Oral health status in relation to nutritional status among institutionalized autistic children and adolescents in Baghdad city, Iraq

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ABSTRACT

Background: The autism spectrum disorder (ASD) describes a wide range of symptoms, including difficulty with social interaction and communication skills. Controversial thinking about oral health of children with ASD, in general may have a lower hygiene level than healthy individuals, low caries rate and high body weight in comparison to healthy children. This study was conducted to assess the oral health status in relation to nutritional status among institutionalized autistic children and adolescents.

Materials and methods: From 12 institutes in Baghdad, the study group contained 364 child and adolescent with ASD (Male= 294, Female=70), while control group included 441 normal child and adolescent (Male=357, Female=84) from primary and secondary schools. The age range (6-15) years old categorized to two age groups, children age group (6-10) years and adolescents age group (11-15) years. Decayed, missing and filled surfaces (dmfs, DMFS), plaque (PII), Gingival (GI) and calculus (CI) indices were used to measure oral health status for both groups. Assessment of nutritional status performed by using BMI for age z-score value. The data of current study was analyzed using SPSS version 21.

Results: Mean rank values of (dmfs, DMFS) were lower in study group than control group with high significant differences. The mean rank values of PII, GI, and CI in study group were found to be higher than control group with high significant differences. A moderate positive high significant correlation was found between ds, dmfs, DS, DMFS and PII, GI, CI in both groups. The mean rank values of body mass index (BMI) for age z-score were higher in study group than control group. Very weak negative high significant correlation between BMI for age z-score and ds, dmfs, DS, DMFS in study group.

Conclusion: Dental caries severity, oral hygiene and gingival health were lower in ASD group than control group. Dental caries severity was related to oral health status in both groups. Possible of overweight, overweight and obesity were most common in children and adolescents with ASD than control group. Body weight of autistic children was related to dental caries severity.

Keywords: Autism spectrum disorder; DMFS; body mass index; oral hygiene. **(J Bagh Coll Dentistry 2017; 29(1): 117-124)**

INTRODUCTION

[1]The term autism spectrum disorders (ASD) refers to a group of neurodevelopmental conditions defined by impairment in three areas: social interaction, communication and a stereotyped, restricted or repetitive pattern of behavior, interests and activities (1). The etiology of ASD is a mystery. Highly regarded researchers are of the opinion that there is probably more than one cause since the disorder can have such disparate manifestations. Genetics, environmental poisons, neurologic psychopathy, dietary deficiencies, and allergies have all been implicated (2). Patients with ASD do not present very specific oral disorders. They pose the greatest challenge for dentists, due to their complex and varied clinical manifestations. Previous studies have shown that the child with autism had poorer oral hygiene and increased periodontal disease (3,4). Maintaining good oral hygiene in children with autism is a significant task for both the parents or caregivers of the child, and dental staff (4).

Other studies reported no statistically significant differences in the prevalence of caries, gingivitis and degree of oral hygiene in comparison with non-autistic individuals (5,6). Loo CY et al., have demonstrated that the patients with ASD were more likely to be caries-free and have lower decayed, missing and filled teeth (DMFT) scores than controls (7).

The most common way of measuring obesity is the body mass index (BMI). The BMI represent the weight levels associated with the lowest overall risk to health and is an indicator of overall adiposity (8). Studies have been conducted to assess the association of the BMI and oral health. However, a study has even observed a significant association between caries frequency and BMI (9), whereas another study found no correlation between dental decay in obese and non-obese children (10). The relationship between BMI and oral health status is clearly rather complex. A low BMI is easily explainable on the basis of there being real functional difficulties that can prevent normal

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eating in some cases. The association of poor oral health with high BMI is likely to be associated with the quality of the diet [11].

Iraqi study showed more than half of children with autism were overweight/obese. Males affected more commonly than females. No significant association between type of feeding during first six months of life, age at weaning and signs of hungry with nutritional status of autistic children. All the underweight autistic children had history of feeding problems like selective food by either type or texture, behavioral problems during feeding, food allergy and diarrhea. The overweight autistic children had history of sitting
position during feeding, more than three meals per day, and more than 30 minutes duration of meal [12].

