

Comparative Evaluation of Conventional Tooth brushing with Traditional Miswak for Oral Hygiene Maintenance in a Socially Disadvantaged Young Muslim Population.

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ABSTRACT

Background: Chewing sticks were used throughout the Greek and Roman empires and by many communities till date. Many people do not use modern oral hygiene aids such as toothbrushes due to reasons like cost, customs and religious reasons and accessibility. The miswak, obtained from the twigs of the *Salvadora persica* tree, may be beneficial due to its mechanical cleaning. The aim of the present study was to assess and compare the oral hygiene status and gingival conditions following the use of conventional tooth brushing and miswak in socially disadvantaged subjects over a period 100 days. **Methods:** The study was conducted in an orphanage in Srinagar, Jammu and Kashmir. Out of the total 354 subjects, 180 subjects who were within this selected age group were followed and examined. After acquiring the permission and the information to the subjects a total of 148 subjects, were voluntarily willing to participate in the study. Out of these subjects 72 subjects were using miswak (Group I), 46 subjects were using tooth brush and tooth paste (Group II) while 30 subjects (Group III) accepted that they were using both miswak as well as tooth paste and tooth brush as an oral hygiene aid. All of these subjects were evaluated for Gingival and Plaque status on 50th and 100th day following oral prophylaxis. The Mean, Standard Deviation, One way ANOVA test and Scheffe test were performed to reveal the statistical significance. **Results:** Both Group II and Group III showed a significant difference ($p \leq 0.05$), at 50th and 100th day in their mean plaque scores. The mean gingival scores recorded for subjects using only miswak and those subjects using both miswak as well as tooth brush and tooth paste increased from 50th day to 100th day and showed a statistical difference between the two means. **Conclusion:** The results of the present study suggest that miswak can be used as an effective adjunct for oral hygiene maintenance along with toothbrush and tooth paste as it is readily available and inexpensive.

Keywords: Oral Hygiene, Miswak, Toothbrush and toothpaste.

INTRODUCTION

Oral hygiene has been practiced by different populations and cultures around the world since antiquity. Oral hygiene maintenance through regular removal of dental plaque and food debris is an essential factor in prevention of oro-dental disease. Oral hygiene practices may vary from region to region and are affected by the local cultures and religious beliefs.^[1]

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Despite the widespread use of oral cleaning aids as toothbrushes and toothpastes, natural methods of tooth cleaning using chewing sticks prepared from the twigs, stem or roots from a variety of plant species and oil pulling have been practiced for years in many communities. Chewing sticks were used by the Babylonians some 7000 years ago; they were later used throughout the Greek and Roman empires and have been used by Jews, Egyptians, and Muslims.

Today they are used in Africa, Asia, the Eastern Mediterranean region, and South America.^[2] Many of these communities till date do not use modern oral hygiene aids such as toothbrushes due to reasons like cost, customs and religious reasons and accessibility.

Miswak as an oral hygiene aid is widespread among Muslim population due to religious norms. The World Health Organization has recommended and encouraged the use of these sticks in areas

where their use has been established by the custom or religious beliefs.^[3] The use of miswak is an old custom, which was adhered to by ancient Arabs to clean their teeth and was contributed to ritual purity. Some of the people of the particular community may use it five times in a day before every prayer as a rigorous religious practice.^[1] The miswak conventionally meaning a “stick” used to clean teeth, is obtained from the twigs of the *Salvadora persica* tree, also known as *Arak tree* or the *Peelu tree*. Its various names are ‘Miswak’ and ‘Siwak’ as used in the Middle East, ‘Mefaka’ in Ethiopia, ‘Mswaki’ in Tanzania and ‘Datun’ in southeast Asian countries.^[4]

The miswak may be beneficial due to its mechanical cleaning efficacy due to its fibers and due to some chemical action because of its constituents. The release of these beneficial chemicals as chlorides, silica, sulphur, fluorides, saponins and sterols all play an important role in oral hygiene maintenance.^[5] Their taste is agreeable and not unpleasant and reported to have antiplaque and many other pharmacological properties.^[6]

The present study was done to compare the efficiency of miswak with conventional tooth brushing with tooth paste or combination of both as an oral hygiene aid among socially disadvantaged Muslim children residing in an orphanage in Srinagar city, within Kashmir region of Jammu and Kashmir state, India, with the objective to assess the oral hygiene status and gingival conditions in the selected subjects over a period 100 days.

