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Oral health status in relation to nutritional status among kindergarten children aged (4-5) years old in Karbala city / Iraq

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Abstract

Back ground: Dental caries and periodontal disease were the most common and widely spread diseases affecting children. The nutrition may be one of the factors affecting the severity of the oral diseases. The Aims of this study was the assessment of the following oral diseases (dental caries, gingivitis) in addition to assessment of oral hygiene among 4-5 years old children in Karbala city –Iraq. Furthermore, nutritional status was assessed in relation to oral diseases.

Materials and methods: A sample of 658 children (350 males, 308 females) aged four and five years old was selected randomly from the fourteenth kindergartens in Karbala city. Diagnosis and recording of dental caries was followed the criteria of WHO 1987. Dental plaque was assessed using plaque index of Silness and Loe, 1964. Gingival health condition was assessed using gingival index of Loe and Silness, 1963. The assessment of nutritional status was performed using anthropometric measurement (height and weight) according to Body mass index indicator with -2SD cutoff point.

Results: Caries prevalence was found to be (83%) of the total sample the mean rank value of dmfs was higher among boys in comparison to girls with statistically no significant difference ($P>0.05$). The value of dmfs increased with age with statistically highly significant difference ($p<0.01$).The mean rank values of dental plaque and gingival indices for total boys were found to be higher than total girls with statistically highly significant differences ($P<0.01$). Recording of this study demonstrated that 100% of children had dental plaque and gingival inflammation. Positive highly significant correlations were recorded between dental caries with dental plaque and gingival indices. The prevalence of malnutrition described by Body mass index indicator was (3.2%). According to nutritional status indicator Body mass index-for-age, it was found that the wasted children had higher value of dmfs than well nourished children with statistically no significant differences ($P>0.05$). The plaque and gingival indices were higher among well nourished children than among wasted children with statistically highly significant differences ($P<0.01$).The correlation coefficient between body mass index with dental caries, plaque index and gingival index were very weak and statistically not significant ($p>0.05$).

Conclusions: High prevalence of dental caries and gingivitis was recorded indicating the need of public and preventive programs among kindergarten children.

Key words: Dental caries, periodontal disease, gingivitis and nutrition.

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Introduction

Dental caries is an irreversible infectious disease of the hard tissue of the tooth described by demineralization of inorganic portion and destruction of organic matter of the tooth lead to cavitation, it affects persons of every age group, in all races and both gender[1]. Dental caries is considered as a multifactorial disease of several factors, diet, microflora, host and time[2,3]. The caries process can develop as soon as the tooth erupt in the oral cavity[4]. High prevalence and severity of dental caries were reported different geographical locations and different age group that conducted with epidemiological studies[5,6]. The most common type of periodontal disease in children is gingivitis which may start early in life and increase in severity with age[7]. Gingivitis is a reversible condition if it not treated may progress later in life to periodontitis and if periodontitis developed, it may end with loss of teeth [8]. Previous epidemiological studies were conducted concerning the prevalence and severity of gingivitis and reported a high prevalence of gingivitis among different ages [6,9].The mirror of nutritional status of the body is the oral cavity [10],The most significant effect of nutrition is the local action of the diet in the mouth on oral diseases development[11]. In Iraq, several studies were conducted among kindergarten children regarding the oral health status in relation to nutritional status in different geographical areas. Yet, no previous epidemiological study conducted among kindergarten children in Karbala city in Iraq. Therefore, this study was designed and conducted.

