

BEVERAGES DRINKING HABITS AND TOOTH SENSITIVITY EXPERIENCE AMONG ADOLESCENT SECONDARY SCHOOL STUDENTS

ABSTRACT

AIM: The recent increase in consumption of acidic beverages is thought to be the leading cause of dental erosion observed among adolescents. The study assessed the drinking habits of Adolescent Secondary School Students and also evaluated their tooth sensitivity experience. **MATERIALS AND METHODS:** The survey was conducted among adolescent secondary school students. Purposely, students in boarding hostels were excluded. The sample was selected from twelve public and private secondary schools through the class teachers. **RESULTS:** 582 questionnaires were analyzed (294 females, 288 males). Soft drinks were the most consumed (97%) beverage, predominantly by females (94.6%). Parents especially the mother mostly consume soft drinks. (78%) pointed out that that “soft drinks are good in between meals” and also 64% indicated that “soft drinks are good for the teeth”. Participants that preferred drinks at normal room temperature experienced the most tooth sensitivity. Majority (42.3%) use straw but the most tooth sensitivity experience (63.3%) associated with long sipping. A statistically significant difference ($X=0.252$; $df=1$; $p=0.005$) in tooth sensitivity experience found between those that swish their drinks and those that did not. **CONCLUSION:** Soft drinks were the most consumed with a faulty believe that soft drinks are good in-between meals and for the teeth. Tooth sensitivity experience is common with preference for drinks at room temperature and long sipping. Swishing drinks is associated with tooth sensitivity.

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KEYWORDS

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INTRODUCTION

In modern societies, the increased consumption of acidic drinks as soft drinks, sport drinks, fruit juices and fruit teas is increasingly becoming more important because of the concern for dental erosion.¹ According to a study of 1000 secondary school students within the ages of 10 to 20 years, soft drink consumption by Nigerian adolescents is increasing. More than 97% of male and female students consumed at least one soft drink a day.²

The recent dramatic increase in consumption of acidic fruit juices, fruit drinks and carbonated beverages is now thought to be the leading cause of dental erosion observed among children and adolescents.³ Since the production of soft drinks started, children were the most vulnerable to their hazards probably due to the fact that they are unaware of their harmful effects. Sometimes this may lead to irrational use of soft drinks by children and adolescents, and as a consequence health hazards chiefly dental erosion.¹

Many population studies have shown a direct correlation between consumption of carbonated drinks, fruit juices and dental erosion in children,⁴⁻⁶ with excessive consumption of acidic drinks and food being reported as the most important extrinsic factor contributing to dental erosion.¹ Experimental studies have also shown that soft drinks with

low pH can cause erosion in permanent⁷ and in deciduous teeth.⁸

Dentine hypersensitivity, a dental problem which is also on the increase, has as its leading etiological factor the use of soft drinks.⁹ Soft drink intake has been found to be the most important factor related to dentinal tubule exposure.¹⁰ Boys tend to drink more soft drinks than girls¹¹ and pupils of lower parental occupation status tend to drink more than pupils of higher parental occupation status.¹²

Associated with soft drink intake in school-aged children are, taste preferences, availability at home and school and soft drink consumption habits of parents and friends, In one study television viewing have been reported to be associated with soft drink consumption.¹³ Also several behavioral factors that determine the clinical appearance of dental erosion have been mentioned with individual variability. These include the manner in which the dietary acid is introduced into the oral cavity, the frequency of exposure and duration of the erosive content being in contact with teeth.¹

Drinking habits and those accompanying eating and swallowing (especially habits which increase the direct contact time of acidic foods and drinks with the teeth) have an obvious direct correlation with dental erosion.¹⁴ Also the type of acid, calcium chelating properties, temperature, and

exposure time are also important to the erosivity of beverages.¹⁴ Drinking through a straw positioned toward the back of the mouth may also reduce the erosive potential of soft drinks.¹⁵

Splieth and Tachou¹⁶ in 2013 observed that the prevalence of dental erosion with dentine exposure (that often results in dentine hypersensitivity) was found to be increasing in younger adults, therefore there is a need to understand the drinking habits of this group of young adults and also evaluate associated tooth sensitivity.

