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Dental caries and nutritional style amongst school children in Tripoli-Libya

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Abstract
Dental caries is a major public health problem and it is the most prevalent chronic disease. The aim of this study was to determine the association between dental caries using DMFT and nutritional style in Tripoli-Libya. A cross sectional study was conducted on 392 children in Tripoli/ Libya in the age group of 6–12 years. The prevalence of dental caries was assessed by DMFT/dmft index and a self-constructed questionnaire was used to assess nutritional style and nutritional habits.
The data were analyzed by using SPSS software, version 24. Chi square test was applied to elaborate the significance of the association/ differences between study variables.
The overall dental caries prevalence was 74.7%. Most of the children (77.1%) used the bottle-feeding, and 40 (13.2%) of those who used bottle-feeding their mothers mixed the milk with sugar. About two thirds of the children (68.9%) often drink soft drinks and (68.2%) eats sweets and chocolate all the time. There was statistically significant between the DMFT index and drinking soft drinks, drinking juice and insignificant relationship between DMFT and eating candy and chocolate.
In conclusion, Dental caries amongst children in Tripoli/Libya is a common public health problem and prevalence of DMFT was affected by nutritional habits and nutritional style. Therefore, comprehensive oral health educational programs about dietary practices as nutritional style and nutritional habits and the appropriate oral hygiene habits for both children and their parents are needed in order to reduce dental caries among children.

Keywords: DMFT/dmft, chronic disease, nutritional style, nutritional habits

Introduction
Dental caries is a major public health problem and it is the most prevalent chronic disease [1]. In 2015, deciduous tooth decay was ranked as the 12th most prevalent condition, affecting 560 million children [2]. Dental caries is a multifactorial disease, which can affect any age. It is highly related to and influenced by the patient's dietary habits, sugar intake, salivary flow, salivary fluoride level and preventive behaviors. These factors, together with time, promote the microbial residence in the accumulated dental plaque to initiate dental caries [1]. In young age, breastfeeding, bottle-feeding and pacifier play a role in the development of DC during childhood. The WHO recommends exclusive breastfeeding until the age of six months, and breastfeeding complemented with food intake is suggested until two years old. Scientific evidence showed that breastfeeding is more effective at preventing DC in early childhood than bottle-feeding, but prolonged breast feeding could be a risk factor for the development of DC [3]. According to many studies they found bottle-feeding could have a strong relationship with DC if used in inappropriate way. There are many evidence from different types of investigation showed the role of dietary sugars in the etiology of DC. Eating sugar products frequently without removing it from the tooth surface, will lead to cavity formation on the tooth surface, the more times a child eats food containing carbohydrates in a day, the more are teeth exposed to sugars which lead to DC. Therefore, minimizing snacking is recommended, since snacking creates a continuous supply of nutrition for acid-creating bacteria in the mouth [4]. and there are many factors are related to eating habits, which lead to increase of DC such as the number of meals and snacks per day, frequent consumption of simple carbohydrates and type of food and High consumption of sugars and sweet soft drinks and juices [5].

Objective
To determine the association between dental caries using DMFT index and nutritional style, which includes: pacifier, bottle-feeding, drinking soft drinks, drinking juice, eating sweets and eating chocolate amongst school children in Tripoli-Libya.

Methods
Study design
Ethical approval for the study was obtained from the Research Ethics Committees of Ministry of Health in Libya.
A cross-sectional survey conducted among school children aged 6 –12 years in 3 dental public health centers, and one of the biggest public health hospitals in Tripoli from May- August 2016 from summer schools. The children selected by convenient

sampling technique, so each child ages between 6 to 12 years, who has been found at the same time that the investigator (first author) is present in the same place were taken after one of the parent's acceptance. Around 5 -15 children were examined each day except the day off, about forty one working days were needed to complete the study, and each day was represented by 3-4 working hours.