Materials and Methods

This oral health study was conducted among kindergarten children during the period between the middle of December (2015) till the end of March (2016) in Karbala city/Iraq. The sample consisted of kindergarten children aged four and five years old. The age was taken according to criteria of World Health Organization (1997) according to last birthday. According to Ministry of Education, the estimated number of 4 and 5 years kindergarten children living in urban areas of Karbala city/Iraq was (3333) including (1765) males and (1568) females. The sample of this study consisted of (658) randomly selected kindergarten children (350) males and (308) females. In urban area of Karbala, there were fourteen sections according to division of the General Direction of Education and in each section, there was one kindergarten, all the kindergartens were included in this study and form each kindergarten, 47 children were selected randomly [12].Children who look healthy and without medical disease were included only. Permission was obtained from the General Directorate of Education of Karbala Governorate prior to the data collection in order to meet subjects with no obligation. The purpose of the study was explained to kindergarten authority to assure full cooperation. As well a special consent prepared and distributed to the parents of children to obtain permission for including their children in this study and to have their full cooperation. Diagnosis and recording of dental caries was according to the criteria described by WHO[13]. Plaque index of Silness and Loe[14]was used for plaque assessment, gingival index of Loe and Silness[15] was followed for recording gingival health condition. Nutritional status was assessed according to body

mass index (BMI) indicator by using anthropometric measurement (height and weight).

Results

Table (1) illustrates the distribution of the total sample by age and gender. Results showed that the prevalence of dental caries was (83%) for the total sample, total boys recorded a higher percentage of dental caries (84%) compared to total girls (81.8%). The children at 5 years were found with higher percentage of dental caries compared to children at 4 years of age Table (2). Table (3) describes caries experience dmfs and its components (ds, ms, fs). Dental caries was found to be higher in boys compared to girls with statistically significant difference for the ds component ($p<0.05$), also, dental caries was higher at five years than at four years with statistically highly significant difference ($p<0.01$) for the ds, ms and dmfs.

Concerning plaque and gingival indices, the total boys were found with higher plaque and gingival indices than among total girls with statistically highly significant differences ($P<0.01$). At five years old, the plaque and gingival indices were found to be higher than four years old with statistically no significant differences ($p>0.05$) as shown in Table (4). The prevalence of plaque and gingival indices were found to be 100%. The correlations between dental plaque and gingivitis with dental caries were positive and highly significant ($p<0.01$). A very positive strong correlation with highly significant differences was recorded between plaque and gingival indices ($r=0.915$, $p<0.001$).

Table (5) illustrates the distribution of children according to nutritional status. The largest number of children in present study was found to have normal weight. The boys showed well nutritional status than girls. The percentage of malnourished children (wasting and sever wasting) in this study was (3.2%).

The mean rank values of ds and dmfs were found to be higher among wasting in compared to well-nourished children, with statistically no significant differences ($P> 0.05$) as shown in Table (6). The correlation between dental caries and nutritional status (BMI) was very weak and statistically not significant ($p>0.05$).

The mean rank value of plaque index was higher among well-nourished children than wasting children with statistically highly significance difference between them ($P< 0.01$). The same picture was found for the gingival index as illustrated in Table (7).

Discussion

The present study was designed to evaluate oral health status in relation to nutritional status among kindergarten children aged (4-5) years old in Karbala city in Iraq. The collected data are intended to be used as a base line data in evaluating the future efforts to improve oral health preventive program among preschool children in this country.

The percentage of dental caries in the present study was 83% that it was higher than that recorded by previous studies [6,9] and lower than that reported by others[5,16]. Differences in dietary habits, oral hygiene measurements as well as dental health services among governorates in addition to differences in geographical location[17] may explain the variation in the caries prevalence between the present study and others. The relatively high prevalence of dental caries recorded in this study may be an indication of the poor preventive and educational programs in

the studied area. In the present study, boys showed higher caries experience than girls for the total sample. The same finding was reported by previous studies[6,9]. The variation between boys and girls in caries experience could be related to difference in oral cleanliness as a higher plaque index was recorded among boys. Bacterial plaque is regarded essential for the initiation of dental caries [16]. The relation between dental caries and oral cleanliness (dental plaque) was reported by previous study[6]. The present study also reported the same correlation which was positive highly significant correlation. Regarding age, caries experience was found to be higher among five years children than among four years children. The same result was reported by previous studies [6,9]. This result could be attributed to accumulative and irreversible nature of dental caries [7].

