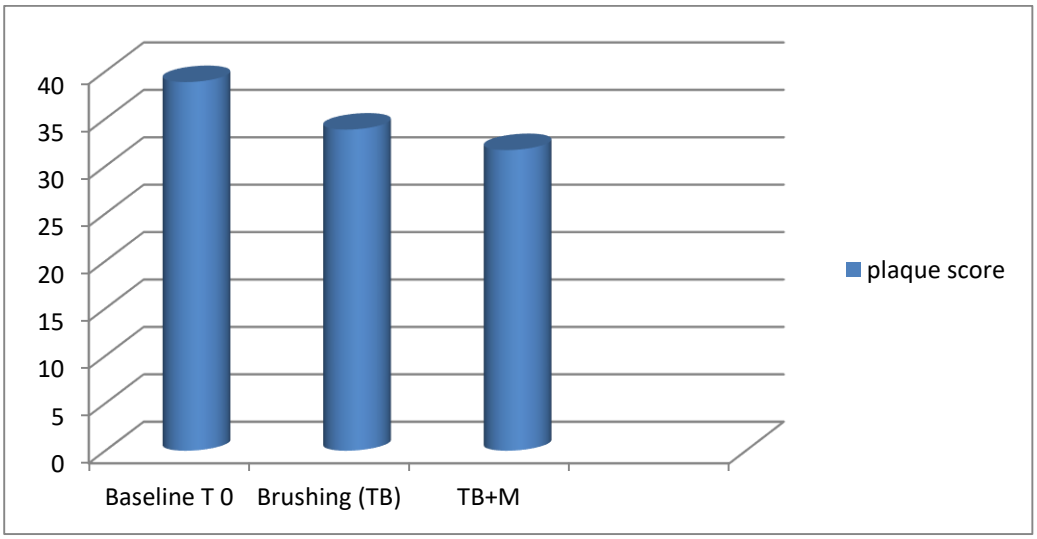
To compare the difference in Plaque Index and Gingival Index at T0(1^{st} day) , TB14 (Tooth Brushing 14 days) and TB+M(Tooth brushing with Miswak 14 days) One Way Analysis of variance (ANOVA) test was performed for both Plaque and Gingival scores at $p \leq 0.05$

The Plaque Index one-way ANOVA result revealed a difference in Plaque Index score ($p=0.01214$), indicating a significant difference between T0 (first day), TB14 (tooth brushing for 14 days), and TB+M (tooth brushing with Miswak for 14 days). To verify which group's Plaque Index score differs significantly from which The Plaque index score between T0 and TB+M 14 days differed statistically significantly, with a

P(T<=t) two-tail value of 0.004525, according to the results of the post-hoc t test. On the other hand, the Tooth brush 14 days and Tooth brush + Miswak 14 days scores showed lower plaque score with TB+M compared to TB alone (P<0.012) (Table 1, Graph 1).

Table 1: Plaque score at baseline

Groups	*Count*	*Sum*	*Average*	*Variance*		
Plaque index score at Baseline	30	38.88	1.296	0.118259		
Plaque index score Brushing	30	33.87	1.129	0.095064		
Plaque index score Brushing +Miswak	30	31.71	1.057	0.078125		
ANOVA						
Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.90194	2	0.45097	4.642013	0.012147	3.101296
Within Groups	8.45202	87	0.09715			
Total	9.35396	89				



