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Research Report

Assessment of behavioral factors associated with dental caries in pre-school children of high socioeconomic status families

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ABSTRACT

Background: *Many Iraqi children of high socioeconomic status (SES) families attend dental clinics presenting predominantly cavitated and painful multiple carious lesions. The factors responsible for dental caries within this sector of society need to be identified.* ***Purpose:*** *The aim of this study is to assess the dental care behavior of mothers and its relationship with the prevalence of dental caries in pre-school age children drawn from high SES families in northern Iraq.* ***Methods:*** *A study was conducted to assess the prevalence of dental caries and its relationship to oral hygiene habits in 440 pre-schoolers living in Erbil, northern Iraq. An oral hygiene questionnaire was distributed among the families. Dental examination of the children was performed to calculate the dependent factor of decayed, missing and filled teeth due to caries (dmf). All data was analyzed by means of the SPSS Microsoft statistical system using descriptive tables to identify the relationship between the dependent and independent variable dmf indexes. In order to find the significances, a Chi-square test, a Fisher's exact test and a likelihood ratio test were used at level of $p<0.05$.* ***Results:*** *67% of the children in the sample had dental caries (mean dmf=3.25±3.77) with 5-year-olds being more affected by dental caries (74%) than 4-year-olds (60%). A strong correlation was found in this study between the dependent factor, dmf, and the following independent factors: frequency of snack consumption, the need to assist the child during brushing, maternal caries and the mother's education.* ***Conclusion:*** *Despite being members of high SES families, the children examined were significantly subject to dental caries, a fact directly correlated with inappropriate behavior on the part of their caregivers in relation to the essential aspects of oral health care.*

Keywords: *dental caries; dmf index; oral health; preschoolers; socioeconomic status*

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INTRODUCTION

Early childhood is defined as the period between birth and the 71st month during which dental caries affect children.[1] An important element within Primary Care is early examination of the child. Dental caries constitute a disease caused by bacteria and, consequently, is transmissible from mother to child thereby negatively affecting the dentition status of the latter.[1] Dental caries caused by aciduric and acidogenic bacteria transform sugar into lactic acid subsequently resulting in the dissolution of the tooth enamel.[2]

Although high SES exerts a noticeable positive influence on the general and oral health of individuals,[3] numerous other factors may cause dental caries, such as poor oral hygiene, the absence of assistance to children during the brushing of their teeth and a high daily consumption of snacks. The incidence of dental caries in young children may be higher due to the frequent intake of snacks, especially sweets. Therefore, restricting the frequency of children's consumption of snacks allied with consistently regular meals is recommended.[4] Dental caries in early childhood may be the result of bottle feeding or breastfeeding while the infant in question is asleep.[2,5]

Regular visits to the dentist and the professional application of fluoride are essential factors in the prevention of dental caries[6] which negatively impact on the psychology of children due to aesthetic problems which can negatively

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affect their self-esteem and ability to eat when the lesions are cavitated.[7] In the USA, it has been proved that caregivers presenting tooth loss due to caries negatively influenced the dental health of their young children who also suffered from the same condition.[8] The level of education enjoyed by the mother is an important influencing factor in the incidence of dental caries in a child, together with such variables as income and the frequency of their visits to the dentist.[9] The aim of this study was to assess the influence of maternal behavior on the prevalence of dental caries in pre-schoolers drawn from high SES families in northern Iraq.

MATERIALS AND METHODS

This study was undertaken in four selected private kindergartens located in the north, south, west and east of Erbil, Northern Iraq. 440 children aged 4-5 years old were examined for dental caries, while information concerning their oral hygiene habits was also collected from their families by means of a questionnaire. All the children were drawn from families in which the parents occupied high income jobs.

The number of subjects drawn from the kindergartens totaled 486. After the application of specific inclusion and exclusion criteria, 46 children were rejected, of which 21 failed to submit their questionnaires, six did not attend on the day of the examination, 18 did not return their oral habit questionnaires and one was excluded due to his being asthmatic. The research population of the study, therefore, comprised 440 individuals.

All subjects satisfying the following criteria were included in the study: aged 4-5 years, free of systemic disease, parental agreement provided, comprehensive oral habits data and complete dental records which could be reviewed by the observers. Failure to meet these criteria was considered justifiable grounds for exclusion.

The questionnaire included items concerning the tooth-brushing habits of each subject, the timing and duration of their feeding during infancy, their eating routine, untreated caries and use of fluoride, together with the level of education of his/her mother. An oral hygiene habits questionnaire in Kurdish, the regional language, was prepared by the author which included the factors potentially causing dental caries[9] (Table 1) and distributed among the families who completed the questionnaire one week before the dental examinations were conducted.

