ORIGINAL ARTICLE / *ARTICLE ORIGINAL*

Pedodontics / *Pédodontie*

ASSESSMENT OF CARIES PREVALENCE AND RELATED RISK FACTORS AMONG A GROUP OF LEBANESE CHILDREN WITH AUTISM SPECTRUM DISORDER: A CASE-CONTROL STUDY

Ranim Bassam Kassab[1] | Aly Osman[2] | Ahmad Tarabaih[3]

Objectives: The study aimed to assess dental caries prevalence and its associated risk factors for children with Autism Spectrum Disorder (ASD) among different age groups.

Material and Methods: Forty-five children with autism aged between 3-16 years matched to 45 healthy children were selected. Children were recruited from autistic centers/schools in Saida, South Lebanon. Each child assessed for caries prevalence and risk factors using DMFT/dmft indices and the WHO standardized questionnaire. Student's t-test, Pearson's correlation test, and One-Way ANOVA followed by Tukey's post hoc tests were used. Statistical significance was set at 95%.

Result: DMFT/dmft scores in non-ASD group were 0.85±1.53 and 2.15± 3.03 respectively and in ASD group were 0.72±1.34 and 1.87±3.09 respectively with no significant difference in both groups ($p > 0.05$).

Conclusion: Preventive dental programs targeting autistic children and their parents/caregivers are needed to enhance their oral health status and general well-being.

Keywords: Autism Spectrum Disorder, Dental Caries, Special Health Care Needs.

Corresponding Author:
Ranim Kassab, e-mail: Kassab_ranim@hotmail.com

Conflicts of interest:
The authors declare no conflicts of interest.

1- Division of Pediatric Dentistry, Faculty of Dentistry, Beirut Arab University - Lebanon
kassab_ranim@hotmail.com
2- Division of Orthodontics, Faculty of Dentistry, Beirut Arab University - Lebanon
a.osman@bau.edu.lb
3- Division of Pediatric Dentistry, Faculty of Dentistry, Beirut Arab University - Lebanon
a.tarabaih@bau.edu.lb

ÉVALUATION DE L'HYGIÈNE BUCCALE, DE L'ÉTAT GINGIVAL ET DES FACTEURS DE RISQUE ASSOCIÉS CHEZ UN GROUPE D'ENFANTS LIBANAIS ATTEINTS DE TROUBLES DU SPECTRE AUTISTIQUE : UNE ÉTUDE CAS-TÉMOIN.

Objectifs: Cette étude visait à évaluer la prévalence des caries dentaires et leurs facteurs de risque associés chez les enfants atteints de troubles du spectre autistique (TSA) dans différents groupes d'âge.

Matériel et méthodes: Quarante-cinq enfants autistes âgés de 3 à 16 ans, appariés à 45 enfants en bonne santé, ont été sélectionnés. Les enfants ont été recrutés dans des centres et des écoles pour autistes à Saida, dans le sud du Liban. Chaque enfant a été évalué pour la prévalence des caries et les facteurs de risque à l'aide des indices DMFT/dmft et du questionnaire standardisé de l'OMS. Le test t de Student, le test de corrélation de Pearson et l'ANOVA à un facteur suivie des tests post hoc de Tukey ont été utilisés. La significativité statistique a été fixée à 95 %.

Résultat: Les scores DMFT et dmft dans le groupe non-TSA étaient respectivement de 0,85 ± 1,53 et de 2,15 ± 3,03, et dans le groupe TSA, ils étaient respectivement de 0,72 ± 1,34 et de 1,87 ± 3,09, sans différence significative entre les deux groupes ($p > 0,05$).

Conclusion: Des programmes dentaires préventifs ciblant les enfants atteints de TSA et leurs parents/aidants sont nécessaires pour améliorer leur santé bucco-dentaire et leur bien-être général.

Mots-clés: Trouble du spectre autistique, Caries dentaires, Besoins spéciaux en matière de soins de santé.

