

Dental knowledge of educators and healthcare providers working with children with autism spectrum disorders

Ebtissam Z. Murshid, MPH, PhD.

ABSTRACT

الأهداف: لتقييم المعلومات التي تختص بصحة الفم والأسنان والطرق المتبعة لممارسة العناية بالفم والأسنان من قبل مقدمي الرعاية الصحية والمعلمين الذين يتعاملون مع الأطفال المصابين باضطراب طيف التوحد في الرياض، المملكة العربية السعودية.

الطريقة: اعتمدت الدراسة على استبيان وزع على 305 من المعلمين ومقدمي الرعاية الصحية في 7 المراكز المختصة برعاية أطفال التوحد في مدينة الرياض خلال الفترة من سبتمبر إلى نوفمبر 2014م. تم جمع 217 الاستبيانات مع معدل استجابة 71.1%.

النتائج: أظهرت النتائج أن 50% من المشاركين العاملين في المجال الصحي والمعلمين القائمين على رعاية الأطفال لم يقدموا أي نصائح للأهالي عن أهمية تفريش الأسنان، 73.3% لم يوصوا بزيارة طبيب الأسنان للكشف على أسنان الأطفال ممن هم تحت رعايتهم. بالإضافة 10% يعتقدوا أن الزيارة الأولى لطبيب الأسنان يجب أن تكون بعد السادسة من عمر الطفل. أجمع المشاركون على ضرورة الاهتمام بنظافة الفم والأسنان. يعتقد 60.4% أن تفريش الأسنان يجب أن يكون مرتين باليوم. يشكل عام اختار المشاركون فرشاة الأسنان والمعجون كأداة لتفريش الأسنان. يعتقد 35% أن الوالدين هم المسؤولان عن تفريش الأسنان، عدد قليل من المشاركين اختاروا المعلمين أو المعالجين كمسؤولين. لم يتلق 71.4% من المشاركين أي نصائح عن العناية بالأسنان من قبل مختصين بالعناية بالفم والأسنان. يعتقد 14.3% أن البكتيريا هي السبب الرئيسي لتسوس الأسنان.

الخاتمة: أظهرت نتائج الدراسة أن هناك قصور في المعلومات والتشجيع على ممارسة نظافة الفم والأسنان لدى العاملين في المجال الصحي والمعلمين اللذين يتعاملون مع الأطفال المصابين باضطراب طيف التوحد المشاركين من بعض مراكز التوحد.

Objectives: To evaluate dental knowledge and attitudes toward oral health care among healthcare providers and educators working with children with autism spectrum disorders (ASD) in central Saudi Arabia.

Methods: There were 305 questionnaires distributed to 7 special-needs centers between September and November

2014. A total of 217 questionnaires were collected with a response rate of 71.1%. The study took place in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia.

Results: Approximately 50.2% of the participants did not offer any toothbrushing advice, and 73.3% never recommended dental checkup visits to parents, and 75.6% never performed dental examinations to children under their care. Ten percent thought that children should have their first dental visit after 6 years of age. Almost all participants agreed that children should practice oral hygiene, and 60.4% think they should brush twice per day. In general, the participants choose toothbrushes and toothpaste as the main tools to perform oral hygiene. There were 35% of participants who believed that parents should be responsible for the children's oral hygiene, and a few participants mentioned teachers and therapists to be responsible. Most of the participants (71.4%) did not receive any dental information from dental professional resources, only 14.3% of participants believed bacteria to be the cause of dental cavities.

Conclusion: There is a clear lack of dental knowledge and attitudes, and its practical application among the participating group of healthcare providers working with children with ASD in Riyadh.

