

Oral Health Characteristics of Preschool Children with Autistic Syndrome Disorder

Haim Sarnat*/ Eli Samuel**/ Naomi Ashkenazi-Alfasi***/ Benjamin Peretz****

Objective: to assess the dental status of young children with Autistic Syndrome Disorder (ASD) in order to allow better understanding of the dentist's role in treating these children. **Study design:** The ASD group consisted of 47 children diagnosed as ASD from three special kindergartens from three towns in Israel. The control group was 44 normally developed children from 4 kindergartens from 2 neighboring towns. Parents were asked to complete a questionnaire requesting the following: socio-demographic information, general medical condition, dental information (previous visit to a dentist, feeding habits, oral hygiene behavior, oral habits and the Vinland Adaptive Behavioral Scales (VABS)). **Results:** While in the control group there was no report of no brushing at all, among the ASD children 25% did not brush at all. Use of pacifier, fussy eating and eating problems were significantly more prevalent among the ASD group. In addition, the ASD children significantly preferred more salty, spicy and sweet foods than the control. There were more caries-free children among the ASD group. In the ASD group, the ability to perform everyday life functions was slightly more than half of what is expected for age. **Conclusions:** autistic children have a relative age of one half, meaning they function at half the level of normally developed children at their chronological age, more eating problems and more persistent oral habits yet no correlation to dental health could be shown. Caries experience of autistic children was lower than in the control group, maintaining good oral hygiene is difficult for autistic children yet their gingival health was found to be good.

Key words: Autism, children, oral health

INTRODUCTION

Autistic Syndrome Disorder (ASD) is a severe, pervasive impairment in social interaction and communication and stereotyped behaviors, interests and activities¹. It is a complex, behaviorally defined, static disorder of the immature brain, a syndrome with multiple non genetic and genetic causes^{2,3}.

The impairments are deviant in comparison to a person's mental

or developmental level. ASD includes autistic disorder, childhood disintegrative disorder, Asperger disorder and pervasive developmental disorder not otherwise specified (PDD-NOS)⁴.

Impairment in reciprocal social skills, language development and limited behavioral repertoire are common characteristic of the disorder⁵, and are manifested early in life and cause persistent dysfunction.

In the past, ASD in the broadest criteria occurred in 1-2 per 1000 children under 12 years⁶. Many countries have reported a dramatic increase in the number of diagnoses over the past three decades, with current prevalence of ASD at 1 in every 110 individuals⁷.

The Autism and Developmental Disabilities Monitoring Network (ADDM) estimates the prevalence of ASDs at age 8 in 14 centers in the USA. Their results showed that approximately one in 54 boys and one in 252 girls living in the ADDM Network communities were identified as having ASDs⁸.

In most cases, it is manifested before age 1 year. The disorder is 5 times more prevalent in boys than in girls. It was thought that there was no socio-economic predilection⁹, yet two recent studies showed that the prevalence of ASD was positively correlated with higher socio-economic status¹⁰, perhaps due to differential access to pediatric and developmental services¹¹.

*Haim Sarnat, DMD, MSc, Department of Pediatric Dentistry, Faculty of Medicine, School of Dental Medicine, Tel Aviv University, Tel Aviv, Israel.

**Eli Samuel, MD, Community Health Center, Ramat Chen, Israel

***Naomi Ashkenazi-Alfasi, DMD, Private Practice, Petach Tikva, Israel.

****Benjamin Peretz, DMD, Department of Pediatric Dentistry Faculty of Medicine, School of Dental Medicine, Tel Aviv University.

Send all correspondence to:

Haim Sarnat
Department of Pediatric Dentistry
Faculty of Medicine, School of Dental Medicine, Tel Aviv University,
69978 Tel Aviv, Israel
E-mail: haimsarnat@yahoo.com

Autism has been associated with a mixed bag of metabolic and chromosomal abnormalities, as well as a range of infectious conditions in the prenatal period. Between 2-8% of siblings of autistic persons also had autistic disorder².

In addition to the core symptoms there are many other non-specific ones such as, abnormal sensory response, hyperkinesis, aggressiveness, sleeping and eating problems, as well as sensory processing problems, anxiety and behavioral problems and obsessive compulsive behavior¹².

The Vinland Adaptive Behavior Scale (VABS)¹³ is an individual assessment of adaptive behavior. Adaptive behavior is defined as performance of the day-to-day activities necessary to take care of oneself and get along with others. Adaptive behavior is age related and is defined by the expectations and standards of others. Thus, the Vinland scale allows the realistic evaluation and establishment of the relative age of children with ASD.