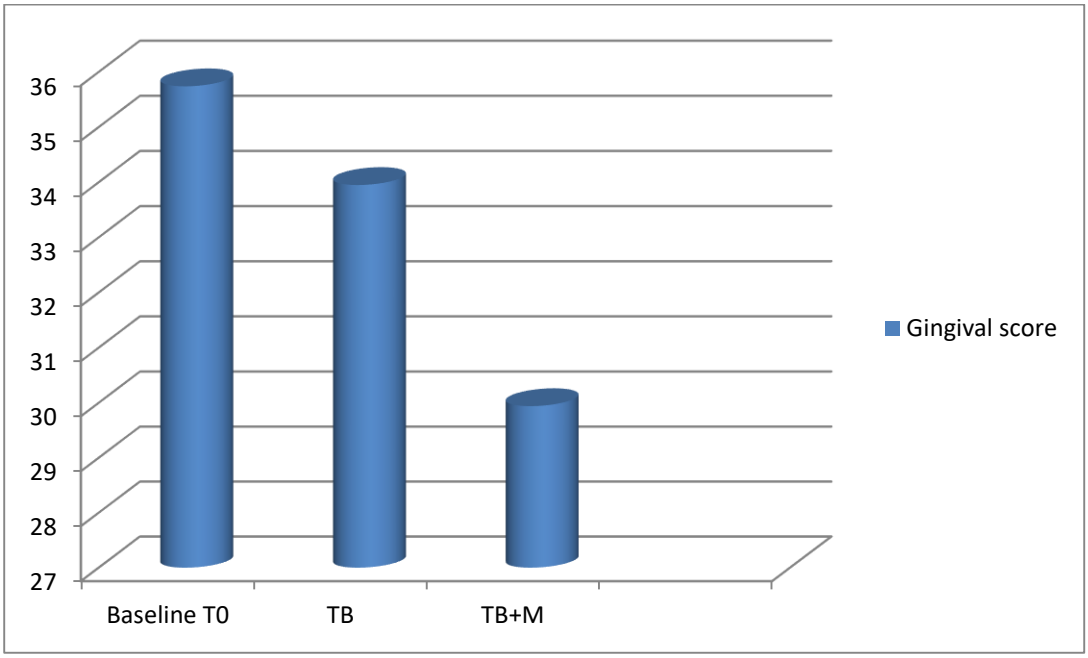
Graph 1: Plaque score at baseline

Similarly the One way ANOVA result for Gingival index scores at T0,TB14 days and TB+Miswak 14 day. One way ANOVA result for Gingival Index showed that there is difference in Gingival index (p=0.011062813) suggesting that there is significant difference in Gingival index score after tooth brushing and tooth brushing with Miswak. To verify which group's Gingival Index score differs significantly with a P(T<=t) two-tail value of 0.00553982, the results of the post-hoc t test indicated a statistically significant difference in the Gingival index score between T0 and TB+M 14 days.Whereas there was lower gingival score with TB+M compared to TB alone at 14 days (P<0.01)(Table 2, Graph 2).

There was significant decrease in plaque and gingival score form baseline to 14 days in both the groups.

Table 2: Gingival score from baseline to after 14 days

Groups	*Count*	*Sum*	*Average*	*Variance*		
Gingival index score at Baseline	30	35.74	1.191333	0.074309		
Gingival index score tooth brushing 14 days	30	33.95	1.131667	0.050821		
Gingival index score toothbrushing+ Miswak 14 days	30	29.94	0.998	0.060741		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.588047	2	0.294023	4.745617	0.011063	3.101296
Within Groups	5.390243	87	0.061957			
Total	5.97829	89				



Graph 2: Gingival score from baseline to 14 days

DISCUSSION

The current single blind cross-over clinical trial was conducted to examine the effects of Miswak as an adjuvant to teeth brushing on gingival and plaque status. The study was carried out on only male subjects only. Female subjects were not included in the study to avoid any variability caused by hormonal changes which is common in females. This crossover study was done to reduce influence of confounders since patients serve as their own controls and it also reduces variability in outcomes being measured. Similar cross over study was conducted by Rifaey et.al in 2021[7] to assess the efficacy of Miswak as oral hygiene aid. Most of studies consisted of groups with different subjects (Batwa et.al 2006[8],Patel.P et.al 2012[9], Abhima kumar et.al 2019[10]).

In the current study, a standardised design was created to reduce the impact of additional factors that can influence plaque control, such as toothbrush and/or miswak type, frequency of brushing, and brushing and/or miswak technique. By teaching each participant how to use the same

traditional toothbrushes and chewing sticks under the investigator's close observation, the study condition was standardised. Additionally, each participant received a brand-new chewing stick of the same length as well as an equal conventional toothbrush. To avoid any bias investigator was blinded about the cross over.

