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Assessment of user Satisfaction of Bamboo Toothbrushes among Students of Dental Institute of North Gujarat: A Questionnaire Study

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Abstract:

Introduction: There are many novel toothbrushes which are available in the market today. The most sustainable option among all is the Bamboo toothbrush. Till date there have not been many studies conducted, in our area which demonstrated the efficacy of bamboo tooth brushes in maintaining oral hygiene.

Objectives: To assess the user satisfaction of bamboo toothbrushes among students of a dental college in North Gujarat.

Materials and Methods: A triple blind randomized controlled study was conducted among the 40 dental students for a period of 3 months. They were divided into 2 groups, were given oral hygiene instructions and brushing technique demonstration at the beginning of the study. At the end of the 2 months, the participants were made to fill a Google form questionnaire to assess the user satisfaction of using the toothbrush given to them.

Results: 40 students had participated in the present study (20 males and 20 females). They were randomly allotted to 2 groups such that each group had 10 males and 10 females. The mean age of the study participants was 21.45 ± 2.11 years. From the above results it can be seen that among the males majority from both the groups and among the females 60% from both the groups agreed that the toothbrushes allotted to them were sustainable.

Conclusion: It was concluded that the bamboo toothbrushes were a sustainable option as compared to the plastic toothbrushes.

Keywords:- *Bamboo toothbrush, environment, satisfaction, sustainability.*

I. INTRODUCTION

Dental plaque has been defined as a highly variable structural entity resulting from sequential colonization of microbes on tooth surfaces, restorations or parts of prosthesis. It is pale yellowish, sticky substance adhering to the tooth surface either above the gingival margin (supragingival plaque) or below the gingival margin (subgingival plaque).[1] These deposits of dental plaque are found in the proximal areas, along the gingival margins and on the defects of the teeth or on restorations. These areas are maintained free of plaque by the natural cleansing mechanism of the oral cavity.[2] Many times, it is found in some individuals, that plaque deposits are adhered to the tooth surfaces, which are not cleaned by the natural cleansing mechanism of the saliva.[2] Deposits of dental plaque, if left untreated, on tooth surface, may lead to stagnation of the surrounding tissues. This may lead to the destruction of the protective tissues leading to gingivitis and periodontitis.[1] Lekholm et al have also shown a direct correlation between the levels of dental plaque and an increased probing depth.[3]

Plaque control is of utmost importance in maintaining the healthy oral hygiene of individuals.[4] Effective plaque control techniques are of 2 types: Mechanical and Chemical. Proper tooth brushing is the easiest and cheapest method of maintaining oral hygiene. [4]

The toothbrush invention dates back to the early 1600s. It was designed to promote the cleanliness of the teeth and the oral cavity. In India, before the invention of the toothbrush, people used “chewing sticks” for maintenance of oral hygiene. The first modern toothbrush was made from an ox thigh bone and the bristles were made from cow’s tail. Eventually the toothbrushes underwent evolutionary changes and nylon bristles, plastic handles came into existence. Ever since then, many toothbrushes with different handles and bristles and neck designs have come into existence.[5] Electric and sonic toothbrushes are also inventions which are said to help individuals with impaired dexterity to maintain oral hygiene.[5]

A common feature among all the toothbrushes is that the body of the toothbrush is usually made of plastic with nylon bristles. Nylon bristles are found to be reusable or if being degraded, they donot take as long as plastic to degrade. Plastic on the other hand, is non biodegradable and is reusuable only in some forms and parts. The remainder of the plastic of the toothbrush is left to haunt the landfills for many years.[6]

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Environmental sustainability is the biggest problem faced by healthcare professionals, globally. Global healthcare is a significant contributor to carbon dioxide emissions. Improving carbon footprint is a common environmental goal for healthcare professionals.[7] The National Health Service in the United Kingdom considers it a success if healthcare professionals are encouraged to consider sustainability principles when deciding treatments protocols for their patients.[8]

Taking into account the environmental sustainability, the bamboo toothbrush was used in the current study to assess its user satisfaction among students of a private dental institute in North Gujarat.

II. METHODOLOGY

This triple blind, randomized, parallel study was conducted among dental students in a private dental college from August 2021 – October 2021 for a period of 3 months. Two types of toothrushes were used – plastic toothbrush and bamboo toothbrush. Ethical clearance was obtained from the Institutional Ethical Committee (IEC). Prior to the start of the study, written consent was taken from all the study participants.

A. Sample Size:

Each group had 20 participants. Sample size calculation was done based on literature and using the G Power software. This sample size provided minimum 0.80 power and 5% significance and minimum 0.77 effect.

