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ORIGINAL ARTICLE

Evaluation of Knowledge, Attitude, and Practices of Parents of Children Aged 6–16 with Autism Regarding Oral Health in Isfahan, Iran

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Abstract

Background: Autism is a complex neurodevelopmental disorder characterized by hypersensitivity to sensory stimuli, unpredictable behaviors, and, in some cases, aggression. These challenges often complicate dental procedures, underscoring the importance of preventive approaches and parental involvement in maintaining oral health among autistic children. This study aimed to evaluate the knowledge, attitude, and practice (KAP) of parents of children aged 6–16 years with autism regarding oral health in Isfahan, Iran.

Materials and Methods: This cross-sectional descriptive-analytical study was conducted on the parents of 60 children with autism. Data were collected using a four-part questionnaire, which included demographic information and items assessing parents' knowledge, attitudes, and practices regarding oral health. Data were gathered according to variables such as parental age, education level, and monthly household income, and were analyzed using the Kruskal–Wallis and Mann–Whitney tests) α= 0.05).

Results: The mean scores for knowledge, attitude, and practice were 14.85, 41.77, and 25.07, respectively. A significant association was observed between parents' educational level and knowledge scores (P < 0.001), with higher education correlating with better knowledge. However, education was not significantly related to attitude or practice. Family income showed no significant relationship with any KAP components, and parental age was significantly correlated only with knowledge.

Conclusion: Higher parental education is a key determinant of oral health awareness among parents of children with autism, whereas income and age exert limited influence. These findings highlight the necessity of targeted educational interventions to enhance parental knowledge and improve oral health outcomes in this population.

Keywords: Knowledge; Attitude; Oral Health; Autism

Introduction

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by difficulties in social communication, restricted and repetitive behavioral patterns, and sensory processing differences. The global prevalence of ASD has increased markedly in recent decades, and according to the World Health Organization, approximately 1–2 in every 100 children are affected worldwide (1). Children with ASD not only experience significant challenges in social and educational interactions but also face considerable impacts on their overall health, including oral and dental health (2).

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Evidence suggests that these children are at a higher risk of developing oral health problems compared to their neurotypical peers. Several studies have reported an increased prevalence of dental caries, periodontal diseases, gingival inflammation, and microbial plaque accumulation among children with autism (3,4). These conditions may result from a combination of behavioral, dietary, pharmacological, and cooperation-related factors. For instance, commonly prescribed medications for autistic children, such as antipsychotics or anticonvulsants, may reduce salivary flow, thereby increasing the risk of dental caries (5). Additionally, sensory sensitivities and resistance to tactile stimulation or routine changes may make regular tooth brushing particularly challenging for these children (6).

Parents play a pivotal role in maintaining oral health in children with ASD, as these children often cannot perform oral hygiene independently. Parental knowledge, attitudes, and practices (KAP) significantly influence the prevention and management of oral health issues (7,8).

However, studies have reported that parental knowledge and attitudes are often suboptimal, leading to inadequate oral health practices (9,10). Practical barriers such as difficulty brushing the child's teeth, sensory issues, and dental anxiety further affect performance (11,12). Targeted parental education focusing on toothbrushing techniques, healthy diets, and behavioral management strategies can substantially improve oral health outcomes in autistic children (13). Therefore, this study aimed to evaluate the KAP of parents of children aged 6–16 years with ASD regarding oral health.

Materials and Methods

This cross-sectional analytical study was conducted in 2023 on 60 parents of children aged 6 to 16 years diagnosed with Autism Spectrum Disorder (ASD) in Isfahan, Iran. The diagnosis of ASD in the children was confirmed based on medical records and clinical evaluation by a specialist according to DSM-5 criteria. Eligible participants were parents who provided full and informed consent to participate in the study and had no intellectual disability, as assessed through self-report and medical records. Only children under the primary care of their parents were included, and participants with incomplete questionnaires or whose children were primarily cared for by someone other than the parents were excluded.