Only a few studies have reported data on weight status of children with ASDs. Several studies have found varying prevalence of obesity in children and adolescents. The results from these studies suggest that the prevalence of obesity in children and adolescents with ASD may be as high as, if not higher than, the general population [13,14]. There was no previous study in Iraq regarding the nutritional status for autistic children in relation to oral health status. For this reason, this study was designed.

MATERIALS AND METHODS

The study group included 364 children with ASD (Males= 294, Females=70),they represent all autistic children from 12 institutes in Baghdad, while control group included 441 normal from school record children selected randomly (Males=357, Females=84) from primary and secondary schools selected from places near institutions of autism in Baghdad. The age range 6-15 years old categorized to two age groups, 6-10 years and 11-15 years. Caries experience for each institutionalized autistic children and normal healthy schoolchildren measured through the application of decayed, missing and filled teeth and surfaces indices (DMFT, DMFS) and (dmft, dmfs) for permanent and primary teeth according to criteria of WHO [15].

Oral hygiene status evaluated by application plaque index (PlI) of Silness and Löe [16], and calculus index (CI) of Ramfjord [17]. Gingival inflammation assessed by using Gingival Index (GI) of Löe and Silness [18]. Assessment of nutritional status performed by using BMI for age z-score value, which recommended by using a -2SD cut off point which represents purely statistical separation of malnourished from well-nourished; therefore, the present study depend this cut off point for the nutritional status indicator [19]. By using SPSS 21 version (Statistical Package for Social Sciences), frequency distribution for selected variables was done first. The statistical significance, direction and strength of linear correlation between two quantitative normally variables, one of which being non-normally distributed was measured by Spearman's rank linear correlation coefficient. P value less than the 0.05 level of significance was considered statistically significant. All analyzed tests were bilateral.

RESULTS

Table 1 and Table 2 show caries-experience (median and mean rank values of ds, ms, fs and dmfs) and (median and mean rank of DS, MS, FS and DMFS) among study and control groups by age and gender respectively. The mean rank values for all components of dmfs and DMFS were higher in 6-10 years age group than 11-15 years age group and higher in male than female. The mean rank values of the total sample for all components of dmfs and DMFS in control group were higher than study group. Mann-Whitney test was used to compare between study and control groups. The result recorded that components of dmfs and DMFS represented by mean rank were highly significant higher among control group than study group. For components of dmfs (Z= -8.93 for ds, -4.98 for ms, -5.79 for fs, -10.12 for dmfs), for component of DMFS (Z= -10.02 for DS, -5.06 for MS, -3.18 for FS, -10.16 for DMFS), as $P<0.001$ for all these differences.

Table 3 illustrates the median and mean rank values of plaque, gingival and calculus indices among study and control groups by age groups and gender. The mean rank values of plaque, gingival and calculus indices in study group were found to be higher than control group with high statistical significant differences (Z= -14.33 for PlI; Z= -13.78 for GI; Z= -9.5 for CI; $P<0.001$ for all indices).

The correlation coefficient between caries-experience of primary and permanent teeth with PlI, GI and CI among study and control group is seen in Table 4. A moderate positive high significant correlation was recorded between ds, dmfs, DS, DMFS and PlI, GI, CI in both groups, except there is a weak positive high significant correlation was revealed between ds, dmfs, DS, DMFS and CI in control group.

The distribution of children according to BMI for age z- score indicator among study and control groups by age and gender is shown in

Table 5. In 6-10 years age group and total sample, the percentages of possible risk of overweight, overweight and obese categories were found higher in study group than control group while, the percentages of acceptable, wasting and severe wasting categories were found higher in control group than study group. In 11-15 years age group, the percentages of acceptable, possible risk of overweight, overweight and obese categories were found higher in study group than control group, while the percentages of wasting and severe wasting categories were found higher in control group than study group. In study group, all categories of BMI for age z-score indicator were higher in males than females except the acceptable category higher in females than males.

Table 6 shows median and mean rank of BMI for age z-score among study and control groups by age groups and gender. The mean rank values of BMI for age z-score were higher in study group than control group in both age groups and total sample. High significant differences were found in males (Mann-Whitney= 4496, Z= -3.20) and total sample of 11-15 years age group (Mann-Whitney= 6611, Z= -3.21), in addition to males (Mann-Whitney= 113334, Z= -6.34) and total sample of study (Mann-Whitney= 170178, Z= -6.97), P<0.001 for all these significant differences. In study group, mean rank values for males were higher than females.

