CROSS-SECTIONAL STUDY

Parents of Children With Versus Without Special Health Care Needs and Oral Health Promotion: Challenges and Best Practices

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Abstract: ***Purpose:*** *Oral health care is a leading unmet health care need of children with special health care needs (CSHCNs). The purposes of this study were to: (1) compare the responses of parents (parents, caregivers) of children with versus without special health care needs (SHCNs) concerning their child's functioning, oral health-related knowledge, attitudes, and behavior; and (2) assess which information parents received/wanted to receive from dentists.* ***Methods:*** *A total of 122 parents of CSHCNs and 115 parents of children without SHCNs responded to the surveys.* ***Results:*** *Parents of CSHCNs reported that their children had lower functioning (per a four-point scale, with zero indicating worst functioning; means without SHCNs/CSHCNs equal 1.98/2.70; P<0.001) and nonverbal interactions (2.24/2.77; P<0.001), flossed and used mouth rinse less frequently (per a five-point scale, with one indicating never: 2.23/2.70; P=0.002; 1.82/2.27; P=0.004) than parents of children without SHCNs. They reported more oral care-related challenges (43.4 percent versus 21.7 percent; P<0.001), were less comfortable helping with oral care (per a five-point answer scale, with five indicating very comfortable: 3.92/4.48; P<0.001) and less interested in receiving information (3.13/3.71; P<0.001) than parents of children without SHCNs.* ***Conclusions:*** *Parents of children with or without special health care needs do not differ in their knowledge and attitudes. However, parents of CSHCNs are less comfortable in helping with oral care and less interested in receiving information than parents of children without SHCNs. Understanding the obstacles parents of CSHCNs face when providing oral care for their children can help dentists better support their oral health-related efforts.* *(Pediatr Dent 2024;46(1):36-44.E2-E4) Received November 22, 2022 / Last Revision August 22, 2023 / Accepted August 25, 2023*

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From 2019 to 2020, approximately 19.4 percent of children in the United States had at least one special health care need (**SHCN**).[1] Research showed that children with special health care needs (**CSHCNs**) were likely to have poorer oral health than children without SHCNs[2] and that oral health care continued to be one of the leading unmet health care needs of this patient population.[1] The COVID-19 pandemic placed additional challenges on receiving dental care, with higher proportions of CSHCNs missing or delaying preventive checkups during the pandemic (35.8 percent) compared to children without SHCNs (25.7 percent).[3]

Medications containing sugar, special diets, the need to eat frequently, physical illnesses that limit movement or motor functions, and poor oral hygiene can cause oral health problems for many children and adolescents with SHCNs.[4] Children with developmental disorders, such as Down syndrome, autism spectrum disorder, and cerebral palsy, faced the most barriers to accessing oral health care services.[5] Poor oral hygiene was reported frequently in patients with different special needs, such as patients with Down syndrome[6] or cerebral palsy.[7]

Prevention is highly stressed in oral health care guidelines for CSHCNs. However, more parents (parents, caregivers) of CSHCNs reported that their children did not receive all the preventive dental care that was needed.[8] Prevention of caries or other oral diseases requires more than twice-a-year dental office visits; it also requires quality oral health promotion efforts at home. Children are more likely to be caries-free if their teeth are brushed from an early age with fluoride toothpaste with parental involvement and when the frequency of sugar intake is controlled.[9] Prevention strategies include establishing dental homes, ensuring appropriate and regular supervision of daily oral hygiene, diet consultation, and addressing the risk of trauma.[10] When considering how to optimize the oral self-care efforts for CSHCNs, it is essential to understand the challenges in oral self-care for these patients to build an effective prevention program.

Age is also a factor that is highly related to the quality of oral self-care.[11] Research showed that guidance in developing tooth brushing should start at age three years and six months.[12] However, research also showed that children should be supervised while brushing their teeth if they are younger than 10 years of age.[11]

CSHCNs can encounter obstacles concerning preventive oral care at home, such as a limited ability to self-maintain oral hygiene or the need for a third person to supervise oral hygiene techniques; these challenges can contribute to poorer oral health.[13] Other barriers include a child's non-acceptance of new brushing regimes or toothpaste use,[14] the need for

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additional technical aids and methodical instructions,[15] and parents' limited social interactions that can cause parents to miss opportunities to receive oral health-related information.[16]

The difficulties in engaging optimally in oral health care efforts are also related to different levels of functioning. Research shows that the degree of communication-related functioning was related to children's oral health and parents' comfort with teaching and helping their children maintain good oral hygiene.[17] Profound functional disabilities, such as a low level of manual dexterity, can result in children being more dependent on parents when performing self-care activities.[18] Considering the skills listed in the Vineland Adaptive Behavior Scales (**VABS**), which was developed to measure the level of functioning of patients with an autism spectrum disorder diagnosis,[19] was helpful when assessing CSHCNs' oral health-related level of functioning.[20]

Parents' oral health-related knowledge and attitudes could also influence oral self-care performance. Interviews with parents of caries-free (**CF**) and caries-active (**CA**) children showed that these two groups of parents held different attitudes toward oral health care.[21] Parents of CF children perceived dental caries as a serious disease and believed in their children's overall well-being rather than focusing on disease prevention.[22] When parents' oral health-related attitudes and beliefs were examined, the best predictor of children being caries-free was parents' self-perceived skill to carry out toothbrushing as part of their child's daily routines. In addition, oral health literacy and attitudes highly affected parents' cooperation in oral health education programs, and decreased cooperation was observed in parents with limited oral-health-related knowledge and negative attitudes.[23] Also, this research pointed out that a lack of relevant educational resources was related to parents' decreased cooperation.[23] While most parents reported that dentists were their main source of oral health-related knowledge,[24,25] approximately five percent of parents had no source for dental information.[25]

One interesting question in this context is how to support parents and parents of CSHCNs optimally to ensure that their children receive the oral health promotion they need in their own homes.

Therefore, the purposes of this study were to: (1) compare responses of parents of children with versus without special health care needs concerning their child's level of functioning and non-verbal interactions, oral health and oral behavior, and parents' own considerations (knowledge, level of comfort, attintered and best practices they used; and (2) assess if the children's level of functioning correlated with parents' oral health-related responses.