Dental health

Lowe and Lindeman¹⁴ stated that the oral hygiene of autistic patients was lower than that of non-autistic patients probably because the autistic patients did not possess the necessary manual dexterity required for tooth brushing and they do not comprehend its importance. Oral hygiene and adaptive oral habits are part of social skills. Clinical experience suggests wide variability among young autistic children and within each child in self-help skills. One factor that affects self-skills is the wish to grow up. Normally young children imitate their parents, siblings or caretakers. Young autistic children lack this essential motivation⁵.

Another issue that might affect oral health is “eating difficulties”. Atypical feeding behavior such as sensitivity to food texture and extreme selective preferences for particular foods are common among children with the autistic spectrum^{5,12,15}. ASD children can be very selective and particular. Some insist on soft food only and no hard parts, or holding food in their mouths^{12,16}. Nevertheless the caries prevalence of those who were institutionalized was lower than those who lived at home, yet they did suffer more calculus and gingival inflammation¹⁶. Others reported similar caries levels for autistic and normally developing children¹⁷. Other surveys have shown lower caries prevalence in ASD children^{14,18,19}, yet a higher risk was also suggested^{6,20}.

Individuals with autistic disorder with better daily skills showed better oral health²¹. In another report it was concluded that ASD patients had difficulties in oral care at home, at the dentist and difficulties in access to care²².

The dentist has to face another challenge as there are often comorbid conditions that need addressing, such as allergies, gastro-intestinal disturbances, immune system problems and seizures²³. Behavioral issues were also described: in a dental hospital environment, four main behavioral challenges were identified: non-compliance, hyperactivity, sensory defensiveness and self-injury, and suggest partnering with the parents to develop treatment strategies²⁴.

Facing these difficult issues and realizing the importance of early recognition and early intervention, our aim was to assess the dental status of young ASD patients in order to allow better understanding of the dentist’s role in treating ASD children.

MATERIALS AND METHOD

The study was approved by the ethical committee of Tel Aviv University.

The ASD group consisted of 47 children diagnosed as ASD from three special kindergartens from three towns in Israel. The control group was 44 normally developed children from 4 kindergartens from 2 neighboring towns.

A full verbal and written explanation of the study was given to the parents, and informed consent was obtained from them.

In the ASD group there were 39 boys (83%) and 8 girls (17%). In the control group, there were 10 boys (22.7%) and 34 (77.3%) girls.

The age range of the children in the ASD group was 3.5-8 years with a mean age of 5.53(SD 1.06). The age range of the control group was 4.5-6.5 years with a mean age of 5.63 (SD 0.43)

Age equivalent.

Age equivalent is the age at which a raw score, arrived at by the Vinland Scale, is compared to the mean for people in the standardization sample.

Relative age

Relative age is the age equivalent divided by the chronological age, defining more accurately the adaptive behavior of children in the ASD group.

Parents were asked to complete a questionnaire requesting the following:

a. Socio-demographic information: age, gender, mothers’ education (number of years of formal schooling).

b. General medical condition: length of pregnancy in weeks, complications during pregnancy (bleedings, contractions, general infections, hospitalization), nature of delivery (normal delivery, instrumental delivery [forceps, vacuum], caesarian section).

c. Dental information

C.1. Previous visit to a dentist (6-12 months or more), behavior during previous visits (cooperative, partially cooperative, uncooperative).

C.2. Feeding habits (eating problems, “fussy eating”, use of sweet drinks, food preference [salty, spicy, sweet]).

C.3. Oral hygiene behavior (number of brushings per day, assisted or not).

C.4. Oral habits (mouth breathing, pacifier, drooling, grinding).

d. Vinland Adaptive Behavior Scale - only for the research group

The Vinland Adaptive Behavioral Scales (VABS)¹³ assess the social competence of handicapped and non-handicapped individuals from birth to age 19 years.

The VABS requires that a respondent is familiar with the behavior of the individual in question in order to answer behavior-oriented questions posed by a trained examiner. The survey form contains 297 items. The scale measures four domains: communication, daily

living skills, socialization and motor skills. The combination of the 4 domains forms the adaptive behavior composite. The communication domain samples receptive and expressive skills; the daily living skills domain evaluates personal living habits, domestic task performance and behavior in the community. The socialization domain focuses on interaction with others, including play and sensitivity to others. The DSM-5 offers a diagnostic tool, while the VABS assesses the realistic functional dimension.