Table 7 demonstrates a very weak negative high significant correlation between BMI for age z-score and ds, dmfs in study group. Table 8 illustrates a very weak correlation between BMI for age z-score and PII, GI, CI among study and control groups. A high significant relation (P<0.01) was recorded between BMI for age z-score and PlI, and a significant relation (P<0.05) with GI in study group.

DISSCUSION

The dietary intakes of macronutrients and some micronutrients in children with ASD have been found to be lower, higher, or similar compared with the recommended amounts [20]. Studies investigating nutrient intake in children with ASD have produced conflicting results [20,21]. A high rate of obesity has been observed among these children [22]. Kopycka-Kedzierawski and Auinger found that children with ASD have a lower hygiene level than healthy individuals, but have a comparable caries rate [23].

Results of the current study showed that the prevalence and severity of dental caries for primary and permanent teeth were lower among study group compared to control group. This could be due to good home and institutional care by the autistics' parents or caregivers and a less cariogenic diet. In addition, children with autism because of their ritualistic behavior, which characterized by unvarying pattern of daily activities, such as an unchanging menu, so they are more regular in their behavior at meals than are unaffected children. Therefore, a lower frequency of snacking between meals and lower intake of carbohydrates could have contributed to the lower caries rate observed [24,25]. This result was in line with several studies [26,27,28], and in contrast with other studies [29,30].

In the present study, all the values of PlI, GI and CI were higher in the study group than control group with highly significant differences. This finding could be related to many reasons such as the irregular brushing habits because of the difficulties the trainers and the parents encountered when they brushed the children's teeth. It could also be due to lack of the necessary manual dexterity of autistic children during brushing by themselves, which made their tooth brushing inefficient. Iraqi study by Rasheed showed GI value lower in ASD group than healthy group with no statistical significant difference [28]. The result of the current study in line with many studies [31,32,33].

In this study, the mean rank values of BMI for age z-score were higher in study group than control group in both age groups and total sample. Mean rank values for males were higher than females. These findings in agreement with many studies [34,35,36]. Although food selectivity might be expected to limit intake and result in inadequate weight gain, but the higher intake levels of energy dense foods (juice, sweetened non-dairy beverages and snacks) and lower intake of fruits and vegetables in children with ASD compared to typically developing children would be associated differentially with BMI z-score across groups. Children with ASD may have atypical physical activity and eating patterns that are uniquely associated with the development of obesity [37].

There is very limited studies related BMI of autistic children and adolescents to incidence of dental caries and periodontal diseases. In the current study, there is a weak correlation between nutritional status and caries experience among study and control groups. A significant relation was recorded between nutritional status and PlI, GI in study group. These results in agreement with some studies [38,39], and in contrast with other [40].

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Table 1: Caries-experience (median and mean rank) of ds, ms, fs, and dmfs of primary teeth among study and control groups by age and gender.

Groups	Age (Year)	Gender	ds		ms		fs		dmfs	
			M	Mean Rank	M	Mean Rank	M	Mean Rank	M	Mean Rank
Study	6-10	M	3	168.35	0	201.06	0	203.76	3	162.47
		F	3	46.14	0	53.94	0	53.81	4	45.08
		T	3	214.05	0	254.46	0	257.12	4	206.84
	11-15	M	0	103.73	0	111.70	0	105.06	0	101.33
		F	0	22.23	0	22.00	0	22.15	0	21.18
		T	0	125.52	0	133.19	0	126.77	0	121.96
	All	M	2	282.06	0	312.03	0	308.37	2	276.28
		F	2	69.27	0	75.42	0	75.48	3	68.08
		T	2	351.09	0	386.92	0	383.45	2	343.77
Control	6-10	M	6	253.89**	0	227.26**	0	225.06**	8	258.69**
		F	5	65.16**	0	58.64	0	58.75	6	66.05**
		T	6	318.54**	0	285.45**	0	283.28**	8	324.44**
	11-15	M	0	116.14*	0	109.50	0	115.03**	0	118.04**
		F	0	21.80	0	22.00	0	21.87	0	22.72
		T	0	137.44	0	131.00	0	136.39*	0	140.42**
	All	M	3	361.16**	0	336.55**	0	339.56**	5	365.89**
		F	4	85.38*	0	80.18	0	80.13	5	86.39*
		T	4	445.84**	0	416.27**	0	419.14**	5	451.89**

