

The relationship between snacking habits and dental caries in school children

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Abstract

Introduction: Sugars are most important cause of dental caries. Frequent consumption of carbohydrate containing snacks between meals is known to increase the amount of dental caries. Snacking several times and allowing snacks to stay on teeth cannot be neglected as an important cause of dental caries.

Objective: To determine the prevalence of dental caries in children consuming snacks.

Materials and Methods: A comparative cross sectional study was conducted at a private school. Subjects were selected on the basis of non-probability convenient sampling. Respondents were asked questions regarding their age and type of daily snack food consumption. Children who were medically fit were included and traumatized teeth were excluded. Diagnostic criteria depended on visual evidence of a lesion, with a blunt periodontal probe being used only to remove plaque. Caries were recorded using the decayed missed filled teeth (DMFT) index. Sample size calculation was done using the W.H.O. software where $\alpha=0.05$, $1-\beta=90$, $P_o=0.67$, $P_2=0.58$, n (sample size)=245.

Result: Descriptive statistics showed 45% were males. Mean age was 12 years. DMFT index showed one tooth decay in 39%, two teeth decay in 11% and three teeth decay in 4% of children respectively. There was no missing or filled teeth. More than half of students, 53% consumed cookies among them 35% consumed cookies once daily. Sweets were consumed by 56% of children. Chocolates as snacks were consumed by 60% of children. Ice cream was consumed by 86% of children. Potato chips were consumed by 76% of children. Citrus fruit juices were consumed by 67% of children. Jellies and jam were consumed by 39% of children. Marmalade was consumed by 14% of children. Halwa was consumed by 47% of children. Dental examination showed caries was present in 54% of children. Binary logistic regression analysis showed caries in children were 3.89 (95% CI, 2.16-7.01) times more in children consuming

cookies as compared to children who do not consumed cookies. ($p=0.0001$) Caries in children were 4.28 (95% CI, 2.09-8.78) times more common in children consuming potato chips as compared to children who do not consumed potatoes chips. ($p=0.0001$)

Conclusion: Our findings suggest that young children with poor dietary habits consuming snacks frequently were more likely to develop caries as compared to children with no snacking habits.

Key words: snacks, cookies, sweets, ice cream, dental caries.

Introduction

Dental caries is a highly prevalent chronic disease and its consequences cause a lot of pain and suffering. Millions of people throughout the world have lost their teeth due to caries. Dental problems impact considerably on self esteem and quality of life and expensive to treat. Sugars are the most important dietary etiological cause of dental caries.^{1,2,3} The frequent consumption of carbohydrate containing snacks between meals is known to increase greatly the amount of dental caries. Tooth decay or dental caries is initiated when simple carbohydrates in the mouth are fermented by bacteria, which collect in a dense matrix called plaque.^{4,5} The period of critically lowered pH needed for caries to occur is mainly a function of the type and frequency of carbohydrates consumed and the microbial composition of the tooth biofilm and salivary factors.^{6,7} However there is relatively little information about the amount of sugar consumed and patterns of consumption in developing countries.^{8,9} Past failure to demonstrate a relationship between caries and sugar consumption may also have been related to inherent difficulties in measuring sugars intake and relating this to dental caries.¹⁰ According to a Journal of American Dental Association, 2004 the overall carbohydrate intake has increased from 46.3% of total energy intake in 1965 to 54.2% of total energy in 1996 among U.S children.¹¹ Aggregate observations from a review of studies indicate that when sugar intake exceeds 15 to 20 kilograms per person per year, such intake is directly associated with increasing caries prevalence.¹² Meals, such as breakfast, often are skipped altogether. Teenagers who miss breakfast are more likely to snack during the day and snacks have the highest sugar content of any type of meal (that is, breakfast, lunch, dinner or snacks).^{13,14} Consumption of whole grains and dairy products has been shown to decrease an individual's appetite,¹⁵⁻¹⁸ while diets high in sugar cause people to feel hungry and seek more calories.¹⁹ Missing meals could have a direct influence on consumption of refined carbohydrates, and skipping meals such as breakfast could lead to increased sugar consumption.²⁰

Rationale

Routine snacking on refined carbohydrates such as candies, cookies, cakes, fruit drinks, soda, honey, processed foods such as potato chips, pasta, crackers, sweetened cereals, french fries, etc are a high risk factor for caries to develop. More importantly snacking several times throughout

the day and allowing the snacks to stay on teeth cannot be neglected as an important cause of dental caries. As oral health data on schoolchildren is lacking in our country this research is conducted to determine the prevalence of dental caries in children consuming junk food.