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From the Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Ebtissam Z. Murshid, Associate Professor, Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia. E-mail: ezmurshid@hotmail.com

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental disability that affects children at a young age. Children with ASD usually show multiple, complicated deficiencies in their social, emotional, and communicative skills.¹ Because of the multiple signs and symptoms of ASD, a multidisciplinary team is required to diagnose and offer comprehensive medical care for affected children. These teams usually include different specialists and subspecialists, such as general practitioners for primary diagnoses, and lead to referrals to relevant professionals or pediatricians who are able to confirm, or refute the ASD diagnosis. Clinical psychologists, psychiatrists, and psychotherapists (who are able to confirm the diagnosis of autism and introduce a customized individual behavior management plan), dieticians (who can provide advice and information concerning nutrition and diet), special educators (who can assess children's educational needs), social workers (who can assess the care needs of children with ASD and their families), speech and language therapists (who can assess speech, language, and communication abilities), audiologists (who can evaluate possible hearing impairments), opticians (who can assess any visual difficulties that the children might have), in addition to specialists in oral health (OH [such as, pediatric dentist, who can perform early check-ups and introduce both primary and comprehensive preventive and therapeutic oral care]).² From a medical point of view, the recognition and diagnosis of ASD in its early stages is significant. Early intervention and treatment can control, and in many cases improve, the symptoms.^{3,4} From a dental point of view, early examinations for intervention and prevention among children in general (and those with special needs specifically) are strongly recommended by major dental academies.^{2,5} However, because children with ASD have multiple medical issues, their dental issues might not receive equal consideration from healthcare providers (HCPs) trying to provide the best comprehensive care. In addition, several well-documented national and international studies have observed a lack of dental knowledge among primary HCPs,⁶⁻¹⁵ and educators¹⁶⁻²⁰ who work with children. Most published studies have reported data collected from HCPs who work with healthy children, or those with disabilities, such as cerebral palsy, or Down syndrome, however, no studies have been conducted to

assess the dental knowledge of educators and HCPs that interact with children diagnosed with ASD. Therefore, because of the unique characteristics of children with ASD, this study evaluated the dental knowledge of, and attitudes toward oral healthcare among different HCPs and educators interacting with children with ASD in Riyadh, Kingdom of Saudi Arabia (KSA).

Methods. This study is a cross-sectional survey undertaken at special-needs centers within Riyadh between September and November 2014. The study took place in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia. This period was selected as it is the beginning of the school year, thus, the researchers would have ample time to review the results of this study, to plan and conduct a special oral health educational workshop with a volunteer group of students, for HCPs involved in the participating centers. Ethical approval was obtained from the Research Center of the College of Dentistry, King Saud University, Riyadh, KSA. Seven special-needs centers from different socio-economic areas of the city were approached through their administrative offices to distribute and collect questionnaires to, and from all their staff members. A total of 305 copies were distributed to 7 centers based on the number of special-needs care providers working at each center who agreed to participate in the study, and only the completely answered copies were included. The questionnaires were formulated in simple Arabic language and designed specifically for the study. Each copy of the questionnaire had a cover letter, which served as an invitation and explained the purpose of the study, as well as provided a short biography of the investigator. The survey was voluntary, and did not collect identifiable participant information. The target group included educators and special-needs care providers who worked with children diagnosed with ASD. A self-administered, 15-item questionnaire included demographic questions concerning gender, age, educational level, employment status (permanent or volunteer job), and type of specialty. Additional questions asked for specific details regarding the special-needs care providers' knowledge and experiences with advice regarding: toothbrush use; pediatric dentist referrals; oral, dental, or both types of examinations provided; appropriate age for a first dental visit; the frequency of tooth brushing; tools used during brushing; suitable people to help the child during brushing; their own sources of dental knowledge; and causes of dental concerns. The validity of the questionnaires was based on previous similar questionnaires designed and used by the author in

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previous studies.²¹ For data reliability it was found that the data was reliable (alpha was 0.715) according to Cronbach's alpha standard cut-off for reliability is 0.7. A pilot study of a group of educators and special-needs care providers (n=25) working at one of the special-needs centers was conducted to evaluate the content validity of the questionnaires. The questionnaires were revised, and corrected according to participants' comments before the final draft was distributed.

Data analysis. Data were entered and analyzed using the Statistical Package for Social Sciences version 21 (IBM Corp., Armonk, NY, USA). Descriptive statistics such as, frequency tables and percentages were conducted to explore the general features of the data. The outcome variable (dependent) was the dental knowledge and attitude of HCPs who advised preventive dental measures. Preventive dental measures consisted of counseling parents regarding oral hygiene, recommending that parents seek dental checkups, visual examinations of the oral cavity and teeth to explore for causes of dental decay, age of first dental visit, number of tooth brushing per day, tolls of toothbrushing, persons responsible regarding the child's oral hygiene, sources of dental knowledge, and the main cause of dental decay. The independent (determinant) variables were age, gender, education level, type of job, and specialties. Chi-square test and logistic regression were used to determine significance of variation, or the association at a 95% confidence level ($p < 0.05$). A cross tabulation analysis was conducted to analyze different categorical variables (responses of the participants).