Methods

The Health Sciences and Behavioral Sciences Institutional Review Board (**IRB**) at the University of Michigan, Ann Arbor, Mich., USA, determined that this research was exempt from IRB oversight (#HUM00209273). This study had a quasi-experimental design, comparing the responses of parents of CSHCNs with the responses of parents of children without SHCNs. A cross-sectional analysis was also conducted.

Respondents. An a priori power analysis using G*Power 3.1.2 software[26] was conducted to determine the sample size needed to have the power to test the hypotheses of interest, namely that the average responses of parents of CSHCNs and parents of children without SHCNs would differ. It was assumed that an independent sample *t*-test would be used to test these one-sided hypotheses, that alpha equals 0.05, power equals 0.95, and that there would be a medium effect size of a difference of 0.5 on a five-point scale with equally large samples. The results showed that 88 respondents in each of the two groups were needed. Given research suggesting that children should be supervised while brushing if they are younger than 10 years of age,[11] this study focused on parents of children between 3.5 to 10 years of age. A total of 122 parents of CSHCN and 115 parents of children without SHCNs responded to an anonymous survey.

Procedure. The data were collected as a convenience sample between April 20, 2022, and August 20, 2022. Parents who brought their child to a regularly scheduled dental appointment at a pediatric dentistry clinic at a dental school (N equals 155) or at a children's hospital (N equals 82) received information about the research and were asked if they would volunteer to respond to a survey (see **Supplemental Electronic Data—Appendix 1**). The children treated in the hospital dental clinic did not receive general anesthesia. In addition, 30 surveys were mailed to parents of CSHCNs who had no time during the dental appointment because of the care they needed to provide for their children. The surveys were mailed to their home, and they could answer and return the anonymous survey via postal mail to the research team in a provided stamped return envelope. A review of the child's clinical chart was used to assign the caregivers into two groups: (1) those with a CSHCN; and (2) those with a child without a SHCN.

Materials. The recruitment letter was written according to the IRB guidelines. A draft survey was developed and pilot-tested with five pediatric dentists who were adjunct faculty or acquaintances of faculty members. Because they knew the research team, they could not participate in this research because of a potential conflict of interest. However, their expertise in pediatric dentistry made them uniquely qualified to consider whether the draft survey was adequately formulated to collect the data validly and reliably.

Their feedback was used to finalize the questionnaire, which consisted of five groups of questions. Part one consisted of questions concerning the parents' and their child's background. Part two focused on questions determining the child's level of functioning as perceived by the parents. These 22 items were adapted from the VABS.[19] Answers ranged from zero (never), one (sometimes), two (usually), or three (always). Questions in part three assessed the respondents' oral health-related knowledge, part four evaluated their attitudes, and part five assessed behavior related to their children's oral health-related care. For the assessment of the frequency of oral health-related behavior as well as the quality of oral health-related considerations, appropriate five-point rating scales were used. While most questions were closed-ended questions, eight questions were open-ended and asked follow-up questions to the closed-ended questions.

Statistical analyses. The data were entered into a data file using SPSS 28 software (IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp). Descriptive statistics, such as percentages and means, were computed to provide an overview of the responses. To compute indices for the correlational analyses, three-factor analyses (extraction method: principal component analysis; rotation method: varimax rotation with Kaiser normalization) were conducted to determine the underlying factors of the items assessing the children's level of functioning, the parents' oral health-related knowledge, and attitudes. Based on the results, indices were computed by averaging the responses to the items with factor loadings over 0.40 on each factor, respectively. Cronbach alpha

Table 1. OVERVIEW OF PARENTS' AND CHILDREN'S BACKGROUND CHARACTERISTICS FOR FAMILIES WITH VERSUS WITHOUT A CHILD WITH SPECIAL HEALTH CARE NEEDS (SHCNs)

	Children with SHCNs N=122	Children without SHCNs N=115	*P*-value*
Parents' background characteristics			
Relationship to child (%)			0.20
Mother	87.7	79.1	
Father	11.5	19.1	
Grandmother	0.8	1.7	
Parents' years of education starting with first grade			0.90
Mean±(standard deviation)	15.48 (3.141)	15.43 (3.062)	
Hours per day parent is actively involved with child			<0.001
Mean±(standard deviation)	15.63 (7.600)	11.71 (7.571)	
Frequency of food insecurity (%)			0.02
Never	92.6	84.1	
Rarely	7.4	9.7	
Sometimes	0.0	6.2	
Parents' oral health-related answers			
Parents' health of teeth and gums (%)			0.14
Poor	3.3	4.4	
Fair	13.3	26.3	
Good	40.0	35.1	
Very good	30.8	23.7	
Excellent	12.5	10.5	
Parent: Have you visited a dentist during the past year?	Yes 73.6%	Yes 64.3%	0.16
Do you need to see a dentist because of problems with your teeth or gums?	Yes 31.4%	Yes 38.6%	0.28
Child's background characteristics			
Gender of child (%)			0.01
Male	63.3	46.1	
Female	36.7	53.9	
Age (years)			0.35
Mean±(standard deviation)	6.84 (2.393)	6.56 (2.162)	

* Chi-square tests were used to compare the ordinal scale responses; independent sample *t*-tests were used to compare the mean answers of the two groups.

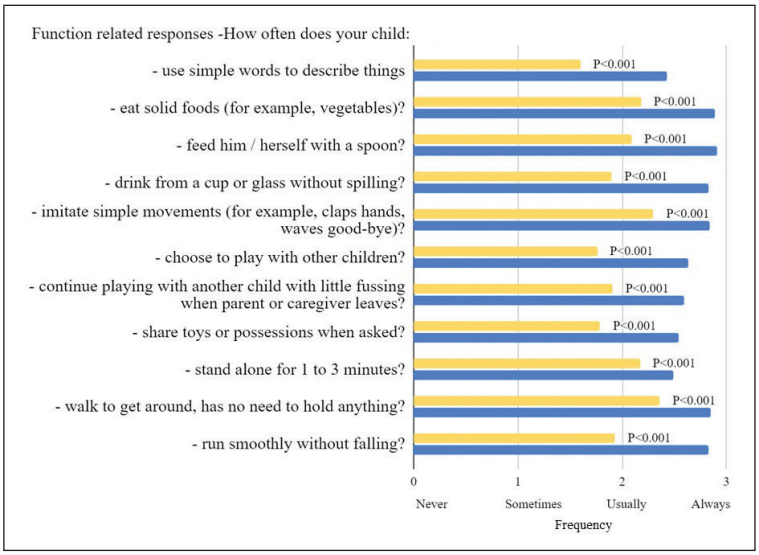

Figure 1. Average level of functioning reported by parents of children with special health care needs versus caregivers of children without special health care needs. Yellow=responses of caregivers of children with special health care needs; blue=responses of caregivers of children without special health care needs. *P* values obtained from the average responses of the two caregiver groups compared using independent sample *t*-tests.