*** Significant, ** Highly Significant (Higher), between study group and control group, M=Median**

Table 2: Caries-experience (median and mean rank) of DS, MS, FS, and DMFS) of permanent teeth among study and control groups by age and gender.

Group	Age (Year)	Gender	DS		MS		FS		DMFS	
			M	Mean Rank	M	Mean Rank	M	Mean Rank	M	Mean Rank
Study	6-10	M	0.0	177.76	0.0	206.11	0.0	207.96	0.0	171.87
		F	0.0	48.33	0.0	54.59	0.0	54.83	0.0	47.91
		T	0.0	225.52	0.0	260.22	0.0	262.31	0.0	219.24
	11-15	M	2.0	87.59	0.0	105.50	0.0	103.53	2.5	86.46
		F	3.5	17.60	0.0	20.73	0.0	19.63	4.0	16.80
		T	2.0	104.84	0.0	125.75	0.0	122.75	3.0	103.13
	All	M	0.0	269.96	0.0	311.20	0.0	312.65	0.0	265.30
		F	0.0	67.20	0.0	74.84	0.0	74.37	0.0	66.74
		T	0.0	336.60	0.0	385.57	0.0	386.56	0.0	331.61
Control	6-10	M	2.0	246.23**	0.0	223.14**	0.0	221.64*	2.0	251.03**
		F	0.0	63.33**	0.0	58.10	0.0	57.89	2.0	63.68**
		T	1.5	309.15**	0.0	280.74**	0.0	279.02*	2.0	314.29**
	11-15	M	5.0	129.59	0.0	114.67	0.0	116.31	7.0	130.54
		F	5.0	25.83*	0.0	23.11	0.0	24.07	8.0	26.52*
		T	5.0	154.79**	0.0	137.25	0.0	139.76*	7.0	156.23**
	All	M	2.0	371.09**	0.0	337.24**	0.0	336.05*	3.0	374.91**
		F	2.0	87.13**	0.0	80.67	0.0	81.07	2.5	87.52**
		T	2.0	457.81**	0.0	417.39**	0.0	416.57**	3.0	461.93**

*** Significant, ** Highly Significant (Higher), between study group and control group, M=Median**

Table 3: Median and mean rank of plaque, gingival and calculus indices among study and control groups by age groups and gender.

Group	Age (Year)	Gender	PlI		GI		CI	
			M	Mean Rank	M	Mean Rank	M	Mean Rank
Study	6-10	M	1.33	263.94**	0.58	262.51**	0.00	248.02**
		F	1.58	72.76**	0.75	73.28**	0.08	68.37**
		T	1.34	336.71**	0.62	335.30**	0.04	315.97**
	11-15	M	1.38	139.02**	0.75	135.28**	0.08	120.18*
		F	1.73	30.45**	0.83	29.58**	0.17	28.93**
		T	1.50	168.75**	0.75	164.63**	0.08	148.74**
	All	M	1.33	401.81**	0.63	397.20**	0.08	367.49**
		F	1.63	102.79**	0.75	102.50**	0.08	96.66**
		T	1.40	504.66**	0.67	499.52**	0.08	463.89**
Control	6-10	M	0.71	176.05	0.33	177.22	0.00	189.02
		F	0.65	42.90	0.29	42.47	0.00	46.57
		T	0.71	218.11	0.33	219.26	0.00	235.09
	11-15	M	0.71	86.73	0.33	89.85	0.00	102.44
		F	0.73	14.65	0.36	15.41	0.00	15.98
		T	0.71	101.16	0.33	104.62	0.00	117.95
	All	M	0.71	262.87	0.33	266.65	0.00	291.04
		F	0.67	57.05	0.32	57.29	0.00	62.23
		T	0.71	319.09	0.33	323.33	0.00	352.74

*** Significant, ** Highly Significant (Higher), between study group and control group, M = Median**

Table 4: Correlation coefficient between caries-experience (primary and permanent teeth) and plaque, gingival and calculus indices among study and control group.

