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Caregivers' Knowledge of Sugar and Control Over Children's Sugar Consumption

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Abstract

Purpose: The purpose of this study was to understand caregivers' knowledge about sugar, intended and actual control, and barriers in controlling sugar consumptions of their children.

Methods: A 17-item preliminary knowledge questionnaire on sugar was developed. Fifty-five caregivers of pediatric dental patients completed the survey regarding their knowledge about sugar, intention to control, actual control, and barriers in controlling children's sugar consumptions. The same survey was also used with 62 fourth-year dental students to assess the construct validity of the questionnaire. Fisher's exact, Wilcoxon rank-sum test, and generalized linear model were used in data analyses.

Results: Compared to caregivers, dental students had better knowledge about sugar ($P < 0.001$). Caregivers in the higher sugar knowledge group had greater intention to control their child's fruit juice consumption ($P = 0.037$) and greater actual control over their child's sweet snacks ($P = 0.046$), soft drinks ($P = 0.034$), and fruit juice consumption ($P = 0.003$). Other family members allowing sugar snacks/drinks was considered the top barrier in controlling children's sugar consumption (reported by 44% of caregivers).

Conclusion: Knowledge about sugar was associated with caregivers' intended and actual control over their child's sugar consumption, indicating an education need for caregivers that focuses on the role of sugar in the development of caries.

Keywords

caregivers' knowledge of sugar; knowledge questionnaire on sugar; intention to control; actual control; children's sugar consumption

Dental caries is the most common chronic infectious diseases among children in the United States.¹ Although the rate of dental caries has decreased since the 1960s, it continues to be a major health problem,²⁻⁴ despite wide advances in fluoride use.⁵

Sugar consumption plays a crucial role in dental caries among multilevel factors. Specifically, the cariogenic process begins with sugar and is accelerated by microorganisms and limited salivary flow.⁶ A systematic review found moderate quality evidence, showing a positive association between the amount of sugar consumption and levels of dental caries, consistently over 50 years in over 20 countries.⁷ The World Health Organization strongly recommends reducing free sugar intake to less than 10 percent of total energy intake in order to prevent dental caries.⁸ However, there is a lack of study on practical ways for people to adopt these recommendations and change their actual behavior to reduce their sugar intake.⁹

Caregivers play a critical role in a child's diet and oral health.¹⁰ The theory of planned behavior (TPB) predicts that behavior is directly influenced by one's intention for the behavior, which, in turn is influenced by one's attitude, perceived behavioral control, and subjective norm.¹¹ Applying TPB, studies have found that mothers' perceived behavioral control plays a significant role in their intentions to limit their child's sugar intake.¹² Also, parental attitudes, subjective norms, and perceived barriers predict their intention to control their child's sugar snacking and children's actual sugar intake.¹³

Parental knowledge could also predict their behavior related to control of their child's sugar intake. Parents with greater oral health-related knowledge have a good influence on their child's oral health behaviors.¹⁴ Parents who have greater nutritional knowledge have children with good nutritional knowledge.¹⁵ To the best of our knowledge, there is currently no study that evaluates parental knowledge specifically on the role of sugar (particularly specific food and drink items) in causing caries and its relation to parental intent and actual control over the child's sugar consumption. Applying TPB, we hypothesize that caregivers' knowledge of sugar is positively correlated with their intended and actual control over their child's sugar intake.

The purposes of this study were to: (1) develop a preliminary knowledge questionnaire that measures subjects' knowledge regarding the role of sugar intake in the development of dental caries; (2) evaluate caregivers' knowledge of sugar, intended and actual control over their child's sugar intake, and factors that prevent or promote caregivers' control; and (3) explore the association between caregivers' knowledge, intention, and actual control over their child's sugar consumption. The findings from this study will provide preliminary guidance in designing interventions that will help reduce children's sugar intake and prevent caries, along with other preventive strategies.

