

ORIGINAL RESEARCH

Dental awareness of the parents, dietary habits and oral hygiene of autistic children at Prince Mohammed Bin Salman Autistic Center in King Fahad Armed Forces Hospital Jeddah, Kingdom of Saudi Arabia (observational study)

Reem Allarakia^{1,*}, Bashaer Abdulhadi¹, Albatool Shinawi¹, Manal Al-Malik¹

¹Pediatric Dentistry Department, Faculty of Dentistry, King Fahad Armed Forces Hospital, 22233 Jeddah, Kingdom of Saudi Arabia

***Correspondence**
dr.reemallarakia@gmail.com
(Reem Allarakia)

Abstract

Background: Dental health care is very challenging for autistic children and their families. The study aims to report baseline information about the dental awareness of the parents and dental health of a group of autistic children in King Fahad Armed Forces Hospital, Jeddah. This information proved essential for enhancing the quality of care provided at the hospital. It facilitated the development of impactful educational initiatives tailored for autistic children and their families, to enhance their overall well-being and oral health. **Methods:** Consent forms were dispersed among the parents or legal guardians of autistic children, while the questionnaires, written in simple Arabic, encompassed socio-demographic details, the child's daily dietary and oral hygiene practices and the parents' dental knowledge. The chi-square test was employed to explore relationships between categorical variables, assuming a normal distribution. Significance was determined using the conventional p -value of < 0.05 to reject the null hypothesis. **Results:** The total of 72 samples showed that 86% were male autistic patients and 13.9% were females. Their ages range from 6–8 years old. Most of the parents had a high school education. The frequent use of sweet food as a reward scored 73.6%. At the same time, a soft diet was favored by 68% of the participants, and 81.9% of the children demonstrated a preference for snacking between meals. In terms of tooth brushing habits, most mothers assisted their children with brushing (80.6%), while 55.6% of the children brushed their teeth independently. Furthermore, 79% of the participants indicated a dislike for the taste of toothpaste. When asked about seeking dental care for their child when experiencing dental pain, 72.2% of parents responded positively, however, they showed reluctance towards conducting regular dental check-ups at home. **Conclusions:** Most parents knew about oral hygiene, but their attitudes and practices needed to reflect the same knowledge.

Keywords

Autistic children; Oral care; Dietary habits; Dental awareness of parents

1. Introduction

Autism is a lifelong neurodevelopment disability notable through significant impairment in communication skills, social interactions, and cyclic stereotypes of behaviours [1]. Leo Kanner is an American child psychologist who defined autism in 1943 [2]. Further, it has been noted by researchers that the characteristics and severity of autism differ significantly from one child to another [3–5]. This spectrum of conditions is present across all ethnic and socioeconomic groups. The spectrum encompasses Autism, Asperger Disorder (AD), and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), each displaying variations

in the quantity and intensity of diagnostic traits [6]. Boys have a greater likelihood of developing Autism Spectrum Disorders (ASD) compared to girls, with a reported gender-specific epidemiology ratio of 4.6:1 for autism spectrum disorders [3]. ASD symptoms typically manifest before the age of 3 [7]. Those with ASD often exhibit significant challenges in utilizing various forms of non-verbal communication, forming social connections, sharing emotions and experiences, delayed or absent speech development, and a strong preference for routines [8]. Additionally, individuals with ASD may also experience sensory sensitivities, cognitive impairments or epilepsy [9]. All the characteristics mentioned above may hamper professionally delivered and home dental care, putting