Data collection and examination procedure

The first author carried out all dental examination and data collection; the first author is a dentist with 9 years' experience as a general dental practitioner.

Children whose mothers agreed to participate in the study, were asked to prepare himself/herself for dental examination, meanwhile in the waiting room the author gave the mothers of children the questionnaire and made a personal presentation for the questionnaire for clarification of the questionnaire and to avoid any misconception of the questions and asked them to answer all of the questions with honesty and clarification.

Oral examination had been taken for each child by using artificial light using a dental mirror. Instruments used during data collection were sterilized before dental examination and at the end of the data collection. Disposable gloves and masks were used during the data collection.

Tools of data collection

A self-constructed questionnaire was used in this study, consists of two sections: socio-demographic characteristics section consisted of 8 questions including: sex of the child, age of the child, number of family members, order of the child in the family, educational level of the mother, mother's occupation, family income, house ownership. And nutritional style and nutritional habits section consisted of 8 questions. The answers of the questions were either yes, no, or sometimes. Regarding the scoring scale (blooms method). The correct answer was given 1 point while the wrong answer was given zero point.

Statistical analysis

Data collected were entered in Statistical Package for Social Sciences Software (SPSS), version 24.

The severity of dental caries was recorded using DMFT scores with the mean. The prevalence of DC was calculated as the frequency and proportion of subjects with DC experience in the primary and permanent teeth.

Chi square test was employed to test the statistical significance of any observed association.

Results

A total of 389 school children (198 boys and 202 girls), aged between 6 to 12 years were screened. Two thirds of them (60.2%) aged more than 8 years, 62.7% live with family members, having 5 members and below and 30.1% were the first-born child in the family. More than one third of child's mothers were at the university level of education (38.5%) and (57.1%) of the mothers were housewives. The family income: (41.4%) where poor, while the majority of children (78.4%) lives in houses they own (Table 1).The prevalence of DC amongst children was 74.7%. The prevalence of DC in primary teeth using dmft index was (63.5%) and the prevalence of DC in permanent teeth using DMFT was (32.7%).

Dependent on mother response, most of the children (77.1%) used the bottle-feeding, and 40 (13.2%) of those who used bottle-feeding their mothers mixed the milk with sugar. The majority of children who did use bottle-feeding 76.7% used it at bedtime. And the percentage of children who did not use a pacifier was 224 (58.5%) and 41 (22.4%) of those who used a pacifier their mothers dipped the pacifier in sugar or honey.

About two thirds of the children (68.9%) often drink soft drinks, while 11.2% never drank soft drinks. The highest percentage of children 55.4% drink juice all the time, and 2.1% of the children never drank juice.

The highest percentage of children eats sweets and chocolate all the time (68.2%), while the lowest percentage did not eat sweets and chocolate all the time 1.8% (Table 2).

There was statistically significant association between DMFT with the use of pacifier (P=0.05). A higher prevalence of DMFT values were observed in children who used a pacifier 37.3% comparing with those who did not use the pacifier; the prevalence of DMFT value was 28.6%.

The use of sweetened pacifier had a significant relationship with DMFT index with (P=0.000). The prevalence of DMFT index in children who had used sweetened pacifiers was 58.5%, while the prevalence of DMFT values of those who had not used was 27.5%.

The prevalence of DMFT index had no statistical significance with the use of bottle feeding (P >0.05), and there was a statistical significance with mixing fluid with sugar in the bottle feeding with (P=0.000), the highest prevalence of DMFT index was 55.0% compared with children who did not drink a fluid mixed with sugar in bottle feeding (27.1%).

There was no statistically significant difference in DMFT values and between bottle-feeding at bedtime (Table 3).

The prevalence of DMFT index was higher among children who drink soft drink (51.3%) compared with those who did not drink soft drink (4.7%).