B. Selection of study participants:

Volunteers - students from the dental institute of North Gujarat were invited to participate in the study. They were informed about the study protocols and were also informed about being free to leave the experiment at any time, if they wished to. Study participants were aged between 18 – 25 years.

C. Inclusion criteria:

- Individuals willing to give written informed consent.
- All individuals from 1st year BDS to Interns were included in the study.
- Individuals having good general health.

D. Exclusion Criteria:

- Individuals not willing to give informed consent.
- Individuals who had undergone oral prophylaxis in the last 3 months.
- Individuals undergoing orthodontic treatment or wearing fixed orthodontic retainers.

The individuals were randomly given numbers from 1-40 and were divided into 2 groups based on odd- even numbers. All individuals belonging to the odd number group were given the Bamboo toothbrush (TB1) and those belonging to the even number group were given the Plastic toothbrush (TB2). They were then given the Modified Bass technique demonstration and were asked to brush with the given toothbrush twice daily for 3 months.

E. Questionnaire:

At the end of 3 months, all individuals were asked to fill a Google form questionnaire. The questionnaire consisted of 2 parts – the first part consisted of demographic details and the second part consisted of 21 questions related to the user satisfaction of using the bamboo toothbrushes and the plastic toothbrushes.

F. Statistical Analysis:

All the data was recorded into MS excel 2013. Percentages were calculated for each question.

III. RESULTS

40 students had participated in the present study (20 males and 20 females). They were randomly allotted to 2 groups such that each group had 10 males and 10 females. The mean age of the study participants was 21.45 ± 2.11 years.

Question	TB1		TB2	
	Yes	No	Yes	No
Do you have the practice of using any inter dental aids?	00	10 (100%)	2 (20%)	8 (80%)
Did you experience any gingival (gum) bleeding while brushing prior to start of study?	00	10 (100%)	1 (10%)	9 (90%)
Were you comfortable using the toothbrush allotted to you?	10 (100%)	00	7 (70%)	3 (30%)
Was the lodged food removed after brushing with the tooth brush allotted to you?	10 (100%)	00	8 (80%)	2 (20%)
Were you able to incorporate the Modified Bass technique demonstration given to you?	10 (100%)	00	10 (100%)	00
Were you comfortable using the toothbrush allotted to you?	10 (100%)	00	7 (70%)	3 (30%)
Were you able to clean the backmost teeth using the tooth brush allotted to you?	7 (70%)	3 (30%)	8 (80%)	2 (20%)
Was the tooth brush allotted to you sustainable?	7 (70%)	3 (30%)	6 (60%)	4 (40%)
According to you, are bamboo tooth brushes economical to use?	7 (70%)	3 (30%)	10 (100%)	0
Are bamboo tooth brushes currently available locally in your area?	5 (50%)	5 (50%)	7 (70%)	3 (30%)
Did you feel the need to use another dental aid for better cleaning experience along with the tooth brush?	4 (40%)	6 (60%)	5 (50%)	5 (50%)
Did you find any difference in the bristles of the tooth brush allotted to you?	9 (90%)	1 (10%)	9 (90%)	1 (10%)

Table 1: Shows the responses of male study participants to the questionnaire

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Question	TB1		TB2	
	Yes	No	Yes	No
Do you have the practice of using any inter dental aids?	2 (20%)	8 (80%)	1 (10%)	9 (90%)
Did you experience any gingival (gum) bleeding while brushing prior to start of study?	0	10 (100%)	0	10 (100%)
Were you comfortable using the toothbrush allotted to you?	9 (90%)	1 (10%)	8 (80%)	2 (20%)
Was the lodged food removed after brushing with the tooth brush allotted to you?	9 (90%)	1 (10%)	9 (90%)	1 (10%)
Were you able to incorporate the Modified Bass technique demonstration given to you?	9 (90%)	1 (10%)	10 (100%)	0
Were you comfortable using the toothbrush allotted to you?	9 (90%)	1 (10%)	8 (80%)	2 (20%)
Were you able to clean the backmost teeth using the tooth brush allotted to you?	8 (80%)	2 (20%)	8 (80%)	2 (20%)
Was the tooth brush allotted to you sustainable?	6 (60%)	4 (40%)	6 (60%)	4(40%)
According to you, are bamboo tooth brushes economical to use?	9 (90%)	1 (10%)	4 (40%)	6 (60%)
Are bamboo tooth brushes currently available locally in your area?	3 (30%)	7 (70%)	4 (40%)	6 (60%)
Did you feel the need to use another dental aid for better cleaning experience along with the tooth brush?	3 (30%)	7 (70%)	4 (40%)	6 (60%)
Did you find any difference in the bristles of the tooth brush allotted to you?	5 (50%)	5 (50%)	6 (60%)	4 (40%)

Table 2: Shows the responses of female study participants in the questionnaire.