coefficients showed that the inter-item consistency of the items loading on each factor was over 0.70, indicating that the scales had sufficient to excellent inter-item consistency.[27] Pearson correlation coefficients were used to determine the relationships between the function-related indices and the knowledge and attitudinal indices. Because numerous statistical tests were performed simultaneously when analyzing the relationships between the indices, Bonferroni corrections were used and the alpha value was lowered to $P<0.01$.[28]

Results

Table 1 shows that 107 mothers, 14 fathers, and one grandmother of CSHCNs, and 91 mothers, 22 fathers, and two grandmothers of children without SHCNs, responded to this survey. They ranged in age from 22 to 65 years and had between nine to 25 years of education, with an average number of education years in the college education range. Most parents were full-time employed (54 percent), with an additional 32.3 percent not being employed and 13.2 percent being part-time employed. Parents' self-reported oral health was, on average, good (on a five-point answer scale with 5 = most positive response: mean = 3.23) and ranged from 3.8 percent with poor oral health to 11.5 percent with excellent oral health. Most parents paid for their child's dental visit with dental insurance (65.8 percent); 36.7 percent of the children were covered by Medicaid or the Healthy Kids program, and only 13.5 percent of the parents paid for their child's dental visit by themselves. The majority (69.1 percent) of the parents had visited a dentist the year before. However, 34.9 percent needed to see a dentist due to an oral health-related problem. The parents of CSHCNs and of children without SHCNs did not differ in their oral health, the way they paid for their child's dental visit, and their own past oral health care utilization.

Parents' responses concerning the child's background characteristics showed that the majority of the children (54.9 percent) were male, with 63.3 percent of the CSHCNs being male and only 46.1 percent of the children without SHCNs being male ($P=0.008$). The children ranged in age from three to 10 years and did not differ in their mean age. Parents of CSHCNs spent, on average, 15.63 hours per day with their child, while parents of children without SHCNs spent only 11.71 hours ($P<0.001$). The chronic conditions of CSHCNs ranged widely, from neurodevelopmental disorders (N equals 46), neurologic disorders (N equals 40), pulmonary disorders (N equals 28), cardiac conditions (N equals 25), syndromic conditions (N equals 24), craniofacial anomalies (N equals 17), and gastrointestinal disorders (N equals 12) to endocrine and metabolic diseases (N equals six), blood disorders (N equals four), renal disorders (N equals four), muscular disorders (N equals four), transplants (N equals four), and hearing disorders (N equals three). Fifty-eight children had multiple diagnoses.

Figure 1 shows the parents' ratings of their child's level of functioning. CSHCNs had a lower level of

functioning on each single of the 12 items that were combined in the general functioning index by averaging the responses to each of the 12 items. The average general functioning of the CSHCNs was 1.98 on a four-point scale ranging from zero (never) to three (always), while the mean score of children without SHCNs was 2.70.

The children also differed in every "non-verbal interaction-related" response (Figure 2). Overall, CSHCNs were described

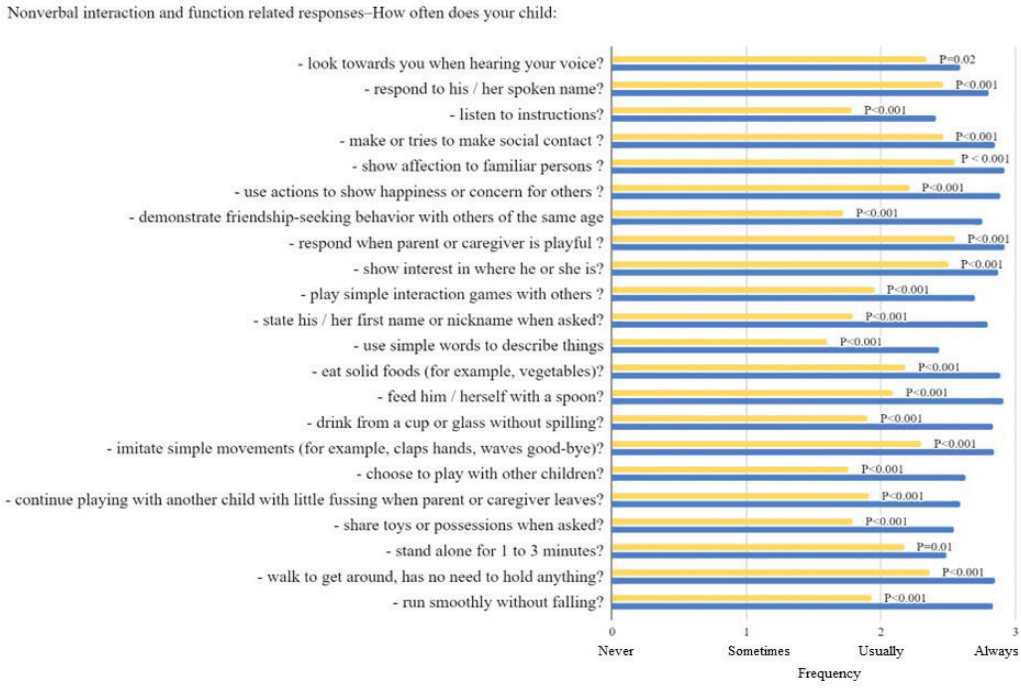

Figure 2. Average levels of non-verbal interactions reported by caregivers of children with special health care needs versus caregivers of children without special health care needs.
* Yellow=responses of caregivers of children with special health care needs; blue=responses of caregivers of children without special health care needs.
† The average responses of the two parent groups were compared with independent sample *t*-tests of caregivers of children without special health care needs.
† The average responses of the two parent groups were compared with chi-square tests.