Our result show that there was a statistically considerabledecrease in the Plaque and Gingival index score between Initial visit recording T0 and Tooth brush with Miswak TB+M. This result is similar to studies by Batwa et.al 2006 ho found no difference between tooth brushing and Miswak but studies by Rifaey N et.al 2021[7] and Patel.P et.al in 2012[9] found significant difference in Plaque and Gingival score, this could be because more time was provided for the study (8weeks) as compared to 14 days in our study due to time constrains Our result suggest that Miswak if used with tooth brushing has beneficial effect on plaque control and gingival health. This could be because of therapeutic effect of various components of Miswak extract. Miswak's silica works as an abrasive to get rid of stains and plaque. [11]The mucosal membrane is astringently affected by tannins (tannic acid). Alkaloids stimulate the gingiva and have bactericidal effects.[12] Essential (volatile) oils have a distinct scent and have antiseptic and carminative properties.[11,13] The sulphur compounds have the ability to kill bacteria.Vitamins 9, 12, and 13 aid in tissue repair and healing.[9] Baking soda, also known as sodium bicarbonate, or NaHCO, has a modest germicidal effect and mild abrasive qualities.[14-16] Calculus formation is inhibited by high chloride concentrations.[17] The present study's increased gingival health may be due to these treatment discoveries from earlier research.

Our findings were in line with those of a randomised cross-over trial conducted by Rafiey et al. (2021)regarding

the effectiveness of miswak chewing sticks as an oral hygiene aid. They also assessed the Streptococcus mutans and Aggregatibacter actinomycetemcomitans from the supra-gingival plaque samples using real-time polymerase chain reaction (qPCR). The researchers discovered that using miswak chewing sticks in conjunction with toothbrushing may improve gingival health and oral cleanliness. They also found that, there was no significant difference in the microbial counts of S. mutans and A. actinomycetemcomitans between the two groups at the end of the study period. [7] This indicates the antibacterial efficacy of miswak.

A study by Patel et al. compared the effects of using miswak in conjunction with brushing your teeth with those of using a toothbrush alone on gingival health and plaque levels. Based on their study's findings, the scientists came to the conclusion that using a toothbrush and miswak combined greatly improves gingival health and plaque score. This demonstrates unequivocally that miswak may be used in addition to a toothbrush by combining the chemical effects of miswak with the mechanical effectiveness of a toothbrush. Saha et al. came to the conclusion that people who use miswak have a higher mean gingival score than people who use toothbrushes and toothpaste. The combined toothbrush and miswak users had the lowest mean plaque score.[18]

Miswak has the potential to improve gingival health with the right instruction, especially in areas where it is easily available and reasonably priced. Several studies have shown the efficacy of miswak in reduction of plaque and gingivitis. Hence we can recommend the use of miswak in daily practice to maintain good oral hygiene.

Limitation of the study: The limitation of the present study was smaller sample size, short study duration and study included

only male participants.There is a need for longer-term studies.

Recommendation: The current study indicates that use of miswak sticks helps in reduction of plaque and improvement in gingival health. Hence we can recommend usingmiswak sticks or mishwak containing tooth paste to improve oral health. Further studies are needed on larger sample with inclusion of both genders along with microbiological studies to validate the antibacterial efficacy of miswak.

CONCLUSION

According to the study's limitations, cleaning your teeth and using Miswak together enhances your gingival and plaque health. On the first day of the visit, there was a significant difference in the Plaque and Gingival index scores between brushing your teeth and using Miswak. However, there was no significant difference in the Plaque and Gingival scores between cleaning your teeth and using Miswak. Longer-term, more comprehensive cross-over clinical research is needed.

Availability of data and materials: The data set analysed in this study are freely provided.

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Conflict of interest: There is no conflict of interest.

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