



COMPARISON OF ORAL HEALTH STATUS AND BEHAVIORS BETWEEN CHILDREN WITH AUTISTIC SPECTRUM DISORDER AND HEALTHY CHILDREN IN RASHT CITY, IRAN

ABSTRACT

Objectives: In this study, the caries experience, gingivitis and behaviors of 6-12 year old children with Autistic Spectrum Disorder (ASD) were investigated according to the Frankl scale during dental examination, and then compared with healthy children.

Materials and Methods: Totally, 55 children with ASD (including 49 males and 6 females) and 165 healthy children (including 83 males and 82 females) were assessed in Rasht, Iran. Before clinical examination, their parents were asked to complete a questionnaire consisting of several questions about parental education level, nutritional status and oral hygiene status. The number of decayed, missing and filled teeth, gingival status and behaviors of the children were recorded during the dental examination. The obtained data were analyzed using Chi-square and Mann Whitney U Test. P-value less than 0.05 was considered statistically significant.

Results: Our results implied that the children with ASD had higher DMFT/dmft scores compared with healthy children ($p < 0.001$). Also, the prevalence of localized and generalized gingivitis was higher in children with ASD than that in healthy children ($p = 0.014$). Most of the children with ASD behaved in negative or definitely negative manner during dental examination ($p = 0.001$). The results showed that the mean level of parental education and oral hygiene habits (such as frequency of brushing and flossing) in healthy children were higher than that in the children with ASD.

Conclusions: According to the results, the children with ASD had higher caries experience and gingivitis compared with healthy children and most of them behaved in negative or definitely negative manner during dental examination.

Keywords: Autistic disorder, dental caries, gingivitis, child.

 Seyedeh Hadiyah DANESHVAR¹
 Alaleh KAVIANFAR²
 Seyed Hossein MASOOMI³
 Mir Mahdi DANESHVAR⁴

ORCID IDs of the authors:

S.H.D. 0000.0002-5002-2350

A.K. 0000-0002-1294-4813

S.H.M. 0000-0002-3981-5114

M.M.D. 0000-0003-4213-3867

¹ Dental Sciences Research Center, Department of Pediatric Dentistry, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran

² School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran

³ Student Research Committee, Dental Research Center, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran

⁴ Postgraduate Student, Department of Prosthodontics Dentistry, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran.

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INTRODUCTION

Autism Spectrum Disorder (ASD) as a neurodevelopment disorder is characterized by repetitive patterns of behaviors and major impairment in social communication. ASD was first described in 1943 by Leo Kanner. This disorder is classified into five subtypes: (a) autism disorder, (b) asperger's syndrome, (c) rett's disorder, (d) childhood disintegrative disorder and (e) pervasive developmental disorder.¹ ASD as a common disorder has a population prevalence of 6 cases in 1000 children. This disorder is considered as an important cause of morbidity and mortality worldwide.² Regardless of the age of the children, ASD interventions should improve all difficulties and challenges in relation to this disorder such as gastrointestinal disturbances, attention deficit hyperactivity disorder (ADHD), learning disability, anxiety and depression, sleep disturbances, sensory sensitivity and motor difficulties.³ It has been well known that ASD is a multifactorial psychiatric condition and a combination of three developmental, environmental and genetic factors is introduced as the etiology of this disorder.⁴ Boys are 3.7 times more likely to be autistic than girls.⁵ Early signs of autism appear in infants as young as 6 months. The signs of this disorder are then stabilized by age 2-3 years, and then tend to continue through adulthood. It has been reported that there are certain problems and obstacles preventing autistic patients from receiving adequate professional dental care, and in most cases the dental needs of these children are ignored. Previous studies have reported controversial outcomes on prevalence of dental caries in children with ASD compared with healthy children.⁶⁻⁹ Some literatures^{4,6,10} have reported that the prevalence of dental caries and periodontal problems in children with ASD is higher than that in healthy children due to the lack of ability to learn and perform oral hygiene habits such as brushing and flossing. By contrast, some other studies¹¹⁻¹³ have showed a lower dental caries in children with ASD due to good supervision of their parents regarding tooth brushing. Therefore, the results of these studies are not comparable and conclusive about oral health status of children with ASD. Hence, the

present study aimed to evaluate oral health status and behaviors of children with ASD during dental examination and to compare them with healthy children in Rasht, Iran.