Table 2. ORAL HEALTH-RELATED RESPONSES OF PARENTS OF CHILDREN WITH VERSUS WITHOUT SPECIAL HEALTH CARE NEEDS (SHCNs)

Child's oral health	With SHCNs N=122	Without SHCNs N=115	*P*-value*
Child's oral health (%)			0.33
1=Poor	12.5	11.4	
2=Fair	26.7	36.0	
3=Good	39.2	31.6	
4=Very good	18.3	15.8	
5=Excellent	3.3	5.3	
Do child's teeth get brushed? (%)	Yes 97.4	Yes 99.1	0.16
Who brushes the teeth? (%)			
Child	58.1	90.2	<0.001
Caregiver	70.1	52.7	0.01
Someone else	16.2	11.6	0.31
How often do teeth get brushed? (%)			0.08
1=Never	5	0	
2=Rarely	10.1	8.1	
3=Daily	9.2	4.5	
4=>1x/day	34.5	51.4	
5=>2x/day	41.2	36.0	
Do child's teeth get flossed? (%)	Yes 62	Yes 77.9	0.01
Who flosses the teeth? (%)			
Child	36.7	61.5	<0.001
Caregiver	54.0	41.3	0.57
Someone else	7.5	5.5	0.54

Child's oral health	With SHCNs N=122	Without SHCNs N=115	*P*-value*
How often do teeth get flossed?			<0.001
1=Never	39.7	15.2	
2=Rarely	24.1	29.5	
3=Daily	16.4	31.3	
4=>1x/day	12.9	18.8	
5=>2x/day	6.9	5.4	
Do you use mouth rinse for your child?			<0.001
1=Never	62.3	39.3	
2=Rarely	11.4	19.6	
3=Daily	13.2	23.2	
4=>1x/day	8.8	10.7	
5=>2x/day	4.4	7.1	
Child's age at first dental visit			<0.001
Mean±(standard deviation)	2.57 (1.615)	3.18 (1.786)	
Range	0.50-9.00	0.50-10.00	
Frequency of dental visit			0.22
<1x/year	9	13.1	
1x/year	25.4	13.9	
2x/year	59.8	60	
When there are dental problems	4.9	11.3	

* Chi-square tests were used to compare the ordinal scale responses; independent sample *t*-tests were used to compare the mean answers of the two groups.

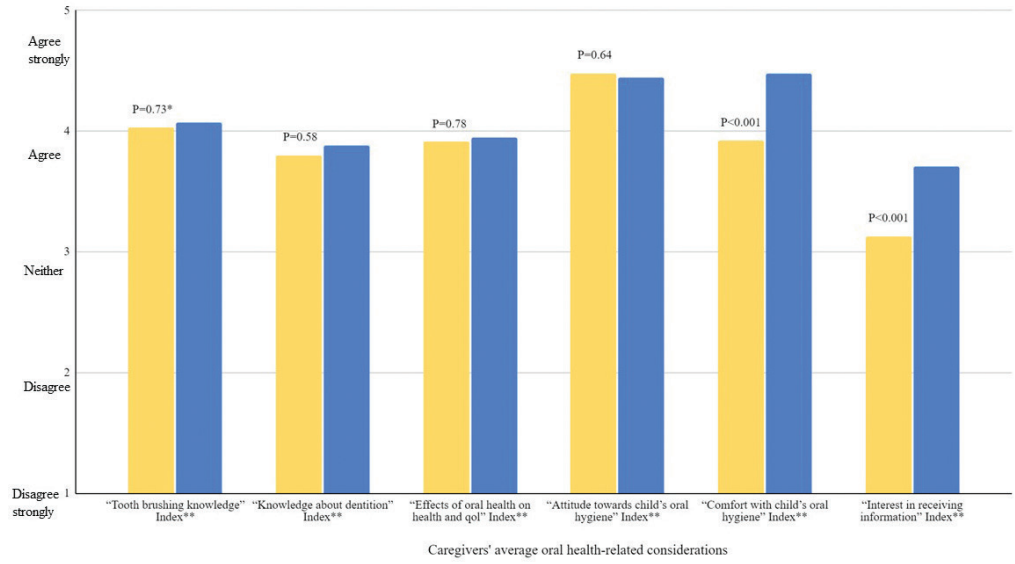

Figure 3. Average oral health-related considerations of caregivers of children with special health care needs versus caregivers of children without special health care needs.

* Yellow=responses of caregivers of children with special health care needs; blue=responses of caregivers of children without special health care needs.

† The average responses of the two parent groups were compared with independent sample *t*-tests.

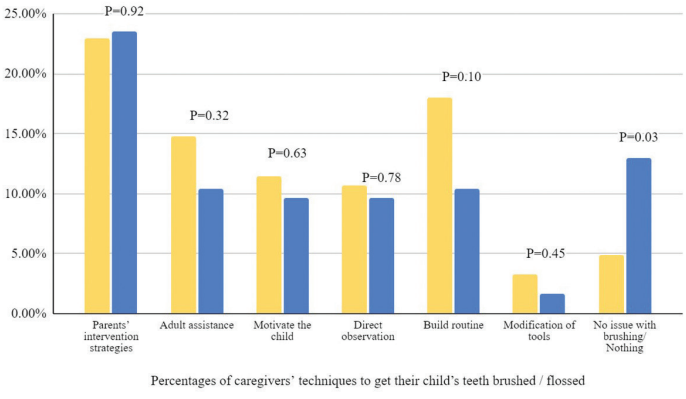

Figure 4. Percentages of caregivers' techniques used to get their children's teeth brushed and flossed by caregiver group.

* Yellow=responses of caregivers of children with special health care needs; blue=responses of caregivers of children without special health care needs.

† The average responses of the two parent groups were compared with chi-square tests.

by their parents as having a lower level of nonverbal interactions than children without SHCNs (2.24 versus 2.77; $P<0.001$).

