Mal J Nutr 16(1): 83 - 90, 2010

Relationship between Frequency of Sugary Food and Drink Consumption with Occurrence of Dental Caries among Preschool Children in Titiwangsa, Kuala Lumpur

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ABSTRACT

Dental caries are attributed to various factors including diet. The present cross-sectional study determined the frequency of sugary food and drink consumption and defined its relationship to dental caries among preschool children. A total of 50 preschoolers (aged 5-6 years) in three kindergartens of the Department of Community Development (KEMAS) in Titiwangsa, Kuala Lumpur participated in this study. A set of structured questionnaires was used to assess the frequency of sugary food and drink consumption. Dental check ups were performed by a dentist. The dft index (decayed, filled teeth) was used to describe incidence of caries in subjects. Results showed that 62% of the subjects had dental caries. with the mean dft score being 3.72. The frequency of sugary food consumption by the majority of subjects was 2 times a day, while the frequency of sugary drink consumption was more than 3 times a day. There was no significant relationship between frequency of sugary food and drink consumption with incidence of caries. Subjects with high dft scores were more likely to report dental pain. The prevalence of dental caries in preschoolers in this study was high, indicating a need for effective dental health promotion to improve dental health status of this age group.

Keywords: Dental caries, preschool children, sugary food and drink consumption

INTRODUCTION

Diet plays an important role in preventing oral diseases including dental caries. Caries is the result of a chronic undermining demineralisation of the teeth by organic acids that are produced by the bacteria of the dental biofilm while fermenting carbohydrates from the human diet. Initial caries lesions without cavitations of the surface can remineralise (heal) under conditions of low cariogenic diet and good oral hygiene. However, once the surface has broken and cavitations occurred, there is no alternative to restorative dental therapy because demineralisation is no longer possible (Imfeld, 2008). Although it is not life-threatening, pain from untreated caries can affect school attendance, eating and speaking, and, subsequently, growth and development (US Department of Health and Human Services, 2000). Dental diseases act

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as a costly burden to health care services, accounting for between 5% and 10% of total health care expenditure even exceeding the cost of treatment for cardiovascular disease, cancer and osteoporosis in industrialised countries (WHO, 2003).

According to the report released by the Ministry of Health, Malaysia, the prevalence of dental caries among 6-year-old children in Peninsular Malaysia was reported to be 80.6% in the year 1997. Although dental caries prevalence has dropped over the past few years, it is still considered to be high (Ministry of Health, 2003). The DMFT index (decayed, missing, and filled teeth) is used to describe occurrence of caries in permanent teeth in an individual's life. For preschool children, score dft applies as they do not experience tooth loss result from dental caries. This score is calculated according to number of teeth that are involved in tooth decay (decayed) or teeth filling (filled). Score 0 show subject is free from caries. Higher score shows that caries is on the rise (WHO, 1997).

Sugars, particularly sucrose, are the most important dietary etiological cause of dental caries (WHO, 2003). Caries risk is greatest if sugars are consumed at high frequency and are in a form that is retained in the mouth for longer periods. Both the frequency of consumption and total amount of sugars is important in the etiology of caries. The intake of free sugars beyond four times a day leads to an increased risk of dental caries (WHO, 2003). WHO has also recommended that countries with a low intake of free sugars do not increase intake and those with higher intake (>15-20 kg per year) aim to reduce intake of free sugars to less than 10% of energy intake (which equates to <15-20 kg per year) (WHO 2003). The consumption of extrinsic sugars levels above 60 g per person per day for teenagers and adults increases the risk of dental caries. It has been recommended that for pre-school and young children, the intake should be 30 g per person per day (Sheiham, 2001).

In Malaysia, studies on dietary habits in relation to dental caries are limited. A study on dental caries experience and frequency of sugary food and drinks foods on young adults has been conducted (Loh, Dahlia & Fatimah, 2007); however, to our knowledge there is no previous information about frequency of sugary foods and drink consumption and its association with occurrence of dental caries in preschoolers. This information is important in designing strategies for dental health promotion targeted at preschoolers. This study aimed to determine frequency of sugary food and drink consumption and its relationship with dental caries experience among preschoolers.