MATERIALS AND METHODS

In this cross-sectional case control study, 55 children with ASD (49 males and 6 females) were selected from autism rehabilitation center of Rasht city as the case group. Also, 165 healthy children (83 males and 82 females) were selected from children referred to the Dentistry faculty of Guilan University of Medical Science, Rasht, Iran, as the control group. Inclusion criteria were an age in the range 6–12 years old and having a diagnosis of ASD for the case group. Exclusion criteria included poor cooperation, having other disorders and parental dissatisfaction. Ethical approval (IR.GUMS.REC.1397.333) for this study was obtained from ethics committee of the Guilan University of Medical Sciences and Autism Rehabilitation Center prior to oral examination. In the both case and control groups, their parents were informed about the procedure and objectives and the informed written consent was obtained.

The parents were asked to complete a questionnaire containing questions about parental education level, nutritional status and oral hygiene status of the children. The severity of ASD was categorized into three levels including mild, moderate and severe based on the impairments in communication, social interaction and repetitive behaviors by a physician¹. The oral examinations of the children were performed by pediatric dentist using Tell-Show-Do technique. The oral examinations were conducted using a dental mirror and explorer under natural light. The dentist recorded all decayed teeth (D/d), missing teeth (M/m) (due to caries) and all filled teeth (F/f) (including primary and permanent teeth) in accordance with WHO guidelines (1997).¹⁴

Gingival status was recorded as generalized or localized gingival inflammation depending on the amount of gingival redness and bleeding during the examination according to the gingival index of Loe and Silness.¹⁵ During dental examination, behavioral status of patients was also evaluated based on Frankl scale.¹⁶ Bruxism was recorded

based on the observation of wear facets as an indication of enamel and dentin attrition.¹⁷ During the examination, their parents/trainers were present to make them feel more comfortable and informed about the dental treatment needs of their children.

Statistical Analysis

Statistical analysis was carried out using SPSS software (version 21). Descriptive statistics were reported as mean \pm standard deviation for quantitative variables. The frequencies and percentages were used for qualitative variables. Chi-square statistic test was used to analyze the data obtained regarding the children's ages, oral habits, Frankl's behavior scale score, bruxism and

gingivitis. Mann-Whitney U test was also applied to compare the caries experience between the two case and control groups. A statistically significant level was considered at $p < 0.05$.

RESULTS

In the present study, 55 autistic and 165 healthy children were selected as the case and control groups, respectively. The mean age of the children in the study and control groups were 9.32 ± 2.33 and 8.71 ± 1.97 , respectively. There was no significant difference between the two means ($p=0.085$). 89.1% of participants in the case group and 50.3% of them in the control group were male. (Table 1)

Table 1. Demographic status, parental education level, nutrition status and oral hygiene habits of children with ASD and healthy children

Parameters		Children with ASD		Healthy children		P-value
		N	%	N	%	
Gender	Male	49	89.1	83	50.3	0.001
	Female	6	10.9	82	49.7	
Age	6-7 yr	19	34.5	73	44.2	0.360
	8-9 yrs	10	18.2	31	18.8	
	10 and above	26	47.3	61	37	
	Age (Mean \pmSD)		9.32 ± 2.33		8.71 ± 1.97	
Dentition	Primary	11	20	28	17	0.125
	Mixed	24	43.6	97	58.8	
	Permanent	20	36.4	40	24.2	
Father's education	Elementary	10	18.2	11	6.7	0.034
	High school	28	50.9	87	52.7	
	University degree	17	30.9	67	40.6	
Mother's education	Elementary	12	21.8	13	7.9	0.014
	High school	24	43.6	75	45.5	
	University degree	19	34.5	77	46.7	
Frequency of sweet consumption	Low	30	54.5	91	55.15	0.110
	Moderate	16	29.1	62	37.6	
	High	9	16.4	12	7.3	
Dental floss use	No	55	100	135	81.8	0.001
	Yes	0	0	30	18.2	
Brushing frequency (per day)	Does not brush	19	34.5	6	3.6	0.001
	Once	30	54.5	86	52.1	
	Twice or more	6	10.9	73	44.2	

The education level of the fathers ($p=0.034$) and mothers ($p=0.014$) in control group was significantly higher than that in the case group. There were no differences between the ASD and control groups in terms of frequency of sweet consumption ($p=0.11$) (Table 1).

