Index Plaque Differences between Before and After

Chewing Apples

Firdaus Taufik* **Hj. Eriska Riyanti**** Hj. Dede Hadidjah***

*   Graduate Student of Dentistry The Faculty of Dentistry Padjadjaran University
Bandung-Indonesia

**   Department of Pediatric Dentistry Faculty of Dentistry Padjadjaran University
Bandung-Indonesia

***   Department of Periodontic Dentistry Faculty of Dentistry Padjadjaran University
Bandung-Indonesia

ABSTRACT

Various of fresh, half-riped, watery, and fibrous fruits can decrease the plaque index, one of them is apple. The purpose of this research was to asses the differences of plaque index between before and after chewing apples. The methode of this research is pra experimental design, one group pretest-postest planning. Sample was taken using purposive sampling consisted of children aged 9-14 years old in Taman Harapan Muhammadiyah Bandung Orphanage. Assesment plaque methode was plaque index from Quigley Hein Turesky Modification and Addy et al. The data was shown as plaque index and statistically analized using ranking test marked Wilcoxon. The result of Wilcoxon test showed that plaque index from Quigley Hein Turesky Modification and Addy et al., rejected Ho because $Z_{count} > Z_{table}$. This meant that there was a significant decrease of plaque index after chewing apples. The research concluded that plaque index decreased after chewing apples especially the oclusal area of posterior teeth, so there were differences between before and after chewing apples.

Keywords: plaque, plaque index, apples.

INTRODUCTION

A very hygiene oral cavity is recommended as an effort to prevent dental and oral diseases. [1] Until this date, the most common dental disease is dental caries, followed by periodontal disease. This cause of the disease occurred in almost 75-90% of the world population is plaque. The result of family health survey in 2004 by Ministry of Health shows that the prevalence of dental caries in Indonesia is 90,05%. Dental caries is caused by the damage in the enamel (demineralization process) due to *Streptococcus mutans* in the plaque.[2]

According to the survey conducted in 1993 by Yayasan Kesehatan Gigi Indonesia, it is shown that 70% of the children develop dental caries and gingivitis. It is not only medical treatment but also preventive and promotive actions that are required to decrease that

number. One of the efforts in preventing dental caries and gingivitis is by keeping the tooth hygiene and free from plaque.[3]

Plaque is primary etiologic factor of dental and periodontal diseases, because it contains pathogen bacteria whose metabolic products adhered in tooth and gingival surface.[4] The effort in preventing dental and periodontal disease as well as increasing oral hygiene can be done by preventing and removing plaque accumulation.[5]

Preventive effort on dental plaque is called plaque control. There are three ways of controlling plaque: mechanically, chemically, and the modification of mechanical and chemical methods.[1] One of the most reliable plaque control method commonly done by community is mechanical plaque control using manual toothbrush. However, lack of tooth-brushing effectivity and individual motivation make the tooth-cleaning process becomes unperfect.[6]

The other effort in controlling plaque can be done chemically using special solution or mouthwash. Besides mechanically and chemically, plaque control can be done by combining these two methods, i.e by chewing fresh and fibrous fruit. Fruit are believed as a good food for dental health and can be used as a natural tooth brush. [1]

Several of fresh, half-riped, watery, and fibrous fruit can decrease the plaque index, one of them is apple. [5,7] The chewing of apple can give positive effect on dental hygiene. Apple can remove the food adhered behind the tooth and gingival, so that can prevent caries and gingival disease. The chewing of apple is often called natural way of tooth brushing, because apple has big particles that should be chewed longer before swallowing, so that it can directly remove the plaque.[8]

The children with age ranged from 9-14 years old become the main target of this research because 9-14 years old is included in school age. In this range of age, children begin to interact with their new environment, and their curiosity on the new thing tends to increase. Children tend to try the new kind of food they find in school environment, therefore their food intake need to be given more attention.[9]

Taman Harapan Muhammadiyah Orphanage is an orphanage located in Jalan Nilem No. 9 Buahbatu Bandung. This orpanage is chosen as the location of the research because this the orphans tends to get less attention on their food, because there are not enough

guardian to keep an eye on the children. Lack of attention make the orphans neglect their dental and oral hygiene.

Based on the theoretical information described, writer is interested in conducting a research on the differences of plaque index before and after chewing apples in children with the age ranges from 9-14 years old in Taman Harapan Muhammadiyah Orphanage, Bandung.

