Libyan Journal of Science & Technology 14:1 (2022) 54-58

Faculty of Science - University of Benghazi

Libyan Journal of Science & Technology

journal home page: www.sc.uob.edu.ly/pages/page/77

Assessment of oral problems and dental status of autistic children in comparison to a matched group of non-autistic healthy children in Benghazi, Libya.

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Highlights

- **A cross-sectional study compares autistic children with their healthy relatives as controls to match the age, sex, and general dental care background.**
- **children with autism in Benghazi experienced moderate levels of attrition and gingivitis, their caries level was lower than their counterparts.**
- **Most autistic children required some or complete assistance during tooth brushing.**
- **Oral health education programs should be planned to provide appropriate preventive protocol as well as an effective treatment for this special section of society.**
- **The dentist in Libya needs additional training in providing oral health care for autistic children.**

ARTICLE INFO

Article history:

Received 23 April 2022
Revised 29 March 2022
Accepted 30 March 2022

Keywords:

Autistic children, Oral problems, Dental caries, Oral hygiene status.

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ABSTRACT

Purpose: The aim of this study is to assess oral problems and the dental status of autistic children in comparison to a matched group of non-autistic healthy children in Benghazi, Libya. **Patients and Methods**: A cross-sectional comparative study included 60 (38 males, 22 females) children with autism and a control group consisting of 60 healthy children, selected from relatives of the autistic patients in an attempt to match the two groups concerning age, sex, and general dental care background. Both groups were recruited and examined in a rehabilitation center for Autism spectrum disorder ASD children in Benghazi, Libya. The age of children in both groups ranged from 4-14 years. Oral problems involving oral infections, eruption patterns, developmental dental anomalies, and tooth fractures were all assessed clinically while; bruxism assessment was based on the attrition shown on enamel surfaces of all teeth. Dental caries, gingival health, and oral hygiene status were assessed using dmft/DMFT index, Gingival Index (GI), and Plaque Index (PI), respectively. Results were tabulated and statically analyzed using a t-test or (Mann-Whitney) for quantitative variables or variables not normally distributed. Similarly, comparison, as regards qualitative variables, will be done using chi-square, Fisher exact, or Monte Carlo correction as indicated. **Results:** No statistically significant differences were presented between both groups, as regards oral infection (P=0.097), eruption pattern (P=0.428), tooth fracture (p=0.119), and developmental dental anomalies (p=0.381). However, there was a statistically significant difference between autistic and non-autistic children with respect to attrition due to bruxism (p<0.001), More enamel attrition was observed in autistic children (26.7% vs 1.7%). On the other hand, the mean dmft score was lower in children with autism than in controls (5.23 vs. 4.06; P < 0.001) these differences were not statistically significant. Moreover, children with autism revealed moderate levels of gingivitis and dental plaque compared to their control group with no statistically significant (p=0.188),(p= 0.157) respectively. **Conclusions:** children with autism in Benghazi experienced moderate levels of attrition and gingivitis, and their caries level was lower than their counterparts. Therefore, oral health education programs should be planned to provide appropriate preventive protocol as well as effective treatment for this special section of society.

1. Introduction

Autism spectrum disorder (ASD) is considered a lifelong neurodevelopmental condition with early childhood onset. It is characterized by persistent impairments in communication and social interaction. The child shows repetitive or restricted patterns of interests and behavior, as well as activities and unusual sensory interests or sensitivities. ASD may occur in association with any level of general intellectual/learning ability, with manifestations ranging from impaired social function and subtle problems of understanding to severe disabilities (Edition, 2013). In 2011, The Centers for Disease Control and Prevention-(CDC) reported that the prevalence of Autistic Disorder criteria, ranges in numbers up to 12 per 1000 children worldwide (Kopetz and Endowed, 2012). Genetic factors such as gene mutations, gene deletions, copy number variants, and other genetic anomalies are all persuasively linked to ASD (Rutter, 2005). However, the exact mechanism by which genes are implicated in autism is unclear (Minshew, 1996).