Introduction

Oral diseases such as dental caries and poor oral hygiene can have a negative impact on the life of healthy children as well as children with special health care needs (CSHCN) [1]. One such disability affecting the world population at a dramatic level is Autism Spectrum Disorder (ASD) [2]. Autism was described in 1943 by the US psychologist Leo Kanner [3]. ASD is a lifelong heterogeneous psychiatric disorder characterized by impairments in communication and social relationships and restricted, repetitive, and stereotyped activities, behaviors and interests [4]. It is estimated that autism occurs in all racial, and ethnic groups equally but is four times more prevalent in males than in females [5].

ASD is a major public health concern affecting children worldwide with a tremendous increase in its prevalence in the last decade accompanied by advances in the diagnostic capabilities and awareness of the disorder. According to the World Health Organization (WHO), the worldwide prevalence of ASD is about 1 in 100 children [6]. Few studies in the Middle East and North Africa (MENA) region have evaluated the prevalence of ASD ranging from 1.4 to 29 per 10,000 children [7]. In Lebanon, ASD prevalence is 1 in 66 children [8]; relatively higher than elsewhere in the MENA region [9].

People with ASD generally have oral health-related problems comparable to the general healthy population. However, poor dietary preferences and behaviors, the inability to take care of themselves independently, drug use and self-injurious behavior put these vulnerable children at a high risk of developing chronic non-communicable oral health conditions [10].

The relationship between ASD and dental caries remains controversial. Some studies reported no significant difference in caries prevalence between autistic and non-autistic children [14, 15, 16, 17] others found lower caries prevalence in autistic children [13, 18, 19, and 20] yet others found higher prevalence in autistic children [12, 21, 22], thus, the need for more exploration into the relationship between oral health status and ASD.

To the best of the authors' knowledge, there has been no data available on this topic in Lebanon. Therefore, the current study aims to assess the oral health status of autistic children aged 3 to 16 years in Lebanon assuming that there is no significant difference in the oral health status between children with or without ASD.

Materials and Methods

This is a case-control study of the oral health status of a group of children with ASD. The study was carried out in different centers for children with ASD matched with their healthy peers in Saida, South Lebanon, during February and June 2022.

The study was approved by the scientific and ethical review committee and institutional review board at Beirut Arab University (BAU IRB code: 2022-H-0099-D-M0481). All the subjects' legal guardians who agreed to participate in the study were asked to provide a written consent.

The inclusion criteria for the present study were children aged between 3 and 16 years, children with positive or definitely positive cooperation based on the Frankl classification [23], autistic children who understand at least very simple instructions, children free from any medical condition or systemic chronic diseases (classified as American Society of Anesthesia Type 1) [24], and children with severity level 1 according to the DSM-V [25], indicating the need for support. On the other hand, children aged above 16 years old with negative or definitely negative cooperation [23] and with severity level 2 (requiring substantial support) or 3 (requiring very substantial support) [25] were excluded.

The G* power test was used to calculate the sample size based on the mean values of a previous study [12] with 80% statistical power to detect a difference of 0.68 effect size with a significant level of 0.05 [26]. The test result was 35 participants. This number was increased to 45 participants per group for more valid results.

A total of 45 autistic children aged between 3 and 16 years were randomly selected from four centers located in Saida - South Lebanon. Concerning the control group, a total of 45 healthy children were matched from 2 different public schools. Children were assigned to three age groups (3-6; 7-11; 12-16 years). In each ASD age group, 7 females and 8 males were enrolled while 8 females and 7 males were enrolled in their corresponding non-ASD group.

Before the start of our study, a simple protocol was sent to the autistic centers explaining the objectives of the study. Following this step, parents were asked to come to the autistic centers and non-autistic schools at arranged intervals of time to have a face-to-face interview to fill out the questionnaire by the examiner. During the first two weeks of the study, the examiner visited the autistic centers for an observational purpose only and got more in contact with the autistic children by sharing with them their class activities. After gaining the child's acceptance, the child was gently asked to sit on a separate chair in the presence of his/her teacher to start behavioral management techniques appropriate to child's age and cognitive development such as modeling, tell-show-do, and positive reinforcement for any slight coop-

eration. Subsequently, a clinical examination was done for each child for about 15-20 minutes. If the child refused to cooperate the first time, behavioral management techniques were repeated and a clinical examination was held on another day. The data collection phase was conducted between February and June 2022 to achieve a matching concept by age and gender in each group.

