Oral health status in relation to nutritional status among institutionalized and non-institutionalized orphans in Baghdad city

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ABSTRACT

Background: Nutritional condition was reported as one of the factors affecting the oral health status, particularly among underprivileged groups. Orphans are one of the known high-risk groups. The aims of this study were to assess the nutritional status of orphans, and its impact on the oral health status.

Materials and Methods: Five-hundred children aged 6-12 years old, 254 males and 246 females: institutionalized, non-institutionalized orphans and controls were participated in this study. Nutritional status assessed according to body mass index (BMI). Ramfjord index teeth were examined to assess oral cleanliness and gingival condition. All data were analyzed using SPSS version 23.

Results this study revealed the institutionalized orphans with low mean value of BMI, significant differ than non-institutionalized orphans and highly significant than controls, whereas the non-institutionalized orphans was significantly differ than controls. Each of institutionalized and non-institutionalized orphans was with highly significant elevated mean plaque and gingival indices than control, while significant high mean rank calculus index for non-institutionalized orphans than each of institutionalized orphans and controls was found. According to BMI indicators of both orphan groups, it was found that thinness group among institutionalized orphans with significant elevated Mean Plaque Index; however, high non-significant values for Gingival and Calculus indices were found among thinness grades.

Conclusion: This study reflected that nutritional status is a relative factor; may affect the oral cleanliness and gingival health. Moreover, oral hygiene and preventive care are mandatory, should be stressed through dental care programs.

Keywords: orphans, oral health, nutrition. Plaque index. **(J Bagh Coll Dentistry 2017; 29(4): 102-109)**

INTRODUCTION

Orphan is a child under the age of 17 years**,** orphaned either due to death or loss of parents, or neglected or abandoned by parents or whose parents are no longer fulfilling any of their parental duties [(1)]. In Iraq, orphans are almost 4.5 million due to violence, conflict and displacement happened after 2003, and this number increases each and every day [(2)]. Thus, they are considered as socially and financially handicapped [(3)], as parents are not available to help and protect them. The vast majority of orphans either living with a surviving parent grandparent or other family member, or residing in orphanages[(4)]. Oral health is a basic human right and critical to general health and wellbeing. Malnutrition affects the oral health and a poor oral health in turn, may lead to malnutrition [(5)].

Plaque is a soft none mineralized, microbial aggregation on the teeth and other solid structures in the mouth, pale yellow in color [(6)].

Plaque is a major causative factor in gingival and periodontal disease and a contributory factor in dental caries. If plaque is not removed, mineralization within plaque will happened and cause calculus.

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Calculus is an important factor in the development of gingival and periodontal diseases. It is classified as supra gingival or sub gingival. Gross accumulations of calculus are occasionally seen in teenaged and pre teenaged children [(7).] Gingivitis is an inflammatory disease restricted to the gingival soft tissues, with no loss of alveolar bone or apical migration of the periodontal ligament along the root surface**;** it is common in children [(8, 9)]. The primary cause is dental plaque related to poor oral hygiene. Inadequate oral hygiene is the most important risk factor in the development of periodontal disease. Gingivitis progress more rapidly in undernourished populations [(10)]. Several Iraqi studies revealed that nutritional status may affect the oral health among children of different age groups and geographical locations [(11-19)]. This study was carried out in Baghdad City because no previous studies were conducted to describe the oral health status in relation to nutritional status of orphan children living under institutionalized care compared to non-Institutionalized orphan children and control group.

SUBJECTS AND METHODS

The sample size comprised of 500 children aged 6 to 12 years, included institutionalized orphans (123 children; 57 girls and 66 boys),

represent the first study group, non-institutionalized orphans living with their relatives, matching with age and gender with the institutionalized ones (127 children; 66 girls and 61 boys), represent the second study group, and children matching with age and gender, living with their parents, examined in schools of same geographic area (250 children; 123 girls and 127 boys), represent the control group. Permission was obtained from the Ministry of labor and social affairs and Baghdad educational institutions in order to meet subjects with no obligation, the purpose of the study was explained to the institutions and schools authorities to ensure full cooperation, also special consents were distributed to parents to obtain permission for including their children in the study. Children without permission from their parents, with serious systemic diseases, wearing orthodontic appliances, and/or uncooperative were not examined.