Results. Of the 305 questionnaires distributed to 7 centers, 217 were collected with a response rate of 71.1% (37 [17.1%] males and 180 [82.9%] females). More than half (66.8%) of the participants were between the age of 20 and 35 years (mean=31.5 years and median=30.5 years). In addition, 69.1% of the participants had bachelor's degrees 40.6% were special educators, 12.9% were speech therapists, and 13.8% were play or training therapists. Participants' work in the centers was their primary job for more than 3 quarters of the sample (76.5%). The remaining 23.5% of participants were either trainees (14.7%) or volunteers (2.3%) as shown in Table 1. In response to the questions regarding dental knowledge, the data revealed that approximately 49.8% of the participants did not offer any advice regarding toothbrushing to parents of children with ASD. Almost 3 quarters (73.3%) of the participants never recommended that any of the parents seek dental checkups, and 75.6% never performed dental examinations of children with ASD under their

care. Approximately, 43.9% of participants believed that children should have their first dental visit between the ages of one and 3 years old, 35.9% thought that children should visit dentist between the ages of 3 and 6 years old, and only 10.1% thought that they should seek dental care after 6 years of age. Fortunately, only 11% of participants thought that children should visit a dental clinic only when experiencing pain. Almost all participants agreed that children should practice good oral hygiene either once (18.9%), or twice per day (60.4%), and 16.6% even supported the notion of brushing one's teeth 3 times per day, or more. In general, the participants choose toothbrushes and toothpaste as the major tools to be used while performing good oral hygiene practices. Only a few (3.2%) participants chose traditional Siwak sticks as a tool for brushing one's teeth (Table 2). Approximately, equal numbers of responses were provided with regard to the person in charge of helping children with ASD with their oral hygiene. One

Table 1 - Distribution of participants working at selected special-needs centers according to socio-demographic data.

Socio-demographics	n (%)
<i>Gender</i>	
Males	37 (17.1)
Females	180 (82.9)
<i>Age, years</i>	
<20-25	78 (35.9)
26-35	67 (30.9)
36-45	59 (27.2)
46-55	12 (5.5)
56+	1 (0.5)
<i>Education</i>	
High school degree or diploma	43 (19.8)
Bachelor's degree	150 (69.1)
Master's degree	18 (8.3)
Doctor of Philosophy or others	6 (2.8)
<i>Specialty</i>	
Speech therapist	28 (12.9)
Training/play therapist	30 (13.8)
Special-needs educators	88 (40.6)
Teachers in merging classes	11 (5.1)
Sociologist	10 (4.6)
Nutritionist	3 (1.4)
Psychologists	10 (4.6)
Trainee or students	32 (14.7)
Others (such as, volunteers)	5 (2.3)
<i>Type of job</i>	
Temporary job	51 (23.5)
Primary job	166 (76.5)
Total	217 (100)

third (35%) of participants believed that parents should be responsible, 34.1% believed that any family member should be able to help, and 24.9% thought that anyone who interacts with them should be able to help. Only a few participants mentioned teachers, therapist, and

nannies. Most participants (71.4%) did not receive any dental instruction or information from professionals, only 11.1% received information from a dentist, and 6.5% received information from official brochures and leaflets. The remaining participants received information

Table 2 - The distribution of participants working at special-needs centers based on their responses to the dental knowledge questions (n=217).