children with ASD at high risk for oral diseases, such as dental caries [10]. Autistic children may exhibit additional dental characteristics such as extensive gingivitis, delayed tooth emergence, dental injuries and misalignment of teeth [10]. These children frequently engage in detrimental oral behaviors like grinding teeth, pushing the tongue against the teeth, and biting lips [11]. The primary oral issue observed in children with autism spectrum disorder (ASD) is tooth decay [10, 11]. Early Childhood Caries (ECC) remains prevalent among children, particularly those from economically disadvantaged backgrounds [12]. Early childhood caries is “the existence of one or more tooth decays (non-cavitated or cavitated lesions), removed (due to caries), or filled tooth surfaces in any primary dentition of children under the age of six years”. Severe early childhood caries (S-ECC) is a type of dental decay that worsens over time in children, classified based on both the quantity of affected teeth and the age of the patient [12]. The presence of cavities on the smooth surfaces of teeth is a key indicator of S-ECC among children under the age of three. One contributing factor to the onset of tooth decay in these young individuals is the frequent consumption of sugary treats, often given as a reward for good behavior [13]. The breakdown of dietary sugars, the elevated level of sugar in the diet, and the continuous intake throughout the day all play significant roles in the development of cavities [14]. Alsajer *et al.* [15] reported that they are selective and picky eaters, as they prefer soft and sweet food, giving a chance for an increased risk of caries development in these children. Furthermore, certain children with ASD are prescribed medications that have a systemic impact on saliva production, leading to a decrease in salivary flow. This reduction can result in dry mouth, diminishing the mechanical and antibacterial properties of saliva that help wash away plaque, ultimately raising the risk of developing dental caries [16]. Additionally, individuals with autism often experience challenges in coordinating their tongue movements, leading to prolonged food retention within the oral cavity. This extended food pouching behavior can further contribute to an increased susceptibility to cavities [17].

In autistic children, the difficulty in maintaining good oral hygiene is noticeable. There are various factors that may contribute to this issue, including inconsistent brushing habits and ineffective flossing resulting from limited manual skills, insufficient guidance on dental care from parents, and challenges faced when trying to brush their children’s teeth [18]. Furthermore, the anti-convulsive and anti-psychotic medications are a significant influence on developing generalized gingivitis that affects maintaining good oral health, thus causing plaque accumulation and caries development [19]. The consistent maintenance of a child’s oral health routine is influenced by the level of parental involvement and understanding of oral hygiene practices [20]. Minervini *et al.* [21], demonstrated a clear correlation between parent’s knowledge and education on oral health and the positive oral hygiene habits observed in their children. Considering the various factors influencing the oral health of individuals with ASD, it is imperative to provide tailored care for this specific group. Offering ongoing education could enhance the provision of oral healthcare for these individuals. Ehsan *et al.* [22] found a positive correlation

between educating adults on oral health and raising awareness, leading to better oral health outcomes for their children.

This study aims to report baseline information about the dental awareness of the parents and dental health of a group of autistic children in King Fahad Armed Forces Hospital, Jeddah. This information was necessary for quality improvement in the hospital. It helped design effective educational programs for autistic children and their parents to improve their quality of life and general health through better oral care.

2. Materials and methods

2.1 Questionnaire design

This descriptive, cross-sectional study follows the (Strengthening the Reporting of Observational Studies in Epidemiology) STROBE criteria/statement [23]. The consent forms were distributed to the parents or legal guardians of autistic children visiting the dental clinic or Prince Mohammed bin Salman autistic center in King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia. The team drafted the surveys using uncomplicated Arabic language. There was a total of 21 questions, covering socio-demographic details like gender, age, parent’s education level, and whether the parents had other children with autism. The survey also inquired about the child’s daily eating and brushing routines, as well as the parent’s knowledge of dental care. Families were reassured that the data collected would solely be utilized for research and that the confidentiality of their responses would be protected. The research was approved through the Research and Ethics Committee pathway at King Fahad Armed Forces Hospital, Jeddah, concerning ethical number REC370. A pilot study was conducted to measure the reliability of the questions by comparing the answers of the responders over some time (06 May 2021). The research sample consisted of 20 participants, with a consistency level of 0.84 (Cronbach’s alpha), suggesting that the responses to the various questions remained stable for each participant throughout the study period. Subsequently, data collection commenced on 06 June 2021, incorporating the findings gathered from the initial pilot study involving the 20 participants.

2.2 Statistical design

This study was analyzed using IBM SPSS version 23 (IBM Corp., Armonk, NY, USA) and visually presented using GraphPad Prism version 8 (GraphPad Software, Inc., San Diego, CA, USA). The study variables were characterized using a basic descriptive statistic, which involved presenting counts and percentages for categorical and nominal variables, as well as mean and standard deviations for continuous variables. A chi-square test was employed to assess the association between categorical variables. These tests were done with the assumption of normal distribution. Lastly, a conventional p -value < 0.05 was the criteria to reject the null hypothesis.