Questionnaire about the brushing frequency during the day was, applied for each child separately.

Body Mass Index (BMI) reflected the nutritional status of the sample, it is a number calculated from child's weight and height name as Anthropometric Measurement [20]. The height of the participants was measured in centimeters, using an ordinary measuring tape installed vertically, while weight was assessed in kilograms using a mechanical scale. The BMI was calculated as the ratio of the subject's body weight (in kg) to the square of their height (in meters), according to this formula;

Bodyweight / (Height)^2=BMI (kg)/m^2

BMI-for-age should be presented in Z-scores based on the WHO Growth Reference (GR) 2007 for children 5-19 years. Categories were defined: Severe thinness (BMI <-3SD), thinness (BMI≥ -3 SD&< -2 SD), acceptable (normal weight) (BMI−2SD to +1SD), overweight (BMI>+1SD & ≤+2 SD) obesity (BM >+2SD) [21].

Dental plaque was assessed by using plaque index (Pll) of Silness and Loe [22], gingival health condition (GI) was assessed by Loe and Silness [23], Calculus (CalI) was scored utilizing the criteria set by Ramfjord. Ramfjord index teeth were examined to represent the whole dentition [24].The severity of oral hygiene was assessed according to the classification introduced by Loe and Silness [23] in to negative (zero state), mild, moderate and severe condition. Statistics: Statistical analyses were computer assisted using SPSS version 23 (Statistical Package for Social Sciences) in association with Microsoft Excel 2013. The statistical tests used are: independent samples t-test, ANOVA, Bonferonni t-test, Kruskal-Wallis test, Mann-Whitney test and Chi-square ($\chi 2$) test. P-values less than 0.05 were considered as statistically significant and P values that less than 0.001 were regarded as highly significant.

RESULTS

Table (1) illustrates the distribution of the total sample according to age, gender, and BMI. The distribution according to age group was divided into four groups (6-7) years old, (8-9), (10-11) and (12) years old. Gender was distributed as males represent highest than females, the distribution according to the BMI: the majority of the children were under the category of Acceptable weight.

Figure (1) illustrates the nutritional status of children by BMI indicator grades. The mean±SE BMI for institutionalized orphans (-0.45±0.088) was significantly lower than non-institutionalized orphans (-0.03±0.11, p=0.037) and highly significant lowered than controls (+0.41±0.093, p<0.001), while the mean BMI for non-institutionalized orphans was significantly lower compared to controls with p=0.007.

Table (2) shows different and comparable percentages of teeth brushing experience among the three groups, but with no significant difference.

Table (3) shows the distribution of sample according to severity of PLI, GI, and CALI, in the present study divided in to negative, mild and moderate conditions, the major prevalence of PLI and GI was of mild type, In regard to calculus, the negatively score was the major percentage.

Figure (2) illustrated the high significant difference in PLI among the groups (p<0.001), with mean±SE values of PLI of institutionalized (0.67±0.03) and non- institutionalized orphans (0.68±0.026) they were highly significant elevated than that of controls (0.54±0.016) with p<0.001 for each. However, there was no significant difference between institutionalized and non-institutionalized orphans in PLI. Similarly, figure (3) showed the high significant difference in GI among the groups (p<0.001), the mean±SE values of GI of each institutionalized (0.52±0.022) and non-institutionalized orphans (0.53±0.022) had highly significant increase in comparison with that of controls (0.39±0.012) with p<0.001 for both.Whereas there was no significant difference between institutionalized and non-institutionalized orphans regarding GI.

Considering CALI among the 3 groups, significant high mean rank value was found among non-institutionalized orphans (270.9)

compared to each of institutionalized orphans (242.1, p=0.011) and controls (244.3, p=0.004), while non-significant difference between institutionalized orphans and controls was found, as shown in table (4).