Clinical examination was done by one trained and calibrated examiner using a mouth mirror and CPI probe (κ=90%). Dental status was evaluated using DMFT/dmft index according to the World Health Organization oral health surveys. Rating scores of dental caries were classified as very low<1.2, low 1.2-2.6, moderate 2.7-4.4, and high 4.4 [27].

To identify food consumption, a standardized questionnaire developed by WHO was given to the children's parents or caretakers. The questionnaire included different sections, personal information, food consumption, and parental educational level [28]. The personal information section included information about the child's gender, age, and location. The food consumption section included information on how often children eat/drink any of the following foods even in small quantities (fresh fruit; biscuits, cakes, cream cakes, sweet pies, buns; lemonade, carbonated drinks or other soft drinks; jam/honey; chewing gum containing sugar; sweets/candy; milk with sugar; tea with sugar) with a 6-Likert scale ranging from never to several times per day. Parental education level sections include the level of education that was completed by each parent with a 6-Likert scale ranging from no formal schooling to college/university.

Data were collected and tested for normality using Statistical Package for the Social Sciences version 28.0 (SPSS software V 28.0). The tested data were normally distributed according to Shapiro-Wilk test. Significance was set at $p \leq 0.05$. Student's t-test, Pearson's correlation test, and One Way–ANOVA test were used followed by Tukey's post hoc multiple comparison test to compare the variables of ASD and non-ASD groups between three different age groups (3-6, 7-11, and 12-16 years).

Results

Dental Indices

The DMFT and dmft scores are presented in table 1. The mean DMFT and dmft scores in the non-ASD group were 0.85± 1.53 and 2.15± 3.03, respectively, and in the ASD group were 0.72±1.34 and 1.87±3.09, respectively, with no significant difference in both groups ($p>0.05$). Concerning the DMFT values in both ASD and non-ASD children, the level of dental caries is considered very low. In terms of dmft values, the level of dental caries is considered low in both groups.

Multivariate Analysis

As table 2 shows, in autistic children, there is a significant difference between the DMFT different age groups with $p<0.001$ and 0.013 respectively. While in non-ASD children there is a significant difference between DMFT among the 3 age groups with p-values of 0.006 and 0.012 respectively.

Based on the multiple comparisons between different groups, in terms of DMFT scores, there is a significant difference between the age groups 3-6 and 7-11, as well as 7-11 and 12-16 with $p<0.001$ and 0.001 respectively. In non-ASD group in terms of DMFT scores, there is a significant difference between the age groups 3-6 and 7-11, 3-6 and 12-16, and 7-11 and 12-16 with $p<0.001$(table 3).

Table 1: Mean decayed, missing, and filled teeth (DMFT, dmft) scores of Non-ASD and ASD children

	Non-ASD/ASD	n	mean	std. deviation	*p-value*
DMFT	Non-ASD	45	.85	1.532	.669
	ASD	45	.72	1.347	
dmft	Non-ASD	45	2.15	3.036	.663
	ASD	45	1.87	3.090	

Table 2: DMFT among different age groups in ASD and Non-ASD groups (One-way ANOVA test)

One-Way ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
DMFT/ASD	Between Groups	27.143	2	13.571	10.614	.000*
	Within Groups	56.261	44	1.279		
	Total	83.404	46			
DMFT/Non-ASD	Between Groups	22.370	2	11.185	5.750	.006*
	Within Groups	85.588	44	1.945		
	Total	107.957	46			

*. The mean difference is significant at the 0.05 level.

Table 3: Post hoc Tukey's test of ASD and Non-ASD groups

Dependent Variable	(I) age group/ autistic	(J) age group/ autistic	Mean Difference (I-J)	Std. Error	Sig.
DMFT/ASD (7-11) Years (12-16) Years	(3-6) Years	(7-11) Years	-.18095	.38227	.884
		(12-16) Years	-1.89091*	.44887	.000*
	(7-11) Years	(3-6) Years	.18095	.38227	.884
		(12-16) Years	-1.70996*	.42087	.001*
	(12-16) Years	(3-6) Years	1.89091*	.44887	.000*
		(7-11) Years	1.70996*	.42087	.001*
DMFT/Non-ASD (7-11) Years (12-16) Years	(3-6) Years	(7-11) Years	-.56250	.49310	.495
		(12-16) Years	-1.67500*	.50125	.005*
	(7-11) Years	(3-6) Years	.56250	.49310	.495
		(12-16) Years	-1.11250	.50125	.079
	(12-16) Years	(3-6) Years	1.67500*	.50125	.005*
		(7-11) Years	1.11250	.50125	.079

*. The mean difference is significant at the 0.05 level.