Evaluation of the results revealed an increase in DMFT prevalence rates with drinking soft drinks. According to the results showed in table 2, the Chi square test indicates statistically significant relationship between the DMFT index and drinking soft drinks (P= 0.000) on a 95% level of confidence.

There was insignificant relationship between the value of DMFT value and drinking juice (P= 0.075).

There was insignificant relationship between the value of DMFT value and eating candy and chocolate (P=0.970).

Also, there was a statistically significant association between DT with the use of pacifier (P=0.025). A higher prevalence of DT values were observed in children who used a pacifier 37.1% comparing with those who did not use the pacifier; the prevalence of DMFT value was 26.3%.

The use of sweetened pacifier had a significant relationship with DT index (P=0.001). The prevalence of DT index in children who had used sweetened pacifiers was 56.1%, while the prevalence of DMFT values of those who had not used was 27.5%.

The prevalence of DMFT index had no statistical significance with the use of bottle feeding (P-value > 0.05), and there was a statistical significance with mixing fluid with sugar in the bottle feeding (P=0.002), the highest prevalence of DMFT index was 50.0% compared with children who did not drink a fluid mixed with sugar in bottle feeding (26.3%).

As indicated by the chi-square test, there was no statistically significant difference in DT values and between bottle-feeding at bedtime.

The prevalence of DT index was higher among children who drink soft drink (50.0%) compared with those who did not drink soft drink (20.9%).

Evaluation of the results revealed an increase in DT prevalence rates with drinking soft drinks. According to the results, there was significant relationship between the value of DT value and drinking juice (P=0.000).

There was insignificant relationship between the value of DT value and drinking juice (P=0.204).

There was insignificant relationship between the DT value and eating candy and chocolate (P=0.988) (Table 4).

Table 1: Socio-demographic characteristics of school children

Characteristic	Number	Percentages (%)
Sex		
Boy	183	46.7
Girl	209	53.3
Age		
6-7	155	39.5
8-9	108	27.9
10-11	64	16.3
12	65	16.3
Number of family members		
Two	5	1.3
Three	38	9.7
Four	87	22.2
Five	115	29.5
More than five	145	37.2
Order of the child in the family		
First	116	30.1
Second	99	25.6
Third	66	17.1
Fourth	50	13.0
More than forth	55	14.2
Educational level of mother		
Primary school	47	12.5
Preparatory school	80	21.2
Secondary school/ Diploma	91	24.1
University graduate	145	38.5
Postgraduate studies	14	3.7
Mother’s occupation		
Employed	166	42.3
Housewife	224	57.1
Monthly family income		
High	81	22.5
Medium	130	36.1
Low	149	41.4
House ownership		
Rent	83	21.6
Ownership	301	78.4

Table 2: Percentages distribution of children according to nutritional habits and nutritional style

Characteristic	Number	Percentages (%)
Did your child use a pacifier?		
Yes	159	41.5
No	224	58.5
Did you dip the pacifier in the honey or sugar?		
Yes	41	22.4
No	142	77.6
Did your child use bottle-feeding?		
Yes	300	77.1
No	89	22.9
Did you mix fluid in a bottle-feeding with sugar?		
Yes	40	13.2
No	262	86.8

Did your child use bottle-feeding at bedtime?		
Yes	231	76.7
No	70	23.3
Child drinks soft drinks all the time		
Yes	76	19.8
Sometimes	264	68.9
Never	43	11.2
Child drinks juice all the times		
Yes	212	55.4
Sometimes	163	42.6
No	8	2.1
Child eats candy and chocolate all the time		
Yes	262	68.2
Sometimes	115	29.9
No	7	1.8

Table 3: Prevalence of DMFT index in relation of the nutrition habits and nutritional style