METHODOLOGY

Background

A cross-sectional study was conducted in three KEMAS kindergartens in Titiwangsa area. A total of 50 preschoolers aged 5 to 6 years were recruited by convenience sampling method. Approval for the study was obtained from the Ethics Committee of Universiti Kebangsaan Malaysia. Parents and teachers were informed both verbally and in writing before data was collected.

Questionnaire

A structured questionnaire was used to obtain information on demography profile, dental health practices, frequency of sugary food intake (Hammond *et al*. 1993) and frequency of sugary drink consumption (Guthrie & Morton, 2000). The questionnaire had been pilot-tested to ensure that parents of the subjects could understand the questions asked. Visits were paid to each kindergarten before the survey to discuss the protocol with the kindergarten teachers and to deliver the questionnaire. The teachers were responsible for the distribution and collection of the questionnaire from the parents. The parents were asked to fill the questionnaire. They were given one week to

fill the questionnaire and return it to the teacher in the respective kindergartens.

Dental checkups

Subjects' dental checkups were performed by a dentist from Department of Dental Public Health, Faculty of Dentistry, Universiti Kebangsaan Malaysia. Dental checkups were conducted in the classroom using a mouth mirror. Dental caries was diagnosed at the cavitation level mainly through visual inspection as recommended by the WHO. After dental checkups, a dental assistant demonstrated the proper way of toothbrushing. Free toothbrushes and toothpaste were supplied to subjects before the demonstration.

Statistical analysis

SPSS programme version 12.0 (Statistical Package for Social Sciences) was used to analyse the data. Data were summarised by using means and standard deviations or medians, and ranges. Categorical variables were expressed as counts and percentages. Data normality was checked before any statistical test was carried out using Kolmogorov-Smirnov test. Group comparisons with respect to quantitative variables were performed by using independent Mann-Whitney test, and group comparisons with respect to categorical data were performed by using the Chi-squared tests. Spearman's correlation test was used to analyse the relationship between frequency of sugary food and beverage intake with the dft score. The significance level was preset at 0.05.

RESULTS

Demographic profile

Of the 50 subjects, 29 were boys (58%) and 21 (42%) subjects were girls (Table 1). Seventeen (34%) of the subjects were aged 5 years and 33 (66%) were 6 years old. The majority of the subjects' parents (86%) had

Table 1. Socio-demographic characteristics of subjects (n=50)

Characteristics	*n*	*%*
Gender		
Boys	29	58
Girls	21	42
Age		
5-year-old	17	34
6-year-old	33	66
Parents education level		
Primary school	2	4
Secondary school	43	86
Diploma / Higher education	41	82
Household income		
< RM 1000	14	28
RM 1000-RM 3000	28	56
RM 3000-RM 5000	6	12
>RM 5000	2	4
Marital status		
Divorcee	1	2
Married	47	94
Widow	2	4

Table 2. Prevalent of dental caries and average of dft score by gender

Variables	*Boys*		*Girls*		*Total*	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*
Prevalence[¥]						
Caries-free	12	(41.4)	8	(38.1)	20	(40)
Experience caries	17	(58.6)	13	(61.9)	30	(60)
dft score[‡], (mean ± S.D)	4.28 ± 5.35 (0-20)		2.95 ± 3.61 (0-13)		3.72 ± 4.7 (0-20)	

[¥] p= 0.563 (Chi-square test) [‡] p= 0.567 (Mann-Whitney test)

Table 3. Frequency of sugary food consumption by gender

Frequency	*Boys*		*Girls*		*Total*	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*
Once a day	8	(27.6)	7	(33.3)	15	(30)
Twice a day	12	(41.4)	8	(38.1)	20	(40)
More than three times a day	9	(31)	6	(28.6)	15	(30)

education till secondary school level. More than half of the subjects' family (56%) had a household income of between RM1000 (USD 297.6) to RM3000 (USD892.9) per month and 28 % less than RM1000 (USD 297.6) per month.