In this study, boys showed a higher plaque index than girls with statistically highly significant difference, the same result was reported by other studies [6,9], while an opposite result was reported by previous study [17]. This finding may be due to better oral hygiene among females rather than males because females are more oriented toward dental hygiene behavior like visiting the dentist and tooth brushing, however, this need to be confirmed in further studies regarding oral hygiene practices among children.

Concerning age, plaque index of 5 years old children was higher than that of 4 years old children. The same result was recorded by previous studies [5,18], while an opposite result was recorded by others[6,9], this could be explained by that older children feel more independent, and with inefficient tooth brushing [19]Additionally, the amount of plaque accumulation in children varies in accordance to their tooth brushing [20] and diet [21], However, this need to be confirmed in further studies regarding oral hygiene practices and dietary analysis among kindergarten children.

In this study, the prevalence of gingivitis was 100%, it was higher than that reported by previous studies [5,9], while the same result was reported by others [6,17]. The high percentage of dental plaque (100%) could explain the high percentage of gingivitis (100%) as dental plaque is a prime inducer of gingivitis[22] and this is supported by the statistically positive highly significant correlation between dental plaque and gingivitis in the present study. The gingival index was higher among boys compared to girls. This result could be attributed to higher plaque index among boys than among girls. The same finding was reported in previous studies [5,9].

Concerning age, gingival index of 5 years old children was higher than that among 4 years old children. The same finding was reported by previous studies [5,6], while an opposite finding was reported by other study [9]. The increase in gingivitis with advancing age could be explained by the increase in the amount of dental plaque with age and it was proven by different observational and experimental studies that dental plaque is a prime inducer of gingivitis [22] and both conditions get worse with age [23] .

The percentage of malnourished children (wasting and sever wasting) was (3.2%), that is lower than that recorded by other studies[6,9]. The largest number of children in present study was found to have normal weight, so, the percentage of wellnourished children was higher than malnourished one, an indication of improvement in the nutritional status among Iraqi children in the current years. The same finding was reported by previous studies [6,9]. In the current

study, boys showed well nutritional status than girls, the same result was reported by previous studies [6,9], on the other hand ,it was inconsistent with others [24,25]. The differences between males and females may be attributed to that the growth was controlled to great extent by the environmental factors[26]. Furthermore, in eastern society, males are still preferable over females and the total amount of protein intake among females is less than among males [24,27]. In this study, although dental caries (ds, dmfs) was found to be higher among wasted children than well-nourished children, but statistically the difference was not significant. The effect of weight status on dental caries in this study was not significant and this is supported by the non-significant correlation between BMI and dental caries. It was reported that dental caries is a multifactorial disease and its prevalence and incidence is influenced by several etiological factors (susceptible tooth, cariogenic substrate and cariogenic microorganisms) [28], additionally, the inorganic and organic salivary compositions and its physico-chemical functions may also play an important role concerning caries pathogenicity [29], furthermore, risk factors like: age, gender, sugar rich diet, incorrect feeding, ethnic group and oral hygiene may also influence caries experience[30], in addition to genetic effect[31]. Several studies reported no association between dental caries and malnutrition [32,33]. On the other hand, other studies (Iraqi studies) showed a direct relation between malnutrition and increase susceptibility to dental caries [6,9], they suggested that malnutrition may exacerbate the development of dental caries in three ways: first, it contributes to the development of dental hypoplasia which in turn increases the susceptibility to dental caries. Secondly, it causes salivary gland atrophy, which results in reduces the salivary flow and altered salivary composition, this reduces the buffering capacity of the saliva and increases the acidogenic load of the diet. Thirdly, malnutrition delays eruption and shedding of the teeth which affects caries experience at a given age [29,35].

In the present study, the value of plaque index was higher among well nourished children than wasted children with statistically highly significant difference. This finding could be attributed to poor brushing behavior among well nourished children due to ignorance of their oral hygiene. The same finding was reported for the gingival index, this finding might be attributed to higher plaque index among well nourished children since dental plaque was reported to be the prime inducer of gingivitis as mentioned previously. No significant correlation was recorded between plaque, gingival indices with nutritional status. The same result was reported by previous studies [32,34] on other age groups.