Materials & Methods

Study Design and Study Cases

This was a comparative cross sectional study which was conducted at a private school of Karachi, Pakistan from March 2012 till May 2012. Subjects were selected on the basis of non-probability convenient sampling. Respondents were asked questions regarding their age, social class, parental education and type of daily snack food consumption at breakfast, lunch and dinner. Snack foods included cookies, sweets, chocolates, ice cream, jam, jellies, marmalade in sandwiches and potato chips. Beverages list included fruit juices, carbonated drinks, ice and tea. Breakfast and dinner list included milk with sugar, tea with sugar, jam, marmalade, halwa.

Inclusion/Exclusion Criteria

All children who were medically fit were included. On dental examination traumatized teeth and children having missing tooth other than caries were excluded.

Data Management and Analysis

Data was entered in Statistical Package for Social Sciences (SPSS) version 20 and analyzed. A descriptive analysis was performed; categorical variables of gender, cookies (yes/no), sweets (yes/no), chocolate (yes/no), ice cream (yes/no), potato chips (yes/no), juices (yes/no), jellies (yes/no), jam (yes/no) jellies (yes/no), marmalade (yes/no), halwa (yes/no), decay (yes/no), missing (yes/no), filled (yes/no) were presented as proportions (%). Binary logistic regression analysis was performed to assess the predictors for the dependent variable of caries, with a threshold for the selection of $p < 0.05$. Independent variables were cookies, ice cream and potato chips. The sample size calculation was done using the W.H.O. software for "Sample Size Calculation" where $\alpha = 0.05$, $1 - \beta = 90$, $P_0 = 0.67$, $P_2 = 0.58$, n (sample size) = 245. The researcher recruited 250 students to avoid the chances of type ii error.

Clinical examination

Dental examinations were conducted and children were examined at their school premises under natural light by a trained examiner. The child sat on an ordinary chair facing a window. A plane mirror and a periodontal probe were used. Diagnostic criteria depended on visual evidence of a lesion with a blunt periodontal probe being used only to remove plaque. Caries was recorded using the DMFT index. A tooth was considered decayed (D) if there was visible evidence of

cavitation (i.e. involving dentine), including untreated dental caries and filled teeth with recurrent caries. The missing component (M) included only those missing teeth believed to have been lost through caries. Filling component (F) included only if teeth were filled due to caries. Examinations were carried out for 250 children who had completed and returned questionnaires.

Results

Frequencies

Descriptive statistics showed 45% males. Mean age was 12 years. DMFT index showed one tooth decay in 39%, two teeth decay in 11% and three teeth decay in 4% of children respectively. There was no missing or filled teeth. More than half of students, 53% consumed cookies among them 35% consumed cookies once daily. Sweets were consumed by 56% of children among them 27% consumed once daily. Chocolates as snack were consumed by 60% of children among them 41% consumed once daily. Ice cream was consumed by 86% of children among them 72% consumed daily. Potato chips were consumed by 76% among them 47% consumed once daily. 67% of children consumed citrus fruit juices among them 38% consumed once daily. Jellies and jam were consumed by 39% among them 31% consumed jellies once daily and 32% consumed jam once daily. Only 14% of them consumed marmalade once daily. Halwa was consumed by 45% once daily. On dental examination 39% of subjects had one decayed tooth and caries was present in 54% of children.

Chi square test

Gender was compared with the variables of cookies, jellies, marmalade, sweets, chocolate, potato chips, ice cream, citrus fruit juice and tooth decay which showed statistically significant results ($p < 0.05$), see table 1.

Logistic Regression

Binary logistic regression analysis showed caries in children were 3.89 (95% CI, 2.16-7.01) times more in children consuming cookies as compared to children who do not consumed cookies. ($p=0.0001$) Caries in children were 5.34 (95% CI, 2.06-13.85) times more common in children consuming ice cream as compared to children who do not consumed ice cream. ($p=0.001$) Caries in children were 4.28 (95% CI, 2.09-8.78) times more common in children consuming potato chips as compared to children who do not consumed potatoes chips. ($p=0.0001$), see table 2.

Confidentiality

The data were collected on the questionnaire without the names of the participants so that anonymity could be maintained.

Ethical Considerations

The study protocol was approved by ethical review committee. Written informed consent was taken from the participants before their enrolment in this study. The participants' involvement in this study was voluntary and no financial incentives were provided to any study participant.