Table (5) demonstrates the mean values of plaque and gingival indices among different BMI grades, A higher mean values of plaque and gingival indices were recorded among thinness than other grades; the mean PLI with significant high value in thinness group of (0.96±0.126, p=0.028) with significant negative relation with BMI (r=-0.199 P=0.027) for institutionalized orphans, While non significant zero linear relation was found for non-institutionalized orphans with high mean rank in thinness group. Considering the mean GI, there was non significant negative linear relation with BMI among both institutionalized and non-institutionalized orphans with high mean in thinness group.

However, table (6) shows high CALI mean rank but with non-significant was found among thinness group of both institutionalized and non-institutionalized orphans with no significant linear correlation with BMI, positive for institutionalized and negative for non-institutionalized orphans.

Table 1: Distribution of the sample by age, gender and BMI for age Z score-categories among the groups.

		Institutionalized Orphans		Non-institutionalized Orphans		Controls	
		N	%	N	%	N	%
Age group (years)	(6-7)	34	27.6	27	21.3	61	24.4
	(8-9)	32	26.0	35	27.6	67	26.8
	(10-11)	41	33.3	44	34.6	85	34.0
	12	16	13.0	21	16.5	37	14.8
	Total	123	100.0	127	100.0	250	100.0
	Mean+ SE	9.11±0.178		9.37±0.173		9.24±0.124	
Gender		N	%	N	%	N	%
	Males	66	53.7	61	48.0	127	50.8
	Females	57	46.3	66	52.0	123	49.2
	Total	123	100.0	127	100.0	250	100.0
BMI	Thinness	6	4.9	8	6.3	7	2.8
	Acceptable	117	95.1	114	89.8	205	82.0
	Overweight/obese	0	0.0	5	3.9	38	15.2
	Total	123	100.0	127	100.0	250	100.0

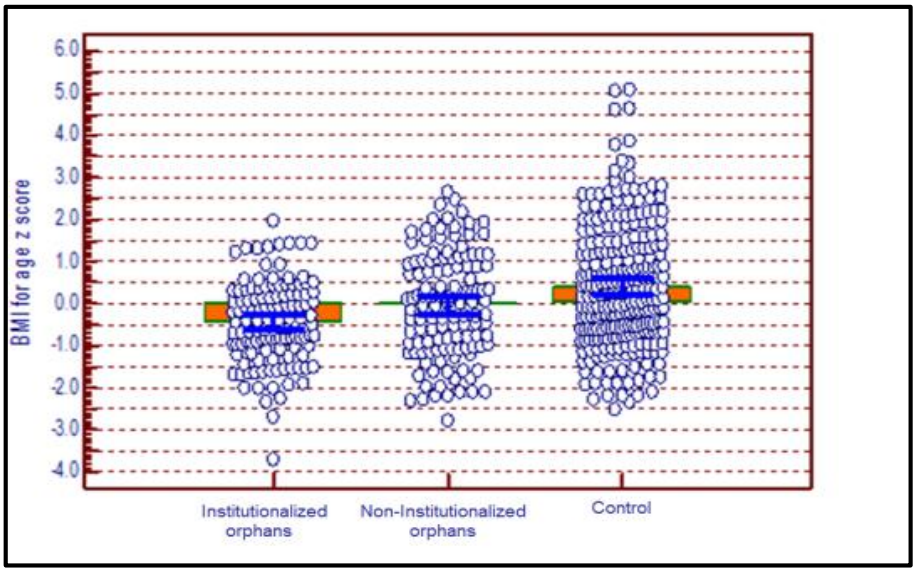

Figure 1: Dot diagram with error bars showing the difference among the 3 groups in mean (with its 95% confidence interval) BMI.

Table 2: Differences in teeth brushing frequency /day among the groups.

Frequency of teeth brushing / day	Institutionalized Orphans		Non-institutionalized Orphans		Controls		P
	N	%	N	%	N	%	
1	36	30.0	6	8.7	57	24.6	
2	26	21.7	31	44.9	74	31.9	
3	31	25.8	18	26.1	50	21.6	**0.43[NS]**
4 (irregular)	27	22.5	14	20.3	51	22.0	
Total	120	100.0	69	100.0	232	100.0	
Mean Rank	207.6		227.7		207.8		

No Significant P>0.05.

