

Determining the Prevalence and Characteristics of Feeding Disorders within a
University Pediatric Dental Clinic

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Abstract

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Pediatric Dentistry

Purpose: To determine the prevalence of feeding disorders and its relationship with health status in 2-7 years old children (n=200) seen at the UW Center for Pediatric Dentistry (UWCPD). Additionally, we aim to evaluate children's and parents' meal time behavior using the Behavioral Pediatrics Feeding Assessment Scale (BPFAS). Finally, we will determine if there is an association between feeding disorders and presence and severity of dental caries. The BPFAS is a validated and calibrated survey used to identify the presence of feeding disorders.

Methods: Descriptive statistics (means, standard deviations, counts, and percentages) will be calculated for demographic and BPFAS scores. The association between the presence and severity of caries and feeding disorders will be analyzed using logistic regression after adjusting for possible confounders. Significance will be set to $\alpha = 0.05$.

Results: The sample was composed of 200 subjects with a mean age of 5 years old and 50.5% were female. We found the presence of a feeding disorder in our study sample was 8%. There was a significant association between the presence of a feeding disorder and being Black or African American ($p=0.040$). There was an association found between being first in birth order and having a feeding disorder ($p=0.026$). Of the group with a feeding disorder 62.5% of them were first born. Most of the children were healthy (ASA I 84.5%) and there was no association found between ASA classification and

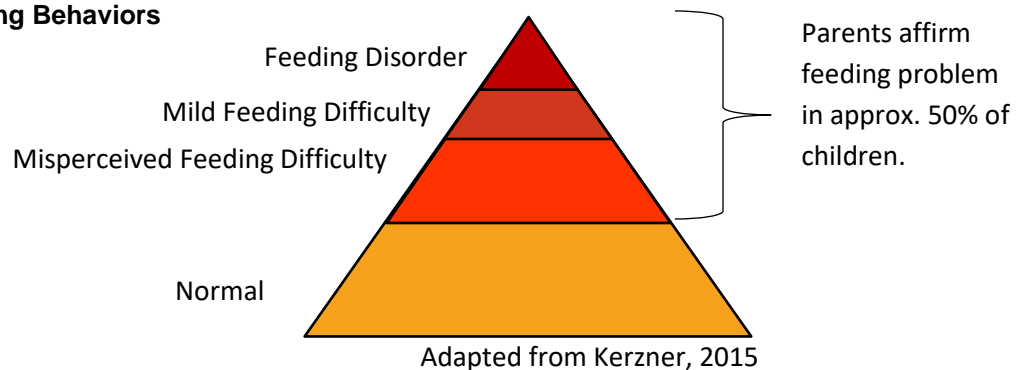
presence of feeding disorder. There was also no association between feeding disorders and presence and severity of dental caries.

Conclusions: Ultimately, we demonstrated an 8% prevalence of feeding disorders within the dental clinic. There was no significant relationship between feeding disorder and health status though our study population only had approximately 3% with special health care needs. Though feeding disorders were not associated with dental caries, the pediatric dentist has an obligation to treat the whole patient and should aid pediatrician in screening for feeding disorders among their patient population.

I. BACKGROUND AND IMPORTANCE OF STUDY

Feeding difficulties in children are a common cause of stress among parents with 50% of mothers reporting that at least one of their children eats poorly. This implies that approximately 20%-30% of children have some form of feeding difficulty (Kerzner, 2015). Feeding difficulty is a broad term that is used to describe a mild or moderate type of feeding issue (Saarilehto, 2004). A feeding difficulty could be excessively prolonged mealtimes, food refusal or a general disinterest in eating. Feeding difficulties are common in children with 21% of parents reporting their 4-5 year old child are picky eaters (Jacobi, 2003). All feeding difficulties require the attention of primary care physicians, though many are transient (Bryant, 2010). If a parent feels, his or her child has a feeding issue, that awareness in and of itself would connote a feeding difficulty, even if the parent misperceives the problem. The most common misperceived feeding difficulty is a parent with a genetically smaller child with a corresponding small appetite who is identified as a poor eater despite appropriate weight gain for his or her size (Saarilehto, 2004). Misperceived feeding difficulties can lead to actual feeding difficulties if parents adopt inappropriate feeding practices (Kerzner, 2015). If the child's feeding difficulty is severe and interferes with physical growth and/or emotional development, the child may be classified as having a feeding disorder (Eddy 2014). This can be irrespective of whether there is detrimental weight gain or loss. (Figure 1)