Correlations between dental indices and associated risk factors.

There is a significant strong positive relationship between age and DMFT in ASD children as the Pearson correlation coefficient is equal to 0.532. No significant relationship between age and DMFT in non-ASD children as the Pearson correlation coefficient is equal to 0.055 (table 4).

Dietary Habits

The frequency, and percentage of food consumption for both groups are shown in table 5. In terms of biscuits, cakes, cream cakes, sweet pies, buns 42.6% of the non-ASD children and 31.9% of ASD children consumed biscuits, cakes, cream cakes, sweet pies, buns every day. There is a statistically significant difference between both groups ($p<0.05$). In terms of lemonade and soft drinks, 23.4% of non-ASD children and 55.3% of ASD children never consumed lemonade and soft drinks. There is a statistically significant difference between both groups ($p<0.05$). Regarding consumption of jam/honey 27.7% of non-ASD children while only 8.5% of ASD children consumed jam or honey once a week. There is a statistically significant difference between both groups ($p<0.05$). Concerning sugar-chewing gum, 8.5% of non-ASD children and 57.4% of ASD children never consumed sugar-chewing gum. There is a statistically significant difference between both groups ($p<0.05$). Regarding the consumption of sweets and candy in non-ASD children, 53.2% consume sweets and candy every day however, 42.6% of ASD children never consume sweets and candy. There is a statistically significant difference between both groups ($p<0.05$). In terms of sweetened milk, 40.4% of non-ASD children and 66% of ASD children never consumed sweetened milk. There is a statistically significant difference between both groups ($p<0.05$). No significant difference was found between the two groups in terms of consumption of fresh fruits, sweetened tea and coffee ($p>0.05$).

There is a significant moderate negative relationship between the level of education of the mothers and fathers of ASD children and sugar consumption as the Pearson correlation coefficient is equal to -0.473 and -0.414 respectively. This indicates that as the level of education of the mother and father increases there will be a decrease in the level of sugar consumption in ASD children. Non-significant results were seen in non-autistic children in terms of the correlation between parental educational level and sugar consumption (Table 6).

Table 4: Pearson correlation results for age DMFT in Non-ASD and ASD children

		Non-ASD	ASD
		DMFT	DMFT
Age	Pearson Correlation	.055	.532
	Sig. (2-tailed)	0.712	.000**
	N	45	45

*. The mean difference is significant at the 0.05 level.
**. Correlation is significant at the 0.01 level (2-tailed).

Table 5: Frequency and percentage of food consumption of Non-ASD and ASD children

		Non-ASD/ASD				
		Non-ASD		ASD		
		Frequency	%	Frequency	%	*p-value*
Biscuits, cakes, cream cakes, sweet pies, buns	Never	0	0.0%	3	6.4%	.001*
	Several times/month	0	0.0%	1	2.1%	
	Once a week	1	2.1%	5	10.6%	
	Several times per week	3	6.4%	14	29.8%	
	Everyday	20	42.6%	15	31.9%	
	Several times per day	23	48.9%	9	19.1%	
Lemonade, carbonated drinks or other soft drinks	Never	11	23.4%	26	55.3%	.015*
	Several times/month	7	14.9%	6	12.8%	
	Once a week	4	8.5%	6	12.8%	
	Several times per week	12	25.5%	4	8.5%	
	Everyday	11	23.4%	4	8.5%	
	Several times per day	2	4.3%	1	2.1%	
Jam/Honey	Never	11	23.4%	28	59.6%	.003*
	Several times/month	5	10.6%	5	10.6%	
	Once a week	13	27.7%	4	8.5%	
	Several times per week	3	6.4%	5	10.6%	
	Everyday	10	21.3%	3	6.4%	
	Several times per day	5	10.6%	2	4.3%	
Chewing gum containing sugar	Never	4	8.5%	27	57.4%	.000*
	Several times/month	1	2.1%	4	8.5%	
	Once a week	8	17.0%	5	10.6%	
	Several times per week	7	14.9%	8	17.0%	
	Everyday	16	34.0%	2	4.3%	
	Several times per day	11	23.4%	1	2.1%	
Sweets/ Candy	Never	1	2.1%	20	42.6%	.000*
	Several times/month	0	0.0%	4	8.5%	
	Once a week	8	17.0%	5	10.6%	
	Several times per week	5	10.6%	6	12.8%	
	Everyday	25	53.2%	8	17.0%	
	Several times per day	8	17.0%	4	8.5%	
Sweetened Milk	Never	19	40.4%	31	66.0%	.022*
	Several times/month	2	4.3%	2	4.3%	
	Once a week	3	6.4%	0	0.0%	
	Several times per week	3	6.4%	6	12.8%	
	Everyday	17	36.2%	8	17.0%	
	Several times per day	3	6.4%	0	0.0%	