3. Results

3.1 Demographic data

According to the findings, 62 (86.1%) of the 72 children were males. While 10 (13.9%) were females. 77.8% were between the ages of 6 and 8 years old. Regarding education, high school degree were held by 34.7% of mothers and 55.6% of fathers. Out of the surveyed parents, 62.5% had a single child diagnosed with autism, while 22.2% had multiple children with the condition. Specifically, 15.3% had two or more children diagnosed with autism. Table 1 presents the demographic data of the participants.

3.2 Dietary habits

73.6% of the parents offered their children sweets as a reward. 48.6% gave them once a day. The soft diet was favored

by a large proportion of the children, with 68.1% showing a preference for it. Additionally, 81.9% indicated a strong liking for pouching their food, while 86.1% favored soft drinks. It was found that 27.8% of the children were currently taking medication. Table 2 presents the dietary habits.

3.3 Oral hygiene practice

55.6% brushed their teeth by themselves once daily, and 8.3% did not brush at all. Meanwhile, 80.6% of the children depended on their mothers for brushing. In addition, the taste of the toothpaste was not favored by 79.2% of the participants. In terms of toothpaste application, 40.3% indicated preference for the pea-sized amount. A majority of 59.7% reported changing their toothbrush every three months. Oral hygiene practices

TABLE 1. Demographic characteristics.

Demographic questions	Variables	N	%
Total		72	100.0
Gender			
	Male	62	86.1
	Female	10	13.9
Age			
	6 yr	28	38.9
	7–8 yr	28	38.9
	≥9 yr	15	20.8
	Missing	1	1.4
Mother education			
	None	2	2.8
	Elementary	9	12.5
	Primary	1	1.4
	Intermediate	8	11.1
	Highschool	25	34.7
	Bachelor	23	31.9
	Master	24	5.6
	Doctorate	0.0	0.0
Father education			
	None	0.0	0.0
	Elementary	1	1.4
	Primary	1	1.4
	Intermediate	9	12.5
	Highschool	40	55.6
	Bachelor	16	22.2
	Master	1	1.4
	Doctorate	0.0	0.0
How many numbers of kids diagnosed with autism other than the one attending the clinic			
	None	45	62.5
	One more	16	22.2
	Two more	11	15.3

yr: year.

TABLE 2. Dietary habits.

Diet questions	Answers	N	%
Total		72	100.0
Do you use the sweet food as a reward?			
	Yes	53	73.6
	No	19	26.4
How many sweet rewards per day?			
	None	2	2.8
	1 per day	35	48.6
	2 per day	22	30.6
	3 per day/more	1	1.4
	All day	5	6.9
	Never	7	9.7
Does your child consume soft food?			
	Yes	49	68.1
	No	23	31.9
Does your child pouch the food?			
	Yes	59	81.9
	No	13	18.1
Does your child drink soft drinks?			
	Yes	62	86.1
	No	10	13.9
Is your child under any medications?			
	Yes	20	27.8
	No	52	72.2

are detailed in Table 3.

3.4 The knowledge of the parents about dental health practice

45.8% of the parents bring their children to the dental clinic when they are six. However, most of them bring their children when there is pain 72.2%. Merely 27.8% of parents schedule regular dental check-ups for their children. Most parents (65.3%) rely on dentists as their main source of information. When inquired about the frequency of their children's dental examinations, 38.9% admitted to doing so infrequently, with an additional 12.5% claiming they never do it. A significant majority (84.7%) acknowledged the interplay between oral and overall health. The knowledge of the parents about dental health practice are detailed in Table 4.

4. Discussion

Autism is a severe public health issue in many countries [24]. Children diagnosed with ASD typically exhibit significant challenges in social interaction, communication deficits, repetitive behaviors and motor skill impairments, along with medication-induced dry mouth, a preference for sugary foods and food hoarding [25]. These factors collectively impact the

provision of home dental care by healthcare givers, leading to an increased susceptibility for oral health issues, notably dental caries, among children with ASD [26]. Advanced educational programs and specialized behavioral therapy can lead to significant improvements in a child's condition, promoting enhanced self-care practices and ultimately, better oral health. As a result, parental involvement and awareness play a crucial role in enhancing the oral health of their children [27]. The study aimed to collect baseline data about the patients diagnosed with autism from Prince Mohammed bin Salman Center at King Fahad Armed Forces Hospital, Jeddah, Kingdom of Saudi Arabia. This information played a crucial role in enhancing the quality of care provided at the hospital. Utilizing these findings, tailored educational initiatives were developed for both children with autism and their parents, aiming to enhance their overall well-being and oral health through improved oral hygiene practices. Additionally, the surveys were presented in straight forward Arabic language. The total number of samples was 72. All the families were assured that all the data and the results would be confidential.