Incidence of dental caries and average dft score

Table 2 shows the incidence of dental caries and average dft score among subjects according to gender. Sixty percent of preschoolers in this study had dental caries. There was no significant difference in the incidence of dental caries between boys (61.9 %) and girls (58.6%), p=0.567. Percentage of caries-free in boys and girls was 41.4% and 38.1% respectively. Average dft score for this study was 3.72 ± 4.7. Boys had a higher average dft score (4.28 ± 5.35) than girls (2.95 ± 3.61). However, the difference was not statistically significant (p=0.563).

Frequency of sugary food consumption according to gender

Table 3 shows the frequency of sugary food consumption by subjects according to gender. More than one-third (40%) of the subjects consumed sugary food twice a day of which 41.4% of them were boys and 38.1% were girls. About 27.6% of boys and 33.3% girls consumed sugary food once a day. Only 9 boys (31%) and 6 girls (28.6%) consumed sugary food more than three times a day.

Frequency of sugary drink consumption

Table 4 shows the frequency of sugary drink consumption by subjects according to gender. Almost half (46%) of the subjects consumed sugary drink more than three times a day with 37.9% of them being boys and 57.1% being girls. Almost one-third of the subject consumed sugary drinks as much as once a day.

Table 4. Frequency of sugary drink consumption by gender

Frequency	*Boys*		*Girls*		*Total*	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*
Once a day	10	(34.5)	7	(33.3)	17	(34)
Twice a day	8	(27.6)	2	(9.5)	10	(20)
More than three times a day	11	(37.9)	12	(57.1)	23	(46)

Table 5. Dental health care practices by gender

Dental health care practices	*Boys*		*Girls*		*Total*	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*
Frequency of toothbrushing						
Once a day	7	(24.1)	3	(14.3)	10	(20)
Twice a day	20	(69)	16	(76.2)	36	(72)
Three times a day	2	(6.9)	2	(9.5)	4	(8)
Dental pain experience[†]:						
Yes	7	(24.1)	8	(38.1)	15	(30)
No	22	(75.9)	13	(61.9)	35	(70)

[†] Chi-square test between gender p= 0.288

Dental health care practices

Table 5 shows dental health care practices by subjects according to gender. Results show that the majority (72 %) of subjects brushed their teeth twice a day, being 69 % for boys and 76.2 % for girls. The percentage of subjects who brushed their teeth once and three times a day was 20 % and 8 % respectively. The majority (70 %) of parents reported that their children never experienced dental pain. A total of 7 boys (24.1 %) and 8 girls (38.1 %) had experienced dental pain (p=0.288). Spearman's correlation test showed that subjects with higher dft were more likely to report the experience of dental pain (r=0.430, p=0.002).

Relationship between frequency of sugary food and drink intake with dft score (dental caries)

Table 6 shows the relationship between frequency of sugary food and drink intake with dft score. Both frequency of sugary food (r=0.030, p=0.832) and drink consumption (r=0.115, p=0.423) showed a positive correlation with dft score. However, the relationship was not statistically significant.

DISCUSSION

This study found that more than half (60 %) of preschoolers had dental caries with a dft score of 3.72 (Table 2). The results of this study were lower than the prevalence of dental caries reported by the Oral Health National Survey among preschoolers aged 6 years. Dental caries was reported to be 80.6 % and dft score was 4.1 (Ministry of Health, 2003). These values are higher compared with the finding in our study, perhaps because the present study only involved preschoolers in Titiwangsa area and also, it included children aged 5-years. It has been reported that the caries experience of the

Table 6. Relationship between frequency of sugary food and drink intake with dft score

Frequency	*r value*	*p value*†
Intake of sugary food	0.030	0.832
Intake of sugary drink	0.115	0.423