Table 3: Distribution of sample according to the severity of plaque, gingivitis and calculus.

Parameters		Institutionalized Orphans		Non -institutionalized Orphans		Controls	
		N	%	N	%	N	%
PLI	Negative (zero)	0	0.0	3	2.4	0	0.0
	Mild (<=1)	102	82.9	106	83.5	237	94.8
	Moderate (1.1-2)	21	17.1	18	14.2	13	5.2
	Total	123	100.0	127	100.0	250	100.0
GI	Negative (zero)	1	0.8	3	2.4	5	2.0
	Mild (<=1)	119	96.7	122	96.1	243	97.2
	Moderate (1.1-2)	3	2.4	2	1.6	2	0.8
	Total	123	100.0	127	100.0	250	100.0
CALI	Negative (zero)	112	91.1	101	79.5	225	90.0
	Mild (<=1)	11	8.9	26	20.5	25	10.0
	Total	123	100.0	127	100.0	250	100.0

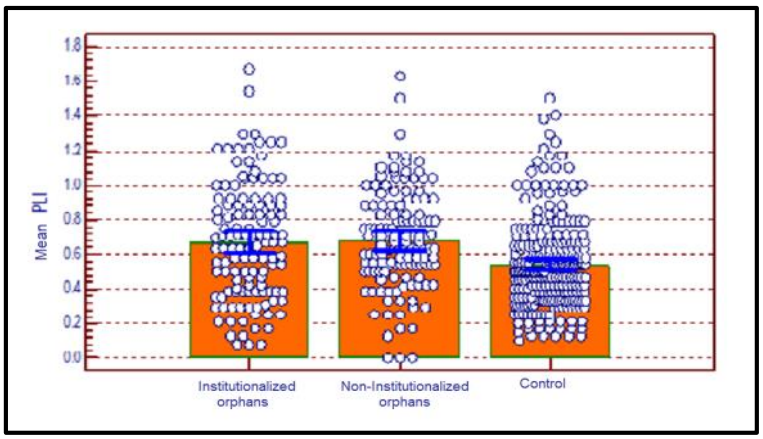

Figure 2: Dot diagram with error bars showing the difference among the 3 groups in mean (with its 95% confidence interval) PLI.

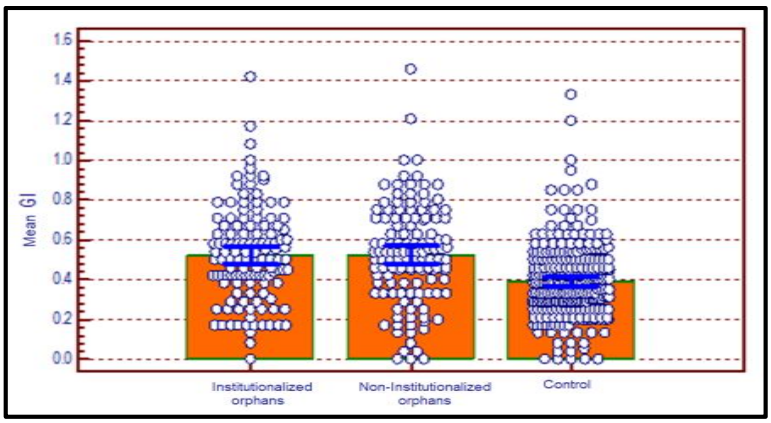

Figure 3: Dot diagram with error bars showing the difference among the 3 groups in mean (with its 95% confidence interval) GI.

Table 4: Difference in CALI (median and mean rank) among the groups.

CALI	Institutionalized Orphans		Non-institutionalized Orphans		Controls		p
	Median	Mean Rank	Median	Mean Rank	Median	Mean Rank	0.006*
	0	242.1*	0	270.9*	0	244.3	

*Significant P<0.05.