Questions	n (%)	Chi-squared	P-value
1. Have you ever advised the parents of a child with ASD to brush their child's teeth?		0.687	0.407
Yes	109 (50.2)		
No	108 (49.8)		
2. Have you ever referred a child with ASD to a dental clinic?		4.846	0.028
Yes	58 (26.7)		
No	159 (73.3)		
3. Have you ever examined the teeth of a child with ASD?		0.511	0.474
Yes	53 (24.4)		
No	164 (75.6)		
4. At what age do you believe that children with ASD should have their first dental visit?		1.974	0.578
Between 1 and 3 years	93 (42.9)		
Between 3 and 6 years	78 (35.9)		
6 years and up	22 (10.1)		
Only in the event of pain	24 (11.1)		
5. In your opinion, how many times should children with ASD practice good OH per day?		5.229	0.156
Never	1 (0.5)		
Irregular cleaning	8 (3.7)		
Once per day	41 (18.9)		
Twice per day	131 (60.4)		
3 or more per day	36 (16.6)		
6. In your opinion, what tools should be used to clean the teeth of children with ASD?		3.367	0.338
Toothbrush and toothpaste	187 (86.2)		
Siwak	7 (3.2)		
Mouth rinse	7 (3.2)		
A combination of tools	11 (5.0)		
Other	5 (2.3)		
7. In your opinion, if the child is unable to practice OH, who should help him or her?		5.387	0.495
The mother or father	76 (35.0)		
Any of the siblings	2 (0.9)		
Any family member	74 (34.1)		
A nanny or house helper	5 (2.3)		
A teacher or trainer	1 (0.5)		
Do not know	5 (2.3)		
Anyone can help	54 (24.9)		
8. Have you ever received instructions for OH practice?		4.616	0.032
Yes	62 (28.6)		
No	155 (71.4)		
9. If so, from which source?		0.547	0.969
Dentist	24 (11.1)		
Media (such as, TV, radio, newspapers or magazines)	6 (2.7)		
Professional brochures and leaflets	14 (6.5)		
Friends or relatives	4 (1.8)		
Other sources	14 (6.5)		
10. In your opinion, what is the cause of dental cavities?		2.658	0.617
Bacteria	31 (14.3)		
Hereditary factors	9 (4.1)		
Irregular OH practices	112 (51.6)		
Do not know	22 (10.1)		
Combination of factors	43 (19.8)		

ASD - autism spectrum disorder, OH - oral hygiene. $p \leq 0.05$ was considered significant

from different sources. Regarding more specific dental knowledge, only 14.3% of participants believed bacteria to be the cause of dental cavities, whereas 4.1% thought that cavities are hereditary. Most participants (51.6%) thought that dental cavities are caused by irregular oral hygiene practices. Furthermore, 19.8% thought that cavities have multiple causes. Finally, 10% did not know their causes (Table 2). Females comprised most of the participants, and more women (55%) than men (27%) advised parents regarding oral hygiene (Pearson's chi-square=9.606). However, with regard to children's referrals, men referred more children to dental care (43.2%) than females (23.3%, Pearson's chi-square=6.212), and an equal percentage (24.4%) were divided between men and women with regard to performing dental examinations (Pearson's chi-square=0.000, Table 3).

Approximately half (42.4%) of the men and women agreed that the appropriate time for the first dental visit is at one to 3 years of age (Pearson's chi-square=4.688, $p=0.196$). With regard to frequency of tooth brushing, women were more in favor of brushing twice (63.9%), or 3 times (18.9%) per day compared with men. In addition, 45.9% of the men chose brushing once per day, whereas 13.9% of the women did so (Pearson's chi-square=20.593, $p=0.000$). An approximate 81% agreement was found between the men and women regarding the use of toothbrush and toothpaste as the main tools used during oral hygiene (Pearson's chi-square=4.322, $p=0.229$). Similar agreements were observed with regard to the person responsible for addressing oral hygiene among the children. The participants chose family members for this responsibility (Pearson's chi-square 3.470, $p=0.748$).

More men (32.4%) received dental information than women (27.8%; Pearson's chi-square=326, $p=0.568$). In addition, more men (66.7%) received dental information from dentists than did women (38.0%; Pearson's chi-square=4.399, $p=0.355$). More men (16.2%) than women (13.9%) thought that bacteria caused dental decay, and more women (52.2%) than men (48.6%) thought that irregular brushing was the primary cause (Pearson's chi-square=0.936, $p=0.919$).