Despite the fact that no oral manifestation is known to be correlated with autism, oral problems might arise because of autism-related behaviors. Communication limitations, self-injurious behaviors, personal neglect, medications, dietary habits, resistance to receiving dental care, hyposensitivity to pain, and possible avoidance of social contact are defiantly factors that compromise the oral

 ISSN: Online 2663-1407, Print 2663-1393; National Library of Libya, Legal number: 390/2018

health of autistic patients (Regn *et al*., 1999). The harmful oral habits, which are common in children with (ASD), include tongue thrusting, bruxism, and lip biting, and picking at the gingiva. The rate of dental injuries mainly the enamel fracture is higher among autistic children and the permanent maxillary central incisors are the most frequently injured teeth (McDonald *et al.* (2011)).

Several studies have reported that the prevalence of caries, gingivitis, and poor oral hygiene are high in autistic individuals (Jaber, 2011, Subramaniam and Gupta, 2011), while others reported no differences in oral health status between autistics and controls (DeMattei *et al*., 2007, Namal *et al*., 2007); in some studies, the prevalence of caries in children with autism may even be comparatively lower (Namal *et al*., 2007) (Loo *et al*., 2008).

Although the dental literature reveals data on the oral health status of autistic patients, few statistics are available in Libya regarding the oral health condition of children with ASD. Such evidence would assist the pediatric dentists to plan and provide appropriate preventive protocol as well as operative treatment for this group of children. For that reason, this study was planned and conducted to assess the oral problems and dental status of autistic children attending the rehabilitation center for ASD in Benghazi in comparison to a matched group of non-autistic healthy children, to establish baseline data needed for ASD children in Benghazi–Libya.

2. Patients and Methods

A cross-sectional comparative study was carried out over 6 months starting from February to July 2017. A total of 120 children were included in the study, 60 with autism and 60 healthy controls were selected from relatives of the autistic patients in an attempt to match the two groups for age, sex, socioeconomic status, and general dental care background. Both groups were recruited and examined in the rehabilitation center for ASD children in Benghazi, Libya. The age of children in both groups ranged from 4-14 years. At the time of the study, there were 90 autistic patients attending rehabilitation centers for ASD in Benghazi, Libya. Based on the inclusion criteria, only 60 autistic children [38 males (63.3 %), 22 females (36.7%)] were included in this study. The inclusion criteria were defined before sample screening and consisted of the following: diagnosis of autistic patients by medical specialists, obtaining written informed consent from the parents of children for their participation in the study. The non-autistic children with any other systemic disease known to cause dental problems and extremely uncooperative were excluded from the study. The study was approved by the rehabilitation center for ASD in Benghazi, Libya. Demographic and dental data were collected from each child using a questionnaire and a clinical examination (Pinkham, 2005). The examiner was trained and calibrated on oral examination of children to develop an acceptable degree of intra-examiner reliability (Kappa statistic) (Organization, 1997). Following a complete medical history, the examination of the soft and hard tissues was done under ordinary room light using a plane mouth mirror and dental explorer, disposable gloves, and gauze**.** dental caries experience was assessed according to the WHO caries diagnostic criteria for epidemiological studies (Organization, 1997), using the decayed, missing, and filled tooth index (DMFT) for permanent teeth. While decayed, missing, and filled teeth (dmft) index was used for primary teeth. Oral hygiene was assessed according to the Silness and Loe plaque index (Sillness, 1964). Gingival conditions were assessed according to the Loe and Silnes Gingival index (GI) (Löe, 1967). Bruxism assessment was based on the attrition shown on enamel surfaces of all teeth. Infections involving soft tissues, eruption patterns, developmental dental anomalies, and tooth fractures were all assessed clinically.

