The effect of chewing stick use on oral hygiene and gingival health of young adults in Nigeria

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ABSTRACT

Objective: The maintenance of good oral hygiene contributes to gingiva health. Several items have been used for mechanical removal of plague, examples of which are the chewing stick and toothbrush. The objective of this study was to assess the effect of using chewing stick to maintain gingival health.

Methods: A randomised, single blind, (clinical investigator) experimental study was conducted among 40 persons (20 chewing stick group and 20 toothbrush and toothpaste group). Data was collected through the use of interviewer-administered questionnaire and clinical examination. Evaluation of the effect on gingival health were done 3weeks and 6weeks after the baseline treatment (Scaling and polishing and oral hygiene instruction with emphasis on the use of toothbrush or chewing stick depending on which group

Results: The mean age of participants in the study was 21.58±2.43years. Participants in chewing stick group had significantly higher oral hygiene score than toothbrush group at 3 weeks post intervention only (P=0.03). The chewing stick group and toothbrush group did not have any significant difference in mean gingival index score at both 3 weeks and 6weeks post intervention stages

Conclusion: Chewing stick use resulted in poorer oral hygiene in the initial assessment but improved at second assessment. Chewing stick use resulted in lower non-significant positive effect on gingival health in comparison with toothbrush/toothpaste use. Dentists in resource poor economy should not discourage the use of chewing stick but rather educate users on the proper use of it, since it is cost effective

Keywords: Chewing stick, effect, gingival health. Toothbrush

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INTRODUCTION

Periodontal disease is one of the public oral health diseases and a major cause of tooth loss in Nigeria.[1] It is broadly categorised as gingivitis and periodontitis. Gingivitis is an earlier reversible form of periodontal disease in which inflammation is restricted by the gingiva without destruction of the supporting tissues. It may progress to periodontitis which is the irreversible destruction of the deeper structures of the periodontium with resultant connective tissue attachment and alveolar bone loss, periodontal pocket, tooth mobility and eventual tooth loss. There is general consensus that marginal gingivitis begins in early childhood, increase in prevalence and severity in the early teenage years, thereafter subsiding slightly and levelling off towards

the end of the second decade of life.[2] In Nigeria, a study done to assess the prevalence of gingivitis and periodontitis reported a prevalence of 75.4% and 15.4% respectively.[3] The primary aetiological factor for periodontal disease is dental plaque.[4] The removal and prevention of accumulation of plaque on the teeth and adjacent gingival surfaces helps to retard the formation of calculus, resolve gingival inflammation, facilitates the return to and preservation of periodontal health and oral health.[4] Cleaning agents used in the oral cavity are aimed at reducing plaque level. The role of regular plaque removal in controlling periodontal disease is based on the fact that if plaque is left undisturbed, it has the potential to become colonized by pathogenic bacteria.

Toothbrush, chewing sticks and other oral cleaning agents are used in both developing and developed countries to maintain oral hygiene. The toothbrush which historically dates as far back as 1600 when it was 1st invented by the Chinese, is now the most frequently used cleaning aid around the world in maintaining oral hygiene.[5] It is efficient, easy to use and has a good cleaning effect when the right method is used. However, chewing stick use has remained a common teeth cleaning device in many African houses. There is a long history of the use of plants to improve dental health and promote oral hygiene and is still commonly practiced amongst Asians and Africans. Teeth are cleaned in the morning by chewing the root, stem or twigs of certain plants until they acquire brush-like end before being used for thorough teeth cleaning.[6] In Ghana, Senegal, Nigeria and many other countries, chewing sticks are used frequently as teeth cleaning agent during the day.[7] Agbor and Azodo[8] reported that 85.0% of Muslims inhabitants of Banyo in Adamawa region of Cameroon use chewing stick for teeth cleaning. Buadu et al.[9] reported varying taste sensations from various chewing sticks ranging from a tingling peppery taste, a bitter taste to numbness. Some of the chewing sticks or their extracts are used in the ethnomedical treatment of oral infections.[10] Scientifically, the effectiveness of ethanol derivatives and aqueous extracts from chewing sticks against microorganism implicated in the aetiology of periodontal diseases like *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa* has been reported.[10]