While the children in the two groups differed in their levels of functioning and nonverbal interactions, Table 2 shows that parents' assessments of their child's oral health did not differ. Both groups of parents described their children's oral health as fair to good. The two groups did not differ in the percentages of children who got their teeth brushed at home. However, CSHCNs were less likely to get their teeth flossed at home ($P< 0.01$) and use mouth rinse at home ($P<0.01$) than children without SHCNs. The percentage of CSCHN participating in brushing/flossing at home was also lower than the percentage of children without SHCNs (58.1 percent versus 90.2 percent; $P<0.001$). While the mean age of a first dental visit was higher in the group of CSHCNs than in the group of children without SHCNs (3.18 versus 2.57 years; $P<0.01$), the two groups did not differ in the frequency of dental visits.

Figure 3 provides an overview of how the parents in the two groups differed in their oral health-related knowledge and attitudes. Both groups agreed that they knew how to engage in tooth brushing behaviors (five-point scale, with five indicating agree strongly: 4.05 versus 3.84; $P=0.73$), but described themselves as less knowledgeable about patterns of teeth exfoliation or eruption. The two groups also did not differ in the degree to which they understood that oral health was related to their child's quality of life and in how important they considered good oral health. Both groups agreed, on average, that the child's oral hygiene was important. However, parents of CSHCNs were less comfortable with teaching their child how to brush and helping their child to brush than parents of children without SHCNs. In addition, parents of CSHCNs were also less interested in receiving oral health-related information.

The difference in the comfort level of the two parent groups raises the question which specific challenges the two groups of parents encountered when engaging in oral hygiene-related behavior with their children. Open-ended responses to the question which challenges the parents encountered showed that 43.4 percent of the parents with CSHCNs reported that their child's behavior was a challenge when engaging in oral hygiene-related efforts compared to only 21.7 percent of parents of children without SHCNs ($P<0.001$). Parents of children without SHCNs were more likely to report that parent-related factors, such as not having enough time or being too busy, were challenges related to engaging their child in oral hygiene-related efforts (20.9 percent versus 9.8 percent; $P=0.04$). In addition, 13.1 percent of parents of CSHCNs versus 9.6 percent of parents of children without SHCNs reported oral hygiene technique-related challenges ($P=0.50$). A total of 11.4 percent of the parents of CSHCNs also reported challenges because of their child's SHCN conditions compared to no parents in the second group ($P=0.03$). The two groups did not differ in their routine-related challenges (4.9 percent versus 10.4 percent; $P=0.06$).

These above described challenges raise questions concerning which best practices parents might have developed to overcome these problems. Figure 4 shows that the two groups did not differ in the best practices they used to overcome challenges. Both groups most frequently reported caregiver interventions as

Table 3. RELATIONSHIPS BETWEEN CHILDREN'S LEVELS OF FUNCTIONING/INTERACTIONS AND PARENTS' AND CHILDREN'S ORAL HEALTH AND PARENTS' ORAL HEALTH-RELATED CONSIDERATIONS

Parents' evaluations of their child's levels of functioning	Level of functioning" index	Level of nonverbal interactions index*
*Level of nonverbal interactions index**	0.86† *P*<0.001	1
Parents' oral health-related responses		
Parents' own oral health	-0.04 *P*=0.61	-0.05 *P*=0.51
Parents' dental visit in last year	0.05 *P*=0.52	-0.00 *P*=0.94
Parent has dental care need	-0.01 *P*=0.86	-0.01 *P*=0.85
Parents' tooth brushing knowledge index*	0.11 *P*=0.12	0.17 *P*=0.02
Comfort with child's oral hygiene index*	0.49 *P*<0.001	0.38 *P*<0.001
Importance of child's oral hygiene index*	0.10 *P*=0.17	0.12 *P*=0.07
Interest in receiving information about oral hygiene index*	0.17 *P*=0.02	0.21 *P*=0.00
Knowledge about dentition index*	0.07 *P*=0.33	0.09 *P*=0.20
Pediatric patients' background and oral health-related characteristics		
Child age	0.05 *P*=0.49	0.03 *P*=0.63
Having chronic conditions	-0.44 *P*<0.001	-0.41 *P*<0.001
Number of hours per day parent is with child	-0.19 *P*=0.01	-0.12 *P*=0.09
Child's oral health	-0.04 *P*=0.60	0.01 *P*=0.92
Child's teeth brushed	0.22 *P*<0.001	0.22 *P*<0.001
Child's teeth flossed	0.26 *P*<0.001	0.20 *P*=0.00
Frequency of brushing child's teeth	0.11 *P*=0.11	0.05 *P*=0.46
Frequency of flossing child's teeth	0.27 *P*<0.001	0.26 *P*<0.001

* **Supplemental Electronic Data—Appendix 2** provides the information concerning how all indices were created.

† Pearson correlation coefficients were computed and *t*-tests were used to test for the significance of the correlations.

best practices (CSHCN equals 26.2 percent versus no SHCN equals 30.4 percent; *P*=0.92), followed by adult assistance (15.6 percent versus 13.0 percent; *P*=0.32), using motivating techniques (12.3 percent versus 11.3 percent; *P*=0.63), building a routine (8.2 percent versus 3.5 percent; *P*=0.10), or modifying tools (5.7 percent versus 2.6 percent; *P*=0.45).

Table 3 shows that the more chronic conditions the children had, the lower their level of functioning (r equals -0.44; *P*<0.001) and non-verbal interaction skills (r equals -0.41; *P*<0.001). The higher the children's functioning and nonverbal interaction skills, the more comfortable the parents were with oral hygiene efforts, the more likely it was that the children's teeth were brushed and flossed, and the more frequently the teeth were flossed. The higher the children's level of nonverbal interactions, the more the parents were interested in receiving oral health promotion-related information from their dentist.

Discussion

Before discussing oral health-related topics, it is important to consider how parents assessed their children's level of functioning. Previous research showed that the level of communication-related functioning was related to children's oral health and parents' comfort with teaching and helping their children maintain good oral hygiene.[17] The CSHCNs versus children without SHCNs did not differ in their average chronological age in this study. Therefore, age should not be an influencing factor if any differences in the children's level of functioning were found. When the parents' ratings of their children's level of functioning were analyzed, the results showed that CSHCNs versus children without SHCNs differed, as predicted, both in their levels of general functioning and level of nonverbal interactions. This finding is of clear relevance when exploring children's oral health-related behavior and parents' attitudes and behavior related to engaging their children in oral health promotion efforts. In particular, it would be expected that the parents of CSHCNs versus without SHCNs would describe different challenges as well as different best practices related to overcoming these challenges.

