

Social & Behavioral Risk Factors and Early Childhood Caries – A Cross-Sectional Study on Preschool Children in Shah Alam

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ABSTRACT

Introduction: Early childhood caries (ECC) remains a major challenge among the 5-6 year olds in Malaysia with a caries prevalence of 71.3% as indicated in the last survey of preschool children in 2015. Studies have shown that behavior and income status can influence development of ECC. **Objectives:** The aim of this study was to measure the caries prevalence among 2 – 5 years old preschool children and to study the association of parents' socio behavioral factors on ECC. **Materials and methods:** 140 preschool children participated in this study. Parents were given a set of structured questionnaires and oral examination was conducted on their children after receiving consent. **Results:** Findings showed prevalence of dental caries was 50.1% with mean dft score of 2.51. There was significant association between dental caries and children drinking formula milk and sweet drinks in their bottles: ($p < 0.05$). Children from lower income family and lower education level have significantly higher caries prevalence compared to those from more privileged family. **Conclusions:** Drinking pattern, family income and education level appear to be contributing factors towards development of ECC among this group of children. It is recommended that health promotion interventions be targeted towards the lower income group with emphasis on drinking pattern of the children.

Keywords: Early childhood caries, drinking pattern, preschool children.

INTRODUCTION

Early childhood caries (ECC) in Malaysia is a major challenge as indicated by epidemiological surveys. Caries prevalence among the 6-year-olds have remained high with only a slight decline from 80.9% in 1997 to 74.5% in 2007 (NOHSS 2007). The National Oral Health Survey of Preschool Children 2015 (NOHPS 2015) showed a decreasing trend in caries prevalence (dft \neq 0, DMFT \neq 0) compared to previous survey – 87.1% in 1995, 76.2% in 2005 and 71.3% in 2015 (NOHPS 2015). Even though it shows a decreasing trend, the prevalence is still high as the reduction in caries severity is rather slow with a mean decayed component of 4.55 and almost two-thirds of the children (65%) required treatment for dental caries in the deciduous dentition (NOHPS 2015). ECC has been defined as the presence of 1 or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger (AA Pediatric Dentistry,



2020). A variety of terms have been used besides Early Childhood Caries such as nursing caries, nursing bottle syndrome and baby bottle tooth (AA Pediatric Dentistry, 2020). Early Childhood Caries is a multi-factorial disease. Development of caries is not only the result of a time-specific interaction of microorganisms with sugars on a tooth surface, which is *Streptococcus Mutans* (Hallet & Rouke, 2003, Kumar et al, 2014, Poh et al, 2012) but other factors also influence the carious process. Studies have shown that social, demographic and behavioral factors such as ethnicity, family income, maternal education level, family status, tooth brushing habits and parental knowledge and beliefs are scientifically associated with the development of ECC (Kumar et al 2014, Poh B.K et al 2012, Ruhaya H et al 2012).

A number of studies have demonstrated a clear correlation between social and behavioral factors and the prevalence of early childhood caries among preschool children (Hallet et al 2003, Kumar et al 2014, Poh B. K et al 2012, Nahed AA 2013, Naidu et al 2013). There is strong evidence on the influence of behavioral factors towards development of early childhood caries. The primary factor was said to be a pattern of sugar consumption that has been established early in life of the child (Annerosa et al 2010). According to Campus et al., (2004), children with high frequency of sweet food consumption and those who use pacifiers at night are at a higher risk of getting caries (Campus, G., et al 2004). This prolonged and improper feeding habits also contributed to the development of early childhood caries (Hallet et al 2003, Ruhaya H 2012, Widowati Witjaksono et al 2006, Prakasha Shrutha et al 2013). In addition, preschool children who did not practice tooth brushing at all and frequently took sweet foods are at higher risk of getting dental caries (Kumar et al 2014, Ruhaya H et al 2012, Nahed A A 2013, Naidu R 2013, Annerosa Borutta et al 2010).

There was also a significant increase in ECC risk caused by infant feeding behaviors such as not breast feeding up to 12 months of age, sleeping with the bottle, and children who continuously sipped from the bottle (Hallet et al 2003).

Parental knowledge and oral health awareness play an important role in minimizing the occurrence of nursing bottle caries among young children. Families with better family income experienced improved dental health as compared to low family income (Hallet et al 2003, Poh et al 2012, Ruhaya H et a; 2012,Naidu et al 2013, Peltzer et al 2014).