Groups		ds		dmfs		DS		DMFS	
		r	P	r	P	r	P	r	P
Study	PII	0.551	< 0.001**	0.559	< 0.001**	0.428	< 0.001**	0.416	< 0.001**
	GI	0.485	< 0.001**	0.496	< 0.001**	0.444	< 0.001**	0.428	< 0.001**
	CI	0.448	< 0.001**	0.458	< 0.001**	0.449	< 0.001**	0.440	< 0.001**
Control	PII	0.457	< 0.001**	0.502	< 0.001**	0.452	< 0.001**	0.440	< 0.001**
	GI	0.418	< 0.001**	0.455	< 0.001**	0.467	< 0.001**	0.449	< 0.001**
	CI	0.227	< 0.001**	0.243	< 0.001**	0.394	< 0.001**	0.388	< 0.001**

** Highly Significant

Table 5: The distribution of children according to body mass index for age Z-score indicator among study and control groups by age and gender

Group	Age	Gender	Total No.	Severe wasting (<-3)		Wasting (-3 to -2)		Acceptable (>-2 to 1)		Possible risk of overweight (1-2)		Over-weight (>2 to 3)		Obese (>3)	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Study	6-10	M	193	5	2.59	12	6.22	126	65.29	33	17.10	10	5.18	7	3.63
		F	51	1	1.96	2	3.92	37	72.55	8	15.69	2	3.92	1	1.96
		T	244	6	2.46	14	5.74	163	66.80	41	16.80	12	4.92	8	3.28
	11-15	M	100	2	2.00	4	4.00	70	70.00	16	16.00	6	6.00	2	2.00
		F	20	0	0.00	1	5.00	19	95.00	0	0.00	0	0.00	0	0.00
		T	120	2	1.67	5	4.17	89	74.17	16	13.33	6	5.00	2	1.67
	All	M	293	7	2.39	16	5.46	196	66.89	49	16.72	16	5.46	9	3.07
		F	71	1	1.41	3	4.23	56	78.87	8	11.27	2	2.82	1	1.41
		T	364	8	2.20	19	5.22	252	69.23	57	15.66	18	4.95	10	2.75
Control	6-10	M	237	10	4.22	20	8.44	162	68.35	33	13.92	8	3.38	4	1.69
		F	61	1	1.64	5	8.20	47	77.05	7	11.48	1	1.64	0	0.00
		T	298	11	3.69	25	8.39	209	70.13	40	13.42	9	3.02	4	1.34
	11-15	M	120	5	4.17	13	10.83	82	68.33	16	13.33	3	2.50	1	0.83
		F	23	0	0.00	2	8.70	20	86.96	1	4.35	0	0.00	0	0.00
		T	143	5	3.50	15	10.49	102	71.33	17	11.89	3	2.10	1	0.70
	All	M	357	15	4.20	33	9.24	244	68.35	49	13.73	11	3.08	5	1.40
		F	84	1	1.19	7	8.33	67	79.76	8	9.52	1	1.19	0	0.00
		T	441	16	3.63	40	9.07	311	70.52	57	12.93	12	2.72	5	1.13

Table 6: Median and mean rank of body mass index for age Z-score among study and control groups by age groups and gender.

Age (Years)	Gender	Study			Control		
		Total No.	M	Mean Rank	Total No.	M	Mean Rank
6-10	M	193	0.17	224.42	237	0.02	208.24
	F	51	0.14	62.17	61	-0.13	51.76
	T	244	0.16	285.90	298	-0.01	259.71
11-15	M	100	0.46	125.54**	120	0.20	97.97
	F	20	0.01	23.75	23	-0.13	20.48
	T	120	0.41	148.41**	143	-0.04	118.23
All	M	293	0.35	349.37**	357	0.03	305.91
	F	71	0.03	85.13	84	-0.13	71.97
	T	364	0.25	433.70**	441	-0.01	377.66

**** Highly Significant (Higher), between study group and control group.**

Table 7: Correlation coefficient between BMI for age z-score and caries-experience of primary and permanent teeth among study and control groups.