The usefulness of chewing stick in maintaining oral hygiene and gingival health in comparison to toothbrush and toothpaste needs to be studied to provide evidence-based data for quality periodontal healthcare delivery. This study will also help provide adequate information to the general public about chewing stick. Few studies[11-15] that compared the effectiveness of chewing sticks in plaque removal to that of toothbrush reported that there is no difference in the cleanliness capacities of the toothbrush and chewing sticks. Adenirokun et al.[16] study, on the effect of chewing stick on gingival health and oral hygiene among 12 years old primary school pupils in Ibadan found no significant difference in the oral health status between those using the toothbrush and those using chewing stick. They reported a slight improvement in the gingival status of those using the chewing stick relative to those using toothbrush. However, the study did not perform scaling and polishing before the commencement of the study which undermined the baseline as scaling and polishing helps to restore the gingiva to state of health and the teeth to state of cleanliness. The objective of this study was to assess the effect of chewing stick use on oral hygiene and gingival health of young adult Nigerians

MATERIALS AND METHODS

This randomised, single blind, (clinical investigator) experimental was carried out in University of Benin Teaching Hospital Dental Clinic, Benin City, Edo State between January and August, 2017. Otherwise healthy volunteers aged between the age of 18 and 45years diagnosed with mild to moderate gingivitis using gingival index using Loe and Silness[12] with probing depth less than or equal to 3 and more than 1 gingival index score and those available at the time of study who gave their consent were included. Patients who did not give their consent to be part of the study, those less than 18years of age or greater than 45years, those who were systemically compromised, pregnant and lactating mothers, those with orthodontic appliances, those that have grossly carious teeth, mal-positioned teeth, crowded teeth, overhanging restoration, crowns and fixed partial dentures, those who used antibiotics in the previous three months and those with xerostomia and on antihistamine medication, those without index teeth for oral hygiene and gingival indices were excluded from the study.

Recruitment/sampling technique

Volunteers that met the inclusion criteria were randomised into 2 groups, the chewing stick and toothbrush groups by toss of coin until the minimum sample size is met. Written informed consent was

obtained from the participants. Participation was voluntary. Participants were assured of confidentiality and given the opportunity to withdraw at any time without prejudice in line with the Helsinki declaration.

1. Group A-patients cleaned their teeth with the provided toothbrush and toothpaste twice daily, mornings and evenings. (Control group)
2. Group B-patients cleaned their teeth with the provided chewing sticks twice daily, mornings and evenings. (Test group)

Forty age and sex of the patients in the group were also matched. In selecting patients, group B (chewing stick group) were given *Pako ijebu* of 20cm length and 1cm diameter while group A (toothbrush group) were given same type of toothbrush usually of straight handle and medium strength and toothpaste which they used exclusively for six weeks. *Pako ijebu* was procured from New Benin market and was identified by Dr. E. Ukpebor of Department of Plant Biology and Biotechnology, University of Benin.

Data were collected by means of questionnaire and clinical examination. The visit after recruitment, scaling and polishing were done for the participants in both groups, training on how to use the chewing sticks or toothbrush depending on their group was done using jaw model as a guide. The recording of clinical indices i.e gingival index according to Loe and Silness[17] and simplified oral hygiene index according to Greene and Vermillion[18] were done after 3weeks and 6 weeks. The obtained data was analysed using IBM SPSS version 21.0. The data was subjected to independent t-test and differences were considered significant if P-value was less than 0.05.