Figure 1. Pyramid of Feeding Behaviors

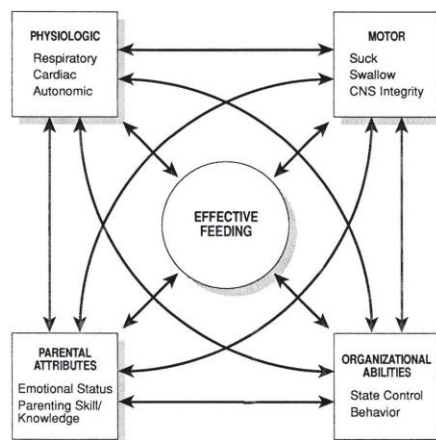


Classification systems of feeding disorders are non-standardized and vary greatly among the medical disciplines that are treating patients. In 2013, The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) added to its classification list of feeding disorders of early childhood to

include “avoidant/restrictive food intake disorder” (ARFID). ARFID is broken into three main feeding disorder categories: 1. lack of interest in food 2. selective eating due to sensory issues 3. fear of eating. These categories include a large subset of childhood feeding disorders, but do little to help classify medical or parental variations that contribute to the feeding disorder. Professionals from the pediatric medical community recognize that there are feeding disorders based on organic conditions such as congenital anomalies, congenital heart disease, prematurity, gastrointestinal defects, and dysphagia (Kedesky, 1998). Professionals acknowledge that feeding disorders also can have components of a relational disorder between the feeder and the child, even when medical factors are present. The caregivers’ feeding and parenting styles must therefore be incorporated into the diagnosis of these problems (Davies, 2006). The large variation of descriptions and labeling of feeding disorders have also caused confusion over how to treat children with these disorders (Chatoor, 2004).

It is important to remember that any feeding disorder is complex and is best represented as a multifactorial system. Many classification systems try to fit patients with feeding disorders in to categorical boxes such as fear of eating due to esophagitis. Though this child may have many other reasons, they are having difficulty feeding, such as a controlling parent or an anatomic issue that is contributing to the feeding disorder. Effective feeding is a byproduct of physiologic, motor, organizational abilities and parental attributes (Figure 3: Wolf & Glass, 1991). Any breakdown in any component of the system will lead to diminished feeding ability and a potential feeding disorder.

Figure 3: Multifactorial Complexity of Effective Feeding:



Diagnostic models of feeding disorders have been developed to simplify their multifactorial nature by breaking them into definitive diagnosis and treatment modalities. The Chatoor model breaks feeding disorders of infants, toddlers and young children into six categories (Figure 4). Each category has a detailed diagnostic criteria, clinical presentation and effective treatment method. This system helps to differentiate between severe feeding disorders and milder transient feeding difficulties. Though it is not all-inclusive it covers the most commonly seen feeding disorders associated with behavioral symptoms (Chatoor, 2004).

Figure 4: Chatoor Feeding Disorder Classifications:

1. **State regulation:** Infant has difficulty maintaining a state of calm alertness necessary to feed.
2. **Infantile anorexia:** Child refused to eat adequate amounts of food for 1 month.
3. **Concurrent medical condition:** Child has concurrent medical condition that contributes to feeding disorder.
4. **Posttraumatic:** Caused by traumatic event or repeated traumatic events.
5. **Sensory food aversion:** Refuses to eat specific foods with specific tastes, textures, smells, or appearances.
6. **Reciprocity:** Caused by neglect or disinterest by parent.

Given the multifactorial nature of feeding disorders, diagnosis is a complicated process. Differentiating between a true feeding disorder and a problematic but typical child feeding behavior takes skill and comprehensive evaluation. Considering the high prevalence of parental reported feeding difficulties, it may be easy for a clinician to dismiss the concern as a common childhood problem. While feeding difficulties may be common, they are not harmless. Selective eating in children is associated with impairment in physical, emotional, and social domains (Dubois 2007). Both moderate and severe levels of selective eating were associated with psychopathological symptoms such as anxiety, depression, and attention-deficit/hyperactivity disorder (Segovia, 2015). Feeding problems in early childhood are often a predictor of later eating disorders in adolescence or adulthood (Kotler, 2001). Parents may seek help from

medical professionals when they suspect their child may be having some form of feeding difficulty. A recent study revealed that 189 of 300 (63%) of parents of selective eaters reported health care providers did not address their concerns (Segovia, 2015). This disconnect is perceived to be due to the lack of understanding about the importance of identifying feeding disorders, and the knowledge of when to refer for treatment.

There are several parent administered feeding questionnaires available, which focus on identifying children with feeding difficulties. The Behavioral Pediatric Feedings Assessment Scale (BPFAS) (Crist, 2001) has been shown to be the most psychometrically robust parent questionnaire for measuring feeding disorders in young children (Sanchez, 2015). The BPFAS survey consists of 35 questions, divided into 25 child behavior questions, and 10 parent feeding practice questions. Parents rate the child and his or her behavior on a 5-point Likert scale and then answer if the behavior is a problem for the parent. The results are calculated into four scores - two for the child's behavior and two for the parent's behavior. Validated cut off scores have been identified which have been shown to identify a clinical sample with an identified feeding disorder from a nonclinical sample with 87% accuracy (Dovey, 2013). In addition, the BPFAS examines the mealtime habits of families and identifies common feeding problems.

The pediatric dentist has a unique opportunity to identify patients at risk for having feeding disorders and offer support to their families. Dietary counseling is a major component to a comprehensive dental exam, and patients look to their dentist to deliver dietary advice that will improve oral health. Thus, feeding difficulties become a component of dental health in addition to the overall health of the child. There is currently limited information available to dentists regarding feeding disorders in young children. There are no recommendations for pediatric dentists which aid in screening and identifying patients with potential feeding disorders. To our knowledge, no studies have examined childhood feeding disorders within the dental clinic. The goal of this study is to determine the prevalence and characteristics of feeding disorders present within a University based pediatric dental clinic. Additional objectives are to evaluate the mealtime behavior of children and parents and parental feelings related to their child's feeding

disorders. We are also interested in seeing if there is a correlation between feeding disorders, presences of dental caries and severity of dental caries.