Methods

This cross-sectional study was approved by the Institutional Review Board of University of California, San Francisco. An English questionnaire (see supplemental electronic appendix) was developed to measure participants' characteristics, knowledge of sugar, intention and actual control over sugar consumption, and barriers or promoters for sugar control. The

questionnaire was reviewed by two dietitians and pediatric dentists for clarity and interpretability. Responding to the questionnaire took three to five minutes to complete. The questionnaire included four sections:

(1) Knowledge of sugar:

A 17-item preliminary knowledge questionnaire was developed with two subsections. The first subsection included nine statements on the role of sugar in caries development. All nine statements were true statements; therefore, answer choices “strongly agree” or “agree” were considered correct (one point) and “disagree,” “strongly disagree,” “not sure,” or missing answer were considered incorrect (zero points), based on the consideration that caregivers who answered “not sure” or skipped the question did not know the correct answer. The second subsection contained eight food/drink items; subjects were asked to identify whether the food/drink had high sugar content with high risk for caries. All food/drink items had high content of sugar/sticky sugar, therefore, the answer “yes” was considered correct (one point) and “no,” “not sure,” or missing answer (for not being able to answer the question) were considered incorrect (zero points). Sum scores were computed per subsection and for the entire knowledge questionnaire, with 17 maximum points awarded. Participants with higher scores indicated having higher knowledge of the role of sugar intake in caries development. The construct validity of an instrument can be examined by predefined hypothesis tests on “expected internal relationships, expected relationships to scores of other instruments, or expected differences in scores between relevant groups.”¹⁶ Construct validity of the knowledge questionnaire has been assessed via a predefined comparison between caregivers’ and fourth-year dental students’ scores, as dental students are expected to have higher knowledge of sugar than caregivers from generally low-income families.

(2) Intention to control child’s sugar consumption:

A questionnaire with six statements was developed to assess caregivers’ intention to control their child’s sugar consumption. Statements assessing subjective norm and perceived behavioral control were included, as these factors were known to influence one’s intentions.^{12,13} All six statements indicated having no intention to control child’s sugar consumption. Therefore, answer choices “strongly agree,” “agree,” and “not sure” or missing answers were regarded as having no intention to control the child’s behavior (zero points), because caregivers who answered “not sure” or skipped the question did not show a clear intention to control. “Strongly disagree” or “disagree” were considered definitely having the intention (one point). The sum of individual scores was computed for each participant, and a higher score indicated having more intention to control a child’s sugar consumption behavior.

(3) Actual control of child’s sugar consumption:

A six-item questionnaire was developed to assess caregivers’ actual control over children’s sugar consumption. The first three questions asked about the caregivers’ frequency in controlling their child’s sugar consumption. Five answer choices were given. “Almost always” or “often” were considered having control over the child’s behavior (two points). “Sometimes” was considered having some control (one point). “Never,” “not sure,” or missing answer were considered having no control (zero points), as caregivers who answered “not sure” or skipped the question did not show a clear actual control. The next

three questions asked the caregivers to rate, out of 10 times, how many times the caregiver would control their child's sugar intake. The sum of individual scores was computed; a higher score indicated having better control over the child's sugar consumption behavior.

(4) Barriers/promoters for caregivers' control:

Barriers and promoters were assessed through open-ended questions, such as, "what do you think makes control of your child's intake of sugar snacks or drinks difficult?" Responses were analyzed via qualitative analysis, and common themes were identified. Frequencies and percentages were used to understand common barriers in caregivers' control over child's sugar consumption behavior.

English speaking caregivers of pediatric dental patients (two to 16 years old) and fourth-year dental students were eligible to participate in the study. Fifty-five caregivers who accompanied pediatric dental patients for a regularly scheduled dental appointment at a dental school between April and August 2016 were approached in the waiting area and asked to participate in the study. Caregivers who gave informed consent were asked to complete the developed questionnaire. In addition, 62 fourth-year dental students were consented and recruited at the end of their lecture to complete the same questionnaire. The fourth-year dental students with oral health training were considered to have better knowledge of sugar.

Participants' characteristics were summarized with mean, standard deviation (**SD**), frequency, and percentage. The predefined group comparison between caregivers and fourth-year dental students was used to assess the construct validity of the 17-item preliminary sugar knowledge questionnaire. Individual questions (caregivers versus dental students and lower knowledge versus higher knowledge caregiver group) were assessed via Fisher's exact test, and the subsection and total score were assessed via Wilcoxon rank-sum test. The internal consistency and reliability were assessed with Cronbach's alpha. The point biserial correlation between performance on an item (one equals correct, zero equals incorrect) and total score, excluding the item being considered, was used to assess the power of an item to discriminate among knowledge of participants.¹⁷ A Rasch model was fitted, and goodness-of-fit tests were conducted to assess the dimensionality of the questionnaire.¹⁸

Caregivers' knowledge scores on sugar were dichotomized to lower or higher knowledge score based on the median score of all the caregivers. Generalized linear models, such as logistic and log-linear models, were used to explore associations of caregivers' knowledge of sugar with intention to and actual control of sugar while controlling for caregivers' race, gender, education, and family income. Analyses were performed using SPSS 24.0 software (IBM Corp., Armonk, NY, USA)¹⁹ and SAS 9.4 software (SAS Institute, Cary, NC, USA).²⁰

Results

Subject demographics.