MATERIALS AND METHODS

Study design: This forward looking descriptive study was done among a heterogeneous population living in a similar environment. Efficacy of different oral hygiene aids was assessed depending upon the ability of each method in maintaining the plaque status and gingival status of the selected subjects.

Selection of Study Population: A single orphanage in the main city of the Srinagar district of Kashmir valley of Jammu and Kashmir state was selected based on the maximum number of the subjects present in it. A total of 354 socially disadvantaged Muslim, male subjects were staying in the orphanage were included. A written permission was acquired from the Head of the orphanage and every subject was educated about the study. Ethical clearance was taken from the institutional ethical committee at Dental College, Srinagar, Jammu and Kashmir. All the subjects who were present in the selected orphanage from December 2015 to April 2016 were included in the study. After completion of oral prophylaxis of the subjects within a span of 14 days, the study was conducted for a period of next 100 days. Every subject was evaluated on 50th and 100th day after

the completion of scaling and polishing with rubber cup and pumice. Selected study population was within the age group of 12-17 years. Out of the total 354 subjects, 180 subjects who were within this selected age group were followed and examined After acquiring the permission and the information to the subjects a total of 148 subjects, were voluntarily willing to participate in the study. Out of these subjects 72 subjects were using miswak (Group I), 46 subjects were using tooth brush and tooth paste (Group II) while 30 subjects (Group III) accepted that they were using both miswak as well as tooth paste and tooth brush as an oral hygiene aid. All of these subjects were permanently residing in the orphanage.

Certain exclusion criteria were set in which the subjects under medication for any systemic diseases, tobacco users, subjects under orthodontic treatment or complex periodontal therapy, subjects receiving antibiotic therapy, physically disabled subjects were excluded from the study. Subjects having mixed dentition were not included in the study justifying the selection of the selected age group.

Method of obtaining data: A pre-designed proforma, enquiring about the age of the subjects and the method of cleaning the teeth and any other measure used for maintaining of oral hygiene. Assessment for oral hygiene was done using Gingival Index (Loe H & Silness J 1963)^[7] and Plaque Index (Silness J & Loe H 1964)^[8]. Clinical examination was carried out by two examiners and the recordings as observed were copied by dental hygienists into the preformed proforma.

Intraexaminer reliability: The examiners was trained and calibrated in the Department of Public Health Dentistry on 15 subjects each within the age group of 12 – 15 years representing the study population. The inter and intra-examiner reliability was assessed by using Cohen's weighted kappa (κ) statistic which was 0.84 and 0.89 respectively indicating high reliability.

Data Collection: Examination of the subjects was done on 50th day after the start of the study followed by 100th day as final examination. Examination was carried out in natural light. Examination at both the intervals was carries out by the same investigators on same subjects in order to decrease the variability in results. Type III examination^[9] was carried out with recommended sets of sterilized instruments. Hot water sterilizer was carried to the examination area for sterilization of the used instruments after cleaning them with running water.

The recordings were compiled and data were entered into an Excel Sheet database (MS Office Excel 2000; Microsoft Corporation, Redmond, WA, USA). The Data was analyzed using Minitab 16.1.1 version of statistical software. The significance of differences within the groups (over

the course of the study) was sought using The Mean, Standard Deviation, One way ANOVA test and Scheffe test were performed to reveal the statistical significance. The confidence level of the study was proposed to be 95%; hence a P value <0.05 has been considered significant, P value <0.01 has been considered highly significant and a P value <0.001 has been considered very highly significant.

RESULTS

Table 1: Mean Gingival Index score among the study subjects.

Study Groups	Mean \pm SD 50 th day	Mean \pm SD 100 th day	P value
Group I (Only miswak)	1.57 \pm 0.46	1.77 \pm 0.34	T-Value = -124.31 P-Value = 0.046
Group II (Toothpaste/ tooth brush users)	1.61 \pm 0.52	1.72 \pm 0.63	T-Value = -132.89 P-Value = 0.066
Group III (Miswak/ toothbrush users)	1.32 \pm 0.43	1.37 \pm 0.22	T-Value = -144.27 P-Value = 0.02

Paired t test, *Significant at 5% level

Table 1 shows the mean gingival index score for group I, group II and group III at 50th day and 100th day after the start of the study. The mean gingival scores recorded for subjects using only miswak and those subjects using both miswak as well as tooth brush and tooth paste increased from 50th day to 100th day and showed a statistical difference between the two means. Group II that is the subjects who were using toothbrush and tooth paste did not show any significant difference in the mean gingival scores when compared between 50th and 100th day as shown by the Students t test ($p \leq 0.05$).