From the above results it can be seen that among the males majority from both the groups and among the females 60% from both the groups agreed that the toothbrushes allotted to them were sustainable. 100% of male participants were comfortable using the bamboo toothbrush allotted to them, whereas 90% female participants were comfortable using the bamboo toothbrushes. None of the participants from any genders and any groups had any bleeding gums while brushing.

IV. DISCUSSION

Health interventions often include many unquantifiable variables which usually add layers of complexity to the environment. Many healthcare items although, life saving, (eg. Tablet packaging, vial bottles, syringes, etc) come in non environmental friendly packaging. These items in the long run, have a damaging effect on the environment as they donot decompose easily.[9] Toothbrush is one such example.

The toothbrush is the most effective and economical way of mechanical plaque control. The major drawback of the toothbrush is that they have always been made of plastic, which is harmful for the environment. In a study conducted by Duane B et al, it was stated that the production of the manual plastic toothbrushes produced around 2.5 million kg CO2E, every year.[9]

A simple yet effective mechanical plaque control method could be initiated by the use of the bamboo toothbrushes. Bamboo is largely cultivated in China. For the making of the toothbrushes, the handle is completely carved out of bamboo, whereas the brush bristles are made of nylon material.[9] During the degradation process, only the nylon bristles would take a longer time to decompose as compared to the handle of the brush. It is important to note here that the bristles would still take fewer years to decompose as compared to the handle of the plastic toothrushes.[9]

The current study was conducted with an aim to assess the user satisfaction while using a bamboo toothbrush. In the past, studies have been conducted with many other types of toothbrushes like the electric toothbrush, the sonic toothbrush, etc. This was the first study, conducted in our area which used a bamboo toothbrush.

In a study conducted by Bhimani et al, they reported similar results to our study regarding bleeding gums while brushing. They stated that 85.96% study participants did not experience any bleeding while brushing their teeth with the toothbrush given to them. Both the toothbrushes used in our study had soft bristles with end rounded filaments.[5] Breintenmoser stated that manual toothbrushes with cut filaments resulted in greater gingival lesions or gingival bleeding than end rounded filaments. [10]

Male study participants who were allotted the bamboo toothbrush stated that they were able to remove the lodged food from the tooth surfaces, whereas, among those males in the plastic toothbrush group, 20% stated that they were not able to do so. Similarly, among females in the plastic toothbrush group, 10% stated that they were unable to remove the lodged food during brushing. In a similar study conducted by Bhimani et al, they found that 84.62% males experienced residual food debris with the toothbrush allotted to them. The authors have stated that a possible reason for this could be the regular use of the medium/ hard toothbrush by males on a daily basis which made them believe that the soft bristled toothbrush was not effective due to its soft texture. [6]

20% females from both the groups reported that they were unable to clean the backmost teeth with the toothbrush allotted to them. Similarly, 30% males belonging to the bamboo toothbrush group and 20% belonging to the plastic toothbrush group couldn't access their backmost teeth with the toothbrush allotted to them. Kanchanakamol and Srisilapanam have stated in their study that angulated handles and neck design of toothbrush resulted in better

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plaque removal from the posterior teeth of individuals. [11] Khare et al in their study have stated that females have lesser mouth opening than males which makes it difficult for them to access the posterior most teeth in the mouth. This statement is in contrast to the results obtained in our study. In our study, a higher number of male participants couldn't access the posterior most teeth as compared to females.[12]

Lazarescu et al in their study have stated that patient compliance is of paramount importance and plays a vital role in mechanical plaque control methods. Encouragement of patients on a repetitive basis with tailor made instructions, and demonstrating brushing technique to them help retain information better regarding the brushing technique. Almost all the participants in the current study found the brushing technique demonstration to be useful to them and were able to incorporate it in their daily schedule.[11,16]

The authors of this particular study believe that the results of this study can be put forward to the public to get an opinion of their perception regarding the manual use of the bamboo toothbrushes. Dentists should also actively take part in the policy making of such decisions which focuses on environmental health as well as satisfaction of their patients.[3]

The main limitations associated with the bamboo toothbrush used in our study were that it did not have a flexible neck design and it was expensive as compared to a plastic, conventional toothbrush.

V. CONCLUSION

The current study throws some light on the user satisfaction of using the bamboo toothbrushes. The authors recommend that further studies should be done on populations with intermediate or advanced dental diseases to check for efficacy and on populations with limited mobility to check for manual dexterity of such patients while using this toothbrush.

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