Dental examinations involving the use of a plan mouth mirror and CPI probe were conducted under natural light in the well-lit hall of the kindergartens with the subject seated on an ordinary chair. The dentition status for children, Annex 2, WHO (2013)[10] was used to register the examination results. Dental caries were recorded when a lesion in a pit or fissure, or on a smooth tooth surface, constituted an observable cavity, damaged enamel due to caries, or a visibly softened floor or wall. Temporarily restored teeth, or ones previously restored but also carious, were classified as decayed. A tooth was considered to be present even if only parts of it remained in the mouth. In cases of uncertain tooth presence, caries were not recorded as existing. In order to enhance the reliability of clinical judgments, four dentists were trained to collect the dental examination data. The dmf index was used to measure the prevalence of dental caries. In order to quantify intra-observer validity, a pediatric dentist repeated ten of the observations previously performed by each dentist, thereby acting as a calibrator. A level of intra-observer validity between the pedodontics specialist and each dentist was achieved. The research was initiated after approval by the scientific committee of Tishk International University (Document No. IU.FA.FR. 137E. Decree No. 4, 2018), and that of the families of the subjects had been secured.

IBM SPSS system 22 was used to analyze the data collected. Descriptive tables were used to indicate the

Table 1. Oral habits questionnaire

No.	Questions	Answers	
Q1	Does the child suffer from any systemic disease?	Yes	No
Q2	Does the mother have caries?	Yes	No
Q3	The feeding time of the child during infancy	daytime hours only	both daytime and nighttime hours
Q4	Does the child demonstrate poor eating habits, such as consuming cakes, sweets, chocolate, soda drinks and potato chips?	Yes 1-2 times a day >3 times a day	No
Q5	Does the child brush his/her own teeth?	Yes	No
Q6	Do you assist your child during tooth-brushing?	Yes	No
Q7	Has the child ever undergone professional fluoride application?	Yes	No
Q8	Education level of the mother or caregiver	Primary school Secondary school Undergraduate degree Postgraduate degree	

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total research population together with the gender of each and his/her relationship to the dependent variable dmf index. A chi-squared test, a Fisher's exact test and a likelihood ratio test were used to compare the relationship between the dependent variable (dmf) and the independent variables; tooth-brushing habits, the frequency of feeding during infancy, eating habits, untreated maternal caries, professional fluoride application and the level of education of the mother. The p-value was measured at a level of p<0.05.

RESULTS

440 pre-school children were examined during this study, 67% of whom had dental caries (mean dmf=3.25±3.77). The 5-year-olds were more affected by dental caries (74%) than their 4-year-old counterparts (60%) with respective dmf indexes of 3.8±4.33 and 2.9±3.4 which represented a statistically significant difference. The contents of Table 2 confirm that males were more affected by dental caries (70%), than females (52%) and had a higher dmf index (3.6±3.76).

Table 2. Distribution of age and gender and dmf index in the sample

Variables	Factors	N	Caries (%)	Mean dmf±SD	p-value
Age	4 years	160	60.00	3.8±4.33	0.021*
	5 years	280	74.00	2.9±3.40	
Total		440	67.00	3.25±3.77	
Gender	Boys	240	70.00	3.6±3.76	0.25
	Girls	200	52.00	2.8±3.78	

*significant difference at the level p<0.05

Table 3. The relationship between mean dmf and tooth brushing habits in the sample

Variable	Type	N	Caries (%)	Mean dmf±SD	p-value
Tooth Brushing	1/day	304	63	3.5 ± 3.87	0.244
	2-3/day	96	40	1.9 ± 2.7	
	None	40	80	4.6 ± 4.59	

Table 4. The relationship between mean dmf and brushing assistance habit

Variable	Type	N	Caries (%)	Mean dmf±SD	p-value
Brushing assistance	No	240	67	3.93 ± 4.06	0.05*
	Yes	200	50	2.37 ± 3.29	

*p-value at the limit of significance

Table 5. The relationship between the mean dmf and snack consumption

Variable	Type	N	Caries (%)	Mean dmf±SD	p-value
Snacking	Once and twice/ day	232	58.60	2.75 ± 3.02	0.001*
	>3/day	104	84.00	5.46 ± 4.85	

*significant difference at level p<0.05

Table 6. The relationship between mean dmf and nursing time during infancy

Variable	Type	N	Caries (%)	Mean dmf±SD	p-value
Nursing Time	Day and night	56	85.70	5.42 ± 3.58	0.001*
	Day	384	56.25	2.93 ± 3.71	

*significant difference at the level p<0.0

Table 7. The relationship between mean dmf and topical fluoride application

Variable	Type	N	Caries (%)	Mean dmf±SD	p-value
Topical Fluoride	Yes	64	62.50	3.75 ±4.18	0.214
	No	376	59.50	3.17± 3.71	

Table 8. The relationship between mean dmf and dental caries among the children' mothers

Variable	Type	N	Caries (%) of children	Mean dmf±SD	p-value
Mother caries	Yes	184	60.00	3.4 ± 3.72	0.025*
	No	256	59.40	3.12 ± 3.83	

*significant difference at the level p<0.05

Table 9. The relationship between the mothers' education and dmf in the sample

Variable	Type	N	Caries (%)	Mean dmf±SD	p-value
Mother's education	Post-graduate	48	16.6	0.16±0.38	0.001*
	Bachelor	200	56	2.26±2.6	
	Secondary	120	73.3	5.9±4.7	
	Primary	72	77.7	3.55±3.29	

*significant difference at the level p<0.05

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The dmf index was higher in the research subjects who did not brush their teeth (4.6±4.59) and who were most susceptible to caries (80%) than those who brushed once or twice a day, but it showed no statistically significant difference (Table 3). Responses to the question about brushing assistance showed that 240 mothers did not provide this to their children. Of the subjects who were not assisted with tooth brushing, 67% had caries with a higher dmf index (3.93 ± 4.06) than those who were assisted (2.37 ± 3.29). However, the difference was not statistically significant (Table 4).