PRIMARY AIMS:

1. Determine the prevalence of feeding disorders present in children seen at the University of Washington Center for Pediatric Dentistry (UWCPD) using the Behavioral Pediatric Feeding Assessment Scale (BPFAS). We will investigate the relationship between health status and feeding disorders.
2. Evaluate the mealtime behavior of children with feeding disorders and their parents seen at UWCPD using the BPFAS.
3. Assess the association between feeding disorders and presence and severity of dental caries. We will obtain the mean number of decay, missing and filled teeth from dental charts and determine associations with feeding disorders.

II. METHODS

This study was approved by the University of Washington Institutional Review Board (IRB) (#52642). This cross sectional study collected data from a validated survey instrument and from patient's electronic health records at a university based pediatric dental clinic; the University of Washington Center for Pediatric Dentistry (UWCPD). The UWCPD has a diverse patient base with a wide range of ethnic backgrounds and health care needs. The survey consisted of demographic information and the BPFAS survey (Appendix A). In an effort to collect a random sample of patients, the survey was administered on differing days of the week. A trained research assistant administered the survey from December 2016 to February 2017. It was determined through power calculation that 200-300 surveys would need to be collected ($\alpha=0.05$ power = 80%) A total of 207 surveys were collected with 7 left out of the study due to incomplete survey or incomplete consent for a total of 200 surveys included in the study.

SELECTION CRITERIA

Only patients from 20-85 months of age were eligible for participation, as the BPFAS has been validated for this age group (Dovey, 2013). One child per family and the youngest child in the family present at the dental appointment were selected to avoid bias for selection. Parent/guardians were at least 18 years old, speak and read English at a 7th grade level or higher, and had been living with the child for the previous 6 months.

ENROLLMENT:

Parents of eligible children were approached on their dental appointment day by a calibrated research team member who explained the purpose of the research study. Parent/child dyads interested in participating in the study completed an informed consent and a HIPPA authorization form. A "de-identified" study ID number was given to the participant and recorded on the survey. On a separate secured computer, the patient's medical health record number was recorded with the study ID number for later reference. Participants then completed both the survey and demographic collection form (Appendix A). After the survey was completed, the research team member collected weight, height and ask the participant if they have any further questions. All surveys were scored later to allow the research assistant

to collect the maximum number of surveys during clinic hours. The results of the survey were not shared with the participants due to our limited ability to have a healthcare provider present trained in counseling families about suspected feeding disorders. If participants were concerned about potential feeding issues we recommended that they contact their primary care physician to help them identify a potential feeding issue who would be able to send an appropriate referral.

DATA COLLECTION:

Demographic variables that were collected from the survey include age of parent/participant, relationship to child, marital status, ethnic background of participant and child, level of schooling, number of dependents, gestational age less than 37 weeks, birth order, past history of feeding therapy, past diagnosis of feeding or eating disorder. Data collected from dental electronic records (AxiUm software) included known medical diagnosis, age of child, sex of child, insurance status, and decayed, missing, and filled teeth (primary and permanent dentition). Body mass index (BMI) and percentiles based on age and gender were recorded using the CDC growth charts. ASA classification was determined based on medical diagnosis and by using the American Society of Anesthesiologists Classification system. All data collected was entered in to REDCap© software and exported to STATA 13 for data analysis.

BPFAS SCORING:

The BPFAS contains two main sections; 25 child related questions and 10 parent related questions. The first 25 questions of the BPFAS produce 2 scores; the child frequency score, obtained using the 5 point Likert scale, and the child problem score, obtained by adding the number of yes answers to the behavior causing a problem for the parent. The last 10 questions of the BPFAS produce an additional 2 scores; parent frequency score, obtained from the 5 point Likert scale and parent problem score obtained by adding up the number of yes responses to the behavior being a problem for the parent. Our study used the same critical cut off values identified in a validation study for the BPFAS survey to identify children with potential feeding difficulties (Dovey, 2015). The clinical cut off values utilized included values above 61 for the Child Frequency score, 6 for the Child Problem scores, 20 for the Parent Frequency score, and above 2 for the Parent Problem score (Dovey, 2015). Higher scores in each of the

4 subscales mean a higher level of feeding difficulty. Ultimately the child frequency score was used as delineation between feeding disorder in an effort to include the highest level of accuracy and increase our confidence in identify those children with the most severe feeding disorders.

DATA ANALYSIS:

Descriptive statistics (means, standard deviations, counts, and percentages) were used to calculate for all variables. Means and standard deviations were used to rank highest frequency scores for all 4 sections of the BPFAS. Associations between parent and child characteristics and feeding disorder were analyzed with Chi square and Fischer Exact test. Unadjusted and adjusted logistic regression models were used to assess the impact of feeding disorders and the presence of dental caries. Unadjusted and adjusted Poisson regression models were used to assess the impact of feeding disorders and the severity of dental caries. Significance was set at 0.05. All analysis was performed with Stata 13 for Windows (StataCorp LP, College Station, Texas, USA).