All but two caregivers (98 percent) finished the questionnaires with a few questions skipped. The missing answers were accounted for based on our understanding of the rationale given by the caregivers. The two caregivers who did not provide information on their children

were similar to other caregivers in terms of their characteristics. Table 1 shows participants' characteristics. Children (n=53) were, on average, 9.9 years old (± 3.7 SD), 62 percent male, 46 percent White and 34 percent Hispanic/Latino. Ninety-eight percent of children had Medicaid. Sixty-six percent of children were at clinic for an exam and 86 percent had high caries risk according to the Caries Management by Risk Assessment tool.²¹ Caregivers who accompanied the child (n=55) were 84 percent female, average 39.9 years old ($SD \pm 9.8$), 52 percent White and 40 percent Hispanic/Latino. Seventy-five percent were the child's mother. Forty-nine percent of caregivers were unemployed, 81 percent had family annual income of under \$50,000 and 59 percent had a college degree or less. Dental students (n=62) were average 29.4 years old ($SD \pm 3.8$), 67 percent female, 56 percent Asian, and nine percent Hispanic/Latino.

Caregivers' knowledge of sugar.

Overall goodness-of-fit test of the Rasch model did not provide an evidence of good fit ($P < 0.05$); this indicated multidimensionality as expected, since the questionnaire was developed to include knowledge of sugar-caries relation, protective factors, dietary recommendation, and food items. Therefore, we examined the individual item score, subsection score, and overall score. The questionnaire was well accepted by parents without any reports of undue burden on the visit. Cronbach's alpha was 0.82, indicating a questionnaire of good internal consistency and reliability.¹⁷ The point-biserial correlation was between 0.23 and 0.69, except for questions one (-0.11) and six (0.09), indicating that most questions have moderate power to discriminate¹⁷ among participants with different levels of knowledge. Question one, "Sugar is one of the most important causes of dental caries," is the easiest question that nearly all the participants answered correctly. Question six, "Both adults and children should reduce the intake of free sugars to less than 10 percent of total energy intake," is a relatively hard question that 80 percent of caregivers and 73 percent of dental students answered correctly. Although the two questions have limited power to discriminate between caregivers and dental students, they were considered important for the content validity and, therefore, included in the questionnaire.

As expected, caregivers scored significantly lower than dental students in the 17-item sugar knowledge questionnaire (10.65 ± 3.37 versus 14.58 ± 2.14 , $P < 0.001$; Table 2). In the first section with nine knowledge statements, caregivers scored significantly lower compared to dental students (6.22 ± 1.87 versus 7.90 ± 1.14 , $P < 0.001$). Significantly fewer caregivers answered correctly than dental students in six out of nine items, including statements on sugar-acid-caries relation (91 percent versus 100 percent, $P = 0.021$), sugar intake frequency-caries risk relation (78 percent versus 98 percent, $P = 0.001$), how frequency is more important than the total amount of sugar consumption (66 percent versus 90 percent, $P = 0.001$), starch-caries relation (60 percent versus 90 percent, $P < 0.001$), and the role of calcium-rich food (27 percent versus 65 percent, $P < 0.001$) and saliva (46 percent versus 98 percent, $P < 0.001$) in caries prevention. There was no significant difference between caregivers and dental students for three questions (items one, five, and six in Table 2).

In the second section with eight food/drink items, caregivers scored significantly lower than dental students (4.44 ± 2.07 versus 6.68 ± 1.70 , $P < 0.001$) for seven out of eight individual

items, including fruits (44 percent versus 81 percent, $P<0.001$), soft drinks (93 percent versus 100 percent, $P=0.046$), juices (84 percent versus 98 percent, $P=0.006$), cereals (56 percent versus 89 percent, $P<0.001$), rice (24 percent versus 71 percent, $P<0.001$), pasta (26 percent versus 69 percent, $P<0.001$), and potatoes (26 percent versus 61 percent, $P<0.001$; Table 2). No significant difference was found for sweets/candies (93 percent versus 98 percent, $P=0.186$).