To evaluate parents' knowledge, attitudes, and practices (KAP) regarding oral health in children with ASD, a researcher-developed questionnaire was used. The questionnaire was designed based on a comprehensive review of relevant literature (14–16) and consisted of four sections: demographic information, knowledge, attitude, and oral health practices. The scoring method was as follows: for two-choice questions, a wrong answer received 1 point and a correct answer received 2 points. For multiple-choice questions, a weak or bad answer received one point, an average answer received two points, and a good answer received three points. For the Likert scale, I strongly disagree was given 1 point, I disagree was given 2 points, I have no opinion was given 3 points, I agree was given 4 points, and I strongly agree was given 5 points. (Appendix)

The content validity of the questionnaire was evaluated using the Content Validity Ratio (CVR) and Content Validity Index (CVI). Ten dental specialists reviewed the items. For CVR, each item was classified as "essential," "useful but not essential," or "not essential," and items with CVR values below 0.75 were revised or removed. For CVI, experts rated each item for relevance, clarity, and simplicity on a 4-point Likert scale, and items scoring below 0.79 were modified or excluded.

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The questionnaire's reliability was assessed using the test–retest method with 20 participants. The questionnaire was administered twice with a two-week interval, and the scores from the two administrations were compared using the intraclass correlation coefficient (ICC). ICC values above 0.7 were considered acceptable. Additionally, the internal consistency of each KAP subscale was evaluated using Cronbach's alpha.

Following coordination with the Welfare Centers of Isfahan, the study objectives were explained to both staff and parents, and written informed consent was obtained from all participants. The Welfare Centers were only involved in facilitating access and coordination, and did not participate in selecting participants. Parents were informed of their right to withdraw at any time without any consequences, the confidentiality of the data, the voluntary nature of participation, and that study results would be reported anonymously. Questionnaires were provided to the parents, and any unclear items were explained verbally if needed.

The normality of the collected data was assessed using the Shapiro–Wilk test. Due to non-normal distribution, non-parametric tests, including the Kruskal–Wallis and Mann–Whitney U tests, were applied for data analysis. Statistical significance was set at $p < 0.05$, and all analyses were conducted using SPSS version 26

Results

The relationship between parental education level and their knowledge, attitude, and practice was examined. Kruskal-Wallis Test revealed a significant association between parents' education level and their knowledge scores ($p < 0.001$). However, no significant relationships were observed between education level and parents' attitude scores ($p = 0.602$) or practice scores ($p = 0.249$) (Table 1).

Table 1. Association between parental education level and knowledge, attitude, and practice scores

Education Level	n	Knowledge (Mean ± SD)	Attitude (Mean ± SD)	Practice (Mean ± SD)
Illiterate /Below Diploma	5	14.80 ± 1.64	42.00 ± 3.30	25.75 ± 3.01
Diploma	8	13.63 ± 1.19	42.00 ± 3.30	25.75 ± 3.01
Associate degree	10	14.30 ± 1.70	30.42 ± 3.37	24.50 ± 4.14
Bachelor's Degree	27	15.04 ± 1.22	41.26 ± 3.61	24.30 ± 3.23
Master's Degree or Higher	10	16.30 ± 1.16	42.30 ± 4.35	25.90 ± 4.07
P-value		<0.001	0.650	0.409

Pairwise comparisons using the Mann-Whitney test (Bonferroni)revealed that parents with a master's degree or higher had significantly higher knowledge scores compared to illiterate, diploma, and associate degree groups ($p < 0.05$) (Figure 1).

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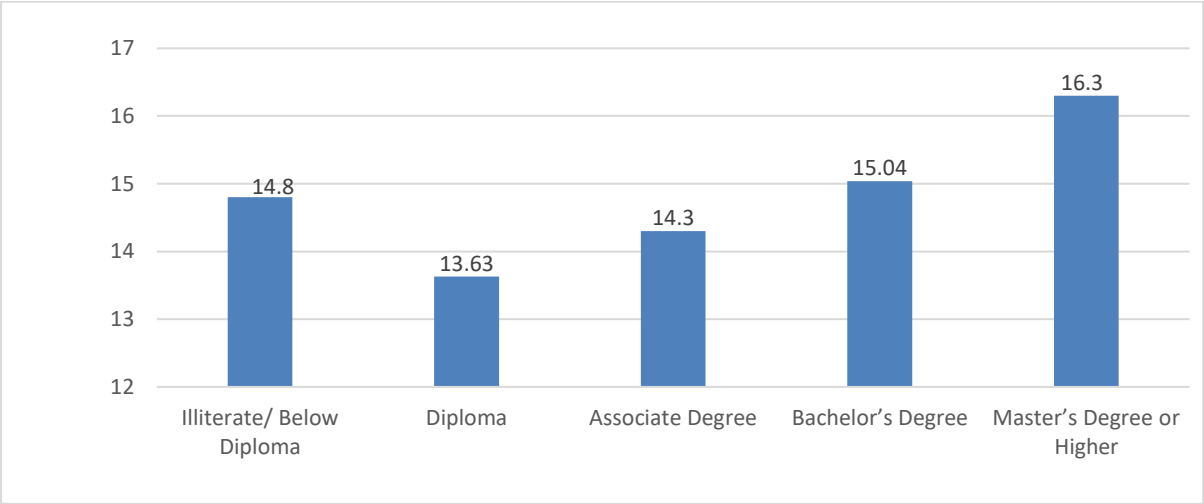