The aim of this study was to measure the caries prevalence among 2 – 5 years old preschool children and to investigate the association of parents' socio-behavioral factors on ECC in preschool children in a local urban area in Shah Alam, Malaysia.

MATERIALS AND METHODS

A cross-sectional study was conducted among a randomly selected group of pre-school children aged 2-5 years old living within the area of Shah Alam, Selangor. A total of 142 preschool children participated in this study. The exclusion criteria included children who were not given consent by their parents, special needs children or children with medical history and difficult children who refused to be examined. Ethics approval was obtained from Universiti Teknologi MARA (UiTM) Research Ethics Committee. A set of questionnaires on parents' demography and behavioral factors were given to the selected sample of preschool children and will be completed by their parents. The questionnaire was adapted from a previous study on social and behavioral determinants of early childhood caries (Hallet et al 2003). Only parents who have given consent for their children to undergo oral examination and answered the questionnaire were included in the study. Even though parents of 142 children responded, not all the questionnaires were fully answered by the parents. Oral examination was carried out at the childcare premises using portable equipment. Caries experience was recorded using WHO survey method. The oral examination was conducted in the class or in the kindergarten premises in the presence of their teachers and caregivers.

Data obtained from the questionnaire and oral examination were computed and analyzed using the SPSS (Statistical Programme for Social Science, Raleigh, North Carolina, USA) (V.21). Parents' social and behavioral factors were then grouped into demography and oral health behavior.

RESULTS

Demography and dental caries prevalence

Table 1 shows caries prevalence and oral health behavioral variables of the children in the study. The difference in caries prevalence between the boys and girls were not statistically significant ($P>0.05$). However, the association between education level and income level with caries prevalence was statistically significant ($P=0.005$ and $P=0.003$). More than 50% of children whose parents' have education level up to secondary level have higher caries prevalence (62.5%) compared to those with university education (30.5%). In the income group, children from households whose earnings were less than RM5000 have higher caries prevalence (31.9%) compared to those from the higher income bracket (8.5%).

Table 1: Socio - behavioral factors and caries prevalence

Variables	Caries				Chi-sq test p-value
	Absent		Present		
	N	%	N	%	
GENDER					0.973
Boys	43	30.3	29	20.4	
Girls	42	29.6	28	19.7	
EDUCATION LEVEL					0.005
Primary& secondary level	9	37.5	15	62.5	
Pre-university& vocational	9	45.0	11	55.0	
University	66	69.5	29	30.5	
HOUSEHOLD INCOME					0.003
<rm3000	18	12.8	23	16.3	
Rm3001- rm5000	21	14.9	22	15.6	
Rm5001-rm8000	20	14.2	7	5.0	
>rm8000	25	17.7	5	3.5	
DURATION OF BREAST FEEDING					0.761
< 6 months	21	16.9	19	15.3	
6 months- 12 months	15	12.1	19	15.3	
Between 12- 24 months	15	12.1	12	9.7	
More than 24 months	13	10.5	10	8.1	
AGE TO START BOTTLE FEEDING					0.757
Not on bottle feeding at all	3	2.4	5	4.0	
< 6 months	27	21.8	21	16.9	
6-12 months	21	16.9	18	14.5	
At age between 12-24 months	7	5.6	10	8.1	

After 2 years old	6	4.8	6	4.8	
CONTENT OF DAILY BOTTLE					
Infant formula	57	46.0	44	35.5	0.024
Plain water	29	23.4	28	22.6	0.880
Cordial fruit juice	12	9.7	12	9.7	0.860
Sweet drink	12	9.7	24	19.4	0.009
SLEEP WITH BOTTLE					0.409
Yes	15	12.1	18	26.6	
No	49	35.9	42	33.9	
USAGE OF SWEETENED DUMMY					0.079
Yes	1	0.8	5	4.0	
No	63	50.8	44.4	55	
AGE STARTED TOOTH BRUSHING					0.937
<6 months	7	5.6	8	6.5	
Between 6-12 months	23	18.5	21	16.9	
Between 12-24 months or more	27	21.8	23	18.5	
More than 2 years old	7	5.6	8	6.5	

Socio behavioral Factors and dental caries prevalence

Children who consumed infant formula or sweet drinks in the bottle daily had significantly higher caries prevalence ($p=0.024$) and ($p=0.009$) respectively. As for duration of breast feeding and other socio behavioral factors, even though they were not significant, there is an increasing trend of dental caries in children who were breastfed for a shorter duration (30.6%) compared to those who were breastfed for more than a year's duration (17.8%). Those who started bottle-feeding earlier before the age of 1 year showed higher caries prevalence (31.4%) compared to those who started bottle-feeding after twelve months (12.9%). However this study showed that children who did not sleep with the bottle seemed to have higher caries prevalence (33.9%) compared to those who slept with the bottle. Sweetened dummies also did not have much effect towards caries formation.