Caregivers' knowledge of sugar versus intended control.

Cronbach's alpha was 0.78 for the questionnaire of intention to control, indicating a questionnaire of good internal consistency and reliability.¹⁷ The point-biserial correlation was between 0.44 and 0.68, indicating that all of the questions have moderate power to discriminate¹⁷ among participants with different levels of intention to control.

Caregivers were dichotomized by the median score (10) of the 17-item knowledge questionnaire. Table 3 shows that significantly more caregivers in the higher knowledge group (N equals 27) than lower knowledge group (N equals 28) had intention to control their child in their fruit juice consumption (48 percent versus 14 percent, $P=0.037$) and found it difficult to stop a child from eating or drinking anything with sugar (37 percent versus 75 percent, $P=0.049$). This could be because caregivers with higher knowledge were more aware of the sugar issue and were frustrated with more attempts of sugar control. Furthermore, although not significant compared to the lower knowledge group, more caregivers in the higher knowledge group intended to control their child's sweet snacks (64 percent versus 43 percent, $P=0.236$) and soft drinks (70 percent versus 54 percent, $P=0.503$).

Caregivers' knowledge of sugar versus actual control.

Cronbach's alpha was 0.80 for the questionnaire of actual control, indicating a questionnaire of good internal consistency and reliability.¹⁷ The point-biserial correlation was between 0.45 and 0.82, indicating that all the questions have moderate power to discriminate¹⁷ among participants with different levels of actual control. Caregivers with higher knowledge had significantly better control over their child's consumption of sweet snacks ($P=0.046$) and soft drinks ($P=0.034$) compared to the lower knowledge group (Table 3). The higher knowledge group showed greater control for fruit juices than the lower knowledge group, although the results were not significant. When asked how many times out of 10 the caregivers would say "no" to their child, caregivers in the higher knowledge group reported saying "no" more often when their child asked for sweet snacks, soft drinks and fruit juices, although the results were only significant for the control on fruit juice ($P=0.003$).

Barriers in controlling child's sugar consumption.

Forty-four percent of all the caregivers reported that other family members allowing their children to consume sugar snacks/drinks was the top barrier in controlling their child's sugar consumption. Twenty percent of caregivers reported that it's not easy to say no to other people who give sugary snacks or drink to their child, 18 percent considered sugary snacks/drinks to be a good reward for their child, 13 percent said they don't have time to monitor their child, 13 percent thought their child has more important things to do, and five percent don't know how to say no to their child without a battle.

When asked why they allow their child to consume sweet snacks or beverages, caregivers gave the following reasons: allowing sugar intake for special occasion (e.g., parties; 24 percent); rewarding good behavior (15 percent); their child likes/wants it (15 percent); allowing snacks between meals (seven percent); they eat sugar themselves, and it's hard to say no to their child (five percent); and other children/peers eat them (four percent).

When asked why they won't allow their child to consume sweet snacks or beverages, caregivers gave the following reasons: they cause cavities or harm to teeth (22 percent); they're not healthy (18 percent); the child already had too many sweets (13 percent); controlling the child's weight/diet (11 percent); sweets make the child hyperactive (five percent); punishment for bad behavior (five percent); it was close to meal time (five percent); and the child had already brushed (four percent).

When caregivers and dental students (N equals 117) were asked what make them want to consume sugary snacks or drinks, they gave the following reasons: liking/craving sweets (21 percent); prevalence and availability of sugar (12 percent); convenience of sugary food/drinks (nine percent); lack of healthier options (six percent); stress in life (four percent); people around them eat sugar (four percent); it's cheap (three percent); and they like carbohydrates such as rice or pasta (one percent).

Discussion

This study aimed to evaluate caregivers' knowledge of sugar, via preliminary questionnaire, and its relation to their intent and actual control over the child's sugar consumption; it also attempted to understand the barriers of sugar control. The questionnaire developed in this study was able to differentiate different levels of knowledge among low-income caregivers and dental students.