Figure 1. Mean knowledge scores according to parental education level

Pairwise comparisons using the Bonferroni correction indicated that the knowledge score in master's degree or higher was significantly higher than those in other groups ($p < 0.05$).

Literate parents showed significant differences compared to those with a bachelor's degree and those with a master's degree or higher. Likewise, the diploma group differed significantly from both the Bachelor's and Master' s-or-higher groups. Parents with an associate degree also exhibited a significant difference compared to those with a master's degree or higher. In addition, a statistically significant difference was observed between the Bachelor's and Master's or higher groups.

If we want to use the Bonferroni adjustment, we divide 0.05 by the number of comparisons. In this test, we had 15 pairwise comparisons. As a result, dividing 0.05 by 15 equals 0.0033. If we want to compare the significance level obtained from the Mendeleev test with 0.0033, there is only a significant difference between the diploma and master's degree and higher, because the significance level is less than 0.0033.

Regarding the relationship between parental income and knowledge, attitude, and practice scores, Kruskal-Wallis test results showed no significant associations. Specifically, mean knowledge scores ($p = 0.778$), attitude scores ($p = 0.342$), and practice scores ($p = 0.596$) were not significantly related to family income (Table 2).

Table 2. Association between parental income level and knowledge, attitude, and practice scores

Income Level (IRR/month)	n	Knowledge (Mean ± SD)	Attitude (Mean ± SD)	Practice (Mean ± SD)
≤ 7,300,000	13	14.62 ± 1.56	42.62 ± 2.63	25.08 ± 3.62
7,300,001 – 20,000,000	31	14.77 ± 1.45	41.94 ± 3.59	24.77 ± 3.13
> 20,000,000	16	15.19 ± 1.76	40.75 ± 4.07	25.63 ± 4.16
P-value		0.576	0.352	0.737

For the analysis of parental age, the data were divided into three groups: 21–30, 31–40, and 41–50 years. The Kruskal–Wallis test indicated a significant association between parental age and knowledge scores ($p = 0.014$), whereas no significant differences were

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observed for attitude (p = 0.988) or practice scores (p = 0.714) (Table 3).

Table 3. Association between parental age and knowledge, attitude, and practice scores

Age Group (years)	n	Knowledge (Mean ± SD)	Attitude (Mean ± SD)	Practice (Mean ± SD)
21–30	14	13.86 ± 2.14	41.64 ± 2.90	24.43 ± 3.82
31–40	28	15.00 ± 1.15	41.79 ± 4.13	25.14 ± 3.27
41–50	18	15.39 ± 1.24	41.83 ± 3.20	25.44 ± 3.68
P-value		0.014	0.988	0.714

Pairwise comparisons using the Mann–Whitney test with Bonferroni correction revealed that parents aged 41–50 years had significantly higher knowledge scores than those aged 21–30 years (p = 0.025). The effect size for this difference was calculated (r = 0.32), indicating a moderate effect.

Pairwise comparisons using the Bonferroni correction indicated that the knowledge score in the 41-50 age group was significantly higher than in other groups (p=0.017).

If we want to use the Bonferroni adjustment, we divide 0.05 by the number of comparisons. In this test, we had 3 pairwise comparisons. As a result, dividing 0.05 by 3 equals 0.0167. If we want to compare the significance level obtained from the Mann-Whitney test (0.0167) with 0.0167, there is no significant difference between any pairs of means because the significance level is greater than 0.0167.

Spearman correlation analysis showed That Parental education was strongly and positively correlated with knowledge (r = 0.53, p < 0.001) .Parental age was moderately correlated with knowledge (r = 0.349, p = 0.006) .Parental income showed no significant correlation with any of the KAP domains (Table 4).