III. RESULTS:

During the study interval of December 2016 to February 2017 207 subjects were screened for eligibility and surveys were collected. The final sample was composed of 200 subjects with a mean age of 5 years old and 50.5% were female. There were 28 (14%) of the subjects born at 37 weeks or less and 12 (6.1%) having received feeding therapy in the past. Gestational age and history of feeding therapy were not associated with feed disorders. The majority of the subjects were White (64%) followed by Asian (24.5%) and Black or African American (13%). There was a significant association between the presence of a feeding disorder and being Black or African American ($p=0.040$). Twenty-five percent of the total group found to have a feeding disorder were Black or African American. Child subjects were evenly disbursed in birth order with 35% first born, 39.5% second born and 25.5% third or later born. There was an association found between being first in birth order and having a feeding disorder ($p=0.026$). Of the group with a feeding disorder 62.5% of them were first born. When asked about previous diagnosis of an eating disorder most of the subjects had no formal diagnosis (96.5%). There was a significant association between subjects testing as having a feeding disorder, according to the BPFAS survey, and not having a formal diagnosis of an eating disorder ($p=0.019$). Most of the children were healthy (ASA I 84.5%) and there was no association found between ASA classification and presence of feeding disorder. Most of the subjects had a BMI of 5%-85% (139 or 68.5%) with a similar distribution of children with a BMI of 5% or less (12 or 7.5%), BMI of 86%-94% (20 or 10%), and BMI over 95% (26 or 13%). The majority of the children had no decayed, missing or filled (DMFT) permanent teeth (97.5%) though 121 (60.5%) had 3 or more primary teeth that had decay, were missing or had fillings (dmft). There was no association between BMI percentile, DFMT or dmft and feeding disorders (Table 1).

Table 1: Descriptive Summary of Enrolled Children

	Feeding Disorder			
	Total N (%)	Yes N (%)	No N (%)	p- value
Total:	200	16 (8%)	184 (92%)	
Characteristics of child				
Sex				
Female Sex	101 (50.5%)	7 (44%)	94 (51%)	0.573
<i>Categorical Age in months</i>				
24-54 months	79 (39.5%)	4 (25%)	75 (40.8%)	0.290

55-86 months	121 (60.5%)	12 (75%)	109 (59.2%)	
<i>Gestational age</i>				
37 weeks or less:	28 (14%)	2 (12.5%)	26 (14.1%)	0.934
Over 37 weeks	149 (74.5%)	10 (62.5%)	139 (75.5%)	
Missing	23 (11.5%)	3 (18.8%)	15 (8.2%)	
<i>Ethnic background</i>				
White	128 (64%)	7 (35%)	121 (51.7%)	0.103
Black or African American	26 (13%)	5 (25%)	21 (9.0%)	0.040
American Indian or Alaska Native	5 (2.5%)	0 (0%)	5 (2.1%)	
Asian	49 (24.5%)	5 (35%)	44 (18.8%)	0.547
Native Hawaiian or Other Pacific Islander	6 (3%)	0 (0%)	6 (2.6%)	
Hispanic or Latino	32 (16%)	2 (10%)	30 (12.8%)	1.0
Other:	8 (4%)	1 (5%)	7 (3.0%)	0.493
<i>Birth Order</i>				
1st	70 (35%)	10 (62.5%)	60 (32.6%)	0.026
2nd	79 (39.5%)	4 (25%)	75 (40.8%)	0.290
3 rd +	51 (25.5%)	2 (12.5%)	49 (26.6%)	0.368
<i>Received feeding therapy</i>				
Yes	12 (6.1%)	2 (12.5%)	10 (5.5%)	0.229
<i>Diagnosed with an eating disorder</i>				
None	192 (96.5%)	13 (81.3%)	179 (97.8%)	0.019
PICA	3 (1.5%)	1 (6.3%)	2 (1.1%)	0.222
Avoidant/Restrictive Food Intake Disorder	2 (1%)	0	2 (1.1%)	
Other	2 (1%)	2 (12.5%)	0	0.006
<i>ASA Classification</i>				
I	169 (84.5%)	14 (87.5%)	155 (84.2%)	1.0
II	25 (12.5%)	2 (12.5%)	23 (12.5%)	
III	6 (3%)	0	6 (3.3%)	
<i>BMI Percentile:</i>				
Below 5%	15 (7.5%)	1 (6.3%)	14 (7.6%)	1.0
5%-85%	139 (68.5%)	13 (81.3%)	126 (68.5%)	0.4
86%-94%	20 (10%)	1 (6.3%)	19 (10.3%)	1.0
95%+	26 (13%)	1 (6.3%)	25 (13.6%)	0.7
<i>DMFT:</i>				
0	195 (97.5%)	15 (93.8%)	180 (97.8%)	0.344
1-2	4 (2%)	1 (6.3%)	3 (1.6%)	0.285
3+	1 (0.5%)	0	1 (0.5%)	
<i>dmft</i>				
0	60 (30%)	5 (31.2%)	55 (29.9%)	1.0
1-2	19 (9.5%)	0 (0%)	19 (10.3%)	0.373
3+	121(60.5%)	11 (68.8%)	110(59.8%)	0.598