Oral examination was then carried out that included caries status (number of decayed, extracted, or filled teeth [def], oral hygiene (good, medium, bad), enamel defects (yes/no), and signs of traumatic injuries (yes/no, by examining tooth fracture, tooth malposition, tooth discoloration).

The examination was performed using mirrors and explorers under natural light in the kindergarten classrooms.

RESULTS

There were no differences between the ASD and controls with regard to mothers' education (nearly half of the mothers in both groups had university education).

Table 1 shows the oral hygiene habits of the ASD and control groups as reported by the parents. While in the control group there was no report of no brushing at all, among the ASD children 25% did not brush at all.

Parents' reports of their child's habits and eating problems were summarized in table 2. Not all the parents answered all the questions therefore the N value was not the same for all the results. Use of pacifier, fussy eating and eating problems were significantly more prevalent among the ASD group. In addition, the ASD children significantly preferred more salty, spicy and sweet foods than the control.

Table 3 shows the findings of the clinical dental examination. No signs of enamel defects were found in the ASD group while the control group demonstrated 43% prevalence of some enamel defects. There were more caries-free children among the ASD group.

The findings regarding the Vinland Adaptive Behavior Scale are shown in table 4. In the ASD group, the ability to perform everyday life functions was slightly more than half of what is expected for age (57.6, 52.85, 57.64 for the daily living skills, motor skills and adaptive behavior composite respectively).

Age – equivalent age and the relative age were calculated for the ASD group:

The mean chronological age was: 5.53 (SD 1.06), the equivalent age was 2.75 (SD 1.06) therefore the relative age was 0.5 (SD 0.16), that means that the children operated at half the expected level for their age.

Table 5 shows the correlation between living skills and motor skills, and oral hygiene evaluation and caries. Children who had high living skills demonstrated significant better oral hygiene (p = 0.026). There was no difference in the caries status (as expressed in def) between the ASD and the controls.

No correlation between adaptive behavior composite and caries experience was found (Table 6).

Table 1. Oral hygiene habits and parental assistance

	ASD	Control
Don't brush	25.5% (12)	0.0%
Brush once/day	44.7% (21)	50.0% (22)
Brush twice/day	29.8% (14)	50.0% (22)
Parents help	63.8% (30)	57.0% (25)

Table 2. Oral habits and feeding problems

	ASD	Control	p
Pacifier use	32.5%(13)	7.0% (3)	P=0.004
Mouth breathing	30% (12)	23.0% (10)	P=0.46
Drooling	12.5% (5)	5% (2)	P=0.24
Sweet drink/night	22.5% (9)	7.0% (3)	P=0.06
Grinding	20% (8)	7.0% (3)	P=0.10
“Fussy eating”	68.2% (30)	7% (3)	P<0.001
Prefer salty	71% (28)	11% (5)	P<0.001
Prefer spicy	56.4% (22)	7% (3)	P<0.001
Prefer sweet	87.2% (34)	16% (6)	P<0.001
Eating problems/past	5.3% (2)	0.0 (0)	P<0.001
Eating problems/past & present	44.7% (17)	4.5% (2)	P<0.001
Eating problems/present	2.6% (1)	2.5% (1)	P<0/001
No Eating problems	47.4% (18)	93.0% (41)	P<0.001

Table 3. Clinical findings

	ASD	Control	p
Scars	17% (8)	34% (15)	0.09
Tooth trauma	32% (15)	25% (11)	0.38
Enamel defects	0.0% (0)	43% (19)	<0.001
Good oral hygiene	80.8% (38)	68% (30)	0.22
Mean def	1.28(2.42)	1.84(2.56)	0.059
Caries free	66% (31)	46% (20)	0.059

Table 4. Results of VABS by component

N=40	Daily living skills	Motor skills	Adaptive behavior composite
Mean	57.50(23.08)	52.85(9.30)	57.64(10.72)

Table 5. The correlation between living skills and motor skills, and oral hygiene evaluation and caries.