Age groups and dental knowledge. The younger participant age group (20 and 25 years old) was repeatedly less likely to attend to children's OH compared with the other age groups. Approximately 64.1% of this group did not advise parents regarding oral hygiene (Pearson's chi-square=16.334), 79.5% had not referred any children for a dental examination (Pearson's chi-square=10.459), and 83.3% had not examined any children's teeth (Pearson's chi-square= 4.782, Table 4). Approximately equal percentages of participants (29%) from all age groups agreed that children should have their first dental visit between the ages of one and three years old (chi-square=11.766, $p=0.465$), and up to 45% of 20-35-year-old participants thought that children should practice good oral hygiene at least twice a day (chi-square=17.765, $p=0.123$). Most of the age groups chose a toothbrush and toothpaste as the major tools of oral hygiene (chi-square=9.812, $p=0.632$). In addition, all of the participants agreed that mothers or family members should be responsible for helping with the oral hygiene of children with ASD (chi-square=57.941, $p=0.000$). Participants between 36 and 45 years old received dental information more often (37.3%) than the other groups (chi-square=9.033, $p=0.060$), and dentists were the source of their knowledge (chi-square=18.964,

Table 3 - The distribution of participants working at special-needs centers based on gender and their responses to the dental knowledge questions (n=217).

Questions	Gender		Total	Chi-square	P-value
	Male	Female			
<i>Have you ever advised the parents of a child with ASD to brush their child's teeth?</i>				9.606	0.002
Yes	10 (27.0)	99 (55.0)	109 (50.2)		
No	27 (73.0)	81 (45.0)	108 (49.8)		
<i>Have you ever referred a child with ASD to a dental clinic?</i>				6.212	0.013
Yes	16 (43.2)	42 (23.3)	58 (26.7)		
No	21 (56.8)	138 (76.7)	159 (73.3)		
<i>Have you ever examined the teeth of a child with ASD?</i>				0.00	0.988
Yes	9 (24.3)	44 (24.4)	53 (24.4)		
No	28 (75.7)	136 (75.6)	164 (75.6)		

ASD - autism spectrum disorders. $p \leq 0.05$ was considered significant

Table 4 - The distribution of participants working in special-needs centers based on age and their responses to the dental knowledge questions (n=217).

Questions and participant response	Age group, years					Total	Chi-square	2-sided p-value
	20-25	26-35	36-45 n (%)	46-55	56+			
<i>Have you ever advised the parents of a child with ASD to brush their child's teeth?</i>							16.334	0.003
Yes	28 (35.9)	33 (49.3)	39 (66.1)	9 (75.0)	0 (0.0)	109 (50.2)		
No	50 (64.1)	34 (50.7)	20 (33.9)	3 (25.0)	1 (100.0)	108 (49.8)		
<i>Have you ever referred a child with ASD to a dental clinic?</i>							10.459	0.033
Yes	16 (20.5)	14 (20.9)	25 (42.4)	3 (25.0)	0 (0.0)	58 (26.7)		
No	62 (79.5)	53 (79.1)	34 (57.6)	9 (75.0)	1 (100.0)	159 (73.3)		
<i>Have you ever examined the teeth of a child with ASD?</i>							4.782	0.310
Yes	13 (16.7)	18 (26.9)	18 (30.5)	4 (33.3)	0 (0.0)	53 (24.4)		
No	65 (83.3)	49 (73.1)	41 (69.5)	8 (66.7)	1 (100.0)	164 (75.6)		
Total	78 (100.0)	67 (100.0)	59 (100.0)	12 (100.0)	1 (100.0)	217 (100.0)		

$p \leq 0.05$ was considered significant. ASD - autism spectrum disorders

Table 5 - Multinomial logistic regression analysis, gender, age, educational level, type of job, and specialty as explanatory variables versus dental knowledge and attitude (outcome variables).