Discussion

This study has considered the relationship between snacks consumption and severity of caries in school going children. Snack foods and drinks were consumed by a high percentage of children. The results show that caries is more common in children who consume snacks frequently than in children who consume snacks rarely. Descriptive statistics showed that caries was present in 54% of the children who consumed different types of snacks more than once a day. A study conducted by A. Sayegh et al showed major types of foods consumed at breakfast were savory items and milk/tea with sugar were reported for more than 85% of the children with approximately one third having the food items that were high in Non Milk Extrinsic (NME) sugars and marmalade/jam/honey. Confectionery was eaten regularly by 76% of 4–5-year-old children and biscuits/cakes by 71%. Younger children of four years of age consumed confectionery and chewing gum. Majority of children had savory foods at dinner time and about 40% had cooked vegetables with or without meat. Among the children, 50-60% drank milk or tea with sugar at dinner time and less than one third had items considered very high in NME sugars. There were no obvious differences with age but fewer girls had milk/tea with sugar and marmalade/jam/honey at dinner.²¹ A higher percentage of English children in Norwich (47%) were reported to consume fruit squash at mid-afternoon or at school.²² Higher percentages of children of similar age (75%) were reported to have canned soft drinks and packed fruit juices in the capital of Saudi Arabia and to have carbonated drinks (67%) in England reflecting the increasing popularity of this type of drink.^{23,24} Caries prevalence in young children from Scandinavian countries has also been found to be independently associated both with the mother's (young) age and daily sugar consumption in candies and in beverages.²⁵ In this research the prevalence of caries was 54 % whereas RN Yabao et al documented a 71.7 and 68.2% prevalence of dental caries in primary and permanent dentition, respectively, among schoolchildren aged 6–12 years in La Trinidad, Benguet, Philippines, indicating a widespread neglect of oral health in the children.²⁶ The increased rate of tooth decay in school going children consuming snacks frequently predicates that snacks are high risk factors for caries in young age and their frequent consumption should be discouraged.

Conclusion

Our findings suggest that young children with poor dietary habits who consume snacks frequently are more likely to experience caries as compared to children with no snacking habits.

Recommendations

The following recommendations are suggested to improve overall oral health status among children with snacking habits:

1. The impact of increasing carbohydrate exposure, including consumption of sodas and juice drinks, on the rate of dental caries should be further investigated and awareness should be given to prevent dental caries.
2. Research into the optimum fluoride ingestion for different ages and healthy nutritional status should be encouraged.
3. Effective means of promoting increased consumption of Non Starch Polysaccharides (NSP) diet like fruits, vegetables and cereals in subjects with compromised dental status need to be developed and evaluated.

Conflict of Interest: The authors declare that they have no competing interests.

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Table 1: Comparison of gender with cookies, jellies, marmalade, sweets, chocolate, potato chips, ice cream, citrus fruit juice and tooth decay.

Gender	Cookies Consumption (%)				p-values
	Yes	No			
Male	55.1%	33.3%			0.002
Female	44.9%	66.7%			
Jellies Consumption (%)					
	Yes	No			0.014
Male	55.7%	38%			
Female	44.3%	62%			
Marmalade Consumption (%)					
	Yes	No			0.009
Male	67.9%	41.3%			
Female	32.1%	58.7%			
Sweets Consumption (%)					
	Once a day	Twice a day	Thrice a day	No sweets	0.001
Male	23.6%	42.9%	66.7%	51.7%	
Female	76.4%	57.1%	33.3%	48.3%	
Chocolate Consumption (%)					
	Once a day	Twice a day	Thrice a day	No sweets	0.0001
Male	38.6%	15.4%	94.1%	51.4%	
Female	61.4%	84.6%	5.9%	48.6%	

Potato Chips Consumption (%)					
	Once a day	Twice a day	Thrice a day	No chips	
Male	39.4%	45.7%	83.3%	36.2%	0.001
Female	60.6%	54.3%	16.7%	63.8%	
Ice cream consumption (%)					
	Once a day	Twice a day	Thrice a day	No ice cream	
Male	43.1%	100%	60%	28.6%	0.002
Female	56.9%	0%	40%	71.4%	
Citrus Fruit juice consumption (%)					
	Once a day	Twice a day	Thrice a day	No ice cream	
Male	29.9%	53.8%	74.1%	47.1%	0.001
Female	70.1%	46.2%	25.9%	52.9%	
Tooth decay (%)					
	No tooth decay	One tooth decay	Two tooth decay	Three tooth decay	
Male	37%	61.5%	36.4%	0%	0.0001
Female	63%	38.5%	63.6%	0%	

Table 2: Probability of dental caries – Binary logistic regression analysis

Variables	Odds ratio (95% confidence interval)	<i>p</i> -values
Caries in children consuming cookies (ref: caries in children not consuming cookies)	3.89 (2.16-7.01)	0.0001
Caries in children consuming ice cream (ref: caries in children not consuming ice cream)	5.34 (2.06-13.85)	0.001
Caries in children consuming potato chips (ref: caries in children not consuming potato chips)	4.28 (2.09-8.78)	0.0001