METHOD AND RESEARCH MATERIAL

Research method is *pra experimental design, one group pretest-postest* design with research procedures including plaque assessment before and after chewing apples. [10] Plaque assessment method used was plaque index from Quigley Hein Turesky Modification 1970 for buccal and lingual surface. Meanwhile for occlusal surface, plaque index of Addy et al 1998 was used. Sample was the children in Taman harapan Muhammadiyah Orphanage, which was taken using purposive sampling. Population criteria in this research are: children with the age ranged from 9-14 years old, male or female, having good general health, having good dental and oral health, having chewing habits in both sides, is not using removable or fixed orthodontic appliances and dentures, is not consuming any medicine. Instruments and materials used in the research were handle mirror, explorer, tweezers, flashlight, handscoone masker, rinsing glass, informed consent, research form and questioner, stationery, *Romebeauty* apple, disclosing solution, alcohol 70%. The procedures of the research are: before treating, samples were asked not to do the activities of cleaning tooth and mouth, such as tooth brushing, flossing or tooth picking for 24 hours before plaque assessment was done. Samples were then instructed to clean the food remained in oral cavity by rinsing their mouth, then two drops of disclosing solution were dropped in the back of the tongue. Afterwards they were instructed to rinse using saliva, so that the solution can spread into all teeth surfaces. Sample's initial plaque index was calculated using plaque index of Quigley Hein Turesky Modification for all bucal and lingual surface of all teeth, meanwhile for occlusal surface of molar and premolar, plaque index of Addy et al was used. After the assessment, samples were instructed to chew apple in both side for 8 minutes before they were instructed to rinse again using a glass of water. Samples' plaque

index was then calculated again using Quigley Hein Turesky Modification and Addy et al methods after chewing apples. The data obtained were plaque index which were analyzed using ranking test marked Wilcoxon.

RESULT OF THE RESEARCH

The research was done on 30 children in Taman Harapan Muhammadiyah Orphanage whose age ranged from 9-14 years old. Each sample was given twice plaque assessment. The results of the research are:

1. Plaque Index of Quigley Hein Turesky Modification.

Table 1 shows average value before and after chewing apples based on Plaque Index of Quigley Hein Turesky Modification.

Table 1   The average of Plaque Index of Quigley Hein Turesky Modification before and After Chewing Apples

	n	Average of plaque Index
Before Chewing Apples	30	2,45
After Chewing Apples	30	1,69

Based on Table 1, it can be seen that the average of plaque index before chewing apples is 2,45 and average of plaque index after chewing apples is 1,69. It can be concluded that based on Plaque Index of Quigley Hein, plaque index before chewing apples is higher than those after chewing apples.

Wilcoxon Test shows a significant difference before and after chewing apples. Statistical hypothesis for bucal and lingual Quigley Hein Turesky Modification plaque index as follows:

$H_0 : \mu_{sebelum} = \mu_{sesudah}$ There are no differences of plaque index in bucal and lingual surface before and after chewing apples.

$H_1 : \mu_{sebelum} \neq \mu_{sesudah}$ There are differences of plaque index in bucal and lingual surface before and after chewing apples.

Table 2 .Wilcoxon Value for Plaque Index of Quigley Hein Turesky Modification .

Z count	Z table	Conclusion	Note
4,78	1,96	Rejected H_0	Significant difference

According to Table 2, it is obtained that Z_{count} is 4,78 and Z_{table} is 1,96. Because Z_{count} > Z_{table} , so H_0 is rejected. It can be concluded that there is a significant difference in plaque index of bucal and lingual surfaces before and after chewing apples.

2. Plaque Index of Addy et al.

Table 3 Shows the average of plaque index before and after chewing apples based on Plaque Index of Addy et al.

Table 3. Plaque Index of Addy et al.before and after chewing apples

	n	**Average of plaque Index**
Before Chewing Apples	30	1,95
After Chewing Apples	30	1,16

Table 3 shows that the average of plaque index before chewing apples is 1,95. Meanwhile the average of plaque index after chewing apples is 1,16. It can be concluded that according to plaque index of Addy et al, the value of plaque index before chewing apples is higher than the value after chewing apples.

Statistical hypothesis for occlusal surface of plaque index of Addy et al. is as follows:

$H_0 : \mu_{sebelum} = \mu_{sesudah}$ There are no differences of plaque index in occlusal surface before and after chewing apples.

$H_1 : \mu_{sebelum} \neq \mu_{sesudah}$ There are differences of plaque index in occlusal surface before and after chewing apples.

Table 4. Wilcoxon Value for plaque index of Addy et al.

Z count	Z table	Conclusion	Note
4,78	1,96	Rejected H_0	Significant difference

Based on Table 4, it is obtained the value of Z_{count} is 4,78 and the value of Z_{table} is 1,96. Because the value of $Z_{count} > Z_{table}$ thus H_0 is rejected. It can be concluded that there are significant differences of plaque index in occlusal surface before and after chewing apples.

DISCUSSION

Based on the result of the reserach, the average of both plaque index of Quigley Hein Turesky Modification and the plaque index of Addy et al. before and after chewing apples show the differences and the decrease of plaque index. Table 1 and 3 show that chewing apples can decrease the plaque index of Quigley Hein Turesky Modification, with the decrease value 0,76. The same is also applied for plaque index of Addy et al., with the value 0,79. Writer has an opinion that the content of fibrousa and watery apples, which is sweet and sour, can function as a natural tooth brush that can decrease the plaque index. This opinion is agree with the statement of Blignaut and Grobler [7] stated that several fibrous fruit (e.g. apples) can give benefit to oral and dental health, because it can decrease the plaque index.