Table 5: The difference in mean PLI and GI among BMI for age Z score groups of institutionalized and non-institutionalized orphans.

BMI groups	Plaque index		Gingival index	
	Institutionalized Orphans	Non-Institutionalized Orphans	Institutionalized Orphans	Non-Institutionalized Orphans
	Mean± SE	Mean± SE	Mean± SE	Mean± SE
Thinness	0.96±0.126	0.73±0.153	0.68±0.105	0.6±0.108
Acceptable	0.66±0.031	0.68±0.027	0.52±0.022	0.52±0.023
Overweight / Obese	-	0.56±0.065	-	0.43±0.078
Difference	0.028*	0.58[NS]	0.11[NS]	0.52[NS]
	r=-0.199, p=0.027*	r=0, p=1[NS]	r=-0.114, p=0.21[NS]	r=-0.089, p=0.32[NS]

* Significant P<0.05.

Table 6: Difference in CALI (median and mean rank) among BMI groups of institutionalized and non institutionalized orphans.

BMI groups	Institutionalized Orphans		Non-institutionalized Orphans	
	Median	Mean rank	Median	Mean rank
Thinness	0	67.3	0	67.6
Acceptable	0	61.7	0	63.8
Overweight / obese	-	-	0	62.1
Difference	0.45[NS]		0.91[NS]	
	r=0.061,P=0.5[NS]		r=-0.014,P=0.87[NS]	

* Significant P<0.05, ** Highly Significant P<0.001.

DISCUSSION

The present study was conducted to reveal the oral health status among institutionalized and non-institutionalized orphans. Orphan's children represent a high risk group of disadvantaged children as they lack basic information, motivation, and supervision provided by parents, especially in the beginning of their childhood. Moreover, they may be neglected or abused in the latter half of childhood by relatives and/or society [25]. Therefore comparison with the general population cannot be justified.

Several studies revealed the oral health status of institutionalized orphans could be differing than general populations [26-32].

As far as it's known, there was only Iraqi study conducted by Ahmed [26], concerned oral health status and treatment needs among institutionalized orphans compared to control group.

While none of institutionalized orphans was obese, high percentage was found among controls followed by non-institutionalized orphans. Thinness may be present among non-institutionalized orphans in elevated per cent compared to the other groups; and this may be due to poverty level at which the former group lived.

The comparison of malnutrition of the present study with other studies is difficult because of using of different criteria in classification of malnutrition; moreover, there is no study about the nutritional status in relation to the oral health status of orphans to compare with its results. The means of BMI-age of each institutionalized and non-institutionalized orphans were lower than that estimated by Ahmed [33] for the age 7-12 years, but the mean BMI-age for controls in the present study at the same age range is comparable to what estimated by Ahmed [33]. However high percentage of children in the three groups was having acceptable weight especially the institutionalized orphans and this finding comes in accordance with Al-Ani [18] for age 12 and Ahmed [33] for the age group 7-12 years. This is an

indication of improvement in the nutritional status among Iraqi children in the current years.