Table 6. Pearson Correlation results for mother's and father's level of education and sugar consumption in Non-ASD and ASD children

		Non-ASD Sugar Consumption	ASD Sugar Consumption
Mother's Level of education	Pearson Correlation	-.157	-.473
	Sig. (2-tailed)	.220	.001**
	N	45	45
Father's Level of education	Pearson Correlation	-1.86	-0.414
	Sig. (2-tailed)	.210	.004*
	N	45	45

Discussion

A major characteristic of ASD patients is rigid and inflexible adherence to routines. The severity and extent of oral diseases and the resulting changes in the patient's environment may provoke an aggressive outburst or tantrum [29]. It takes patience and knowledge of the patient's degree of intellectual disability to provide dental care. Autistic children have multiple medical and behavioral issues which makes dental treatment extensively challenging. A better understanding of autism's effects on behavior helps dental practitioners to deliver appropriate oral health care.

This study is the first attempt to identify the oral health status of autistic children in Lebanon. The findings indicate that both non-autistic and autistic children exhibit a relatively low prevalence of dental caries, with 48.9% and 51.1% being caries-free respectively according to the WHO classification [27]. The mean DMFT and dmft scores in non-ASD group were 0.85±1.53 and 2.15± 3.03 respectively whereas in the ASD group were 0.72±1.34 and 1.87±3.09 respectively with no significant difference between both groups ($p>0.05$). Previous studies have reported significantly lower dmft and DMFT values in autistic children [13, 17]. The disparity between our results and those of previous studies may be attributed to the limited sample size in our study. On the other hand, it is important to highlight that Jaber and his colleagues demonstrated that dental caries levels are higher among autistic children in Dubai [12]. This difference could potentially be explained by cultural differences, as parents in Dubai use sugar as a form of positive reinforcement for their autistic children, whereas this practice was not observed among the Lebanese parents in our sample.

Several studies confirmed a strong positive correlation between age and DMFT in autistic children as their compliance and cooperation decrease with age, particularly in the absence of proper child management and proper parental supervision leading to poor oral hygiene and increased risk of dental caries [12, 13, 16].

Diet control has a vital role not only in reducing hyperactive behavior in autistic children but also in preventing their risk for dental caries. There is a significant association between a high-sugar diet and dental caries in autistic children [33]. Autistic children in the present study have a significantly lower frequency of sugar consumption regarding biscuits, cakes, cream cakes, sweet pies, buns; lemonade, carbonated drinks or other soft drinks; jam/honey; sugar gum containing sugar; sweets and candies, and sweetened milk when compared to their healthy controls. Mothers restricted frequent sugar intake in their autistic children to avoid their hyperactive behavior. Thus, lower sugar consumption explains the results of low levels of dental caries.

High levels of education among parents have been found to be associated with reduced sugar consumption [34]. The present study found a moderate negative correlation between parental education levels and sugar consumption, indicating that higher education levels in both mothers and fathers are associated with reduced sugar intake. This has potential implications for decreasing dental caries in autistic children, highlighting the importance of parental influence on the oral health status of autistic children.

In conclusion, as autistic children grow older, their oral health status tends to decline. This deterioration can be attributed to the progression of their autistic features, decreased compliance with dental care, and diminished parental supervision over time. Preventive dental programs targeting autistic children and their parents/caregivers are needed to enhance their oral health status and general well-being. The available literature on the oral health status of autistic children is limited. Therefore, there is a need for further research to expand the relationship between different oral health statuses and treatment needs in autistic children.