The mean age of the parent/guardian participants was 38.25 years old most of whom were mothers (70%) and married (70.2%). Over 62% of the parent/guardian participants were white (62.5%), followed by Asian (21%) and Hispanic or Latino (11%). There was a significant association between presence of feeding disorder and a parent/guardian ethnicity of Black or African American ($p=0.028$). Level of schooling of parent /guardian was evenly distributed with most having some college/vocational training or more (81.3%). Number of children/dependents living at home was evenly distributed with 24.5% having 1 dependent, 38% 2 dependents, and 21.5% 3 dependents. DSHS/Apple/Medicaid insurance was carried by the majority of participants (62.5%) followed by private insurance (35.5%) and no insurance (2.0%). There was no association between feeding disorder presence and insurance status (Table 2).

Table 2: Descriptive Summary of Enrolled Parent/Guardian Participants

Characteristics of Participant	Feeding Disorder			p-value
	Total N (%)	Yes N (%)	No N (%)	
<i>Categorical Participant age (in months)</i>				
18-20	1 (0.5%)	0	1 (.5%)	1.0
21-30	23 (11.5%)	1 (6.25%)	22 (12.0%)	0.700
31-40	83 (41.5%)	6 (37.5%)	77 (41.8%)	0.797
41+	93 (46.5%)	9 (56.3%)	84 (45.7%)	0.445
Continuous Participant Age: mean (SD)	38.25 (9.08)	38.5 (2.15)	38.23 (0.78)	0.925
<i>Relationship to child</i>				
Mother	140 (70%)	13 (81.3%)	127 (69%)	0.401
Father	44 (22%)	3 (18.8%)	41 (22.3%)	1.0
Other	16 (8%)	0	16 (8.7%)	
<i>Marital status</i>				
Married	139 (70.2%)	8 (50%)	131 (71.2%)	0.092
Single	44 (22.2%)	5 (31.3%)	39 (21.2%)	0.353
Divorced/Widowed	11 (5.5%)	0 (0%)	11 (6.0%)	
Other	4 (2.0%)	2 (12.5%)	2 (1.1%)	0.033
<i>Ethnic background</i>				
White	125 (62.5%)	6 (37.5%)	119 (64.7%)	0.056
Black or African American	16 (8.0%)	4 (25%)	12 (6.5%)	0.028
American Indian or Alaska Native	4 (2.0%)	0	4 (2.2%)	
Asian	42 (21%)	5 (31.2%)	37 (20.1%)	0.336
Native Hawaiian or Other Pacific Islander	4 (2.0%)	0	4 (2.2%)	
Hispanic or Latino	22 (11%)	2 (12.5%)	20 (10.9%)	0.691
Other	8 (4%)	1 (6.25%)	7 (3.8%)	0.493
<i>Level of schooling:</i>				

Less than high school	6 (3.0%)	1 (6.3%)	5 (2.7%)	0.398
High school/GED	32 (16%)	1 (6.3%)	31 (16.8%)	0.477
Some college or vocational training	53 (26.5%)	7 (43.8%)	46 (25%)	0.137
4-year college degree	53 (26.5%)	4 (25%)	49 (26.6%)	1.0
Graduate of professional schooling	56 (28%)	3 (18.8%)	53 (28.8%)	0.564
<i>Number of children/dependents at home:</i>				
1	49 (24.5%)	5 (31.3%)	44 (23.9%)	0.547
2	76 (38%)	5 (31.3%)	71 (38.6%)	0.789
3	43 (21.5%)	2 (12.5%)	41 (22.3%)	0.530
4+	32 (16.5%)	4 (25%)	28 (15.2%)	0.294
<i>Insurance status:</i>				
DSHS/Apple/Medicaid	125 (62.5%)	10 (62.5%)	115 (62.5%)	1.0
Private insurance	71 (35.5%)	6 (37.5%)	65 (35.3%)	1.0
No insurance	4 (2.0%)	0	4 (2.2%)	

We found the presence of a feeding disorder in our study sample was 8%. Child Problem and Parent Problem scores came out similar with results at 9%. Parent frequency score was the least similar to the rest of the scores with 17% testing above the cut off value of 20 or higher. This score subscale was identified in Dovey's study to be the least reliable of the four scoring subscales so its results were not included (Table 3).

Table 3: Prevalence of feeding disorders based on BPFAS

	Mean	Std. Dev.	Cut Off Score	% (n=200)
Feeding Disorder*	46.47	9.96	>61	8%
Child Problem	2	3.23	>6	9%
Parent Frequency	16.76	5.01	>20	17%
Parent Problem	0.6	1.43	>2	9%

* Feeding disorder is child frequency score from BPFAS.