This research uses two plaque assessment, they are plaque index of Quigley Hein Turesky Modification for assessing buccal and lingual surfaces of all teeth, and plaque index of Addy et al. for assessing occlusal surface of posterior teeth. In anterior teeth, the region having highest decrease of plaque is buccal region, whereas in posterior teeth, the highest decrease occurs in occlusal region, as shown in Table 3. Supposedly, it is because most of the sample chew their food using posterior teeth, thus apples clean more in occlusal region of posterior teeth. This presumption is according to the statement of Malahayati and Lestari [11] that chewing fresh apples can decrease the plaque in occlusal region.

The result of the research shows the differences in the decrease of plaque in each sample. Some of them shows low decrease of plaque index, and others show average or high decrease. Supposedly this is due to habitual factor of the samples in chewing.

According to Amerongen[12], one of the factors affected saliva secretion is chewing movement. Chewing movement results from the movement of mastication muscle, which will stimulate saliva secretion, therefore the longer the chewing, the more saliva secreted. Thus saliva will clean the teeth better.

Apples are solid and rough, so by chewing apples, it can increase the volume of saliva. According to the opinion of Rensburg[13], chewing rough food can stimulate the volume and the flow of saliva mechanically. It can help in cleaning particles in the mouth by carrying the particles with saliva, and then bring them together when swallowing. According to Amerongen[12], the increase of saliva flow will cause the increase of saliva pH, thus can prevent bacterial metabolism in oral cavity.

The content of sour and sweet tastes in apples can help in increasing saliva flow chemically. According to Amerongen[12]'s opinion, the taste of sweet and sour in fruit can stimulate saliva flow, thus can help in cleaning the bacteria and food remained in the tooth.

It can be concluded that cleaner capacity of apples derive from the content of fiber, the rough texture, sour and sweet tastes, and the chewing movement. These all factors can increase saliva flow, although cleaner capacity derived from sour and sweet tastes is not as strong as mechanical cleaner capacity derived from fiber and rough texture in decreasing plaque index. The rate of saliva flow gives optimal protection towards the teeth.

GRATITUTION

REFERENCE

1. Lindhe, J. *Clinical Periodontology and Implant Dentistry.* 4th ed. UK: Blackwell Munksgaard. 2003. 81-98, 449-461.

2. Mangku. Orang Indonesia malas menggosok gigi 2007. Available at : http://www.suarakarya-online.com. Diakses 10 Maret 2008.

3. Yayasan Kesehatan Gigi Indonesia. Meningkatkan kesehatan gigi dan mulut melalui pelayanan pencegahan dan pendidikan (*Preventive Care* dan *Dental Health Education*). 2008. Available at: *http://www.ykgi.or.id/profilykgi.html*. Diakses 10 Maret 2008.

4. Carranza, *et al. Clinical Periodontology*. 10th ed. California: Saunders Elsevier. 2006. 137-149, 728-743.

5. Hoag, P.M., *and* E.A. Pawlak. *Essentials of Periodontics*. 4th ed. Philadelphia: C.V. Mosby Company. 1990. 146-174.

6. Kidd, E.A.M., dan S.J. Bechal. *Dasar-dasar Karies, Penyakit, dan Penanggulangannya*. Jakarta: EGC. 1992. 141-162.

7. Blignaut, J.B., *and* S.R. Grobler. High fruit consumption and the periodontal status of farm workers. *Clin Preventive Dent Vol. 14 No. 1.* Texas: Steven Publishing Corporation. 1992. 25-28.

8. Zein. Manfaat apel. 2007. Available at : *http://www.sportindo.com.htm*. Diakses 5 Oktober 2007.

9. Pinkham, J.R. *et al. Pediatric Dentistry : Infancy Through Adolescene*. 4th Ed. Saint Louis: Elsevier Saunders. 2005. 421-422, 469-476.

10. Notoatmodjo, S. *Metodologi Penelitian Kesehatan*. Jakarta: Rineka Cipta. 2005. 162-164.

11. Malahayati, C., dan Lestari, S. Pengaruh makan apel dalam pembentukan plak gigi pada anak-anak Panti Asuhan Al-Khairiyah Jakarta Selatan. *JKGI Tahun Ke-54 No. 1*. 2004. 17-20.

12. Amerongen, A. *Ludah dan Kelenjar Ludah Arti bagi Kesehatan Gigi*. Diterjemahkan oleh R. Abyono. Yogyakarta: Gajah Mada University Press. 1991. 1-2, 36-41, 157-159.

13. Rensburg, B.G. *Oral Biology*. Germany. Quintessence Publishing Co, Inc. 1995. 469-477.