Analyzing whether oral health-related behaviors such as brushing, flossing, and mouth rinse use were different was, therefore, of interest. The results were surprising: The parents did not differ in the description of their child's oral health and in the percentages of children who get their teeth brushed. However, lower percentages of parents of CSHCNs reported that their children brushed themselves and higher percentages reported that the parents brushed their children's teeth than parents of children without SHCNs. In addition, parents of CSHCNs reported lower frequencies of brushing, flossing, and mouth rinse use than parents of children without SHCNs. More parents of CSHCNs reported no daily brushing or/flossing or mouth rinse use than parents of children without SHCNs. Whether the child's teeth got brushed or flossed as well as the frequency of flossing correlated with both the "level of general functioning" and the "level of nonverbal interactions" indices. The two groups did not differ in the frequency of their child's dental visits. However, the mean age of the first dental visit was higher for children without SHCNs.

Previous research was consistent with these findings because it showed that profound functional disabilities could limit the ability to self-maintain oral hygiene[13] and result in children being more dependent on parents when performing self-care activities.[18] There is no doubt that this situation places CSHCNs at higher risk for poorer oral health. Therefore, it was expected to find reflections of this situation in the open-ended answers of the parents of CSHCNs. The results indeed showed that the frequency of oral self-care of CSHCNs was lower and their need for adult assistance was higher than those of the children without SHCNs. As presented herein, the CSHCNs established a dental home on average at an earlier age than children without SHCNs. This finding could be related to the fact that the surveys were handed out in a medical center where other medical professionals could have referred CSHCNs with other medical conditions to the dental clinic at an early age.

Engaging a child in oral health promotion is likely to be related to the parents' oral health-related knowledge. However,

the two groups of parents did not differ in their tooth brushing knowledge nor their knowledge related to dentition; they also did not differ in their attitudes toward the importance of children's oral hygiene efforts and the effects of children's oral health on their overall health and quality of life. Previous research showed that parents of children with and without SHCNs had similar attitudes toward the effects of children's oral health on their overall health[29] but differed in their knowledge levels.[30] Parents of children with a diagnosis of an autism spectrum disorder (**ASD**) had significantly higher overall oral health knowledge scores than parents of children without an ASD.[30]

These results contradict the hypotheses that parents of CSHCN would be so preoccupied with their children's medical conditions that they might not prioritize oral health-related needs or might not value their children's oral health as much as parents of children without SHCNs. One potential explanation could be that the parents of CSHCNs had established a dental home for their children earlier and, thus, might have benefitted from these dental visit-related experiences. This interpretation is supported by research that found that lower percentages of parents of CSHCNs had good knowledge about toothbrushing.[31] Unfortunately, the results showed that the lower the "level of functioning" and "level of nonverbal interaction" indices were, the less interested the parents were in receiving oral health-related information. This could be because of the challenges encountered when attempting unsuccessfully to apply the knowledge in efforts related to their child with special conditions and their lower level of comfort with providing oral care at home.

The responses related to the question from which sources parents received oral health-related information showed that, for the majority of parents, this information came from their dentists/dental visits, while very few parents reported that family members, friends, or caregiver groups had informed them. This finding is consistent with other research findings that also showed that dentists were the main source of oral health information.[24,25] However, compared to these previous studies, a higher percentage of parents in the present study relied on their own general knowledge.

When the parents were asked to consider five different ways to receive oral health-related information in the future–namely in a pamphlet, on a DVD, in a YouTube video/on the web, during discussions with a dentist, or via a starter kit with instructions–approximately one-third of the parents chose a starter kit or a discussion with a dentist. While receiving information from dentists is a widespread approach, developing starter kits for introducing parents early on in their child's life to establish good oral health promotion efforts should be further explored. When developing such starter kits, attention should be given to the specific challenges parents of CSHCNs face. Responses to an open-ended question concerning challenges encountered showed that parents of CSHCNs were more likely to describe their child's behavior (such as obstructive behavior, hypersensitivity/oral aversion, child could not follow instructions, was afraid/anxious) and their child's medical condition as the top two barriers when taking care of their child's teeth. Alternatively, parents of children without SHCNs more frequently mentioned caregiver-related topics such as that oral hygiene efforts were too time-consuming or energy-consuming and that the parents could not always supervise their child to be the major challenge.

Related to the reported challenges were the answers concerning the best techniques that parents used when getting their child's teeth brushed or flossed. Both groups of parents mentioned that they helped with their child's brushing routine, motivated their child, and had the child directly observe how other family members brushed, built routines, and switched or picked certain toothbrushes or toothpastes. More than 20 percent of parents reported difficulties and had to use other techniques, such as making verbal requests of, reasoning with, fighting, distracting, bribing, or threatening the child. The techniques used in the two groups did not differ significantly.

This study had several limitations. The first was that, while the number of parents in each of the two groups was sufficient to test the hypotheses of interest based on the a priori power analysis, the subgroup size was too small to compare the responses of subgroups of parents with children with different SHCNs. The survey was designed to compare the differences between the two groups of parents. This design did not allow for studying the problems of children in groups with specific problems, such as children who are G-tube fed. Future research should focus on finding out which challenges parents of children with certain types of SHCNs encounter and how specific resources for these children could be created. The benefit of this study was that the level of functioning of the children was assessed by the parents and could, therefore, be considered in relationship to the oral health-related constructs.

A second limitation was that only parents who were proficient in English were included in this study. It seems important to design future research that focuses on parents who are first-generation immigrants to the United States and analyze their knowledge and considerations since they might rely on the knowledge they bring from their own country and might not be informed about certain best practices developed in the United States.