Caregivers showed very good understanding that sugar is one of the most important causes of dental caries. Caregivers also agreed that sweets/candies and soft drinks have high content of sugar and are cariogenic. The most frequent response given by caregivers for controlling their child's intake of sweet snacks/drinks was they cause cavities and are harmful to teeth. These findings are consistent to a previous study in which mothers frequently responded that sugar intake causes caries.²²

Although caregivers had good knowledge of sugar-causing caries, they had poor knowledge of caries prevention—such as the role of saliva and calcium-rich food (e.g., cheese) in reducing caries risk. Similarly, a previous study showed that mothers do not know all the aspects of caries etiology, such as the role of microorganisms and fluoride.²² Parents self-reported to have inadequate knowledge of the cause of early childhood caries, and they perceived this lack of knowledge to be an important contributor to their child's caries.²³ These findings suggest the need to educate caregivers about preventing caries and weapons that can be used in this fight, like saliva and calcium-rich foods.²⁴

Caregivers also showed poor knowledge of the sugar composition of starchy food (e.g., rice, pasta, potatoes) and its role in causing caries. Starch, a polymer of sugar molecules, is a fermentable carbohydrate that, although not as cariogenic as sucrose, still has the potential to

cause caries.^{24–26} Starch is a significant effect modifier in the relationship between food with low sugar levels and pit and fissure caries.²⁷ Such findings indicate the need for parental education that starch, like sugars in sweets and soft drinks, is cariogenic.

Our study showed a positive correlation between caregivers' knowledge of sugar and intended and actual control over child's sugar consumption. Previous studies found parents' perceived behavioral control, attitudes, subjective norms, and perceived barriers as predictors for their intention to control their child's sugar snacking and the child's actual sugar intake.^{12,13} This study's findings are innovative in that they suggest that knowledge, specific to the role of sugar in caries etiology, is a new predictor for caregivers' intention to control and their actual control over their child's sugar consumption. TPB was an effective model to investigate and support the existence of this relationship.²⁸ This finding suggests a need for better education among caregivers, as their knowledge is a good predictor in limiting their child's sugar intake that can eventually help prevent caries.

In terms of barriers, caregivers reported other people (i.e., another family member) giving sugar to child as the main barrier in controlling their child's sugar consumption. This is similar to a previous study, where parents faced difficulty in controlling children's daily activities and interactions that provide unhealthy food.²³ This finding highlights the importance of educating not only primary caregivers but also other family members.

Caregivers also reported that sugary snacks/drinks have been used as a reward for a child's positive behavior. This finding raises concern, as a mother's food rules may have a long-lasting impact on a child's eating behaviors and may provide mixed messages to child by rewarding the child's behavior with unhealthy food.²⁹ Rewarding a child's behavior with sugary foods may encourage binge eating and dietary restraint in the long-term.²⁹ Caregivers should be clearly educated and cautioned against rewarding sugary snacks/drinks for their child's good behavior.

As for their own reasons for consuming sugary snacks/drinks, both caregivers and dental students said they did so because they like sweets and because of the convenience and availability of sugary food/drinks around them. Taste preference has been the strongest predictor of soft drink consumption in school-aged children.³⁰ Mothers consider child's preferences, food availability, accessibility, and affordability when making food choices for their child.³¹ These reasons for sugar consumption are important to note for future studies that aim to design interventions limiting sugar consumption and to guide caregivers' healthy food choices for children.

This study's primary limitation was that caregivers were recruited at a dental clinic where the majority of patients were already at high risk for caries; therefore, no associations could be made whether caregivers' knowledge had a direct effect on the child's dental health. Future studies should be applied in a community setting and explore the association between caregivers' knowledge and child's actual dental outcome.

This study was innovative in that, unlike many previous studies, it examined caregivers' knowledge specific to the role of sugar (including food/drink items) in caries development and its association to their intended and actual control on their child's sugar intake.

Although caregivers showed some knowledge of the role of sugar in causing caries, they still lack knowledge in other important aspects of caries etiology, such as preventive factors and sugar composition in starchy food. These findings suggest the need to educate caregivers in preventive aspects of caries and the role of starchy food in caries development. Caregivers play a critical role in child's food preferences and intake.^{32–34} It is crucial to provide adequate education to caregivers and other family members so that they can make knowledgeable decisions about food choices for their child and be more willing to control their child's sugar intake and prevent caries.