The top five mealtime characteristics were taken from each of the 4 subscale sections of the BPFAS and are included in Table 4. Child frequency and parent frequency were ranked from highest to lowest mean score from the Likert scale. Where child problem and parent problem were ranked based on highest occurring number of yes answers. Three behaviors that were found most frequently in both the child frequency and child problems sections were, "Takes longer than 20 minutes to finish a meal", "Gets up from the table during meals", and "Will try new foods." The three common parent/guardian problems from the two parent/guardian sections were "If my child does not like what is being served, I make

something else”, “I coax my child to get him/her to take a bite”, and “I feel confident in my ability to manage my child’s behavior at mealtime.” (Table 4).

Table 4: Mealtime Characteristics According to BPFAS

Child Questions	Mean	SD
7. Takes longer than 20 minutes to finish a meal	2.98	1.20
13. Gets up from table during meal.	2.65	1.21
5. Will try new foods.	2.55	1.01
24. Tries to negotiate what s/he will eat and what s/he will not eat.	2.48	1.24
16. Eats vegetables.	2.24	1.13
Parent Questions	Mean	SD
31. If my child does not like what is being served, I make something else.	2.5	1.22
30. I feel confident in my ability to manage my child’s behavior at mealtime.	2.0	1.15
29. I feel confident my child gets enough to eat.	1.92	1.24
27. I coax my child to get him/her to take a bite.	1.85	1.06
33. I disagree with other adults (for example, my spouse the child’s grandparents) about how to feed my child.	1.65	0.99

Child Problem	Freq
13. Gets up from table during meal.	36
16. Eats vegetables.	36
7. Takes longer than 20 minutes to finish a meal	33
5. Will try new foods.	29
24. Tries to negotiate what s/he will eat and what s/he will not eat.	27
Parent Problem	Freq
26. I get frustrated and/or anxious when feeding my child.	17
27. I coax my child to get him/her to take a bite.	16
31. If my child does not like what is being served, I make something else.	16
29. I feel confident my child gets enough to eat.	14
30. I feel confident in my ability to manage my child’s behavior at mealtime.	14

Logistic regression tests were run to test the association between feeding disorders and the presence of dental caries unadjusted and adjusted for confounders (Table 5). Not having a feeding disorder was found to be protective against dental caries both unadjusted and adjusted for confounders though the association was found not to be significant ($p=0.910$ and $p=0.172$). We chose the following child variables to be confounders; age in months, gestational age, ethnic background, ASA classification, and BMI percentile. There was a slight increase in odds of having caries with a child 55-86 months old

(1.05 OR) which was found to be significant ($p < 0.001$). Though after adjusting for confounders the odds ratio reversed (0.11 OR) though there was still a significant association between these two variables ($p < 0.001$). The adjusted relationship between ASA III classification was shown to be protective against the presence of dental caries (0.08 OR) and was a significant association ($p = 0.003$). Parent/guardian variables that were confounders were level of schooling and insurance status. Having private insurance as compared to DSHS/Apple/Medicaid insurance was protective against dental caries both adjusted (0.29 OR) and unadjusted (0.24 OR). (Table 5)

Table 5: Logistic Regression Association of Study Variables and Presence of Dental Caries

Presence of Dental Caries (Y/N)

	Unadjusted OR (95% CI)	p- value	Overall p- value	Adjusted OR (95% CI)	P- value	Overall p- value
Feeding Disorder						
Yes	Ref			Ref		
No	0.94 (0.31, 2.83)	0.910		0.32 (0.06, 1.63)	0.172	
Characteristics of child						
Categorical Age in months:						
24-54 months:	Ref			Ref		
55-86 months:	1.05 (1.03, 1.08)	<0.001		0.11 (0.05, 0.23)	<0.001	
Gestational age:						
Over 37 weeks:	Ref			Ref		
37 weeks or less:	1.23 (0.50, 2.99)	0.655		0.90 (0.29, 2.81)	0.854	
Ethnic background:						
White:	0.68 (0.36, 1.31)	0.250		0.88 (0.27, 2.90)	0.835	
Black or African American:	3.74 (1.07, 13.0)	0.038		2.22 (0.51, 9.58)	0.285	
American Indian or Alaska Native	1.74 (0.19, 15.95)	0.626		0.61 (0.06, 5.90)	0.676	
Asian:	0.75 (0.38, 1.49)	0.411		1.25 (0.40, 3.92)	0.705	
Hispanic or Latino:	0.41 (0.10, 1.71)	0.222		1.04 (0.31, 3.53)	0.951	
Other:	1.08 (0.32, 3.60)	0.904		0.76 (0.21, 2.78)	0.679	
ASA Classification:			0.167			0.013
I:	Ref			Ref		
II:	1.33 (0.50, 3.54)	0.567		1.00 (0.31, 3.29)	0.100	
III:	0.21 (0.04, 1.19)	0.078		0.08 (0.01, 0.43)	0.003	
BMI Percentile:			0.582			0.900
Below 5%:	Ref			Ref		
5%-85%:	1.04 (0.34, 3.24)	0.940		0.67 (0.15, 3.09)	0.612	
86%-94%:	2 (0.43, 9.31)	0.377		0.98 (0.13, 7.37)	0.986	
95%+:	1.67 (0.41, 6.84)	0.478		0.91 (0.16, 5.07)	0.915	
Characteristics of Participant						
Level of schooling:			0.229			0.648