Table 4. Spearman correlation between parental characteristics and KAP scores

Variable	n	Knowledge	Attitude	Practice
		r (P value)	r (P value)	r (P value)
Parental age	60	0.349 (0.006)	0.011 (0.936)	0.149 (0.256)
Parental education	60	0.530 (< 0.001)	-0.064 (0.625)	-0.138 (0.295)
Parental income	60	0.082 (0.534)	-0.189 (0.148)	0.071 (0.589)

Regression for knowledge:

According to the regression test of the hypothesis, the coefficient of determination between the response variable (Knowledge) and the independent variables is 33.3 percent, indicating that the independent variables explain 33.3 percent of the variation in the dependent variable.

According to the analysis of variance table 7, the value of the F statistic is 9.322, and the probability value related to its significance is 0.000, therefore, with 0.95 confidence, the null hypothesis of a linear relationship between the response variable and the independent variables is confirmed because the significance level is less than 0.05 and there is a relationship between the response variable Knowledge and the independent variables. The regression coefficients for parental age and parental education level are significant because the p-values are less than 0.05. The regression coefficients for parental age, parental education level, and parental income level are, respectively, 0.068, 0.551, and -0.049.

Knowledge = 9.989+ 0.068 × parental age + 0.551 × parental education level - 0.049 × parental income level

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Regression for attitude:

According to the regression test of the hypothesis, the coefficient of determination between the response variable (Attitude) and the independent variables is 3.9 percent, indicating the independent variables' influence on the dependent variable and their ability to predict 3.9 percent of the changes in the dependent variable.

According to the analysis of variance table 7, the value of the F statistic is 0.751 and the probability value related to its significance is 0.527, therefore, with 0.95 confidence, the null hypothesis of a linear relationship between the response variable and the independent variables is rejected because the significance level is bigger than 0.05 and there is not a relationship between the response variable attitude and the independent variables. None of the regression coefficients is significant because the p-values are greater than 0.05. The regression coefficients for parental age, parental education level, and parental income level are 0.05, 0.02, and 0.02, respectively.

Attitude = 42.822+ 0.009 × parental age + 0.172 × parental education level - 1.052 × parental income level

Regression for Practice:

According to the regression test of the hypothesis, the coefficient of determination between the response variable (Practice) and the independent variables is 6.5 percent, which indicates the influence of the independent variables on the dependent variable, and the independent variables predict 6.5 percent of the changes in the dependent variable.

According to the analysis of variance table 7, the value of the F statistic is 1.292 and the probability value related to its significance is 0.286, therefore, with 0.95 confidence, the null hypothesis of a linear relationship between the response variable and the independent variables is rejected because the significance level is bigger than 0.05 and there is not a relationship between the response variable attitude and the independent variables. None of the regression coefficients is significant because the p-values are greater than 0.05. The regression coefficients for parental age, parental education level, and parental income level are, respectively, 0.084, -0.662, and 0.704.

Practice = 23.501+ 0.084 × parental age - 0.662 × parental education level + 0.704 × parental income level.

Table 6. Model Summary between Practice and parental age, parental education level, and parental income level

Variable	R Square	Adjusted R-Square	Std. Error of the Estimate
Knowledge	0.333	0.297	1.299
Attitude	0.039	-0.013	3.576
Practice	0.065	0.015	3.462

Table 7. ANOVA between practice and parental age, parental education level, and parental income level

Variable		Sum of	df	Mean Square	F	P value
Knowledge	Regression	47.177	3	15.726	9.322	0.000
	Residual	94.473	56	1.687		
Attitude	Regression	28.789	3	9.596	0.751	0.527
	Residual	715.944	56	12.785		
Practice	Regression	46.466	3	15.489	1.292	0.286
	Residual	671.268	56	11.987		

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Table 8. Coefficients between Practice and parental age, parental education level, and parental income level

Variable		Unstandardized Coefficients	Std.	Standardized Coefficients	t	P value
		B	Error	Beta		
Knowledge	(Constant)	9.989	1.093	-	9.136	0.000
	parental age	0.068	0.026	0.296	2.656	0.010
	parental education level	0.551	0.147	0.446	3.76	0.000
	parental income level	-0.049	0.258	-0.022	-0.191	0.849
Attitude	(Constant)	42.822	3.01	-	14.228	0.000
	parental age	0.009	0.071	0.017	0.129	0.898
	parental education level	0.172	0.404	0.061	0.426	0.672
	parental income level	-1.052	0.71	-0.207	-1.483	0.144
Practice	(Constant)	23.501	2.914	-	8.064	0.000
	parental age	0.084	0.069	0.161	1.218	0.228
	parental education level	-0.662	0.391	-0.238	-1.694	0.096
	parental income level	0.704	0.687	0.141	1.025	0.310