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Table (1): The distribution of total sample by age and gender.

Age (year)	Gender					
	Boys		Girls		Total	
	No.	%	No.	%	No.	%
4	140	52.6	126	47.4	266	40.4
5	210	53.6	182	46.4	392	59.6
Total	350	53.2	308	46.8	658	100

Table (2): Prevalence of dental caries among children by age and gender.

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
4	108	77.1	100	79.4	208	78.2
5	186	88.6	152	83.5	338	86.2
Total	294	84	252	81.8	546	83

Table (3): Caries experience (Median, Mean Rank of ds, ms, fs, dmfs) among children by age and gender

Age in year	Gender	ds		ms		fs		dmfs	
		Median	Mean Rank	Median	Mean Rank	Median	Mean Rank	Median	Mean Rank
4	Boy	3	287.6	0	305.7	0	328.7	3	279.1
	Girl	4	283.3	0	300.9	0	324	4	273.6
	Total	4	285.6	0	303.4	0	326.5	4	276.5
5	Boy	8	380.3**	0	348.8**	0	330.3	10	383.1**
	Girl	6	335.1*	0	345.4**	0	333	8	345.2**
	Total	8	359.3**	0	347.2**	0	331.6	9	365.5**
Total	Boys	7	343.2*	0	331.5	0	329.6	8	341.5
	Girls	5	313.9	0	327.2	0	329.3	6	315.9

*Significant p<0.05
**Highly significant p<0.01

Table (4): Plaque and gingival indices (Median and Mean rank) by age and gender

Age (year)	Gender	PlI		GI	
		Median	Mean Rank	Median	Mean Rank
4	Boy	0.583	360.1	o.666	354.2
	Girl	0.416	270.5	0.458	275.6
	Total	0.5	317.7	0.541	317
5	Boy	0.583	356.1	0.683	353.6
	Girl	0.5	316.1*	0.562	320*
	Total	0.5	337.5	0.625	338
Total	Boys	0.583	357.7**	0.666	353.9**
	Girls	0.458	297.4	0.521	301.8

*Significant p<0.05
**Highly significant p<0.01

Table (5): The distribution of children according to Body Mass Index for age (BMI) Indicator by age and gender.

Age	Gender	Sever wasting (<-3)		Wasting (-3 to -2)		Acceptable (-2 to 2)		Over-weight (>2 to 3)		Obese (>3)	
		No	%	No	%	No	%	No	%	No	%
4	Boy	0	0.0	0	0.0	131	93.6	7	5.0	2	1.4
	Girl	4	3.2	4	3.2	116	92	2	1.6	0	0.0
	Both	4	1.5	4	1.5	247	92.8	9	3.4	2	0.8
5	Boy	1	0.5	6	2.9	192	91.5	9	4.3	2	1.0
	Girl	1	0.5	5	2.7	167	91.7	8	4.4	1	0.5
	Both	2	0.5	11	2.8	359	91.6	17	4.3	3	0.8
Total	Boys	1	0.3	6	1.7	323	92.3	16	4.6	4	1.1
	Girls	5	1.6	9	2.9	283	91.8	10	3.3	1	0.3
	Total	6	0.9	15	2.3	606	92.1	26	4.0	5	0.8

Table (6): Caries experience (ds, dmfs) according to nutritional status indicator (Body Mass Index ″BMI″)

Variable	BMI			
	Well nourished		Wasting	
	Median	Mean Rank	Median	Mean Rank
ds	6	328.6	7	339.8
dmfs	7	328.1	8	355.8

Table (7): Plaque and gingival indices (Median, Mean rank) according to nutritional status indicator (Body Mass Index ″BMI″).

Variable	BMI			
	Well nourished		Wasting	
	Median	Mean Rank	Median	Mean Rank
PLI	0.5	333.2**	0.25	202
GI	0.583	332.5**	0.375	222.4

**Highly significant p<0.01