MATERIALS AND METHODS

The survey was conducted among adolescent secondary schools students residing at Ile Ife Osun State, Nigeria. The sample was selected from twelve public and private secondary schools. Purposely, students in boarding hostels were excluded from the study because participants were asked to provide information about their parents and other siblings at the time of the study. Self administered paper questionnaires were distributed through the class teachers in each school. The content validity of the questionnaire was determined by presenting it alongside the objectives to the project supervisor after which modifications were made. Reliability of the questionnaire was ensured by administering it to the target population who participated in the research

through test and re-test methods. The first part of the questionnaire sought information on their socio-demographic data.

From a list of common beverages, they were asked to indicate their preferred drink in the last one year; also the frequency, forms of consumption and various sources of the drinks were to be noted.

The frequency of consumption of soft drinks by parents, other siblings, uncles and friends were evaluated with responses that ranged from “very frequently” to “very rarely”. Their attitude to the consumption of soft drinks was evaluated by five statements with responses that ranged from “I strongly agree” to I strongly disagree”.

They were asked to indicate their preferred method of drinking soft drinks. In the affirmative they were asked to signify whether they are aware of side effects of soft drinks on the teeth and the presence of any sensitive teeth in their mouth.

DATA ANALYSIS:

Based on the information provided by the respondents the data was analyzed by SPSS Software Version 16.0. Part of the data where variables were measured according to the Likert's scale of measurement were assigned weight values of 5 (very frequently), 4 (frequently), 3 (occasionally), 2 (rarely) and 1 (very rarely). Also weight values of 5 for

(strongly agree), 4 (agree), 3 (undecided), 2 (disagree) and 1 (strongly disagree)

The total weight value (TWV) for each variable was obtained through the summation of the products of the frequency of responses for each rating and the respective weight value. This is also expressed mathematically below:

$$TWV = \sum_{i=1}^5 F_i \cdot W_i$$

(where TWV is the total weight value, F_i is the frequency of respondents that rated the variable i ; and W_i the weight assigned to the rating of the variable i .)

The score for each variable (VS) was arrived at by dividing the TWV for each item by the total number of respondents which is expressed mathematically below: variable score (VS) = $\frac{TWV}{N}$ where N=number of study population (582).

The variable scores ranged from 1 to 5; the closer the value to 5 the higher the significance of the variable for the participants. These were calculated for two sections in the questionnaire; (i) frequency of consumption of soft drinks by parents and other siblings; (ii) attitudes towards the use of soft drinks. The percentage of the variable scores (VS) were calculated by dividing the scores by 5 and the answer multiplied by 100%.

RESULTS

Five hundred and eighty two questionnaires were analyzed comprising of 294 females and 288 males. Their ages ranged from 10 to 19 years (Mean 15.7; SD 2.7).

Consumption of seven common drinks (soft drinks, fruit juice, yoghurt, tea, fresh orange, fresh pine apple and energy drink) in the past one year was evaluated. Findings shows that soft drinks were the most consumed (97%) by the participants especially among the females (94.6% females and 87.4% males) followed by fruit juice (95.9%) and energy drinks were the least consumed.

On the consumption of beverages by family members, parents particularly the mother (76%) was the highest, this is followed by their best friends (74%) and other sibling had the least percentage (68%) (Table 1).

The participants had a fair knowledge of the best time to consume soft drinks as they predominantly indicated that "soft drinks are good at mealtimes" (86%). However, sizable number (78%) pointed out that "soft drinks are good in between meals" and 64% indicated that "soft drinks are good for the teeth". (Table 2).

Majorly the participants obtain their drinks from home (75.6%), restaurant (13.4%) and school premises was the least. 50% of the participants prefer cooled drinks, 25.8% prefer drinks at normal room temperature while 23.7% has no preference. Participants that

preferred drinks at normal room temperature claimed the most tooth sensitivity experience. On habits of drinking, 42.3% claimed to drink with a straw, 19.6% “nip” their drinks while holding is least 5.2%. Those that reported the most tooth sensitivity experience (63.3%) were found among those that sipped their drinks for a longer time. (Table 3)

29.2% of the participants agreed they have the habit of swishing their drinks in the mouth while 70.1% indicated otherwise. Tooth sensitivity experience was reported by 68.8% of those that swish drinks with a difference that is statistically significant ($X=0.252$; $df=1$; $p=0.005$) from those that did not (44.9%).