Table 2 shows the mean plaque index score for group I, group II and group III at 50th and 100th day. Highest mean plaque scores were seen in Group I, subjects using only miswak, which did not

A total of 148 male subjects were taken into the study out of which 4 subjects did not attend the final examination on the 100th day. However the data for these subjects was carried forward using the concept of intention to treat (ITT). Therefore the loss of subjects in form of attrition was avoided. The results were by calculated for the three groups with no attrition. In the present study Group I comprised of 48.6% subjects, Group II included 31% subjects and Group III comprised of the least 20.2% subjects. .

show any significant difference in the mean values when compared at the two intervals. However, the mean plaque score difference at 50th and 100th day in group II and group III were statistically significant ($p \leq 0.05$), but plaque scores showed that mean plaque score for Group III was lowest among the three groups. Mean plaque score of Group III was seen to have a statistically significant difference when compared to the mean of other two groups as shown by the *Scheffe Test* ($p \leq 0.05$). While there was no significant difference between the mean plaque scores of Group I and Group II, that is the subjects who were using toothbrush and tooth paste had a similar plaque accumulation as compared to those using both the methods of tooth cleaning.

Table 2: Mean Plaque Index score among study subjects.

Study Groups	Mean \pm SD 50 th day	Mean \pm SD 100 th day	P value
Group I (Only miswak users)	1.09 \pm 0.16	1.14 \pm 0.22	T-Value = -112.22 P-Value = 0.065
Group II (Toothpaste/ tooth brush users)	1.11 \pm 0.14	1.12 \pm 0.17	T-Value = -128.56 P-Value = 0.048
Group III (Miswak & tooth brush users)	0.85 \pm 0.18	0.94 \pm 0.13	T-Value = -144.27 P-Value = 0.039

At 100th day : Group I vs Group II, Group I vs Group III*, Group II vs Group III* (* = $p \leq 0.05$ using Scheffe Test).

DISCUSSION

The present descriptive study was performed in a homogenous population living in an orphanage in Srinagar city of Jammu and Kashmir state, India. As it has been previously reported that in Muslim religious institutions Children are taught to use miswak at about age six years.^[10] The selected population had similar diet pattern and the water source was common to all of these subjects. Out of the total population of 354 children, 180 subjects who were in the age range of 12-17 years were

included in the study so that all subjects with mixed dentition and primary dentition were avoided. Final results were prepared for the 148 subjects who were voluntarily willing to participate in the study. The attrition of the 4 subjects was caused by either use of medication or their unavailability at the 100th day examination. This reduction in the sample size was reduced by using Intention to treat analysis (ITT).^[11] ITT analysis avoids overoptimistic estimates of the efficacy of an intervention resulting from the removal of non-compliers by accepting that noncompliance and protocol

deviations are likely to occur in actual clinical practice.

The present study results show that the subjects who were using both miswak as well as toothbrush and toothpaste were having better oral hygiene and had a lower plaque and gingival scores as scores as compared to the other two groups. All the methods used for the maintenance of oral health are mainly either mechanical or chemical. Toothbrushes with toothpastes are the most widely used method of oral hygiene maintenance.^[12] Though various cultures have many other methods of oral hygiene maintenance, chewing stick (Miswaak) is an old culture in Arabic nations with Islamic culture.^[1] Sticks of various plants are chewed and used as brush when they fray. This flared end cleans the teeth in a similar manner to the use of a conventional toothbrush. In Middle East the most common source of chewing sticks or miswak is Arak (*Salvadora persica*) obtained from its roots, branches and bark.^[13, 14] The religious impact of Miswak is the principal reason for it to be used in Islamic countries. As recommended Muslims consider Miswak use a holy practice,^[10] Miswak is either used five times a day at the time of ablution or fewer than five times a day or used as a conventional toothbrush once usually at morning.^[15]

Recent Consensus Statement on Oral Hygiene concluded that chewing sticks may play a role in the promotion of oral hygiene; however it was put forth that evaluation of the effectiveness of chewing sticks requires further research.^[16] Many studies have examined its effect on gingival and periodontal health and the results were found to be contradictory.^[6]