Comparison between the two groups was done using t-test or (Mann-Whitney) for quantitative variables (or variables not normally distributed). Similarly, comparison, as regards qualitative variables, was done using chi-square or Fisher exact as indicated. The significance of the obtained results was judged at the 5% level. IBM SPSS version 20.0 (Kirkpatrick, 2015) was used to analyze these data.

3. Results

The majority of the children in both groups were males they represented 63.3% of the study sample. The mean age was (7.41±3.41 years) in autistic children and (7.32±3.53 years) in non-autistic children. In an attempt to match the two groups, the controls were either siblings of the autistic child (45%) or cousins (55%). No statistically significant differences between the two groups regarding gender or age distribution (p=1.000).

Five types of oral problems were identified among the study subjects. There were no statistically significant differences presented between both groups as regards oral infection (p= 0.097), eruption pattern (p=0.428), tooth fracture (p=0.119) and developmental dental anomalies (p=0.381). About 33% of autistic children had oral infections compared to a prevalence of 25 % of non-autistic children. Delay of tooth eruption was observed in three 'non-autistic children whereas, no autistic children had a delay in tooth eruption. In autistic and non-autistic children, tooth fracture was present in 20% and 26.7% respectively. On the other hand, there was a statistically significant difference between autistic and non-autistic children concerning attrition due to bruxism (<0.001) see Fig. 1. More enamel attrition was observed in autistic children (26.7%) versus (1.7%) in non-autistic children.

Table 1

The proportion of oral infection, eruption pattern, developmental dental anomalies, tooth fracture and attrition in both groups

	Autistic children (n = 60)		Non autistic children (n = 60)		χ^2	p
	№	%	№	%		
Oral infection	**(n=60)**		**(n=60)**			
Yes	20	33	15	25	1.008	0.097
No	40	67	45	75		
Eruption pattern	**(n = 60)**		**(n = 60)**			
Normal	56	93.3	54	90	1.036	^{MC}p=0.428
Delayed eruption	0	0	3	5		
Early eruption	4	6.6	3	5		
Developmental dental anomalies	**(n = 60)**		**(n = 60)**			
Yes	2	3.33	2	3.33	0.000	P = 0.381
No	58	96.7	58	96.7		
Tooth fracture	**(n = 60)**		**(n = 60)**			
Yes	12	20	16	26.7	0.745	P = 0.119
No	48	80	44	73.3		
Attrition	**(n = 60)**		**(n = 60)**			
No attrition	44	73.3	59	98.3	15.4	^{FE}**p** <0.001*
Enamel attrition	16	26.7	1	1.7		
Attrition involving the pulp	0	0	0	0		

χ^2: Chi square test MC: Monte Carlo test FE: Fisher Exact test

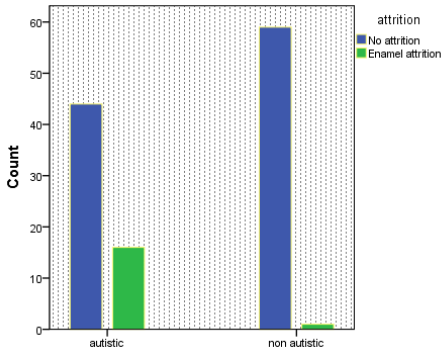

Fig. 1. Bar graph shows the proportion of attrition of both groups, there was a statistically significant difference between autistic and non-autistic children

Table 2 present the oral hygiene and gingival condition. Most autistic children (93.3%) required assistance during tooth brushing some or complete compared to 51.5% of non-autistic children. The difference was statistically significant (p<0.001). Regarding tooth brushing 90% of autistic children brushed their teeth, whereas, all non-autistic controls reported tooth brushing. The mean PLI in autistic children (1.40±0.56) was higher than that of their controls (1.20±0.58). The mean GI in autistic children (0.93±0.44) was higher than (0.78±0.37) in non-autistic children. No statistically significant difference was found between the two groups in the oral hygiene habits (p< 0.105), PLI (p= 0.118), and GI (p= 0.157).