Groups	ds		dmfs		DS		DMFS	
	r	P	r	P	r	P	r	P
Study	-0.196	< 0.001**	-0.196	< 0.001**	-0.041	0.313	-0.032	0.431
Control	-0.204	< 0.001**	-0.180	< 0.001**	0.261	< 0.001**	0.286	< 0.001**

**** Highly Significant**

Table 8: Correlation coefficient between BMI for age and PII, GI, CI among study and control groups.

Groups	PII		GI		CI	
	r	P	r	P	r	P
Study	-0.142	< 0.001**	-0.099	0.015*	-0.060	0.142
Control	-0.039	0.292	0.025	0.491	0.058	0.117

*** Significant, ** Highly Significant**

الخلاصة

المقدمة: اضطراب طيف التوحد (ASD) يتصف بمجموعة واسعة من الأعراض، بما في ذلك صعوبة في مهارات التفاعل والتواصل الاجتماعي . صحة الفم والأسنان للأطفال الذين يعانون من اضطراب التوحد مثير للجدل، بشكل عام قد يكون مستوى نظافة الفم أقل من الأفراد الأصحاء، ولكن لديهم معدل تسوس قابلة للمقارنة . أجريت هذه الدراسة لتقييم حالة صحة الفم فيما يتعلق بالحالة الغذائية بين الأطفال والمراهقين المصابين بالتوحد في مراكز رعاية اضطراب التوحد في بغداد.

المواد والطرق: من 12 معهد في بغداد، تضمنت مجموعة الدراسة 364 طفل ومراهق يعانون من اضطراب التوحد (ذكر= 294، أنثى = 70)، في حين شملت مجموعة السيطرة 441 طفل ومراهق سليم (ذكر= 357، أنثى= 84) من المدارس الابتدائية والثانوية القريبة من معاهد رعاية اضطراب التوحد الفئة العمرية. صنفت الاعمار إلى فئتين عمريتين، فئة الاطفال (6-10) سنة وفئة المراهقين (11-15) سنة. تم تشخيص تسوس الاسنان، اللويحة الجرثومية، القلح والتهاب اللثة من اجل تقييم نظافة الفم وحالة اللثة الصحية، في حين تم تقييم الحالة الغذائية لهم باستخدام مؤشر كتلة الجسم (BMI). تم تحليل بيانات الدراسة الحالية باستخدام برنامج SPSS النسخة 21.

النتائج: كان معدل رتب لمقياسي تسوس الاسنان (dmfs, DMFS) في مجموعة الدراسة اقل من مجموعة السيطرة وبفارق معنوي عالي. وكان معدل الرتب لمقاييس اللويحة الجرثومية (PII)، التهاب اللثة (GI) والقلح (CI) في مجموعة الدراسة اعلى من مجموعة السيطرة وبفارق معنوي عالي. وجود ارتباط متوسط إيجابي وبفارق معنوي عالي بين مقاييس تسوس الاسنان (ds, dmfs, DS and DMFS) ومقاييس اللويحة الجرثومية (PII)، التهاب اللثة (GI) والقلح (CI) وفي المجموعتين (الدراسة والسيطرة). وقد كان معدل رتب مقياس كتلة الجسم (BMI for age z-score) في مجموعة الدراسة اعلى من مجموعة السيطرة. بينما كان هناك ارتباط ضعيف عكسي وبفارق معنوي عالي بين مقياس كتلة الجسم ومقاييس تسوس الاسنان في مجموعة الدراسة.

الاستنتاج: بينت الدراسة ان شدة تسوس الاسنان، نظافة الفم وصحة اللثة في مجموعة اضطراب التوحد اقل من مجموعة السيطرة. وجود ارتباط متوسط بين مقاييس تسوس الاسنان ومقاييس نظافة الفم وصحة اللثة. وقد اظهرت الدراسة ان فئات امكانية زيادة الوزن، زيادة الوزن والبدانة في مجموعة اضطراب التوحد اعلى من مجموعة السيطرة. وجود ارتباط ضعيف بين مقياس كتلة الجسم ومقاييس تسوس الاسنان في مجموعة اضطراب التوحد.