DISCUSSION

Consumption of soft drinks was higher than other drinks accessed in this study and it is predominantly consumed by females. This is similar to that of Rampersaud et al in the US who assessed the consumption of 100% fruit juice and other beverages, using data from nationwide surveys conducted 1994-1996 and 1998. The authors found that soft drink intake was significantly higher than consumption of fruit juice and milk. Soft drinks are well-known, readily available and marketed extensively, especially to adolescents.¹⁷

Overwhelming Increase in consumption of soft drinks as dietary habit has been explained. Soft drinks, as do other sugar-sweetened beverages, have a very high energy

density due to their high sugar content. Consumption of liquid foodstuffs can have distinct physiological effects when compared to eating of solid foods, as drinking fluids will often not activate the satiety centers of the brain, which leads to increased energy intake. Furthermore, consumption of fluids is not always accompanied by a reduction in intake of solid foods, which also leads to increased caloric intake.¹⁸

In our study soft drinks were predominantly consumed by females, this is in contrast to the results of Forshee and Storey who observed that males were the predominant users.¹¹

Findings in this study show that most of the participants were influenced by parent especially their mothers. A number of personal, social, cultural and environmental factors are associated with increased soft drink consumption in school aged children which include taste, parental consumption habits, consumption habit of friends and other siblings. In a study by Grimm et al.¹³ they found that youth whose parents regularly drank soft drinks was more likely to consume soft drinks compared with those whose parents did not regularly drink soft drinks. Parents constitute a role model for children and adolescents and therefore may significantly influence the behaviour of their children.

The adolescents that participated in the present study reported the home as the most

common source of the soft drinks in a list that includes some outside environments like the school setting, restaurants and vendors. This is similar to the findings of Estimal et al.¹⁹ It is

therefore not surprising that their parents ranked highest in the consumption of soft drinks by relations.

Table 1. Consumptions of beverages by relations.

| S/N | Relations | Very frequently | Frequently | Occasionally | Rarely | Very rarely | Total Weight value (TWW) | Variable score (VS) | % |
|-----|-----------------------|-----------------|------------|--------------|--------|-------------|--------------------------------|------------------------|----|
| | | | | | | | | | |
| 1 | Mother | 855 | 792 | 405 | 144 | 12 | 2208 | 3.8 | 76 |
| 2 | Father | 940 | 708 | 351 | 168 | 15 | 2182 | 3.7 | 74 |
| 3 | Other siblings | 675 | 648 | 441 | 198 | 21 | 1983 | 3.4 | 68 |
| 4 | Best Friend | 1080 | 480 | 414 | 180 | 18 | 2172 | 3.7 | 74 |

Table 2. Knowledge of participants about the benefits of soft drinks.

| S/N | Statement | Strongly agree | Agree | Undecided | Disagree | Strongly disagree | Total weight value (TWW) | Variable Score (VS) | % |
|-----|--|----------------|-------|-----------|----------|----------------------|-----------------------------|---------------------------|----|
| | | | | | | | | | |
| 1 | Soft drinks are good at meal times | 1275 | 1056 | 153 | 42 | 3 | 2529 | 4.3 | 86 |
| 2 | Soft drinks are good in between meals | 795 | 1092 | 198 | 138 | 27 | 2250 | 3.9 | 78 |
| 3 | Soft drinks are good to quench thirst | 930 | 792 | 270 | 120 | 48 | 2160 | 3.7 | 74 |
| 4 | Soft drinks are good for general health | 1035 | 852 | 234 | 132 | 24 | 2277 | 3.9 | 78 |
| 5 | Soft drinks are good for the teeth | 555 | 696 | 360 | 204 | 63 | 1878 | 3.2 | 64 |

Table 3. Association of Tooth sensitivity experience with Sources of drinks, Forms and Preferred methods of drinking.

