

---

## THE EFFECT OF SNACKS ON PERIODONTAL HEALTH AND DENTAL CARIES AMONG SCHOOL GOING ADOLESCENTS IN WESTERN KENYA

Omutimba D.S., Joseph K. Rotich, C.K. Sang ,  
School of Public Health, and Dentistry, Moi University, Eldoret, Kenya  
Email: scott.omutimba@gmail.com

### ABSTRACT

The state of oral health in Kenya continues to generate a lot of interest considering there has been no national oral health survey for the entire nation. The main aim of the study was to investigate the relationship between snacking behavior and the level of dental caries and periodontal health. Simple random sampling techniques were used to select the study participants. Data collection was done through self-administered questionnaires and oral examination of the 389 respondents from a total of 20 schools in Western Kenya. Snacking behavior was reported in 62.5% of the respondents. Higher caries and poor periodontal health reported in those who didn't take snacks. The risk of poor periodontal health was 1.7 times more likely in those who didn't take snacks.

*Key words: Dental Caries, Periodontal Health Status, Snacking*

---

### INTRODUCTION

Dental caries is defined as a chronic infectious condition that affects the mineralized portions of the tooth, characterized by the demineralization of the organic portion followed by dissolution of the organic residues. Dental caries is a multi factorial and complex process entailing the interaction of both direct and indirect factors. The direct factors include a susceptible tooth, fermentable carbohydrate and cariogenic microorganisms while the indirect factors are saliva, patient or dentist measures, fluorides and genetics.

Periodontal conditions are one of the major oral diseases that afflict the mouth and its related tissues and are considered among the world's commonest diseases (Ohito, 1992). The Application for the International Classification of Diseases to Dentistry and Stomatology (WHO 2009) classifies gingival periodontal conditions using the code K05 as an almost universal disease that afflicts the gingival periodontal tissues. Chronic gingivitis is a periodontal condition defined as inflammation of the marginal gingival tissues due to the accumulation of dental plaque around the necks of the teeth. It occurs as a result of persistent low grade infection of the gum around the teeth, which is characterized clinically by redness, swelling and bleeding of the gingival tissues (Williams, Odell and Farthing, 1992). Gingival periodontal conditions may cause undue discomfort, pain, social and functional impairments and limitations to the unfortunate victims. There has been a vast amount of experimental work (Jenkins, 1978) linking

fermentable carbohydrate etiology and it has shown how dietary advice has an important role in the management of the carious process.

Animal experiments have confirmed the positive correlation between frequency of sugar intake and caries severity (Jenkins, 1978). In animal experiments which have been used to test the cariogenicity of foods, glucose and sucrose were found to be the most cariogenic (Kidd and Joyston-Bechal, 1997).

Controlled diet before the age of 12 does not confer any immunity from caries after the age of 12 years. The Vipeholm study carried out by the Swedish government in 1939 sought to investigate the relationship between diet and caries. It observed that caries increased with the addition of sucrose supplements between meals (Kidd and Joyston-Bechal, 1997). A longitudinal study done in Northumberland (UK) and Michigan (USA) among adolescent school children living in areas with minimal fluoride found a positive but low correlation between caries increase and diet (Rugg-Gunn, Hackett, Appleton, Jenkins and Eastoe, 1984; Burt et. al, 1988 ).Caries was seen to be more in children with high sugar intakes. The invasion of sweet snacks into the Kenyan urban way of life could have contributed to the development of dental caries in school children (Masiga and Holt, 1993).Some past studies found no significant relationship between snacking and caries (Joshi, Rajesh and Sunitha, 2005;Guadagni , Cocchi , Tagariello and Piana,2005 and Burt et.al,1988). Many studies have reported a positive association between snacking and caries level (Rugg-Gunn et. al,, Walker et.al, 1981and de

Moura et.al, 2006 and Normark and Mosha, 1989). In one study, girls had a higher snacking behavior compared to boys (Joshi et. al) There have been no studies to demonstrate the association between periodontal health and either snacking or frequency of tooth brush change.

Dental caries is also an important problem to address among adolescents since it may result in loss of teeth that may interfere with self esteem of those in this age bracket. Periodontal conditions are important in adolescents due to the effect of hormonal changes on the periodontal tissues during this phase of human development. This study examined the relationship between dental caries, periodontal health and snacking between meals of school going adolescents.

## MATERIALS AND METHODS

This was a cross-sectional study involving secondary school students from public, private, day and boarding schools aged between 13-19 years (158 males and 231 females) in Webuye Division, Western Kenya.

### Sampling Procedure

The formula  $z^2(p.q)/d^2$  was used to determine the sample size required for the study, therefore, an estimated prevalence of 50% was employed since at the time of the study the prevalence of dental caries and periodontal health was unknown for the Kenyan population.

$z$ =statistical constant representing 95% confidence interval=1.96.

$d$ =sampling error=0.05.