Discussion

The results of the present study indicated that parental education level was significantly associated with their knowledge regarding oral health in children with autism spectrum disorder (ASD), whereas no significant associations were observed for parental attitudes or practices. Parents holding a master's degree or higher achieved higher knowledge scores. This finding is consistent with previous studies, suggesting that parents with higher educational attainment are more aware of the importance of oral hygiene and generally implement more preventive behaviors for their children (2, 12, 17). Higher parental education may enhance understanding of the importance of preventive care, promote the adoption of appropriate dietary habits, and encourage adherence to daily oral hygiene routines, thereby improving their children's oral health (12).

However, Hemmati et al. (18) reported no significant differences in parental education levels between children with ASD and typically developing children. This discrepancy with the present study may be attributable to differences in the age range of children, the timing of the research, or the target population. On the other hand, Krishnan et al. (19) demonstrated that maternal education was significantly associated with parental knowledge, whereas income was associated with knowledge, attitudes, and practices.

Despite the significant association between parental education and knowledge, the present study found that education did not affect parents' attitudes or practices. This finding suggests that even with sufficient knowledge, parental attitudes and practices may be influenced by cultural factors, personal experiences, access to healthcare services, and social support (20, 21). Similarly, Magoo et al. (14) reported that parental attitudes and practices were influenced by financial constraints and preconceived beliefs about the child's cooperation, which contrasts with the present study's findings.

Regarding the effect of parental age on knowledge, the present study found that parents aged 41–50 years had higher knowledge scores than those aged 21–30 years. This indicates that parental experience gained with age may enhance knowledge about children's oral health care. However, parental age did not significantly affect

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attitudes or practices, which is consistent with the findings of Krishnan et al. (19). In contrast, Florindez et al. (22) found no significant relationship between parental age and knowledge, which may reflect the complexity of behavioral and social factors influencing parents. Such discrepancies may be attributed to differences in children's age ranges, target populations, or the timing of data collection. Some studies have suggested that parental experience effectively increases knowledge, but targeted interventions and practical training are necessary to change attitudes and practices (17, 23).

According to the findings of the present study, parental income had no significant effect on their knowledge, attitudes, or practices, which differs from the results reported by studies such as Krishnan et al. (19). This discrepancy may be related to the relative accessibility of educational resources and healthcare services for parents in Isfahan. These results suggest that socio-economic factors alone do not determine health behaviors; rather, education, access to services, and social support play a more critical role in improving children's oral health (24).

An important aspect highlighted by the present study is the differential impact of demographic factors on knowledge, attitudes, and practices. The results indicate that parental knowledge is primarily influenced by education and age, whereas attitudes and practices are more dependent on environmental, cultural, and supportive factors. This finding aligns with previous studies and emphasizes that practical parental education, coupled with continuous training and professional guidance, is essential to effect changes in attitudes and improve caregiving practices (12, 17).

Murshid et al. (15) reported that parents of children with ASD possessed limited knowledge regarding their children's oral health, which is consistent with the findings of the present study and underscores the need for targeted educational interventions.

Given the heightened sensitivity of children with ASD to sound, light, and social interactions, it is particularly important to provide specialized parental training and to create dental environments that accommodate these children's sensory needs. Similarly, studies on oral healthcare providers in Iran have highlighted gaps in knowledge and practice regarding preventive measures, such as silver diamine fluoride, indicating that both caregivers and professionals may benefit from targeted educational interventions to improve oral health outcomes (25). Research has shown that combining parental education with preparation of the therapeutic environment can enhance children's cooperation and improve the success of preventive and restorative treatments (12, 17).

Ultimately, the design of parental education and counseling programs should include practical training on tooth cleaning, fluoride use, establishing healthy dietary habits, managing children's fear and anxiety, and appropriate interaction strategies with children with ASD. Such interventions can improve parental attitudes and practices, thereby helping to bridge the gap between parental knowledge and actual caregiving behaviors in maintaining oral health for children with ASD (17, 26).