Socio-behavior factors and mean dft scores

The association between social and behavioral factors and the mean decay and filled deciduous teeth (dft) scores is shown in Table 2. Children from families with lower education background have higher mean dft (3.16) compared to those children whose parents have achieved university education (mean dft = 2.03). Children with lower income parents also have higher mean dft of 3.17 compared to those parents who have higher income (mean dft = 1.45). Children who consumed fruit juice or sweet drinks in their bottles or use a sweetened dummy have higher mean dft (3.58, 3.83, 5.00 respectively) compared to children who drink plain water in their bottle (mean dft=2.74) and children who do not use the sweetened dummy (mean dft=2.38). Even though there was no statistical difference between children who slept with the bottle and those who did not sleep with the bottle, it still poses a risk in caries formation as shown by the mean dft (3.42) compared to those who did not sleep with the bottle (mean dft=2.18).

Table 2: Socio – behavioral factors and mean dft score

Variables	dft		
	Mean	Sd	
GENDER	male	2.90	3.790
	Female	2.13	3.670
EDUCATION LEVEL			
Primary & secondary	3.16	3.837	
Pre-university & vocational	3.75	4.667	
university	2.03	3.395	
HOUSEHOLD INCOME			
<RM 3000	3.17	3.390	
RM 3001-RM 5000	2.36	3.681	
RM 5001-RM 8000	2.71	4.101	
>RM 8000	1.45	3.019	
DURATION OF BREAST FEEDING			
< 6 months	2.15	3.199	
6 months- 12 months	2.65	3.992	
Between 12- 24 months	2.37	3.814	
More than 24 months	3.09	4.231	
AGE TO START BOTTLE FEEDING			
Not on bottle feeding at all	3.38	1.523	
< 6 months	1.81	0.414	
6-12 months	2.59	0.640	
At age between 12-24 months	3.94	1.174	
After 2 years old	2.42	1.055	
CONTENT OF DAILY BOTTLE			
Infant formula	2.04	3.307	
Plain water	2.74	4.099	
Cordial fruit juice	3.58	4.818	
Sweet drink	3.83	4.507	
SLEEP WITH BOTTLE			
Yes	3.42	4.528	
No	2.18	3.362	
USAGE OF SWEETENED DUMMY			
Yes	5.00	4.817	

No	2.38	3.647
AGE STARTED TOOTH BRUSHING		
<6 months	2.15	3.199
Between 6-12 months	2.65	3.992
Between 12-24 months or more	2.37	3.814
More than 2 years	3.09	4.231

Children who started solid food as early as less than 12 months have a higher risk of caries (mean dft=2.76) compared to those who started solid food after 18 months (mean dft=1) and children who started brushing after 2 years of age also have higher dft (mean dft=3.0) compared to those who started brushing as early as 6 months (mean dft=2.15).

Overall, the mean dft score for our study population in Shah Alam was 2.51 (SD 3.730) with 59.9% of children having caries free deciduous dentition and 50.01% of them with caries experience. Of these, 19.3% of the children presented with dft score of 6 and more.

DISCUSSION

Dental caries is one of the most common public health problem that can affect deciduous and permanent teeth. Managing dental caries in young children, especially those with rapid progression, can indeed be challenging for dental professionals.

According to the guideline of European Academy of Paediatric Dentistry (EAPD) on the prevention of early childhood caries, ECC presents a public health problem with biological, social, and behavioral determinants among some of its associated factors (EAPD Policy Doc 2008). A comprehensive review of literature showed that the prevalence of ECC varies across the world with it being between 1-12% in developed countries and up to 70% in developing countries (Colak et al 2013). The highest prevalence of dental caries is found in Africa and South East Asia (Milnes 1996) while in European countries (England, Sweden and Finland) the prevalence of ECC is estimated to range from 1% to 32% while in Eastern Europe it is reported to be as high as 56% (Szatko F et al 2004). As mentioned earlier, ECC is still a major challenge in Malaysia despite efforts taken to provide early oral healthcare to children from as young as infancy (Early Childhood Caries, OHD, MOH 2008).