RESULTS

A total number of 40 persons participated actively for the 6 weeks in which the study was carried out. A higher proportion of participants assigned to the toothbrush group were in the 21-23 years age group 8 (57.1%) compared to the chewing stick group where the highest proportion 9 (56.3%) was seen to be in the 18-20 years group. There were more male participants in the chewing stick group 12 (54.5%) compared to the toothbrush group 10 (45.5%). Once-daily teeth cleaners constituted 56.0% of chewing stick group (Table 1).

Table 1: Sociodemographic variables, frequency and mode of tooth cleaning device

Variable	Tooth Cleaning Device	
	Chewing Stick n (%)	Tooth brush n (%)
Age (years)		
18-20	7 (43.8)	9 (56.3)
21-23	8 (57.1)	6 (42.9)
24-26	5 (50.0)	5 (50.0)
Mean ± SD	21.50 ± 2.35	21.65 ± 2.56
Sex		
Male	12 (54.5)	10 (45.5)
Female	8 (44.4)	10 (55.6)
Tooth cleaning frequency		
Once-daily	14 (56.0)	11 (44.0)
Twice daily	6 (40.0)	9 (60.0)

Before intervention, participants that were in the chewing stick group (case group) had a mean debris score of 1.06±0.06 which was statistically higher than 0.71±0.04 seen in the toothbrush group (control group) (P=0.000).The mean oral hygiene score of 2.11±0.19 in chewing stick group was higher compared to those in the toothbrush group (control group), 1.70±0.14. This difference in oral hygiene score observed with the different groups was not statistically significant (p = 0.09). The mean GI of participants in the chewing stick group was 0.78±0.07 which was higher compared to that of those in the toothbrush group 0.58±0.07. This difference in mean GI observed in different groups was not statistically significant (P=0.05) (Table 2).

Three weeks post intervention, the mean SOHI for both groups had dropped, however, the mean value obtained for the chewing stick group was still higher 0.40±0.06 than that observed for the toothbrush group 0.23±0.05. This difference in 3 weeks post

intervention mean SOHI observed with the different groups was statistically significant (p = 0.03). Similarly, 3 weeks post intervention GI was also found to be lower than that seen earlier. Three weeks post intervention mean GI for participants in the chewing stick group was 0.67±0.05 which was higher albeit slightly than that observed for participants in the toothbrush group 0.49±0.08. This difference observed was however not statistically significant (p = 0.08) (Table 3).

After 6 weeks post intervention, on reassessing the mean SOHI of participants, the value gotten for both groups was slightly higher than that observed 3 weeks post intervention. The participants in the chewing stick group had a 6 weeks post intervention mean SOHI of 0.50±0.08 which was higher compared to the value gotten for participants in the toothbrush group 0.33±0.05. This difference in mean SOHI observed 6 weeks post intervention among different groups was not statistically significant (p = 0.08). A similar trend was observed with the 6 weeks post intervention mean GI as a slight rise was observed. Those in the chewing stick group had a mean GI of 0.78±0.07 compared to participants in the toothbrush group who had a 6 weeks post intervention mean GI of 0.58±0.07. This difference observed was statistically significant (p = 0.05) (Table 4).

Table 2: Mean Oral hygiene and gingival scores of participants at baseline

Variable	Group		t	P-value
	Chewing stick (n = 20) Mean±SEM	Toothbrush (n = 20) Mean±SEM		
Baseline				
Debris Index score,	1.06±0.06	0.71±0.04	4.749	0.00
Calculus Index score,	1.05±0.14	0.99±0.12	0.313	0.76
Simplifed Oral Hygiene Index score	2.11±0.19	1.70±0.14	1.735	0.09
Gingival index score	0.78±0.07	0.58±0.07	2.061	0.05

Table 3: Mean Oral hygiene and gingival scores of participants at 3weeks post intervention

Variable	Group		t	P-value
	Chewing stick (n=20) Mean±SEM	Toothbrush (n= 20) Mean±SEM		
3weeks post intervention				
Debris Index score	0.32±0.05	0.18±0.04	2.055	0.05
Calculus Index score	0.08±0.03	0.04±0.02	1.269	0.21
Simplifed Oral Hygiene Index score,	0.40±0.06	0.23±0.05	2.327	0.03
Gingival index score	0.67±0.05	0.49±0.08	1.794	0.08