Less than high school	Ref			Ref		
High school/GED	2.7 (0.38, 19.02)	0.319		3.40 (0.52, 22.14)	0.200	
Some college or vocational training	1.39 (0.23, 8.50)	0.719		1.75 (0.30, 10.38)	0.536	
4-year college degree	1.06 (0.18, 6.39)	0.950		2.68 (0.41, 17.39)	0.301	
Graduate of professional schooling	0.77 (0.13, 4.60)	0.777		1.75 (0.27, 11.29)	0.555	
Insurance status:			<0.001			0.004
DSHS/Apple/Medicaid	Ref			Ref		
Private insurance	0.29 (0.15, 0.55)	<0.001		0.24 (0.10, 0.57)	<0.001	
No insurance	0.25 (2.58, 6.21)	0.177		0.16 (0.01, 4.26)	0.271	

Poisson regression tests were run to test the association between feeding disorders and the severity of dental caries unadjusted and adjusted for confounders (Table 6). Not having a feeding disorder was found to increase your risk of having caries both unadjusted and adjusted (1.35 RR and 1.20 RR) though this association was not found to be significant ($p=0.164$ and $p=0.572$). Child variables that were used as confounders were age in months, gestational age, ethnic background, ASA classification and BMI percentile. Subjects age 55-86 months had a slight increase in risk of dental caries unadjusted (1.02 RR, $p<0.001$). Though after adjusting for confounders the age became protective against caries (0.51 RR) and was still significant ($p<0.001$). Children that were Black or African American had an unadjusted and adjusted increased relative risk of severity of dental caries (1.77 RR and 1.61 RR) which was determined to be a significant association ($p<0.001$ and $p<0.005$). Parent/guardian variables used as confounders were level of schooling and insurance status. Having private insurance lowered your relative risk unadjusted (0.48 RR) and adjusted (0.45 RR) for severity of caries and was found to be significant ($p<0.001$). (Table 6).

Table 6: Poisson Regression Association of Study Variable and Severity of Dental Caries

Severity of Dental Caries

	Unadjusted RR (95% CI)	p-value	Overall p-value	Adjusted RR (95% CI)	P-value	Overall p-value
Feeding Disorder						
Yes	Ref			Ref		
No	1.35 (0.88, 2.07)	0.164		1.20 (0.64, 2.27)	0.572	
Characteristics of child						
Categorical Age in months:						
24-54 months:	Ref			Ref		
55-86 months:	1.02 (1.01, 1.02)	<0.001		0.51 (0.37, 0.72)	<0.001	

Gestational age:						
Over 37 weeks:	Ref			Ref		
37 weeks or less:	1.03 (0.69, 1.52)	0.895		0.87 (0.60, 1.26)	0.467	
Ethnic background:						
White:	0.81 (0.63, 1.04)	0.094		0.90 (0.69, 1.18)	0.456	
Black or African American:	1.77 (1.39, 2.26)	<0.001		1.61 (1.15, 2.25)	0.005	
American Indian or Alaska Native	1.57 (0.90, 2.71)	0.109		1.50 (0.88, 2.56)	0.137	
Asian:	0.77 (0.56, 1.06)	0.113		0.87 (0.62, 1.23)	0.437	
Hispanic or Latino:	1.06 (0.77, 1.46)	0.722		0.86 (0.61, 1.21)	0.397	
Other:	1.07 (0.68, 1.67)	0.779		0.75 (0.52, 1.08)	0.121	
ASA Classification:			0.446			0.614
I:	Ref			Ref		
II:	1.21 (0.86, 1.69)	0.266		0.94 (0.68, 1.30)	0.721	
III:	0.72 (0.23, 2.28)	0.576		0.52 (0.13, 2.06)	0.348	
BMI Percentile:			0.7716			0.267
Below 5%:	Ref			Ref		
5%-85%:	0.83 (0.54, 1.28)	0.396		0.70 (0.47, 1.04)	0.076	
86%-94%:	0.96 (0.56, 1.63)	0.875		0.75 (0.45, 1.25)	0.267	
95%+:	0.89 (0.53, 1.49)	0.659		0.65 (0.41, 1.01)	0.058	
Characteristics of Participant						
Level of schooling:			0.039			0.660
Less than high school	Ref			Ref		
High school/GED	1.75 (0.61, 5.07)	0.301		1.68 (0.71, 3.96)	0.237	
Some college or vocational training	1.59 (0.55, 4.61)	0.393		1.71 (0.71, 4.09)	0.229	
4-year college degree	1.13 (0.38, 3.33)	0.822		1.48 (0.61, 3.58)	0.387	
Graduate of professional schooling	1.14 (0.39, 3.36)	0.811		1.79 (0.74, 4.34)	0.198	
Insurance status:			<0.001			<0.001
DSHS/Apple/Medicaid	Ref			Ref		
Private insurance	0.48 (0.35, 0.66)	<0.001		0.45 (0.32, 0.63)	<0.001	
No insurance	0.47 (0.17, 1.29)	0.141		0.51 (0.20, 1.34)	0.172	

IV. DISCUSSION:

The purpose of this study was to determine the prevalence of feeding disorders in children seen at the UWCPD using the BPFAS feeding survey. Our secondary aims included investigating the relationship between health status and feeding disorders and examining the mealtime behaviors of children with feeding disorders and see what common problems parents were experiencing in the clinic. Lastly, we wanted to test the association between feeding disorders with presence and extent of dental caries.