$p$ =prevalence (50%) =0.5

$q=1-p=1-0.5=0.5$

Substituting the formula:

$$\frac{1.96 \times 1.96 \times 0.5 \times 0.5}{0.05 \times 0.05} = 385$$

This was the minimum sample size required but in order to obtain an equal number of participants from each of the 20 schools, a convenience sample of 400 was chosen out of which 11 were non-respondents leaving a sample of 389.

Simple random sampling was used to select 20 schools out of a total of 23 schools within the study area. A total of 20 students meeting the inclusion criteria were randomly selected from each of the 20 schools that took part in the study. The following were the inclusion criteria;

a) The selected school was within Webuye Division, Bungoma District, and Western Province of Kenya.

b) Any student among the selected schools in Webuye Division.

c) Those students that were willing to participate in the study.

d) Students aged 13-19 years, both male and female.

The exclusion criteria were the following;

a) Students who were in their final year at the school at the start of the study.

b) Those students who met the inclusion criteria but were unwilling to participate in the study.

Ethical clearance was sought from Institutional Research and Ethics Committee of Moi University and Moi Teaching and Referral Hospital in Eldoret, Kenya. Informed consent was obtained from the school administration of the all the students who were examined. The participants were interviewed about their snacking behaviour to ascertain whether they took any sweet snacks between meals. They then underwent an intra oral examination to assess their level of dental caries periodontal health which recorded using the Decayed, Missing and Filled Tooth (DMFT) index and Community Periodontal Index (CPI) respectively. All the subjects were Kenyans of African origin.

The statistical package for social sciences (SPSS V.12) was used for data entry and analysis. Descriptive statistics including frequencies, means and standard deviation were used as measures of central tendency. For analytical statistics Mann-Whitney U and Kruskal Wallis tests were used to measure differences in means for dependent variables in two and more than two groups respectively. Chi-square test was used to check for associations between independent variables. Multiple logistic regressions were employed to identify factors associated with the outcome or dependent variables.

## RESULTS:

This study was able to evaluate the relationship between dental caries and periodontal health status of secondary school students and their snacking behavior. A total of 389 respondents took part in this study with 231(59.4%) females and 158(40.6%) males. They were between the ages of 13-19 years with majority in the age range of 16-18 years with a mean age of 16.8. (SD 1.34). Dental caries was present in 366 (94.1%) of the

subjects while 23(5.9%) did not have dental caries. The mean DMFT for the study population was 0.2 with a median of 0.16(SD 0.161). Poor periodontal health as assessed by CPI was present in 295(75.8%) of the respondents while 94(24.2%) were observed as not having poor periodontal health. The mean CPI was 0.317 with a median of 0.33 and SD of 0.274 (Table 1).

More than half(62.5%) of the respondents reported to have had snacks between meals while the rest did not take any snacks between meals(Table 2).The level of dental caries was higher among those that did not take snacks between meals(mean DMFT 0.97) compared with those who did(mean DMFT 0.92) as can be seen from table 3. Those who did not report use of sweet snacks (median CPI 0.82) had a poorer

periodontal health status compared to those that did (median CPI 0.71) as shown in table 4. When Man-Whitney U and Kruskal Wallis non-parametric tests were done, there was no statistically significant association between dental caries and the snacking behavior with a p-value of 0.107(Table 3). Similar findings were observed for the periodontal health status where the p-value was 0.15(Table 4). Keeping all other factors constant, a significant predictive pattern was observed for snacking behavior when CPI and oral health behavior were subjected to regression analysis. Those who did not report use of snacks had more than 1.7 times likelihood of developing poor periodontal health (p=0.0299, OR 1.772) as seen in Table 5.

**Table 1: Summary of Findings**

No. of respondents	Mean age	No. with caries	No. with poor periodontal Health	Mean DMFT	Mean CPI
389	16.8	366(94.1%)	295(75.8%)	0.2	0.317

**Table 2: Frequency of snacking behavior**

Snacking between meals	Frequency	Percent	Cumulative frequency	Cumulative percent
Yes	243	62.5	243	62.5
No	146	37.5	389	100.0

**Table 3: Relation Between Dental Caries and Snacking Behavior**

Oral health behavior	Mean DMFT	Chi-square	df	p-value
Snacking between meals				
Yes(n=243)	0.92			
No(n=146)	0.97	2.594	1	0.107

**Table 4: Relation Between Periodontal Health and Snacking Behavior**

Oral health behavior	Mean CPI	Chi-square	df	P value
Snacking between meals				
Yes(n=243)	0.71			
No(n=146)	0.82	5.92	1	0.15

**Table 5: Regression Analysis Findings**

Parameter	df	Estimate	Standard error	Wald Chi-square	p-value	Odds Ratio	95% Wald confidence limits
Intercept	1	0.1150	0.6722	0.0293	0.8642		
Snacking No	1	0.5721	0.2635	4.7138	0.0299	1.772	1.057 2.970