Conclusions

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

1. Caregivers with higher knowledge of sugar had greater intention to control their child's fruit juice consumption and greater actual control over their child's sweet snacks, soft drinks, and fruit juice consumption.
2. Other family members allowing sugar snacks/drinks was considered the top barrier in controlling children's sugar consumption, indicating the need for better education of all family members.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.**BACKGROUND CHARACTERISTICS OF CHILDREN, CAREGIVERS AND DENTAL STUDENTS**

Characteristics	Child (N=53)*	Caregivers (N=55)	Dental students (N=62)
Age (years)			
Mean±(SD) [†]	9.9±3.7	39.9±9.8	29.4±3.8
Gender: N (%)			
Female	20 (38)	46 (84)	41 (67)
Male	33 (62)	9 (16)	20 (33)
Race: N (%)			
Asian	15 (30)	16 (30)	34 (56)
Black/African American	8 (16)	8 (15)	2 (3)
White/Caucasian	23 (46)	28 (52)	22 (36)
Other	4 (8)	2 (3)	3 (5)
Ethnicity: N (%)			
Hispanic or Latino	17 (34)	21 (40)	6 (9)
Insurance: N (%)			
State Medicaid	52 (98)	-	-
Private insurance	1 (2)		
Visit type: N (%)			
Examination	35 (66)	-	-
Restoration	18 (34)		
Caries risk assessment: N (%)			
Low	2 (4)	-	-
Moderate	5 (10)		
High	45 (86)		
Relationship to child: N (%)			
Mother		41 (75)	
Father	-	9 (16)	-
Grandparent		3 (5)	
Other		2 (4)	
Employment: N (%)			
Working part-time		6 (11)	
Working full-time	-	20 (38)	-
Unemployed		26 (49)	
Other		1 (2)	
Family annual income: N (%)			
No income	-	3 (6)	-

Characteristics	Child (N=53)*	Caregivers (N=55)	Dental students (N=62)
<\$50,000		39 (81)	
>\$50,000		6 (13)	
Highest education: N (%)			
High school graduate		15 (28)	
College degree	-	31 (59)	-
Graduate or advanced degree		6 (11)	
Other		1 (2)	

* Two caregivers did not provide information on their child and, therefore, their children's information was not included in the data.

† SD=standard deviation

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Table 2.

CAREGIVERS' AND DENTAL STUDENTS' KNOWLEDGE OF SUGAR

	Caregivers correct (N=55) N (%)	Dental students correct (N=62) N (%)	P-value *
I. Knowledge statements: Five answer choices (strongly agree, agree, disagree, strongly disagree, not sure) were given.			
1. Sugar is one of the most important causes of dental caries.	55 (100)	60 (97)	0.497
2. Acid attacks triggered by sugar consumptions demineralize tooth and increase dental caries risk.	50 (91)	62 (100)	0.021 **
3. The more frequently you consume foods or drinks with sugar, the more likely you will have caries.	43 (78)	61 (98)	0.001 **
4. The amount of sugar consumed is less important than the frequency of sugar consumed and how soon it is cleared from the mouth.	36 (66)	56 (90)	0.001 **
5. With frequent sugar consumption, it's hard to completely prevent caries—even if you floss and brush teeth with fluoride toothpaste twice a day.	41 (75)	49 (79)	0.662
6. Both adults and children should reduce the intake of free sugars to less than 10% of total energy intake.	44 (80)	45 (73)	0.391
7. Frequent consumption of starchy foods increases caries risk.	33 (60)	56 (90)	<0.001 **
8. Eating calcium-rich foods (e.g., cheese) immediately after sugar reduces caries risk.	15 (27)	40 (65)	<0.001 **
9. The greater the salivary flow the better the protection and the lower the risk for caries.	25 (46)	61 (98)	<0.001 **
Mean sum score±(SD) †	6.22±1.87	7.90±1.14	<0.001 **
II. Food/beverage knowledge: Three answer choices (yes, no, not sure) were given for question “Does this food/drink contain high content of sugar/carbohydrate, and therefore, have high risk to cause caries?”			
1. Fruits	24 (44)	50 (81)	<0.001 **
2. Sweets/candies	51 (93)	61 (98)	0.186
3. Soft drinks (regular Coke and Sprite)	51 (93)	62 (100)	0.046 **
4. Juices	46 (84)	61 (98)	0.006
5. Cereals	31 (56)	55 (89)	<0.001 **
6. Rice	13 (24)	44 (71)	<0.001 **
7. Pasta	14 (26)	43 (69)	<0.001 **
8. Potatoes	14 (26)	38 (61)	<0.001 **
Mean sum score±(SD) †	4.44±2.07	6.68±1.70	<0.001 **