†Spearman Test

preschool children increases with age (Chu, Fung & Low, 1999). It is also possible that the difference was due to the declining trend in dental caries prevalence in Malaysia. The above mentioned national survey reported that there was a declining trend in prevalence of dental caries among preschoolers (Ministry of Health, 2003). An increase in public awareness on the importance of dental care is one of the contributing factors. In addition, Oral Division in Ministry of Health Malaysia had implemented various strategies to ensure improvement in dental health status among preschool children. Examples of the strategies include dental check ups, demonstration on proper procedures to brush teeth and seminars for kindergarten teachers in all kindergartens (Ministry of Health Malaysia, 2003). Moreover, preschool children have been trained to brush their teeth everyday at school and at home. These strategies may contribute to declining prevalence of dental caries among preschool children in Malaysia. In northern Philippines, the percentages of preschoolers having dental caries were higher than found in this study. The percentage of preschoolers aged 5 and 6 years with dental caries were 94 % and 92 % respectively. The mean dft was 9.8 ±5.5 in 5-year olds and 10 ±5.5 in 6-year olds (Cariño *et al*, 2003). In more developed countries such as Australia, the prevalence of dental caries is lower. It was reported that 43.7 % of children aged 4 to 7 years old had dental caries, with the dft score beingonly 1.4±2.77 (Hallet & O'Rourker, 2002).

The majority of the preschoolers in this study brushed their teeth twice a day. The Malaysian National Oral Health Plan (NOHP) had outlined strategies to encourage preschoolers to brush their teeth properly in order to reduce dental caries experience, for example to make tooth-brushing as an activity in kindergartens, make available low sinks and mirrors at all kindergartens and nurseries for daily tooth brushing drills and to promote personal hygiene (Ministry of Health, 2002). The results of this study also show a significant relationship between dental pain experienced by the subjects with dft score (Table 2). It has been well documented that children with dental caries were more likely to report dental caries than their counterparts with less caries or caries-free (Petersen, 2001).

In this study, the majority of the subjects consumed sugary food and drinks more than three times per day. This result indicates that the consumption of free sugars by the majority of preschoolers in this study exceeded the recommendation made by WHO (i.e. not more than three times a day). According to WHO (2003), when the frequency of free sugars consumed exceeds three times per day, the amount of sugar consumed will also exceed the recommendated level (i.e. 15kg per year) which eventually will increase the prevalence of dental caries.

This study found that there was no significant relationship between frequency of sugary food and drink consumption with dft score. These data are consistent with the conclusion of Burt and Pai (2001), who

carried out a systematic review of sugar consumption and caries risk and stated, "The relationship between sugar consumption and caries is much weaker in the modern age of fluoride intake than it used to be." Another explanation for this can partly contributed by the study design adopted in this study, that is, cross sectional. Formation of dental caries is a process which takes time to be established. Subjects probably had modified their eating habit after experiencing dental caries. So, the diet when this study was conducted did not represent the actual diet of the subjects at the time or period when the dental caries occurred. Moreover, dental caries is a complex, multifactorial disease process dependent on the presence of oral bacteria, the usage of fluoride, calcium intake and quality and quantity of saliva. Therefore, assessing frequency of sugary food and drinks appears insufficient to capture the complex dietary component of the caries process.

CONCLUSION

The prevalence of dental caries among preschoolers was found to be high and with the majority of preschoolers consuming sugary food and drink more than three times a day. However, there was no statistical relationship between frequency of sugary food and drink intake with the prevalence of dental caries and dft score.

The study has highlighted a number of important findings which will need to be addressed in dental health and nutrition intervention programmes for preschool children. The intervention should highlight the need to reduce the frequency of sugary food and drink consumption. Research in nutrition and dental health in Malaysian is relatively new. Clearly there is a need to carry out further research with the emphasis being on the amount of sugar consumption and its relationship with dental caries prevalence in preschoolers. Further research is also needed to explore dietary habits in relation to dental health among toddlers.

ACKNOWLEDGEMENT

The authors would like to thank to teachers, preschoolers and their parents who participated and contributed to this study.

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