Of 440 children, 232 consumed snacks once or twice a day and 104 more than three times daily. The highest dmf index in subjects was that relating to more than three times (5.45±4.85); 84% were affected by dental caries and the difference was statistically significant (Table 5). Responses relating to the intensity of breastfeeding showed that 56 mothers breast fed their infants both during the day and at night and 85.7% of their children had dental caries. The other 384 children were breast fed only during the day and 56.25% were affected by dental caries, indicating a respective dmf index of 5.42 ± 3.58 and 2.93 ± 3.71 which constituted a statistically significant difference (Table 6).

Topical fluoride was applied to only 64 subjects in the sample who still recorded a high caries index (dmf = 3.37±4.18). 62.5% were affected by dental caries, almost the same percentage as those who did not received fluoride (59.5%) with no statistically significant difference (Table 7). The question concerning whether the mothers were affected by dental caries, showed that 184 had dental caries, while 60% of their children were affected by dental caries with a dmf of 3.4 ±3.72. These was a statistically significant difference in comparison with the caries index of children whose mothers were free of dental caries (mean dmf = 3.12 ± 3.83) (Table 8).

With regard to the education level of mothers and its relationship to the incidence of dental caries, the results of this study showed that the highest percentage of dental caries was found in those children whose mothers had only gained a primary school education (77.7%, dmf = 3.55±3.29). In contrast, only 16.6% of the children whose mothers had undergone higher education were affected (dmf = 0.16±0.38). There was a highly significant statistical difference between the level of the education of the mother in terms of the prevalence of caries in their children, namely; $p<0.05$ (Table 9).

DISCUSSION

As dental caries develops over time, it can be argued that those detected in the subjects of the current study largely began in infancy due to their inappropriate dietary habits becoming increasingly prominent from the point of weaning until the time of the examination (4-5 years). This viewpoint agrees with that contained in the study conducted by Moynihan and Petersen.[11] Caregivers lacked knowledge about the negative impact of frequent snacks. Moreover, high SES families in Iraq purchase sweets for their children to make them feel content. In addition, there was considerable inconsistency regarding the appropriate point in time to wean infants which rendered dental treatment for the entire family essential. There is a need to introduce this practice in Iraq.

There are numerous potential causative factors of dental caries which comprise: the host, the mediator and the environment. The primary one is mutans streptococcus (MS) bacteria. The adherence of MS to the tooth surface will result in the formation of plaque. MS ferments sugar and converts it into lactic acid which leads to demineralization of the enamel.[12] Families need to be aware of the effect of these bacteria in forming dental caries and how to prevent this by tooth brushing, assisting the child during brushing, diet counseling and regular visits to the dentist.

Pediatric dentists, in particular, have a major role to play in educating mothers to manage the oral health of their children. All dentists who treat adults with caries should ask the patient about the oral health of their children.[13] One of the measures to prevent dental caries in infants and toddlers is that of treating the dental caries of their caregivers since these may be induced in the child.[14] Of the mothers featured in the current study, 46% suffered from dental caries. However, this figure may represent a case of under-reporting which can be considered a limitation of this study. Preventive methods should be established such as oral hygiene improvement, fluoride application, the use of pit and fissure sealants, decreased frequency of snacks during the day and educating caregivers.[15] In this study, the mothers with caries themselves were found to have children suffering from high levels of this condition.

The components of the SES are the level of parental education, house ownership, family income and type of parental occupation.[16] In the current study, the families of the research subjects were all owner-occupiers of their homes and earn high incomes, but their children were found to be strongly affected by dental caries. In the current study, one of the factors that directly influenced the dental health of those individuals was the level of their mothers' education. The highest dmf score was found in children whose mothers had only attended primary school, while the lowest was in those whose mothers had progressed to higher education. Several studies[2,5,7,8] concur that the education level of a mother influences the advice she gives her child with regard to diet and duration of brushing, as well as the regularity of both her own visits and those of her child to the dentist in order to monitor their respective oral health. Educational programs can be introduced into schools and may prove beneficial in increasing the health awareness of school children in Iraq[17] which will, in turn, have a positive impact on subsequent generations.

This study is subject to certain limitations in that it relates only to Iraq. Despite being drawn from high SES families, the subjects of this study demonstrated a significant incidence of dental caries. The causative factors

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underpinning their high rates in these children were related to inappropriate behavior on the part of the caregivers with regard to the essential aspects of oral health care. On this point, the author recommends the introduction of educational programs for all categories of Iraqi society using a variety of media and methods and activating community dentistry to increase the awareness of families regarding oral health care.

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