The present study was done to assess the efficacy of miswak with that of conventional tooth brushing with tooth paste or combination of both. The present study was done in an orphanage as it provided subjects of all the groups in a same place thereby reducing many confounding factors. It is also seen that miswak was used in Muslim institutions because of the religious norms followed in these institutions.^[17]

The results of the present study demonstrated that oral hygiene status of the students using both toothbrush with toothpaste and miswak was significantly better as compared to those using only one of the two as toothbrush/ toothpaste or only Miswak. This finding is in accordance with some previous studies.^[3,17] In another study, it was reported that when powdered form of Miswak is used with a toothbrush it will give better results than sticks alone in terms of plaque removal.^[18] These finding may be accredited to the combined mechanical properties of a toothbrushes and chemical plaque controlling with Miswak. Mechanical action of fibers of miswak may have beneficial properties and due to its pharmacological

actions, it yields better plaque removal efficacy.^[19] The release of various chemicals like chlorides, silica, saponins, sulphur, vitamin C and sterols may also play an important role in decreasing the plaque accumulation.^[18] It has been reported elsewhere that sulfur compounds which are present in Miswak smell have a bactericidal effect.^[20] A previous study has reported that fluoride is present in *Salvadora in a reasonable* amount.^[21] Miswak's content of silica also adds to the mechanical action in plaque removal.^[22] Certain plant fibres such as miswak contain sodium bicarbonate which has mild abrasive properties as well as germicidal effect.^[23] In the present study the mean plaque score difference between the subjects using only miswak and toothbrush with tooth paste groups was not statistically significant, but it was significantly different when both these groups were compared to group III. i.e. the combined users of toothbrush and Miswak. In previous studies, similar reports of no significant differences in plaque scores between the Miswak and toothbrush users have been reported.^[4] While there are many studies which have reported a better cleaning efficacy of Miswak when compared to toothbrushing.^[3,17,24] The results of these studies were in agreement with the present study. While comparing the mean plaque of group I and II at 100th day a higher mean plaque score was observed in the miswak group which was similar to a previous study done in Riyadh which revealed higher plaque and gingival bleeding in chewing stick users as compared with toothbrush users.^[25] when comparing the mean plaque score of the miswak group at 50th and 100th day the mean plaque scores showed increase than the tooth brush users at the same interval of 100 days. This could be attributed to the cumulative effect of plaque with time and this could also demonstrate that with longer period of using miswak it might not able to remove plaque efficiently as compared to a toothbrush. In a previous study conducted in Kenyan school-children it was observed that after cleaning teeth for 5 min using chewing sticks with or without toothpaste was as effective in controlling and removing dental plaque as toothbrush and paste which is in accordance with the present study however the duration of the study was lesser than the present study.^[26] However a previous study while finding a contrary result still concluded that miswak could be used in maintenance of oral hygiene as it is economical and readily available.^[5]

The results of the present study also showed that there was no significant change in the gingival index in group I and group II when comparing the 50th day reading to 100th day gingival scores. While a significant difference was observed in the third group using both tooth brush with tooth paste and miswak when comparing the gingival scores at the two intervals. The possible reason for this can be

the mechanical effect of tooth brush and the chemical effect of the miswak. These findings are similar to the previous results from 14 year old Ghana school-children.^[27] It has been reported in previous studies a positive relationship exists between gingival recession and the use of miswak as compared to the conventional toothbrushes.^[25, 28] however in the present study none of the study subjects reported gingival recession which could be possibly attributed to the younger age group chosen for the study. Furthermore, there can be certain limitations which can be attributed to the study, social desirability bias could be possible while the subjects filled the former part of the proforma where they could be socially influenced to write toothbrush or miswak as an oral hygiene maintenance tool. As all the study subjects were males, gender bias could not be ruled out. Study subjects could also have done better oral hygiene maintenance during the study period in order to please the examiners due to Hawthorne Effect. While observation during the present study, an important factor was seen that the miswak users tend to clean or use the miswak stick for a longer duration than the conventional tooth brush users which could affect the outcome of the study while all possible precautions were taken to decrease the Outcome choice bias.

CONCLUSION

The results from the present study denote that miswak can be suggested as an effective tool for oral hygiene maintenance as it is readily available and inexpensive. However, the findings of the present study further stress on the use of tooth brush and tooth paste in adjunct to use of Miswak for oral hygiene maintenance. However, further studies are warranted on modern scientific grounds.

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