Nutritional habit	DMFT		P-value
	Yes No. (%)	No No. (%)	
Did your child use a pacifier?			
Yes	60 (37.30)	99 (62.3)	0.05*
No	64 (28.6)	160 (71.4)	
Did you dip the pacifier in the honey or sugar?			
Yes	24 (58.5)	17 (14.5)	
No	39 (27.5)	103 (72.5)	0.000*
Did your child use bottle-feeding?			
Yes	92 (30.7)	208 (69.3)	0.126**
No	35 (39.3)	54 (60.7)	
Did you mix fluid in a bottle-feeding with sugar?			
Yes	22 (55.0)	18 (45.0)	
No	71 (27.1)	191 (72.9)	0.000*
Did your child use bottle-feeding at bedtime?			
Yes	76 (32.9)	155 (67.1)	0.127**
No	17 (24.3)	53 (75.7)	
Child drink soft drinks			
Yes	39 (51.3)	37 (48.7)	
Sometimes	76 (10.2)	188 (71.2)	0.000*
Never	2 (4.7)	33 (76.7)	
Child drink juice			
Yes	74 (34.9)	138 (65.1)	
Sometimes	64 (28.2)	117 (71.8)	0.075**
No	5 (62.5)	3 (37.5)	
Child eats candy and chocolate			
Yes	86 (32.8)	176 (67.2)	
Sometimes	38 (33.0)	77 (67.0)	0.970**
No	2 (28.6)	5 (71.4)	

Percentages were calculated from the variable that was selected.
Chi square test was used.
*Significant
** Not significant

Table 4: Prevalence of DT index in relation of the nutritional habits and nutritional style

Nutritional habit	DT		P-value
	Yes No. (%)	No No. (%)	
Did your child use a pacifier?			
Yes	59 (37.1)	100 (62.9)	0.025*
No	59 (26.3)	165 (73.7)	
Did you dip the pacifier in the honey or sugar?			
Yes	23 (56.1)	18 (43.9)	0.001*
No	39 (27.5)	103 (72.5)	
Did your child use bottle-feeding?			

Yes	88 (29.3)	212 (70.7)	0.166**
No	33 (37.1)	56 (62.9)	
Did you mix fluid in bottle-feeding with sugar?			
Yes	20 (50.0)	20 (50.0)	0.002*
No	69 (26.3)	193 (73.7)	
Did your child use bottle-feeding at bedtime?			
Yes	72 (31.2)	159 (68.8)	0.269**
No	17 (24.3)	53 (75.7)	
Child drink soft drinks			
Yes	38 (50.0)	38 (50.0)	0.000*
Sometimes	72 (27.3)	192 (72.7)	
Never	9 (20.9)	34 (79.1)	
Child drink juice			
Yes	71 (33.5)	141 (66.5)	0.204**
Sometimes	44 (27.0)	119 (73.0)	
No	4 (50.0)	4 (50.0)	
Child eats candy and chocolate			
Yes	82 (31.3)	180 (68.7)	0.988**
Sometimes	36 (31.3)	79 (68.9)	
No	2 (28.6)	5 (71.4)	

Percentages were calculated from the variable that was selected. Chi square test was used. *Significant ** Not significant

Discussion

Dental caries is a multifactorial disease with several identified risk factors but the relationship between caries and nutritional status is not well understood. The prevalence of dental caries in the present study was higher. Therefore, the present study has identified several characteristics of pacifier, breastfeeding and bottle-feeding practices and dental caries. More than half of children in this study did not use a pacifier and few of mothers dipped the pacifier in sugar or honey. Most of the children used the bottle-feeding; few of their mothers mixed the milk with sugar and the majority of children used bottle-feeding at bedtime. In the current study, we found there was statistically significant association between DMFT and use of pacifier. A higher prevalence of DMFT values was observed in children who used a pacifier comparing with those who did not use the pacifier.