According to the data, the majority of the patients (86.1%) were male, consistent with a recent prevalence study conducted in Riyadh, Saudi Arabia, which indicated a higher proportion

TABLE 3. Oral hygiene practice.

Oral hygiene questions	Answers	N	%
Total		72	100.0
Does your child brush by him/her self?			
	Yes	40	55.6
	No	32	44.4
Who assist the child in brushing?			
	Mother	58	80.6
	Father	10	13.9
	Sibling	4	5.6
	Auntie	1	1.4
	Maid	4	5.6
	None	30	5.6
How many times does you brush his/her teeth per day?			
	Once	36	50.0
	Twice	30	41.7
	Never	6	8.3
Does your child accept the tooth paste taste?			
	Yes	15	20.8
	No	57	79.2
What size of tooth paste form used?			
	None	2	2.8
	Full	20	27.8
	Pea	29	40.3
	Smear	21	29.2

of males compared to females [28]. According to the Centers for Disease Control and Prevention reports, the number of males diagnosed with autism was 3.4 times higher than that of females [29]. According to Bagattoni *et al.* [30], the oral health of children is influenced by the educational background of their parents. They found a correlation between parents with higher levels of education and lower rates of cavities, as well as better oral hygiene practices. In our study, the parents scored 34% for mothers and 55% for fathers with high school education, but none were significant. ASD-specific parental stress, which tends to escalate when there is more than one child diagnosed with autism [31], is identified as a significant factor influencing oral health. These parents often experience high levels of stress, fatigue, and feelings of being overwhelmed by the various obstacles they confront. These challenges can result in ineffective parenting practices, impacting not only the individual child but also posing potential risks to family dynamics, potentially leading to marital issues such as divorce [32]. For example, they might neglect their child's oral health because they are becoming overloaded with the child's general health difficulties [33].

Moreover, behavioral and lifestyle issues experienced by children with autism can significantly impact their oral health by increasing the risk of tooth decay [26]. Included in these

behaviors/lifestyles are the following: (1) favoring sweet and soft foods; (2) inadequate oral hygiene habits; (3) medication use. Our research findings align with previous studies, indicating a strong inclination towards consuming soft diet and sweet treats, utilizing sweet food as a form of reward, and exhibiting a tendency to pocket food in the oral cavity due to insufficient tongue coordination [13, 15, 17, 30]. 86.1% preferred soft drinks; many studies correlate the high soft drink consumption by autistic children [13, 21]. Moreover, the use of the medication as an anti-psychotic and anti-depressant drug was also a common factor in caries progression due to its' reduced salivary flow effect [34].

In terms of oral hygiene habits, many children with autism face challenges due to limited manual dexterity and physical impairments that can impact their ability to brush their teeth effectively [18]. Similarly to findings from previous research, our study revealed that these children rely on their mothers to assist with brushing [20]. The research also indicated that the children typically used a toothbrush once a day, consistent with earlier studies [13, 29, 32]. Moreover, the earlier examiners [4, 30] pointed out that autistic children are sensitive to taste. In our study, the parents stated that their children (79.2%) refused toothpaste due to its taste, which might explain why these children were brushing only once a day.

TABLE 4. The knowledge of the parents about the dental health practice.

Knowledge questions	Answers	N	%
Total		72	100.0
What is the best time for child's first visit?			
	Birth	6	8.3
	6 mon	30	41.7
	1 yr	1	1.4
	4 yr	1	1.4
	6 yr	33	45.8
	Don't know	1	1.4
What is your source of information regarding the dental visits?			
	Dentist	47	65.3
	Social media	29	40.3
	Friends	3	4.2
How many times you do mouth examination at home?			
	Never	9	12.5
	Less often	28	38.9
	More often	19	26.4
	Occasionally	16	22.2
Do you think there is correlation between oral and medical health?			
	Yes	61	84.7
	No	6	8.3
	Doesn't know	5	6.9
How many times you change your child's tooth brush?			
	Every 1 mon	20	27.8
	Every 3 mon	43	59.7
	Every 6 mon	2	2.8
	Every 1 yr	6	8.3
	Doesn't know	1	1.4

yr: year; mon: month.