Dental findings	Mean (SD)	N	p
Daily living skills			
Good oral hygiene	64.16 (14.52)	6	0.026
Medium oral hygiene	64.22 (25.23)	18	0.026
Bad oral hygiene	41.40 (15.0)	10	0.026
Caries def=0	56.08 (23.84)	24	0.58
Caries def >0	60.90 (21.96)	10	0.58
Motor skills			
Good oral hygiene	52.66 (9.20)	6	0.34
Medium oral hygiene	54.83 (9.12)	18	0.34
Bad oral hygiene	49.44 (9.57)	10	0.34
Scars	56.42 (9.72)	7	0.25
Tooth trauma	50.80 (10.43)	10	0.41
Caries def=0	51.20 (9.41)	24	0.11
Caries def>0	56.80 (8.12)	10	0.11

Table 6 Correlation between adaptive behavior composite and caries experience

Caries	Mean score of adaptive behavior composite	N	p
def=0	57.87 (10.57)	24	0.85
def>0	57.10 (11.65)	10	0.85

DISCUSSION

Dental treatment for the autistic child is difficult, complicated and might be stressful to the children and their parents, as well as to the dentist^{16,24}. Therefore it is important to understand the characteristics of the disorder and base the approach to treatment on the children’s unique behavior patterns and sensitivities.

The data in our study is not complete, as not all the parents felt free to share their experiences, not all parents consented to be very specific and answered the entire detailed Vinland questionnaire, although all consented freely to the clinical dental examination. Some parents, asked to be in the control group, were reluctant even to be associated with the research.

The autistic group had a relative age of 0.5, half of the expected for age, that means that the children perform much below their age appropriate level and have difficulties even with the simplest, every day activities. They need help and supervision, they cannot communicate their wishes properly and they often do not understand what is expected of them.

The gender distribution was similar to that quoted in the literature of predominantly boys⁹. Ethnic origin and level of mother’s education as indicators of socio-economic level were similarly distributed in the autistic and control groups. Children of higher socio-economic status are sometimes represented more in surveys, possibly due to easier access to pediatric consultation and care centers^{10,11}.

Compared to the control, the autistic group reported more eating difficulties and persistent oral habits with reluctance to change, as

was previously reported^{5,6} yet none of the deleterious habits had a major effect on caries rate which was low and there was no correlation with daily life abilities. The autistic group had less caries and more caries free members, as was noted frequently^{14,19,25}, although some reported more caries in primary teeth or a similar caries experience^{7,16,17}.

Low caries prevalence in this group of children could be due to less snacking and eating only when food was served, less interest in food, including sweet food⁶, as well as no initiative to take food by themselves. By reducing greatly the frequency of eating the children reduced their caries risk.

Oral hygiene at home was reported as better in the control group yet clinically, both groups had good oral hygiene and good gingival health. Those who had lower abilities demonstrated lower oral hygiene, as was also demonstrated in a previous report who also used the Vinland method for coping abilities²¹.

In young children the gingival reaction to plaque is not as severe as in adolescents and adults, and does not show severe inflammatory reaction in the presence of plaque²⁶.

Dental trauma was somewhat higher in the autistic group who are less agile, though the difference was not significant, probably due to self-preservation and closer supervision.

Enamel defects of the primary teeth were found in 43% of the controls but hardly any in the autistic group. Intra uterine insults might cause enamel defects such as opacities and hypoplasias, none were found in the autistic children where prenatal etiology was suggested²⁷. Either the insult was too subtle or the effect is minute and microscopic similar to the neo-natal line and other traumatic lines²⁸ this should be further investigated. Support to the timing of possible insults could be found by analyzing primary tooth ground sections for traumatic lines.

CONCLUSIONS

1. Young autistic children have a relative age (functional ability, coping) of one half the ability expected of normally developed children
2. Autistic children have more eating problems and more persistent oral habits, yet no correlation to dental health could be shown.
3. Caries experience of this group of autistic children was lower than in the control group (def score lower and caries free percent higher)
4. Maintaining good oral hygiene is difficult for autistic children yet their gingival health was found to be good.
5. This group of Autistic children showed less traumatic injuries to teeth, possibly due to protected environment and close supervision.
6. Hardly any enamel defects in the primary teeth were found in this group of young autistic children.

Dental treatment for ASD children requires a great effort as well as difficulties for the patients, parents and caregivers. Prevention will prevent the need for invasive treatment.

Prevention of caries by regular, assisted tooth brushing twice daily with fluoridated dentifrices will improve the dental status of the children.

It is important to motivate and instruct parents and caretakers on the importance of oral hygiene and the inclusion of tooth brushing as an integral part of the daily routine of the children. Oral hygiene habits have to be instilled from an early age and maintained rigorously.

Parent partnership and participation, as well as their education, by providing anticipatory guidance and moral support should be part of the dental protocol of autistic children.

With the rising number of children with ASD, dentists should know and understand more about this special group of children, to better advise and judiciously treat them, when required, in the office or hospital, with patience, repetition and empathy.

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