Dependent, outcome variables	Independent, determinant variables					
	Overall p-value	Gender	Age	Educational level	Type of job	Specialty
1. Have you ever advised the parents of a child with ASD to brush their child's teeth	0.025	0.34	0.62	0.21	0.23	0.011
2. Have you ever referred a child with ASD to a dental clinic?	0.000	0.001	0.027	0.22	0.44	0.027
3. Have you ever examined the teeth of a child with ASD?	0.001	0.11	0.04	0.12	0.030	0.030
4. At what age do you believe that children with ASD should have their first dental visit?	0.64	0.058	0.75	0.21	0.89	0.66
5. In your opinion, how many times should children with ASD practice good OH per day?	0.17	0.000	0.71	0.41	0.53	0.89
6. In your opinion, what tools should be used to clean the teeth of children with ASD	1.00	0.56	0.97	0.92	0.63	
7. In your opinion, if the child is unable to practice OH, who should help him or her?	1.00	0.32	0.00	0.95	0.98	0.89
8. Have you ever received instructions for OH practice?	0.060	0.68	0.11	0.48	0.60	0.19
9. If so, from which source?	0.009	0.65	0.002	0.06	0.12	0.041
10. In your opinion, what is the cause of dental cavities	NA	0.26	0.000	NA	0.95	NA

$p \leq 0.05$ was considered significant. ASD - autism spectrum disorders, OH - oral health

$p=0.089$). However, approximately equal percentages of all the age groups chose irregular brushing as the major cause of dental decay (chi-square=23.618, $p=0.098$).

Educational level, specialties, and dental knowledge.

Approximately 70% of the participants hold a bachelor's degree. With regard to participant specialties, special educators comprised more than 40% of the participants, and 56% of them advised parents about oral hygiene (Pearson's chi-square=29.233). However, a large percentage (45.9%) of participants did not recommend that any children to seek dental care, and 40.2% never attempted to examine the children's teeth

(Pearson's chi-square=12.602). Approximately half (45.6%) of the special educators also considered 3 and 6 years old as the appropriate age range for the first dental visit (Pearson's chi-square=29.962). Moreover, 62.2% of participants believed that teeth should be cleaned 3 or more times per day using a toothbrush and toothpaste (Pearson's chi-square=49.152). None of the special educators believed that they should play a role in the oral hygiene of the children, however, 48.4% had received dental information. Approximately 60% of their dental information began with dentists, whereas 50.1% came from the media (Pearson's chi-

square=21.146). Most educators (43.8%) believed that irregular brushing was the primary cause of dental decay (Pearson's chi-square=47.939). Approximately 77% of participants were working at the centers as their primary job, and 51.8% of these workers advised parents regarding oral hygiene. However approximately 70% of these employees had not referred any children to dental clinics or examined their teeth. Approximately 40% of them thought that children should seek their first dental visit between one and 3 years old, and 64% thought that children should brush twice per day using a toothbrush and toothpaste (87.8%). In addition, 58% thought that family members should be responsible for their oral hygiene. Almost 68% of participants had not received any dental information; only 43.4% had received information from dentists, and 52% thought that irregular brushing causes dental decay.

Multinomial logistic regression analysis. Table 5 showed the multinomial logistic regression analysis using gender, age, educational level, specialty, and dealing with ASD children as determinant (independent variables) versus outcome variables (dependent) of dental knowledge and attitude; the results show wide variations in the significance of the different variables at $p < 0.05$.

Discussion. One of the most significant issues that major health academies agree on is the recommendation for early dental checkups among children. In the case of children with special needs, the importance of early dental checkups becomes even more significant.⁵ Children diagnosed with ASD, due to the nature of their syndrome are generally exposed to a myriad of HCPs before they have the chance to visit a dental clinic. Primary medical care providers have opportunities to play significant roles in referring, or advising children and their families to seek dental care. Taking into consideration previously published reports of the paucity of dental knowledge among HCPs,^{6-11,13,15} and educators^{16,18,19} working with children, the urgency to assess the dental knowledge of professional personal working with children with ASD greatly increased.

Data from this study reveals that participants primarily focused on the medical and educational aspects of care and abandoned dental aspects. Disappointingly, nearly half of the participants neglected to emphasize the importance of oral hygiene, and fail to advise parents with regard to brushing for their children. Furthermore, they did not make clear efforts to refer the children to their dental colleagues. Although they cannot be expected to have more than basic dental background knowledge, one appropriate course