The results implied that in the ASD group, none of the children were using dental floss, while in the control group, 18.2% of participants were

using dental floss ($p=0.001$). The rate of tooth brushing in the ASD group was significantly less than that in the control group ($p=0.001$). These results are presented in Table 1.

The prevalence of gingivitis ($p=0.014$) and bruxism ($p=0.001$) in children with ASD was significantly higher than that in the healthy group (Table 2).

Table 2. Behavioral status during dental examination according to Frankl scale, gingival status and bruxism in children with ASD and healthy children.

Parameters	Children with ASD		Healthy children		P-Value	
	N	%	N	%		
Frankl scale	Negative	26	47.3	4	2.4	0.001
	Definitely negative	21	38.2	0	0	
	Positive	8	14.5	68	41.2	
	Definitely positive	0	0	93	56.4	
Bruxism	No	24	43.6	159	96.4	0.001
	Yes	31	56.4	6	3.6	
Gingivitis	Non	23	41.8	91	55.2	0.014
	localized	23	41.8	66	40	
	Generalized	9	16.4	8	4.8	

According to Frankl’s behavior rating scale, the healthy children were more likely to behave in positive or definitely positive manner during dental examination compared with the ASD group. There was a statistically significant

difference between the two groups (p=0.001) (Table 2).

As presented in Table 3, the children with ASD had higher DMFT/dmft scores compared with healthy children (p=<0.001).

Table 3. Comparison of number of decayed, missing and filled teeth between children with ASD and healthy children.

Parameters	Children with ASD		Healthy children		P-value
	Mean ± SD	median	Mean ± SD	Median	
DMFT+dmft	6.33±2.88	6	3.88±2.91	4	<0.001
Decayed teeth (D+d)	5.78±3.21	6	2.48±2.69	2	<0.001
Missing teeth (M+m)	0.11±0.42	0	0.13±0.44	1	<0.001
Filled teeth (F+f)	0.44±1.07	0	1.27±1.62	1	<0.001

In this regard, a statistically significant difference was observed in the mean numbers of decayed, missing and filled teeth between the case and control groups (p=<0.001). The results showed that the mean number of decayed teeth in children with ASD was higher than that of the healthy children, while the mean numbers of missing and filled teeth in the ASD group was lower than that in healthy children.

Our findings implied that there were no significant difference in caries experiences between children with ASD and healthy children. So that, no significant difference was observed in primary and mixed dentition between the two groups (p=0.06). The DMFT score in permanent dentition in children with ASD was significantly higher than that of healthy children (p=<0.001) (Table 4).

Table 4. Comparison of caries experiences in permanent, primary and mixed dentition in children with ASD and healthy children.

Parameters	Children with ASD		Healthy children		P-Value
	Mean±SD	Median	Mean±SD	Median	
Permanent dentition (DMFT)	6.20±2.75	6	2.7±2.6	2	<0.001
Primary dentition (dmft)	6.45±3.50	7	4.43±2.87	4	0.06
Mixed dentition (DMFT+dmft)	6.38±2.81	6	4.22±2.93	4	0.06

Table 5 presents the relationship between ASD severity and DMFT/dmft scores. As observed, the mean score of DMFT/dmft in the children with

severe ASD was higher than that in the children with mild and moderate ASD (P=0.007).

Table 5. Relationship between ASD severity and caries experiences (DMFT+dmft).

Disorder severity	N	DMFT+dmft		P-Value
		Mean±SD	Median	
Mild	17	5.59±2.74	6	0.007
Moderate	27	5.78±2.71	5	
Severe	9	8.78±2.05	8	

DISCUSSION

ASD is a developmental disorder that can affect oral health status of people with this disorder. Most of previous studies have focused on the awareness of ASD. While few studies have investigated oral health status in children with ASD. This cross-sectional study assessed the dental caries experiences, behavioral and gingival status of 6-12 year old children with ASD in comparison with healthy children in Rasht city, Iran.