A third limitation was that data were collected from parents who had been referred by their dentist to the dental clinics in the medical center because of the children's obstructive behavior or their complex medical conditions. While this recruitment strategy was beneficial for recruiting parents of CSHCNs, one might consider recruiting parents of children without SHCNs in a general dental practice because they might be more representative of the general population. However, it would have created a discrepancy in the recruitment strategy of the two groups if the parents in the two groups had been recruited in different settings. The decision was, therefore, made to collect the control group data in the same setting as the data from the parents of CSHCNs. Furthermore, these parents' children were all patients who were planning to utilize or had been utilizing the clinic they attended as their dental home. Considering that CSHCNs might not have a dental home increases the importance of developing good resources such as starter kits that are easily accessible to all parents. For example, if resources were developed based on these findings and were shared with pediatricians, these resources could be available for parents who do not have a dental home for their children.

Conclusions

Based on this study's findings, the following conclusions can be made:

1. When children have one or more chronic conditions, their level of functioning and their level of nonverbal interactions are lower, which can affect oral health promotion efforts. Pediatric dentists need to consider that children with special health care needs have a lower frequency of brushing/flossing and rely on adult assistance more than children without special health care needs.

2. When pediatric dentists engage in caregiver education about oral health promotion, they need to consider that the main challenges for parents of CSHCNs are their child's behavior and their medical condition, while parent-related issues are the most frequently named challenges among parents of children without SHCNs.
3. There are no differences between parents of children with or without SHCNs in the techniques that parents utilize to get their children's teeth cleaned; this finding can inform pediatric dentists' oral health education strategies.
4. Though there are no significant differences between the two groups of parents in their oral health-related knowledge or attitudes, parents of CSHCNs are less comfortable in helping with or teaching their children about oral care and are less interested in receiving further information. Additional motivational communication strategies are, therefore, needed to increase these caregivers' motivation.

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Supplemental Electronic Data—Appendices

APPENDIX 1. University of Michigan School of Dentistry & Mott's Children Hospital Survey for parents who bring their child to a regularly scheduled dental appointment

Thank you for participating in this survey. We want to assure you that we treat your information confidentially. This questionnaire asks you about your child's health and dental health.

Please check at which type of appointment you are right now with your child: I am with my child:

-- In the children's dental clinic in the dental school ❑
-- In the Mott Children hospital children's dental clinic ❑
-- In the operating room in Mott's children's hospital ❑

The first questions are about your background:

1. What is your relationship to this child? I am _____
2. What is your gender? I am _____
3. How old are you? _____ years
4. How many years of education do you have starting with first grade?__years of education
5. Are you employed in a full time or part time position?
   No ❑ Yes, part time ❑ Yes, full time ❑
6. If you are employed part or full time, how many hours per week do you work? hours
7. How do you pay for your child's dental visit?
   Dental insurance ❑ Self pay ❑ Medicare/Healthy Kids Program ❑ Other ❑
   If other, please explain: _____
8. How many children do you have? I have _____ children.
9. How many of these children live with you in your household? _____ Children
10. How often does your family experience hunger / food insecurity?

1	2	3	4	5
Never	**Rarely**	**Sometimes**	**Often**	**Very often**

11. How would you describe the health of your teeth and gums?

1	2	3	4	5
Poor	**Fair**	**Good**	**Very good**	**Excellent**

12. Have you visited a dentist during the past year? Yes ❑ No ❑
13. Do you need to see a dentist because of problems with your teeth or gums? Yes ❑ No ❑

The next questions are about the background of your child who is a patient today:

If you bring more than one child for dental care today, please respond to this survey by thinking only about the oldest of these children:

1. What is the gender of the child who is the patient today? This child is _____
2. How old is this child? _____ years old
3. Does this child have one or more chronic medical conditions? Yes ❑ No ❑
   If yes: please describe which medical condition(s) this child has: _____
4. Please list all medications your child takes:
5. How many hours per day are you actively involved with this child?_____ hours.
6. In order to better understand how your child communicates and relates to others, please read the following questions and check if your child never = 0, sometimes = 1, usually = 2 or always = 3 shows this behavior.

How often does your child:	0=Never	1=Some times	2=Usually	3=Always
- look towards you when hearing your voice?				
- respond to his/her spoken name?				
- listen to instructions?				
- make sounds or gestures to get your attention?				
- make one-word requests (for example, up, down)?				
- state his/her first name or nickname when asked?				
- use simple words to describe things?				
- eat solid foods (for example, vegetables)?				
- feed him/herself with a spoon?				
- drink from a cup or glass without spilling?				
- make or tries to make social contact (for example, smiles, makes noises)?				
- show affection to familiar persons (for example, touches, hugs)?				
- imitate simple movements (for example, claps hands, waves good bye)?				
- use actions to show happiness or concern for others (for example, hugs, pats arm, holds hands)?				
- demonstrate friendship-seeking behavior with others of the same age (for example, says, “Do you want to play?”)				
- respond when parent or caregiver is playful (for example, smiles, laughs, claps hands)?				
- show interest in where he or she is (for example, looks around, touches objects)?				
How often does your child:	**0=Never**	**1=Sometimes**	**2=Usually**	**3=Always**
- play simple interaction games with others (for example, peekaboo, patty-cake)?				
- choose to play with other children (for example, does not stay on the edge of a group)?				
- continue playing with another child with little fussing when parent or caregiver leaves?				
- share toys or possessions when asked?				
- stand alone for 1 to 3 minutes?				
- walk to get around, has no need to hold anything?				
- run smoothly without falling?				

Appendix continued on the next page.

The next questions are about your child's dental health:

1. Would you describe your child's dental health as poor, fair, good, very good or excellent?

   ❑ 1 **Poor** ❑ 2 **Fair** ❑ 3 **Good** ❑ 4 **Very good** ❑ 5 **Excellent**

2. Do your child's teeth get brushed? Yes ❑ No ❑ If no: why not?

   If yes: Who brushes the teeth? Please check all that apply:

   My child ❑ I ❑ Someone else ❑

3. Do your child's teeth get flossed? Yes ❑ No ❑ If no: why not?

   If yes: Who brushes the teeth? Please check all that apply:

   My child ❑ I ❑ Someone else ❑

4. How often:

	Never	**Rarely**		**Daily**	**> 1X per day**
- do your child's teeth get brushed?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
- do your child's teeth get flossed?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
- do you use mouthwash for your child?	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5

5. How old was your child at the first dental visit? My child was _____ years old.

6. How often does your child see a dentist?

   Less than 1x per year ❑ 1x per year ❑ 2x per year ❑ When there are dental problems ❑