References

1. Sheiham A. (2006). Dental caries affects body weight, growth and quality of life in pre-school children. British Dental Journal, 201(10), 625– 626.https://doi.org/10.1038/sj.bdj.4814259
2. Karande Autism: a review for family physicians J Ind Med Sci., 60 (2006), pp. 205215
3. Kanner, L. (1943). Autistic disturbances of affective contact. Nervous Child, 2, 217–250.
4. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: Text Revision. 4th ed. Washington, DC: APA; 2000.
5. Maenner MJ, Warren Z, Williams AR, et al. Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2020. MMWR Surveill Summ 2023;72(No. SS-2):1–14. DOI: http://dx.doi.org/10.15585/mmwr.ss7202a1.
6. World Health Organization. Autism spectrum disorders 2019 [cited 2020. July 19. Cited 2019 November]. Available from: https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders.
7. Salhia, H. O., Al-Nasser, L. A., Taher, L. S., Al-Khathaami, A. M., & El-Metwally, A. A. (2014). Systemic review of the epidemiology of autism in Arab Gulf countries. Neurosciences (Riyadh, Saudi Arabia), 19(4), 291–296.
8. Chaaya, M., Saab, D., Maalouf, F. T., & Boustany, R. M. (2016). Prevalence of Autism Spectrum Disorder in Nurseries in Lebanon: A Cross Sectional Study. Journal of Autism and Developmental Disorders, 46(2), 514–522. https://doi.org/10.1007/s10803-015-2590-7
9. Richa, S., Khoury, R., Rouhayem, J., Chammay, R., Kazour, F., Bou Khalil, R., Kheir, W., Choueifaty, D., Kouba-Hreich, E., Gerbaka, B., & Adib, S. (2020). Estimating the prevalence of autism spectrum disorder in Lebanon. L'Encephale, 46(6),414–419. https://doi.org/10.1016/j.encep.2020.05.015
10. Ferrazzano, G. F., Salerno, C., Bravaccio, C., Ingenito, A., Sangianantoni, G., & Cantile, T. (2020). Autism spectrum disorders and oral health status: review of the literature. European Journal of PaediatricD, 21(1), 9–12. https://doi.org/10.23804/ejpd.2020.21.01.02
11. Sarnat, H., Samuel, E., Ashkenazi-Alfasi, N., & Peretz, B. (2016). Oral Health Characteristics of Preschool Children with Autistic Syndrome Disorder. The Journal of Clinical Pediatric Dentistry, 40(1), 21–25. https://doi.org/10.17796/1053-4628-40.1.21
12. Jaber, M. A., Sayyab, M., & Abu Fanas, S. H. (2011). Oral health status and dental needs of autistic children and young adults. Journal of Investigative and Clinical Dentistry, 2(1), 57– 62. https://doi.org/10.1111/j.2041-1626.2010.00030.x
13. Vajawat, M., & Deepika, P. C. (2012). Comparative evaluation of oral hygiene practices and oral health status in autistic and normal individuals. Journal of International Society of Preventive & Community Dentistry, 2(2), 58
14. Zhang, Y., Lin, L., Liu, J., Shi, L., & Lu, J. (2020). Dental Caries Status in Autistic Children: A Meta-analysis. Journal of Autism and Developmental Disorders, 50(4), 1249–1257. https://doi.org/10.1007/s10803-019-04256-x
15. Lam, P. P., Du, R., Peng, S., McGrath, C. P., & Yiu, C. K. (2020). Oral health status of children and adolescents with autism spectrum disorder: A systematic review of case-control studies and meta-analysis. Autism : The International Journal of Research and Practice, 24(5), 1047–1066. https://doi.org/10.1177/1362361319877337
16. Hussein, F. J., Mustafa, A. M., & Sabir, S. M. (2018). Dental caries experience and periodontal health status in a sample of autism children. Zanco Journal of Medical Sciences (Zanco J Med Sci), 22(1), 73–81 https://doi.org/10.15218/zjms.2018.010
17. AlMaweri, S. A., Halboub, E. S., Al-Soneidar, W. A., & Al-Sufyani, G. A. (2014). Oral lesions and dental status of autistic children in Yemen: A case-control study.
Journal of International Society of Preventive & Community Dentistry, 4(Suppl 3), S199–S203. https://doi.org/10.4103/2231-0762.149040
18. da Silva, S. N., Gimenez, T., Souza, R. C., Mello-Moura, A. C. V., Raggio, D. P., Morimoto, S., Lara, J. S., Soares, G. C., & Tedesco, T. K. (2017). Oral health status of children and young adults with autism spectrum disorders: systematic review and meta-analysis. International Journal of Paediatric Dentistry, 27(5), 388–398. https://doi.org/10.1111/ipd.12274
19. Loo CY, Graham RM, Hughes CV. The caries experience and behavior of dental patients with autism spectrum disorder. J Am Dent Assoc. 2008 Nov;139(11):151824. doi: 10.14219/jada.archive.2008.0078. PMID: 18978390
20. Fahlvik-Planefeldt, C., & Herrström, P. (2001). Dental care of autistic children within the non-specialized Public Dental Service. Swedish Dental Journal, 25(3), 113–118.
21. Suhaib, F., Saeed, A., Gul, H., & Kaleem, M. (2019). Oral assessment of children with autism spectrum