Table 2

The oral hygiene and gingival condition status in both groups

	Autistic children (n = 60)		Non autistic children (n = 60)		χ^2	p
	No.	%	No.	%		
Tooth brushing	n = 60		n = 60			
Yes	94	50	58	96.7	2.143	FEp=0.105
No	6	10	2	3.3		
Child required assistance with tooth brushing	**n = 60**		**n = 60**			
Yes	56	93.3	31	51.7	26.123	<0.001*
No	4	6.6	29	48.3		
Frequency of tooth brushing	**n = 60**		**n = 60**			
Infrequently	11	18.3	9	15	5.065	FEp=0.016*
Once/day	27	45	31	51.7		
Twice/day	22	36.7	16	26.7		
After every meal	0	0.0	4	6.7		
Use of tooth paste	**n = 60**		**n = 60**			
Yes	46	76.7	55	91.7	5.065	FEp=0.016*
No	14	23.3	5	8.3		
Plaque and gingival indices	**Mean ± SD**		**Mean ± SD**			
Plaque index (PLI)	1.40±0.56		1.20±0.58		t=1.332	0.188
Gingival index(GI)	0.93±0.44		0.78±0.37		t=1.433	0.157

χ^2: Chi-square test MC: Monte Carlo test FE: Fisher Exact test *: Statistically significant at p≤0.05 t: t-test.

Table 3 show caries experience among autistic and non-autistic children with primary, mixed, and permanent dentitions. As for the primary dentition, the mean decayed, missing, and filled primary teeth (dmft total) in autistic children was 5.50±5.95 and for non-autistic children was 6.53±4.54, the data showed no statistically significant difference between the two groups (p=0.847). No statistically significant difference was found between the two groups regarding the dmf components; decayed (d), missing (m), and filled (f) teeth (p=0.699, p=0.0.983, p=0.726 respectively). The mean total decayed, missing, and filled permanent teeth (DMFT±SD) was 1.20±2.43 for autistic and 1.10±1.83 for non-autistic children. Despite the caries level in ASD being lower than their counterparts, there was no statistically significant difference between the two groups (p=0.392). No statistically significant difference was found between the two groups regarding the DMF components; decayed (D), missing (M), and filled (F) teeth (p=0.392, p=0.317, P=0.1.000 respectively).

Table 3

Comparison between the two studied groups regarding their caries experience.

	Autistic children		Non autistic children		Z	p
	N	Mean±SD.	N	Mean±SD.		
Primary teeth						
d	**55**	5.11±5.47	**60**	5.33±4.16	0.387	0.699
m	**55**	0.81±2.0	**60**	0.20±0.41	0.021	0.983
f	**55**	0.19±0.68	**60**	1.0±1.91	0.351	0.726
dmft total		5.50±5.95		6.53±4.54	0.193	0.847
Permanent teeth						
D	**42**	1.48±2.04	**40**	1.65±2.03	0.857	0.392
M	**42**	0.24±1.09	**40**	0.0±0.0	1.000	0.317
F	**42**	0.0±0.0	**40**	0.0±0.0	0.0	1.000
DMFT total		1.20±2.43		1.10±1.83	0.857	0.392

Z: Z for the Mann-Whitney test

4. Discussion

As the prevalence of ASD has increased in recent years, dentists are increasingly more likely to encounter children with ASD in their practice (Regn *et al.*, 1999). Therefore, it is important for dental professionals to further understand the experiences and challenges encountered by children with ASD as they access and engage in oral care both in the home and dental office (Weil and Inglehart, 2012). As little information is available on the oral health conditions of autistic children in Libya, this study was carried out to provide such valuable information.

Most of the autistic children who participated in this study were males, with a male to female ratio was 1.5:1. Although the ratio was different from other reported ratios, it was in agreement with the previous studies that reported a higher prevalence of ASD among males (Zeglam and Maouna, 2012, Al-Maweri *et al*., 2014, Murshid, 2005). Prevalence differences might be related to gender variation in the expression of more evident clinical symptoms, such as personality disorder and schizophrenia which are reported to be more common among males with ASD, whereas dementia is common among females (Chester *et al*., 2013).