Conclusion

Parental education and age were significantly associated with their knowledge regarding oral health in children with autism spectrum disorder (ASD), whereas environmental, supportive, and educational factors more strongly influenced attitudes and practices. These findings highlight the importance of designing comprehensive and targeted interventions for parents of children with ASD and can serve as a valuable guide for healthcare and dental care centers.

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Conflict of Interest: The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial, in this article

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Demographic Information

1. Age:
2. Education Level: ☐ Illiterate ☐ Below Diploma ☐ Diploma ☐ Associate Degree ☐ Bachelor's Degree ☐ Master's Degree or Higher
3. Monthly Income: ☐ Less than or approximately 7,300,000 IRR ☐ 7,300,000 to 20,000,000 IRR ☐ More than 20,000,000 IRR
4. Age at which your child was diagnosed with autism

Knowledge Questions

1. At what age should a child first visit the dentist?
   ☐ During the first year of life ☐ 1–3 years ☐ 3–6 years ☐ After 6 years ☐ Only when dental pain or problems occur ☐ I don't know
2. How often should a child visit the dentist?
   ☐ Every 6 months ☐ Every 3 months ☐ Once a year ☐ Only when experiencing pain
3. Using fluoride toothpaste helps prevent dental cavities and tooth decay. ☐ True ☐ False
4. Daily flossing helps prevent the formation of bacterial plaque between teeth. ☐ True ☐ False
5. Dental caries are caused by bacterial plaque. ☐ True ☐ False
6. Reducing the consumption of sugary foods helps prevent tooth decay. ☐ True ☐ False
7. Children with autism are more prone to dental caries due to prolonged retention of food in the mouth. ☐ True ☐ False
8. Sensitivity to light and sound affects dental visits for children with autism. ☐ True ☐ False
9. Regular dental check-ups are essential. ☐ True ☐ False

Attitude Questions

1. Oral health affects the overall health of the child.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
2. Oral health affects quality of life.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
3. Treating and maintaining primary teeth is important.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
4. Having caries-free teeth is important for children.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

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5. Brushing the child's teeth is important.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
6. Only a dentist can take care of a child's teeth.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
7. Taking care of a child's oral health is difficult.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
8. Dental caries is a natural disease during childhood.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
9. Dental caries occurs in all individuals.
   ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
10. Learning about children's oral health care is difficult.
    ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
11. Children with autism require special dental care.
    ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

Practice Questions

1. How does your child brush their teeth?
   ☐ Does not brush ☐ Independently ☐ With parental assistance ☐ With teacher assistance
2. Does your child use dental floss?
   ☐ No ☐ Yes, independently ☐ Yes, with parental assistance ☐ Yes, with teacher assistance
3. Does your child consume sweet or sugary foods?
   ☐ Always ☐ Sometimes ☐ Never
4. Does your child have harmful oral habits (e.g., thumb sucking, pencil chewing, or teeth grinding)?
   ☐ Yes ☐ No
5. Does your child react to the sound created during brushing? ☐ Yes ☐ No
6. How does your child behave in a new or unfamiliar environment?
   ☐ Behaves normally ☐ Becomes frightened ☐ Uses coping mechanisms
7. What method does your child use to maintain oral hygiene?
   ☐ Toothbrush and toothpaste ☐ Finger and toothpaste ☐ Toothbrush only ☐ Rinsing with water
8. What auxiliary methods are used to support your child's oral hygiene?
   ☐ Mouthwash ☐ Tongue cleaner ☐ No auxiliary methods used
9. How often did your child brush their teeth in the past month?
   ☐ Irregularly or never ☐ Once a week ☐ Two or three times a week ☐ Once a day ☐ Twice or more per day
10. How do you support your child in oral care?
    ☐ Assist ☐ Supervise ☐ Both assist and supervise ☐ Neither assist nor supervise
11. What type of toothbrush does your child use?

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☐ Regular toothbrush ☐ Modified toothbrush ☐ Electric toothbrush

12. How often did your child consume sweet drinks or snacks in the past month?

☐ Three times a day or more ☐ Twice a day ☐ Once a day ☐ Occasionally, not daily

13. What is your brushing technique?

☐ Back and forth (horizontal) ☐ Up and down (vertical) ☐ Circular ☐ Combination of above ☐ None of the above

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