	Caregivers correct (N=55) N (%)	Dental students correct (N=62) N (%)	P-value*
Knowledge statements and food/beverage total mean sum score \pm (SD) [†]	10.65 \pm 3.37	14.58 \pm 2.14	<0.001**

* P-value: Fisher's exact test was used to compare caregivers' and dental students' knowledge scores for individual questions. Wilcoxon rank-sum test was used to compare caregivers' and dental students' sum scores per subsection and for the entire knowledge questionnaire.

** Significant at $\alpha=0.05$.

[†]SD=standard deviation

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Table 3.

CAREGIVERS' INTENDED AND ACTUAL CONTROL OVER CHILD'S SUGAR CONSUMPTION

	Response	Lower knowledge caregiver group (N=28) N (%)	Higher knowledge caregiver group (N=27) N (%)	P-value*	Odds ratio for intention to control (95% CI [†])
Intention to control child's sugar consumption					
1. I would allow my child to have sweet snacks (candies, chocolates, etc.) when my child asks for it next time.	No	12 (43)	17 (64)	0.236	2.34 (0.57, 9.52)
2. I would allow my child to have soft drinks (Coke, Sprite, etc.) when my child asks for it next time.	No	15 (54)	19 (70)	0.503	1.67 (0.37, 7.51)
3. I would allow my child to drink fruit juices when my child asks for it next time.	No	4 (14)	13 (48)	0.037**	6.60 (1.13, 38.72)
4. Subjective norm: Most people I know well think it's okay to have a child eat or drink things with sugar.	No	8 (29)	8 (30)	0.678	0.75 (0.19, 2.96)
5. Perceived behavioral control: There is very little I can do to make sure that my child does not eat or drink things with sugar.	No	18 (64)	13 (48)	0.460	0.59 (0.14, 2.41)
6. Perceived behavioral control: It is hard for me to stop my child from eating or drinking anything with sugar.	No	21 (75)	10 (37)	0.049**	0.23 (0.06, 0.99)
Mean sum score±(SD) [‡]		2.86±1.65	2.89±2.17	0.951	
Actual control over child's sugar consumption					
1. How often do you say "No" to your child when your child asks for sweet snacks (chocolate, candies, etc.)?	Never Sometimes Always	4 (14) 6 (21) 18 (64)	0 (0) 9 (33) 18 (67)	0.046**	
2. How often do you say "No" to your child when your child asks for soft drinks?	Never Sometimes Always	4 (14) 9 (32) 15 (54)	2 (7) 6 (22) 19 (70)	0.034	
3. How often do you say "No" to your child when your child asks for juices?	Never Sometimes Always	7 (25) 15 (54) 6 (21)	2 (7) 11 (41) 14 (52)	0.056	
Mean sum score±(SD) [‡]		3.86±1.69	4.74±1.32	0.017**	
4. Out of 10 times your child would ask for sweet snacks (chocolate, candies, etc.), how many times would you say "No"?		6.48±2.23	6.82±2.63	0.280	
5. Out of 10 times your child would ask for soft drinks, how many times would you say "No"?		6.63±2.56	7.20±2.65	0.134	
6. Out of 10 times your child would ask for juices, how many times would you say "No"?		4.30±2.36	6.37±2.56	0.003**	

	Response	Lower knowledge caregiver group (N=28) N (%)	Higher knowledge caregiver group (N=27) N (%)	P-value*	Odds ratio for intention to control (95% CI) [†]
Mean sum score±(SD) [‡]		5.80±1.93	6.86±2.42	0.025**	

* P-value: Logistic regression was used to compare lower and higher knowledge caregiver groups' intention and actual control for individual questions while controlling for caregivers' gender, education, race, and family income. A log-linear model was used to compare frequency of lower and higher knowledge caregiver groups' actual control (out of 10 times) of children's request while controlling for caregivers' gender, education, race, and family income.

** Significant at $\alpha=0.05$.

[†] CI=confidence interval

[‡] SD=standard deviation

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