The use of sweetened pacifier had a significant relationship with DMFT index. The prevalence of DMFT index in children who had used sweetened pacifiers was high. And the prevalence of DMFT index had no statistical significance with the use of bottle feeding, and there was a statistical significance with mixing fluid with sugar in the bottle feeding, the highest prevalence of DMFT index was high compared with children who did not drink a fluid mixed with sugar in bottle feeding. There was no statistically significant difference in DMFT values and between bottle-feeding at bedtime. This finding is similar to Olatosi and Sote, [6] found the prevalence of DC in relation with breastfeeding and bottle-feeding, the prevalence of DC was 1.99% among children who were solely breastfed, (53.6%) among children who were solely bottle-fed. Also, in Finland, a cross sectional study was conducted on 166 children to assess the prevalence of DC in relation to the use of bottle-feeding. The findings showed that using a pacifier for a long time has a significant relationship with DC experience, and use of pacifier dipped in sugar or honey show statistically significant differences [7]. On contrary, a cross sectional study was conducted in India, the findings showed that there is no significant relationship between DC and bottle-feeding (P = 0.403) [8]. Many of studies found that babies who had their bottles at bedtime have a high risk of having DC specially (nursing caries), which is related to bottle-feeding. In Nigeria, a cross sectional study conveyed on 302 children to assess the association between DC with bottle feeding and breastfeeding, the prevalence of DC among children who were bottle fed at night was 51% compared to children who were not bottle fed at night (13%) [6]. Using a pacifier is one of the hardest habits to break, children should stop using pacifiers by age 2; the more time used the more negative oral health child gains. Most of the studies believed that there is a relationship between DC and using pacifier. About two thirds of the children often drink soft drinks, while few of them never drank soft drinks. And the highest percentage of children drink juice all the time, and few never drank juice. According to the current study, when studying the nutritional style of children, statistically significant relationship was observed only in relation to DMFT and drinking of soft drinks, and showed statistically insignificant relationship in relation to DMFT and drinking juice. Similar significant relationship between DMFT and drinking soft drinks and juice was reported in several studies, a cross sectional study was conducted on 422 children, found that the prevalence of DC was higher among children who drink soft drinks compared with those who did not drink soft drink (94%, 37%) [9]. This was consistent with similar significant relationship conducted in Libya [10], in India [11]. Also, Sudha *et al*., [12] and Huew *et al*., [10], reported that DC was increased with increasing frequency of juices consumption. The association can be explained by the fact that drinking soft drinks will decrease the level of PH in the mouth which increases acidity in the mouth, which means increased demineralization of teeth structure and with frequency of daily drinking soft drinks the progression of demineralization will continue until DC occur, while non-significant association in relation with the DMFT and drinking juice was statistically unexplainable

In this study highest percentage of children eats sweets and chocolate all the time and few did not eat sweets and chocolate.

According to the results of present study, there was no significant relationship between the prevalence of DMFT in children and eating chocolates and sweet (P=0.970). This non-significant

association was statistically unexplainable.

Similar non-significant relationship between DMFT and eating chocolates and sweets was reported in India [11].

On the other hand, various studies reported a significant relationship between DMFT and eating chocolates and sweets [13]. Reported that prevalence of DC in relation with consumed chocolate and sweets frequently amongst children was (34.2%), while prevalence of DC in children who did not consume chocolate and sweets was (14.3%) (P= 0.03).

In different with Morenike *et al*., [14], investigated the relationship between DC and sugar intake and found that higher levels of the amount and frequency of sugar consumption were significantly associated with DC (P<0.001). Another cross sectional study conducted on 524 children in Mangalore city to assess the prevalence of DC, reported that prevalence of DC increased with increasing of sugar intake [12].

In conclusion, prevalence of DMFT was affected by nutritional habits and nutritional style, but significant differences were observed only in the relation between DMFT and pacifier use, place sugar or honey on pacifier, mix fluid in bottle-feeding with sugar and soft drinks.

Our recommendation, Cooperative program established between the ministries of health and education to include educational programs about dietary practices as nutritional style and nutritional habits and the appropriate oral hygiene habits to increase the knowledge about oral health for children.

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