of action would be to refer them to someone who actually does. Advising parents to seek early dental checkup is associated with increase in dental visits and improvements in dental prevention among young children.²²⁻²⁶ Obviously, the OH of these children was not one of the participants' concerns, even though the children were under their care every day. Ignorance of the necessity of oral examination and reluctance to perform it is predictable, given the results of previous studies,^{8,27} however, the large number of respondents who ignored these issues was unexpected. In addition, most of the HCPs believed that the parents or other family members should be responsible for the children's oral hygiene practices, no one believed that teachers should be involved with tooth brushing in the event that the children were unable to do so, even though the children spend half of their day in special-needs centers under their care. Participants' responses with regard to the cause of dental cavities revealed the paucity of their dental knowledge because only 14% thought that bacteria was the main cause of dental decay. Similar findings were reported among parents of children with ASD, wherein approximately 11% believed that bacteria were the main cause of dental decay.²⁸ This result comes as an unfortunate surprise as HCPs should be better informed and more knowledgeable than the parents. Lewis et al²⁷ and dela Cruz et al⁸ reported similar findings regarding lack of dental care knowledge among HCPs. However, the general dental knowledge of these participants was generally considered as satisfactory, especially with regard to the frequencies of tooth brushing, the tools used for oral hygiene care, and the appropriate age for dental visits. The findings of this study agreed with previously published data reporting the dental knowledge of special-needs care providers and educators working with children.^{6,17,20,27,28}

Due to the complexity of ASD and the disabilities that these children often display, multiple serious medical and behavioral issues can overshadow OH issues. Dental personnel must be held accountable for not disseminating appropriate and specific dental knowledge tailored to children with ASD among their peers. This result is clear given the large number of participants who did not receive dental instructions from dental personal; this finding was similar to a figure reported by previous studies.²⁷⁻²⁹ Dental knowledge may be disseminated by publishing pamphlets and brochures, and making them accessible to their colleagues in centers for special-needs children. Ideally, these brochures would consist of sets of detailed instructions regarding on how to address the large variety of neuro-atypical patients who they might encounter, especially as no universal

and unified set of instructions exist specifically geared toward their OH. These pamphlets and brochures might be useful for special-needs care providers, as well as the parents and guardians of the children. Increasing awareness of the importance of proper oral care among educators and different special-needs care providers by emphasizing dental issues across different medical educational facilities, and planning consecutive dental educational seminars might increase their confidence with regard to performing dental examinations, or at least encourage them to refer the children to receive appropriate dental care. The OH of children with ASD deserves more attention from all healthcare sectors in KSA and worldwide. More dental studies should focus on the different aspects of spreading dental awareness, prevention and treatment for this group of children. Although the number of studies regarding the various medical issues of children with ASD grows every day, studies with a focus on their OH and hygiene are scarce, especially in KSA. Only a limited number of studies have been published with regard to the dental condition of children with ASD.³⁰⁻³⁴

The support of HCPs referring children with ASD to the dentist at an early age will assist their families in understanding proper oral hygiene and initiate different dental preventive measures. Because of the complex behaviors of children with ASD, an early introduction to the dentist will prepare them to accept good oral hygiene because these children are better behaved in familiar places. Although multiple dental studies have reported that children with ASD have a low prevalence of cavities,^{31,32,35,36} the same studies have highlighted other OH problems that cannot be overlooked. Many children with ASD have serious gingival and periodontal problems,^{32,37} habits, such as gum picking, self-tooth extraction, or self-mutilation, or bruxism that can affect their OH, if not their general health.^{32,36,38}

This study identified several issues that need consideration in future exploration and development of educators and special-needs care providers' roles in advising the children with ASD under their care. This study has some limitations that could affect the results, such as the data collection method, limited time of data collection, centers included, and characteristics of the participants. Future studies to include centers of children with special needs from different areas of the kingdom is highly recommended.

In conclusion, given the limitations of this study, it can be concluded that a clear lack of knowledge regarding essential dental attitude exists, and its practical application among the participating group of HCPs working with children with ASD in Riyadh,

KSA is weak. We recommend that: medical education in OH must be restructured to include components that address self-efficacy in providing risk assessment, early detection, and referral services; more efforts from dental personnel sectors should be made to increase special-needs care providers' dental knowledge of the importance of early checkups and referrals to pediatric dentists to promote OH and prevent dental diseases, especially for children with special needs through continuing education workshops and seminars; and HCPs might benefit from the American Academy of Pediatric Dentistry online publication (www.aapd.org), which provides important information to physicians, educators and parents.

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