7. On a scale from 1 = very uncomfortable to 5 = very comfortable, how do you feel about:

	Very uncomfortable				**Very comfortable**
- Teaching your child to brush?	1	2	3	4	5
- Helping your child to brush?	1	2	3	4	5
- Teaching your child to floss?	1	2	3	4	5
- Helping your child to floss?	1	2	3	4	5

8. On a scale from 1 = disagree strongly, 2 = disagree, 3 = neither disagree nor agree, 4 = agree to 5 = agree strongly, how much do you disagree/agree with the following statements:

It is important to me that:	**Strongly disagree**				**Strongly agree**
- my child's teeth are healthy.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
- my child has no cavities in his / her baby teeth.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
- my child's teeth get brushed.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
- my child's teeth get flossed.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
- my child sees a dentist regularly.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
Poor dental health affects my child's general health.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
Dental problems, like cavities, affect my child's quality of life.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
My child snacks between meals.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I think it is the parents' job to make sure their children have good dental health.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know when to expect baby teeth to fall out.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know when adult teeth come in.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know how to check if teeth are brushed well.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know which toothbrush to use.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know when to replace the toothbrush.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know how much toothpaste to use when brushing my child's teeth.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know different methods to keep my child cooperative during brushing at home.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I know what to do if my child does not tolerate toothpaste or mouth-rinse.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
I would like to receive information about dental health.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5
A dental health educator should talk to my child about keeping my child's teeth and gums healthy.	❑ 1	❑ 2	❑ 3	❑ 4	❑ 5

Please check if you are interested in receiving more information about how to keep your child's teeth and gums healthy at home:

- ❑ in a pamphlet
- ❑ on a DVD
- ❑ in a YouTube video/on the web
- ❑ in discussions with a dentist
- ❑ with a starter kit with instructions

1. My main source of information about how to keep my child's teeth healthy is:
2. Please describe anything you do to get your child's teeth brushed/flossed:
3. Please describe which challenges keep you from taking care of your child's teeth (brushing, flossing) at home:

Please, share any other thoughts you may have about the topic of this study:

Thank you very much for taking the time to answer these questions. If you have questions about the questionnaire or want to know about our results, please contact Dr. Tsai at chiaents@ umich.edu.

APPENDIX 2. Information about how the indices were created

The "Level of functioning" Index was computed by averaging the responses to the 12 items presented in Figure 1 under the heading "Function related responses". For the answer categories, see question 19 in the survey presented in Appendix 1.

The **"Level of nonverbal interactions" Index** was computed by averaging the responses to the 10 items presented in Figure 1 under the heading "Nonverbal interaction related responses". For the answer categories, see question 19 in the survey presented in the appendix.

The **"Toothbrush knowledge" Index** was computed by averaging the answers to the items: (*For the answer categories, see question 27 in the survey presented in the appendix*.)

- I know how to check if teeth are brushed well.
- I know which toothbrush to use.
- I know when to replace the toothbrush.
- I know how much toothpaste to use when brushing my child's teeth.
- I know different methods to keep my child cooperative during brushing at home.
- I know what to do if my child does not tolerate toothpaste or mouth-rinse.

The **"Comfort with child's oral hygiene" Index** was computed by averaging the responses to the items in question 26 (*see Appendix 1*). How comfortable are you with:

- teaching your child to brush?
- helping your child to brush?
- teaching your child to floss?
- helping your child to floss?

The **"Importance of child's oral hygiene" Index** was computed by averaging the responses to the items (*For the answer categories, see question 27 in the survey presented in the appendix*.) It is important to me that:

- my child's teeth are healthy.
- my child has no cavities in his / her baby teeth.
- my child's teeth get brushed.
- my child's teeth get flossed.
- my child sees a dentist regularly.

The **"Interest in receiving information about oral hygiene" Index** was computed by averaging the responses to the items: (*For the answer categories, see question 27 in the survey presented in the appendix*.)

- A dental health educator should talk to my child about keeping my child's teeth and gums healthy.
- I would like to receive information about dental health.

The **"Knowledge about dentition" Index** was computed by averaging the responses to the items: (*For the answer categories, see question 27 in the survey presented in the appendix*.)

- I know when to expect baby teeth to fall out.
- I know when adult teeth come in.

Abstract of the Scientific Literature

Is exposure time and content type of on-screen programs associated with mental health in preschool children?

The aim of this study was to examine the association of on-screen exposure time to different on-screen content types and the mental health of preschool children aged three-six years old. Approval for the study was given by the Institutional Review Board of the Shanghai Children's Medical Center at Shanghai Jiao Tong University. The study data came from the Shanghai Children's Health Education and Lifestyle Evaluation-Preschool study. Three age groups composed the study: three–four-year-olds (November 10-24, 2016); four–five-year-olds (April 12-26); and five–six-year-olds (April 22-May 5, 2019). Parents consenting to participate in the study completed online questionnaires for each of the three age groups reporting the time in a regular week and weekend that their child viewed on screen content. The types of on-screen content included electronic games, entertainment, non-child directed programs and educational programs. To assess the mental health status of the children, parents completed the internationally recognized Strengths and Difficulties Questionnaire (SDQ) for each of the three groups. Questions on the SDQ included the child's age, sex, educational level for both parents, single child status, family annual income, separated or divorced parents, parent child interactions and primary caregiver. Initially there were 20,899 children enrolled in the study and a total of 15,965 enrolled at the end of the study. Study findings reported that higher screen times for educational content resulted in a lower risk for mental health problems, while higher screen exposures for non-child directed programs were associated with a higher risk of mental health problems. The mean values for total screen times in group 1 (three years old) was 2.64 hours per day, in group 2 (five years old) was 3.38 hours per day and in group 3 (six years old) 3.13 hours per day, which was like screen exposures in other countries. No matter the screen content, the risk of mental health issues was associated with total screen exposure times (>4 hours per day; 95% CL, 1.17-1.54).

Comment: *Considering the findings of this study, as healthcare providers we should give careful thought to the exposure time and on-screen program types watched by the three–six-year-old children that we treat, especially those who may present with behavior challenges.* ***JGJ***

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