The prevalence of ECC in this study population was quite high (50.1%) with a mean dft of 2.51 which is still below the national findings (NOHPS 2015, dft = 4.83). This could be attributed to the fact that the study area was conducted in an urban area. Despite pockets of urban poverty, access to oral health care is good and efforts are continuously being carried out to promote oral health and to provide oral health care specially to target groups of the population including the pre- school and school children.

The risk factors for ECC include a number of social and behavioral determinants (Annerosa Borutta et al 2010). Our study showed that socioeconomic status and education level remain significant risk factors for the development of ECC in preschool children. This could be attributed to low awareness, lower perceived needs and lower utilization of oral health care services. Parents in the low socioeconomic group are more concerned about providing the essential needs for the family and may not have the time to focus on whether their children are practicing good oral hygiene at home. Watt R. G. in his paper stated that dental scientific literature from many countries has shown that the oral health of lower socioeconomic status (SES) groups is worse than those from higher SES and has stressed the need to address these social determinants to help curb prevalence of dental caries in this disadvantaged group (Watt R. G. (2007). Hallet & O'Rourke (2003) obtained similar results with a caries prevalence of 50.3% among children from low income families compared to those from higher income families.

Increased prevalence of ECC experienced by preschool children from low socioeconomic status may occur due to several factors such as limited access to professional oral health care services and not being able to afford oral health products such as toothbrush and toothpaste for their children due to financial constraints. As a result, these children will have poorer oral health which increases their risk of getting dental caries. Therefore, concerted efforts from various oral health organizations is needed to reduce the prevalence of ECC among preschool children.

Feeding habits also influences the risk of dental caries in young children. Adding sugar to formula milk and fruit juices increases a child's risk towards ECC. Besides this, giving children formula milk early in life also increases their risk of getting dental caries. This study has demonstrated a strong association between ECC and feeding habits. A study done by Ruhaya et al. in 2012 reported that 45% of parents, despite knowing the types of food that are cariogenic, still give sweetened liquid when bottle feeding. Another study conducted by Hallet et al. (2003) showed that daily bottle feeding with juice, cordial and soft drinks significantly increased the prevalence of ECC by 40.9%, 53.8%, 71.4% respectively as compared to daily bottle feeding without juice.

Although studies have shown a link between dental caries and sleeping with the bottle, this was not a significant finding in our study. However there is available scientific evidence that breastfeeding is more effective at preventing dental caries in early childhood than bottle-feeding and should be encouraged as an exclusive feeding method for up to at least six months (Avila WM et al 2015). This significant association of duration of breastfeeding and prevalence of ECC is due to caries protective elements such as maternal immunoglobulin, enzymes, leucocytes and specific antibacterial agents, which are found in human breast, milk (Annerosa Borutta et al 2010).

There were also correlations of other variables such as the age started brushing, usage of toothpaste and sweetened dummy in development of ECC as reported by other researchers. Our study did showed that children who used sweetened dummy have higher dft compared to those who do not. Those children who started tooth brushing earlier at the age of one year old were said to experience less caries as compared to children who started tooth brushing at a later age (Hallet et al 2003). Our studies also showed that children who started brushing after aged 2 years have a higher dft compared to children who started brushing as early as 6 months. However, this is not significant probably due to the small sample size and thus further studies need to be carried out to investigate other risk factors that may influence the onset of caries in young children.

RECOMMENDATIONS

Early childhood caries is an important public health problem among certain segments of the society such as the socially disadvantaged and remains a persistent disease burden to health care systems. Occurrence of dental caries relies very much on the biology and pathogenesis of the disease i.e. the balance between the virulence of the attacking agent (primarily mutans streptococci), the host resistance (integrity of primary tooth enamel, saliva, protective elements) and this is further influenced by environment factors including social, cultural, demographic, behavioral and economic circumstances. This study showed association between income, education, infant formula and juices in bottle feeding as risk factors for dental caries in preschool children in the area of Shah Alam, Selangor. This information is useful for policy makers in targeting oral health promotion for preschool children especially for those from the high-risk groups. Concerted efforts must be directed towards strengthening oral health promotion programs focusing on parents and child-carers.

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