Table 4: Mean Oral hygiene and gingival scores of participants at 6weeks post intervention

Variable	Group		t	P-value
	Chewing stick (n = 20) Mean±SEM	Toothbrush (n = 20) Mean±SEM		
6weeks post intervention				
Debris Index score,	0.35±0.05	0.25±0.04	1.580	0.18
Calculus Index score,	0.15±0.04	0.07±0.03	1.707	0.10
Simplified Oral Hygiene Index score	0.50±0.08	0.33±0.05	1.831	0.08
Gingival index score	0.78±0.07	0.58±0.07	2.061	0.05

DISCUSSION

In comparing the effectiveness of both chewing stick and the toothbrush, there was no significant difference in their efficacy in terms of the mean debris score and calculus score at 3 and 6 weeks after intervention. This non-significant difference in

plaque scores among chewing stick and toothbrush/toothpaste user have also been reported in studies that assessed plaque using Quigley-Hein plaque index by Bhambal et al.[11] in India and photographic method by Batwa et al.[12] in Sweden. Contrary to studies done in Ghana, Saudi Arabia and Pakistan which reported less plaque formation rate in chewing stick users than toothbrush and toothpaste users.[13-15] This may be because chewing sticks result in increased flow of saliva and inhibits the formation of dental plaque. Chewing stick has revealed parallel and at times lesser mechanical and chemical cleansing of oral tissues as compared to a toothbrush. Although, toothbrush and toothpaste users were consistently found to have lower mean debris and calculus scores than chewing stick users. The slightly better result amongst the participants who used toothbrush and toothpaste may be due to the fact that almost all those recruited for this study had never used chewing stick prior to the study. Hence, they were less adept in employing effective tooth cleaning techniques which are required when using chewing stick.

Oral hygiene assessed using simplified oral hygiene index was found to be significantly better in toothbrush/toothpaste users than chewing stick users at the 3week post intervention. Poorer oral hygiene score in chewing stick users may be due to the challenges of topographic design of handles and bristles of the chewing stick particularly in relation to the cleaning of posterior teeth.[19,20] Although twice-daily instruction was given to both groups, the fact that once-daily teeth cleaners were more in the chewing stick group may have contributed to the lower efficacy in chewing stick group as behavioural changes are known to gradually improve since no significant difference was noted at 6weeks post-intervention.

Chewing sticks used in Nigeria has been reported to have antibacterial effect periodontopathogenic organisms[21,22] and they may positively affect the health of the periodontium. The gingival health of the chewing stick and toothbrush and toothpaste users were not significantly different. This non-significant difference in gingival score chewing stick and toothbrush and toothpaste users has also been reported.[18,23] Though not significantly different, chewing stick users had lesser probing depth and higher attachment loss as well as a tendency to gingival bleeding in the posterior sextants than toothbrush/toothpaste users.[24] The observed lesser positive effect of chewing stick on gingiva in this study could be attributed to lesser decline in debris among chewing stick users than tooth/toothpaste user. The lesser resolution of inflammation after scaling due to more plaque and calculus as indicated by the baseline debris and calculus scores in chewing stick users than toothbrush/toothpaste users may have contributed to the non-significantly higher gingival index score in chewing stick users. Further study for a longer period is recommended.

CONCLUSION

Chewing stick use resulted in poorer oral hygiene in the assessment done at 3 weeks post use but improved at second assessment done 6 weeks post use. Chewing stick use resulted in lower non-significant positive effect on gingival health in comparison with toothbrush/toothpaste use. Dentists in resource poor economy should not discourage chewing stick users but rather teach them the proper ways to use it in teeth cleaning because of its low-cost effectiveness.

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