## DISCUSSION:

This study sought to find out whether the respondents took any sweet snacks in between meals. The use of sweet snacks was reported among 62.5% of the respondents while the rest (37.5%) did not report their usage. Contrary to expectations, the caries level was higher among those that reported no snacking behavior (mean DMFT 0.97) compared to those that did (mean DMFT 0.92). This is contrary to what one would expect since the presence of sweet snacks should increase the level of caries. A possible explanation for this observation is that those who took snacks were more meticulous in brushing their teeth and hence decreased their chances of developing caries. There was no statistically significant association between the level of dental caries and snacking behavior ( $p=0.107$ ). Some previous studies have reported no significant relationship between snacking habits and the prevalence of dental caries (Burt et. al, Joshi et.al and Guadagni et al). Most studies however report a positive association between snacking and the level of caries (Rugg-Gunn et. al, Walker et.al, de Moura et.al and Nörmark and Mosha). As is expected, there was a reported higher snacking behavior among the females compared to the males. This is similar to findings from previous studies. The periodontal health status was good amongst those who reported taking sweet snacks between meals (mean CPI 0.71) compared with those who didn't (mean CPI 0.82). This difference may be due to the fact that those who take snacks tend to brush their teeth after the snack thereby improving their periodontal health status. However, there was no statistically significant association between the periodontal health status and snacking behavior ( $p=0.15$ ).

## CONCLUSION:

The findings of this study indicate that there is some association between use of snacks between meals and the periodontal and caries status. The use of snacks had a positive effect on the periodontal health and caries status of those who engaged in the habit. It is conclusive to say that snacking between meals reduces the chances of having poor periodontal health and dental caries by encouraging better oral hygiene after consumption of snacks.

## ACKNOWLEDGEMENT:

This study formed part of a Master's Thesis of Moi University by the corresponding author. The study was supported by the Ministry of Health of the Government of Kenya. The authors are grateful to the authorities of Webuye Division for allowing this study to be undertaken, and the teachers and students of the secondary schools visited for their cooperation.

## REFERENCES:

- Burt B.A, Eklund S.A, Morgan K.J, Larkin F.E, Guire K.E, Brown L.O, Weintraub J.A., (1988). The effects of sugars intake and frequency of ingestion on dental caries increment in a three-year longitudinal study. In: J Dent Res Vol.67 (11):1422-9 Available At: URL: <http://www.ncbi.nlm.nih.gov/sites/entrez?> April 2nd, 2008.
- de Moura, F.R, Romano, A.R, Demarco, F.F, Lund, R.G, Braghini M and Rodrigues S.A., (2006). Demographic, socio-economic, behavioural and clinical variables associated with caries activity. In: Prev Dent. Vol.4 (2):129-35. Available at: URL: <http://www.ncbi.nlm.nih.gov/sites/entrez?> April 2nd, 2008.
- Guadagni, M.G.et al, (2005). In: Minerva Stomatol. Vol.54 (10):541-50. Available at: URL: <http://www.ncbi.nlm.nih.gov/sites/entrez?> April 2nd, 2008.
- Jenkins, G.N. (1978). The Physiology and Biochemistry of the Mouth. London: Blackwell Scientific Publications.
- Joshi, N.et al, (2005). Prevalence of Dental Caries among School Children in Kulasekharam Village: A Correlated Prevalence Survey. Available at: URL: <http://www.jisppd.com/text.asp?2005/23/3/138/16887>. 23rd September, 2006.
- Kidd, E.A.M .and S. Joyston-Bechal.1997. Essentials of Dental Caries. New York Oxford University Press.
- Masiga, M.A. and R.D.Holt, (1993). The Prevalence of Dental Caries and Gingivitis and their Relationship to Social Class amongst Nursery School Children in Nairobi Kenya. In: International Journal of Paediatric Dentistry Vol.3:135-140.
- Nörmark, S. and H.J. Mosha (1989). Relationship between habits and dental health among rural Tanzanian children. In: Community Dent Oral Epidemiol. Vol.17 (6):317-21. Available at: URL: <http://www.ncbi.nlm.nih.gov/sites/entrez?> 2nd April, 2008
- Ohito, F.A. (1992). Dental Caries as a Global Health Problem, Medicus. Vol 6:3-8.
- Rugg-Gunn, A.J.et al, (1984). Relationship between

dietary habits and caries increment assessed over two years in 405 English adolescent school children. In: Arch Oral Biol.Vol.29 (12):983-92. Available at: URL: <http://www.ncbi.nlm.nih.gov/sites/entrez?23rd> September, 2006.

Walker, A.R,Dison, E.,Duvenhage, A.,Walker ,B.F,Friedlander,I and Aucump, V (1981). Dental

caries in South African black and white high school pupils in relation to sugar intake and snack habits.In : Community Dent Oral Epidemiol.;Vol. 9(1):37-43 Available at:URL : <http://www.ncbi.nlm.nih.gov/sites/entrez?2nd> April , 2008.

Williams et al. (1992). Pathology of Periodontal Disease. New York. Oxford University Press.

---