disorder in Rawalpindi, Pakistan. Autism : The International Journal of Research and Practice, 23(1), 81–86. https://doi.org/10.1177/1362361317730299

22. El Khatib, A. A., El Tekeya, M. M., El Tantawi, M. A., & Omar, T. (2014). Oral health status and behaviours of children with Autism Spectrum Disorder: a case-control study. International Journal of Paediatric Dentistry, 24(4), 314–323. https://doi.org/10.1111/ipd.12067
23. Frankl SN, Shiere FR, Fogels HR. Should the parent remain with the child in the dental operatory. J Dent Child. 1962;29:150-63.
24. Doyle, D. J., Hendrix, J. M., & Garmon, E. H. (2022). American Society of Anesthesiologists Classification. In StatPearls. StatPearls Publishing.
25. American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: American Psychiatric Association.
26. Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41, 1149-1160.
27. World Health Organization. 4th ed. Geneva: World Health Organization; 1997. Oral Health Surveys: Basic Methods.
28. World Health Organization. (2013). Oral health surveys: basic methods. World Health Organization.
29. Piraneh, H., Gholami, M., Sargeran, K., & Shamshiri, A. R. (2022). Oral health and dental caries experience among students aged 7-15 years old with autism spectrum disorders in Tehran, Iran. BMC Pediatrics, 22(1), 116. https://doi.org/10.1186/s12887-022-03178-5
30. Kalyoncu, I. Ö., & Tanboga, I. (2017). Oral Health Status of Children with Autistic Spectrum Disorder Compared with Non-authentic Peers. Iranian Journal of Public Health, 46(11), 1591–1593.
31. Pilebro, C., & Bäckman, B. J. I. J. (2005). Teaching oral hygiene to children with autism. International Journal of Paediatric Dentistry, 15(1), 1-9.
32. Shapira, J., Mann, J., Tamari, I., Mester, R., Knobler, H., Yoeli, Y., & Newbrun, E. (1989). Oral health status and dental needs of an autistic population of children and young adults. Special care in dentistry : official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry, 9(2), 38–41. https://doi.org/10.1111/j.1754-4505.1989.tb01022.x
33. Namal, N., Vehit, H. E., & Koksal, S. (2007). Do autistic children have higher levels of caries? A cross-sectional study in Turkish children. Journal of the Indian Society of Pedodontics and Preventive Dentistry, 25(2), 97–102. https://doi.org/10.4103/0970-4388.33457
34. Kotha, S. B., AlFaraj, N. S. M., Ramdan, T. H., Alsalam, M. A., Al Ameer, M. J., & Almuzin, Z. M. (2018). Associations between Diet, Dietary and Oral Hygiene Habits with Caries Occurrence and Severity in Children with Autism at Dammam City, Saudi Arabia. Open access Macedonian Journal of Medical Sciences, 6(6), 1104–1110. https://doi.org/10.3889/oamjms.2018.245