| | | Number of participants (n=582) | Tooth sensitivity experience |
|----------------------------|--------------------|--------------------------------|------------------------------|
| Sources of drink | | | |
| 1 | Home | 440 (75.6%) | 219 (49.8%) |
| 2 | Restaurant | 78 (13.4%) | 39 (50%) |
| 3 | Vendor | 36 (6.2%) | 15 (41.7%) |
| 4 | School | 27 (4.6%) | 18 (66.7) |
| Forms of drink | | | |
| 1 | Cooled | 291 (50%) | 153 (52%) |
| 2 | Normal Temperature | 135 (25.8%) | 75 (55.5%) |
| 3 | Anyone | 138 (23.7%) | 60 (43%) |
| Methods of drinking | | | |
| 1 | Nipping | 114 (19.6%) | 69 (60.5%) |
| 2 | Gulping | 50 (8.6%) | 18 (36%) |
| 3 | Long sipping | 90 (15.5%) | 57 (63.3%) |
| 4 | Short sipping | 51 (8.8%) | 18 (35.3%) |
| 5 | Holding | 30 (5.2%) | 15 (50%) |
| 6 | Sucking with straw | 246 (42.3%) | 120 (48.8) |

There is unfortunate understanding of the participants about health benefits of soft drinks because they hold damaged view on few fronts which was revealed in their responses. Notable in their responses are the claims that “soft drinks are good in between meal” (78%) and “soft drinks are good for the teeth” (64%). This may not be unconnected with defective nutritional information in the schools and warped messages in the media. Consumption of soft drinks in-between meals is believed to leave the teeth bathing in acidic medium for a longer time and soft drinks especially brands with lower pH are known to cause tooth wear (erosion).

Anecdotal reports show that erosion of teeth by soft drinks is likely to be influenced by the temperature of the beverages. One study by Eisenburger and Addy²⁰ concluded that erosion depth increased significantly with increased temperature. In view of this Fayad and Amani²¹ therefore suggested that acidic beverages should be cooled before consumption and hence reduce the erosive effect. Majority of the participants in our study prefers drinks at normal room temperature which we suspected may be high enough to aid erosive activity. This probably accounts for the highest tooth sensitivity experience observed among those with preference for drinks at room temperature.

The individual manner of drinking acidic soft drinks has been said to affect how

long the teeth are in contact with the erosive challenge²² and therefore influence the pattern of destruction caused by them. High erosion was found to be associated with method of drinking whereby the drink is kept in the mouth for a longer period.²³ The tooth-surface pH is strongly affected thereby the increased risk for dental erosion. Johansson et al.²⁴ evaluated six methods of drinking in a randomized order, holding; short-sipping; long-sipping; gulping; nipping; and sucking. Holding the drink in the mouth before swallowing led to the most pronounced pH drop, followed by the long-sipping method.

Gulping resulted in only a small decrease of pH. Our findings show that majority of the participants preferred drinking with a straw but the ones that indulge in long sipping drinking method reported the most tooth sensitivity experience. Long sipping is a drinking habit that increases the direct contact time of acidic foods and drinks with the teeth and had been suggested to have an obvious direct correlation with dental erosion,¹⁴ and tooth sensitivity as a sequel. Also tooth sensitivity experience was reported predominantly by those that swish drinks in the mouth during consumption. Rapid erosion has been observed when erosive drinks are consumed from a straw placed labial to the anterior teeth, or are “swished” between the teeth.²⁵

Popular recommendation is that acidic foods and drinks should be served at mealtimes. This is the time of maximum salivary flow and increased buffering capacity. In addition the frequency must be reduced. The habit of frothing or swishing drinks around the mouth is likely to increase the risk of dental erosion and it is advisable that drinks are consumed quickly or if consumed slowly a wide bore straw placed toward the back of the mouth is advisable in order to reduce contact of acidic fluid with the teeth.¹⁵

CONCLUSION

Although the absence of clinical examination to confirm the presence of tooth sensitivity in participants limits this study, the results however provide sufficient evidence to warrant further investigation of the relationship between different habits of drinking and tooth sensitivity.