Considering the oral hygiene practices, it was observed that the majority of the autistic children required some or complete assistance during tooth brushing because of the compromised manual dexterity whereas, fewer did not brush their teeth. Other clinical features such as sensorimotor deficits, impaired executive function, attention problems, anxiety, increased sensitivity to sounds, light and odors, difficulties in comprehension, and general language impairment, make achieving good oral health very difficult (Rapin and Tuchman, 2008). Murshid in 2005 (Murshid, 2005) showed that children with ASD have generalized gingivitis which could be related to irregular brushing habits and the difficulties encountered by the trainers and the parents when they brush their children's teeth.

Despite caries, levels in ASD being lower than their counterparts, these differences were not significant and we can explain that by prominent saliva drooling and less preference for fruits and sweets by autistic children compared to non-autistic children. This finding corresponds to results from many studies (Loo et al., 2008, Al-Maweri et al., 2014, Murshid, 2005, DeMattei et al., 2007, Du et al., 2015) who reported that there were no significant differences in caries prevalence between children with ASD and healthy children neither in primary nor in permanent dentition. Yet, other studies (Namal *et al*., 2007, Du *et al*., 2015) reported that the prevalence of caries in children with autism may even be comparatively lower. In contrast, other studies reported a higher prevalence of caries (Marshall *et al*., 2010, Jaber, 2011).

Although, there was no statistically significant difference between the two groups in the oral hygiene and gingival conditions, the mean plaque and gingival Índices were reported to be higher in children with ASD. The results were attributed to poor oral hygiene measures in addition, to the fact that some children with ASD were under medications and probably lacked manual dexterity, which compromises their oral health. This finding is in agreement with Murshid (Murshid, 2005) and DeMattei et al (DeMattei *et al*., 2007) In contrast, other studies reported that the oral hygiene and gingival conditions levels of children with ASD were significantly poorer than healthy children (Loo *et al*., 2008, Marshall *et al*., 2010, Yashoda and Puranik, 2014).

Compared to their control group, autistic children in the current study showed a marked habit of bruxism that was manifested by prominent attrition of teeth that was limited to the enamel surface. This was in agreement with other studies (DeMattei *et al*., 2007, Luppanapornlarp *et al*., 2010) which noted an increased incidence of bruxism in children with ASD.

Considering the eruption pattern, developmental anomalies of teeth, oral infection, and tooth fractures, data showed no significant difference between autistic and non–autistic children. In this study the percentage of tooth fractures in autistic children was 20%, which is in agreement with the study of Klein and Nowak in 1998 (Klein and Nowak, 1998) who revealed that 20% of the participants with ASD had a history of trauma to anterior teeth.

Several limitations in our study should be taken into consideration in future studies. One of the limitations of this study is the small size of the study sample, which included attendants of the only center of rehabilitation for autistic children in the City of Benghazi. Another limitation was the lack of comprehensive medical records, which were not available for all subjects and was the reason to focus on only one center of rehabilitation for autistic children. One more limitation of the study was the fact that the examiner was not blind to the group he was examining which might introduce some bias. However, one strong point of this study was the selection of controls that were either cousins or siblings and probably would have common dental and lifestyle characteristics, therefore allowing a high degree of matching between groups. Since the present sample was small, it is unlikely to provide evidence-based parameters in the Libyan population. However, the present study opens channels to explore for documentation of the oral health conditions and quality of life among this unfortunate group of children.

5. Conclusion

In conclusion, children with autism in Benghazi did not reveal a higher prevalence of dental problems in comparison to their controls. Although they experienced moderate levels of gingivitis and dental plaque, their caries level was lower than their counterparts. The habit of bruxism requires more attention and awareness on the parents' part. Effective and continuous involvement in their oral hygiene practices is also required.

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