Finally, parental care is critical in achieving children's best oral health care [25]. Our study showed that parents need to be more educated about the first dental visit and the importance of having it as early as possible, as most parents bring their children when there is pain. This finding is consistent with previous research conducted on children with various disabilities [35, 36]. Additionally, the data revealed that parents should be educated on the importance of conducting regular dental check-ups for their children at home; 38.9% of the parents admitted that they infrequently inspect their children's teeth at home. Past studies have highlighted a discrepancy in parental awareness of appropriate oral hygiene habits and routines, indicating a necessity for improved awareness regarding their children's routine dental appointments [37–39].

Furthermore, 84.7% responded “yes” to the idea that oral health wellness can affect the general oral health of children. Similarly, multiple research studies have demonstrated the direct correlation between oral health and overall well-being. Oral diseases serve as a gateway for various pathogens to enter

the bloodstream and bones, triggering a pro-inflammatory state that may result in severe systemic illnesses [40]. Castilho *et al.* [41] emphasized the significance of parental oral hygiene practices and their impact on the dental well-being of their offspring, consequently enhancing their quality of life.

Lastly, 59.7% changed their toothbrush every three months, which agreed with the authors' recommendation about changing the toothbrush's period, as the chance of bacterial accumulation that causes gingivitis increases more after three months of toothbrush use [42, 43].

It is essential to highlight some limitations of the present report. First, the sample size is small; it was explained that the data collection was in 2021; still, in that year, we had COVID-19, and the people were not compliant with dental appointments unless there was an emergency, which may affect the validity of the findings. Secondly, the completion of the questionnaire by parents may introduce response bias, and the cross-sectional design of the study implies the presence of associations rather than causal relationships. Additionally,

the utilization of a self-developed questionnaire with a limited number of inquiries could potentially introduce bias into the research outcomes. Future studies incorporating a larger sample size, sufficient statistical power, and a more extensive range of questions adopted from existing literature or experts could enhance the validity of the results and mitigate bias. Longitudinal designs are also required to confirm the validity of the findings and explore potential causal relationships that affect the dental caries and poor oral health of autistic children.

5. Conclusions

Most parents and caretakers knew well about children's oral hygiene, but this knowledge was not reflected in their attitudes and practices. Regular oral health promotion education programs, with stress on dietary practices and other preventive measures, are necessary to promote this knowledge among parents and caretakers.

Enhanced cooperation among dentists and various health-care professionals, including psychiatrists, pediatricians and other specialists serving autistic children, is essential. This collaboration should prioritize addressing parental stress and challenges, assisting families in establishing appropriate boundaries between the autistic child and other family members. We need to conduct more awareness programs in the hospital for the pediatricians about early dental referral once the child is diagnosed with autism and emphasize the importance of early prevention and intervention.

Educate all dental providers to be proactive! Remind them of the importance of early prevention and, thus, less harm. Motivate the dentist to use Positive Behavioral Support (PBS) to provide the appropriate service to the autistic patient in a way that improves their quality of life and fulfils their needs by learning new skills without any unnecessary restriction.

ABBREVIATIONS

AD, Asperger Disorder; PDD-NOS, Pervasive Developmental Disorder-Not Otherwise Specified; ASD, Autism Spectrum Disorders; ECC, Early childhood caries; S-ECC, Severe early childhood caries; PBS, Positive Behavioral Support; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

RA, BA, AS and MA—conceptualized and designed the research study. RA, BA and AS—performed the research, as well as interpreted the data; wrote the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This is descriptive, cross-sectional study was carried out following the guidelines of E Von Elm, “Strengthening the Reporting of Observational Studies in Epidemiology” (STROBE statement) and was approved through the pathway of the Research and Ethics Committee at King Fahad Armed Forces Hospital, Jeddah, with reference ethical number REC370. The consent forms were obtained from the parents or legal guardians of autistic children visiting the dental clinic or Prince Mohammed Bin Salman autistic center in King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia and have obtained their informed consent.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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