REFERENCES

1. Lussi A, Jaeggi T, Zero D. The role of diet in the aetiology of dental erosion. *Caries Res* 2004; 38: 34-44.
2. Ansa V.O., Anah M.U., Ndifon W.O. Soft drink consumption and overweight/obesity among Nigerian adolescents. *CVD Prevention and Control* 2008; 3(4): 191-196.
3. Lussi A, Jaeggi T. Dental erosion in children. *Monogr Oral Sci* 2006;20:140-151.
4. Luo A, Zeng XJ, Du MQ, Bedi R. The prevalence of dental erosion in preschool children in China. *J Dent* 2005;33:115-121.
5. Harding MA, Whelton H, O'Mullane DM, Cronin M. Dental erosion in 5-year-old Irish school children and associated factors: a pilot study. *Community Dent Health* 2003;20: 165-170.
6. Al-Majed I, Maguire A, Murray JJ. Risk factors for dental erosion in 5-6 year old and 12-14 year old boys in Saudi Arabia. *Community Dent Oral Epidemiol* 2002;30:38-46.
7. Hughes JA, West NX, Parker DM, Newcombe RG, Addy M. Development and evaluation of a low erosive blackcurrant juice drink in vitro and in situ. 1. Comparison with orange juice. *J Dent*. 1999;27:285-9.
8. Grando LJ, Tames DR, Cardoso AC, Gabilan NH. In vitro study of enamel erosion caused by soft drinks and lemon juice in deciduous teeth analysed by stereomicroscopy and scanning electron microscopy. *Caries Res*. 1996;30:373-8.
9. Rees JS, Addy M: A cross-sectional study of dentine hypersensitivity. *J Clin Periodontol* 2002, 2:997-1003.
10. Pinto SCS, Batitucci RG, Pinheiro MC, Zandim DL, Spin-Neto R, Sampaio JEC: Effect of an acid diet allied to sonic toothbrushing on root dentin permeability: an in vitro study. *Br Dental J* 2010, 21:390-395.
11. Forshee RA, Storey ML. Total beverage consumption and beverage choices among children and adolescents. *Int J Food Sci Nutr* 2003; 54: 297-307.
12. Vereecken CA, Inchley J, Subramanian SV, Hublet A, Maes L. The relative influence of individual and contextual socioeconomic status on consumption of fruit and soft drinks among adolescents in Europe. *Eur J Public Health* 2005; 15: 224-32.

13. Grimm GC, Harnack L, Story M. Factors associated with soft drink consumption in school-aged children. *J Am Diet Assoc* 2004; 104: 1244-9.
14. Zero DT. Etiology of dental erosion: extrinsic factors. *Eur J Oral Sci* 1996;104:162-177.
15. Edwards M, Ashwood RA, Littlewood SJ, Brocklebank LM, Fung DE. A videofluoroscopic comparison of straw and cup drinking: the potential influence on dental erosion. *Br Dent J*. 1998;185:244-9.
16. Splieth C.H., Tachou A. Epidemiology of dentin hypersensitivity. *Clin Oral Invest* (2013) 17 (Suppl 1):S3-S8.
17. Rampersaud GC, Bailey LB, Kauwell GP. National survey beverage consumption data for children and adolescents indicate the need to encourage a shift toward more nutritive beverages. *J Am Diet Assoc* 2003;103:97-100.
18. Bessa M, Valente H, Cordeiro T, Padrão P, Moreira A, Lopes C et al. Ingestão de alimentos fluidos e risco de excesso de peso em crianças. *Acta Med Port* 2008;21:161-70.
19. EstimaI C.C.P; PhilippiII S.T., ArakiIII E.L., LealIV G.V.S., MartinezV M.F., AlvarengaVI M.S. Beverage and soft drink consumption by adolescents from a public school. *Rev Paul Pediatr* 2011;29(1):41-5.
20. Eisenburger M, Addy M. Influence of liquid temperature and flow rate on enamel erosion and surface softening. *J Oral Rehabil*. 2003;30(11):1076-80.
21. Fayad MA, Amani KD. Acid beverages produced in Jordan and tooth erosion. *Odontostomatol Trop* 1995;18(1):9-13
22. Zero DT, Lussi A. Behavioral factors. *Monogr Oral Sci*. 2006;20:100-5.
23. Johansson AK, Lingström P, Birkhed D. Comparison of factors potentially related to the occurrence of dental erosion in high- and low-erosion groups. *Eur J Oral Sci*. 2002;110(3):204-11.
24. Johansson AK, Lingström P, Imfeld T, Birkhed D. Influence of drinking method on tooth-surface pH in relation to dental erosion. *Eur J Oral Sci*. 2004;112(6): 484-9.
25. Shellis RP, Finke M, Eisenburger M, Parker DM, Addy M. Relationship between enamel erosion and liquid flow rate. *Eur J Oral Sci*. 2005;113(3):232-8.