Results showed that the majority of institutionalized and non-institutionalized orphans had lower percentage mild type of plaque index than controls, but elevated percentage of moderate plaque index compared to the controls. This may explain the significant high mean values of plaque index in orphans (with no significant difference between them) compared to controls. This result disagrees with Ahmed [26], Mazhari et al. [27] and Camacho et al. [28]. This finding was in controversy with brushing teeth/day indicated some of orphanage's staff/family members were unaware about consequences of improper oral hygiene maintenance, or over reporting of tooth brushing by children or simply reflecting a lack of tooth brushing skills [32]. Dental plaque was found to be the main causative factor for gingivitis [34, 35], this may explain the higher significant mean GI which was found in orphans groups (with no significant difference between them) compared to controls, while the reverse was reported by Ahmed [26] Gu et al. [30] and the result of this study was lower than reported by Mazhari et al. [27] who revealed moderate and sever gingivitis among orphans. The CALI mean rank among institutionalized orphans was found lower than controls with no significant difference between them, and this agrees with Ahmed [26] but disagrees with Ojahanon et al. [29] Gu et al. [30], and Sharma et al. [31]. However, these two groups were significantly lower than non-institutionalized orphans, reflecting a lack of tooth brushing skills in the latter group, or neglecting due to limited resources and time of the family member, thus they in need of dental education programs through schools. According to body mass index indicators; results revealed significant elevated PlI was found among thinness compared to normal weight group of institutionalized orphans. However, higher PlI was found among thinness group than overweight/obese of non-institutionalized orphans with no significant difference. This may partly be attributed to the fact that the most of malnourished children are from low socioeconomic families that exhibit also a poor oral hygiene [36]. Non-significant elevated GI was found among thinness group compared to acceptable/or overweight/obese of institutionalized and non-institutionalized orphans respectively. The increase in GI in thinness group was in accordance with increase in PlI in the same group, or may be due to lack of certain vitamins and nutrient which increase the severity of gingival inflammation [37], especially vitamin A and C role in maintaining and repairing healthy connective tissue along with its antioxidant properties [16, 38]. This study revealed CALI mean rank, was high among thinness than acceptable /or overweight/obese, and this due to bad brushing skills and oral cleanliness among malnourished children, or due to increase in PlI in the same group.

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الحالة الصحية للفم وعلاقتها مع الحالة الغذائية للاطفال الايتام المقيمين في المؤسسات و الايتام غير المقيمين في المؤسسات في مدينة بغداد

الخلاصة

المقدمة: ان حالة التغذية هي احد العوامل المؤثرة على الحالة الصحية الفموية, خاصة ضمن الفئات التي تعاني من الحرمان و من ضمنهم الاطفال الايتام. ان اهداف هذه الدراسة هو تقييم الحالة الغذائية للايتام وتاثيرها على صحة انسجة ماحول الاسنان.

المواد و طرائق البحث: تكونت العينة من خمسمائة طفل ضمن الفئة العمرية 6-12 سنة (254 ذكور و 246 اناث) شملت الايتام مقيمين في مؤسسات الايتام و الايتام غير مقيمين في مؤسسات الايتام ومجموعة الضابطة الذين هم تحت رعاية الوالدين .تم تقييم الحالة الغذائية حسب مؤشر كتلة الجسم BMI, وتم فحص الاسنان اعتمادا على مؤشر Ramfjord لتحديد مقدار الصفيحة الجرثومية ,التهاب اللثة و حالة القلح. تم تحليل البينانات حسب برنامج التحليل الاحصائي نسخة 23.

النتائج: ان مؤشر كتلة الجسم لايتام المؤسسات كان متدني بفرق معنوي قياسا للايتام من غير المؤسسات و بفرق معنوي عالي قياسا للمجموعة الضابطة, بينما كان الايتام من غير المؤسسات اقل بفرق معنوي قياسا للمجموعة الضابطة. ان مؤشرات الصفيحة الجرثومية والتهاب اللثة لكل من ايتام المؤسسات والايتام من غير المؤسسات كانوا اعلى بفرق معنوي عالي قياسا للمجموعة الضابطة, بينما متوسط مرتبة مؤشر القلح للايتام من غير المؤسسات كان اعلى بفرق معنوي عن ايتام المؤسسات و المجموعة الضابطة.اظهرت مؤشرات كتلة الجسم لمجموعتي ايتام المؤسسات وغير المؤسسات,ان مجموعة النحافة من المؤسسات لديهم قيمة عليا من معدل الصفيحة الجرثومية بفرق معنوي ,ومع هذا فقد وجدت قيم عالية بدون فروق معنوية لمؤشرات التهاب اللثة والقلح ضمن مجاميع النحافة.

الاستنتاج: هذه الدراسة اشارت ان حالة التغذية هي عامل نسبي, قد تؤثر على حفظ صحة الفم و اللثة, بالاضافة ان نظافة الفم و الرعاية الوقائية ضرورية يجب التركيز عليها من خلال برامج العناية بالاسنان.