In the present study, M/F ratio was 8:1, which indicated that the boys are at a higher risk for having ASD. This finding is in agreement with all previous studies around the world.^{10,11} The higher prevalence of this disorder among males suggests an x-linked disorder, involving up to 20 interacting genes. It is believed that children born with a genetic vulnerability to autism, are sensitive to external environmental factors. In this disorder, parental environmental factors include taking antidepressants during pregnancy, maternal viral infections and nutritional deficiency, especially folic acid deficiency. Some other factors have been also addressed such as extremely low birth weight and neonatal anemia.^{10,18,19}

Children with ASD suffer from poor muscle coordination and tend to consume sweet and soft food. They are more likely to keep their food in oral cavity instead of swallowing due to oral motor deficiencies. These nutritional problems lead to increased risk of dental caries in these children. Drugs that are used by these children to control the symptoms of this disorder, can cause xerostomia and subsequently make the patient more susceptible to dental caries.⁵ Some literatures reported that the prevalence of dental caries in children with ASD is higher than that in healthy children.^{4,6,10}

Suhaib *et al.*⁴ reported that the high rate of dental caries experience among ASD children is attributed to inability or irregular brushing habits. Some studies showed that children with ASD have lower prevalence of dental caries.¹¹⁻¹³ This finding can be attributed to the good oral health care supervision by their parents and using

carbohydrate-restricted diets. Sarnat *et al.*¹¹ concluded that the lower dental caries in children with ASD is a result of a decreased consumption of sweet snacks.

Shapira *et al.*²⁰ found lower caries prevalence and severe periodontal problems in these patients. Tharapiwattananon *et al.*²¹ showed that half of the children with ASD had dental caries and poor oral hygiene, and the caries may lead to early tooth loss in these children and subsequently causes malocclusion. Desai *et al.*²² also reported a higher prevalence of dental caries in children with ASD.

In this study, children with ASD had more untreated dental caries compared with healthy children, and the number of extracted and filled teeth in healthy children were more than children with ASD. These results could be due to poor dental awareness and poor cooperation of these children with dentists. On the other hand, the parents of children with ASD are often exhausted for constant supervision, feeding, bathing and the children are unable to follow oral hygiene instructions. In addition, inadequate training of dentists and dental specialists, and high sensitivity of these children to unfamiliar sounds, lights, odors and colors are the barriers to access their dental care.²³

Namal *et al.*¹³ reported that children with ASD had more extracted permanent teeth compared with healthy children. It is believed that extraction in children with ASD is preferred due to the challenging nature of their management.

There was no significant difference in frequency of sweet consumption between the children with ASD and healthy groups. These results are consistent with findings of previous studies conducted in Pakistan⁴ and Egypt.²³

Bruxism is one of the relatively common oral health problems in children with ASD.^{24,25} In this study, 56.4% of the children with ASD and 3.6% of the healthy children had bruxism. In Önoğlu *et al.*²⁶ study, in the western mediterranean region of turkey, 41.3% of children with ASD and 5.4% of children without ASD had bruxism. El Khatib AA *et al.*²³ reported a higher prevalence of occlusal

facets, as an indication of bruxism, in children with ASD ($p < 0.001$)

During dental examination, children with ASD showed more uncooperative behaviors compared with the healthy children, which is in agreement with Marshall *et al.*, study²⁷, in which 65% of children with ASD were uncooperative. It has been suggested that the behavioral management should involve gradual desensitization to familiarize these children with basic dental instruments and procedures.²³

The results of the gingival status of children with ASD showed that 41.8% and 16.4% of them had localized and generalized gingivitis, respectively. In Jaber MA study⁶ in the United Arab Emirates, 97% of children with ASD had gingivitis, which was generalized in 78% of the cases and localized in 22% of the studied cases.

According to the results obtained, the oral hygiene and gingival status of children with ASD were significantly poorer than that of healthy children, which could be attributed to irregular brushing, lack of ability to brush and side-effects of medications used to control the symptoms of this disorder.¹¹

CONCLUSIONS

The above discussion emphasizes the fact that the children with ASD had a higher prevalence of caries and gingivitis with poor cooperation during dental examination compared with healthy children. Therefore, comprehensive oral health educational programs should be implemented for their parents to prevent dental and oral diseases in the children with ASD. With regard to the increase of the number of children with ASD in recent years, it is essential to implement effective training programs to raise the awareness of dentists about the problems of these children, and to provide better dental services for them.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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