Ultimately, we demonstrated an 8% prevalence of feeding disorders within the dental clinic. There was no significant relationship between feeding disorder and health status though our study population only had 6 subjects that were ASA class III and 25 that were ASA II. Only one of the ASA III subjects had a diagnosis that directly affected feeding which was presence of a gastrostomy tube for feeding. Our representation of children with special health care needs (approximately 3%) was limited and does not necessarily reflect the national estimate of children with special healthcare needs of 13%-19% (Bethell, 2007).

The BPFAS helped us collect information about common problems families are experiencing in our clinic. The three most common child mealtime behaviors that parents struggled with were; child that gets up from the table frequently during mealtime, child that takes longer than 20 minutes to eat, and child that refuses to try new foods. These three behaviors are characteristic of children that are selective eaters and that display general food refusal (Crist, 2001). Characteristics of children with sensory or textural food issues were not as prevalent within the clinic population. The parent-focused questions helped us see the general attitudes of parents struggling with a child with a feeding disorder. The three most common parent attitudes were; feeling frustrated and anxious about feeding their child; lacking confidence that their child is eating enough; and when their child refuses what is made they make them something else. These three questions paint a clear picture that parents of children with feeding disorders are frustrated, anxious and lack confidence in feeding their child. Ultimately, these parents end up giving into their child's desires which reinforces the poor feeding behavior.

For our final aims of determining if there is an association between feeding disorders and the presence and extent of dental caries we found no association both adjusted and unadjusted for confounders. This demonstrates that feeding difficulties may not have a significant impact on oral health and further studies would be appropriate to look at the diet and oral hygiene practices of those with feeding disorders. There was an association between having DSHS/Medicaid/Apple insurance and dental caries ($p < 0.001$). Children who have DSHS/Medicaid/Apple insurance are eligible for this type of insurance due to their family financial status. The findings of this study are in line with previous studies that have shown a relationship between lower socio-economic status and higher dental caries rates in children (Kenney, 2002).

The strengths of our study are that we used a well validated survey, the BPFAS, to determine the presence of subjects with feeding disorders. We were also successful at collecting a large sample of 200 subjects with good diversity in patient population. When comparing the range of scores with other studies that used the BPFAS our means and standard deviations were similar to previous studies..

Some limitations to our study include that it would have been preferable to have more subjects with special health care needs so our population matched the nation averages. Also, the surveys were taken during the dental visit some of which may have been stressful for the parent/guardian, which could have influenced the way they answered the questions. Being able to take the survey with little to no distractions may have made parents more likely to give answer more accurately.

Use of BFAS demonstrated that approximately 8% of our dental population has some form of feeding disorder; most of these feeding disorders were previously undiagnosed and untreated. Interestingly, the subjects with identified feeding disorders on the BFAS were typically developing children with normal weights and generally were healthy. Many of these families did not realize that their child may have a feeding disorder and they were unaware that there are options for treatment. As pediatric dentists we should heighten our awareness of the signs of feeding disorders among our patients. When asking about mealtime be aware if the child has a selective diet with a limited number of foods consumed. For example, does the parent say their child will only eat french fries, quesadillas and only drinks apple juice and will not drink water? Also be aware of parents attitudes when discussing mealtime. Does it sound like

the parent is frustrated or having a hard time having the child stay seated during mealtime? If a feeding disorder is suspected, the BPFAS can be administered to collect more tangible data. This information can be relayed to the primary care physician or included with a referral to a feeding therapist. Having an understanding of feeding disorders and difficulties will also help pediatric dentists to deliver constructive advice to parents who struggling with feeding their child. Further studies are required to evaluate the effectiveness of referral systems and dietary advice given to patients with feeding disorders in an effort to determine the best way to get help for those who struggle with feeding difficulties and disorders.

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APENDIX A: BPFAS and Demographic survey:

Part 1: Questions about child's eating habits and your feelings about meal time

Directions: Below are a series of questions that describe children's eating behaviors and parent's feelings about or strategies for dealing with these behaviors. Please: 1) circle the number describing how often the behavior currently occurs and 2) circle "yes" or "no" to indicate whether the behavior is currently a problem to you.

Child	Never Sometimes					Problem For You	
	Always					Yes	No
1. Eats fruits.	1	2	3	4	5	Yes	No
2. Has problems chewing food	1	2	3	4	5	Yes	No
3. Enjoys Eating	1	2	3	4	5	Yes	No
4. Chokes or gags at mealtime.	1	2	3	4	5	Yes	No
5. Will try new foods.	1	2	3	4	5	Yes	No
6. Eats meat and/or fish.	1	2	3	4	5	Yes	No
7. Takes longer than 20 minutes to finish a meal	1	2	3	4	5	Yes	No
8. Drinks milk.	1	2	3	4	5	Yes	No
9. Comes readily to mealtime.	1	2	3	4	5	Yes	No
10. Eats junky snack food but will not eat at mealtime.	1	2	3	4	5	Yes	No
11. Vomits just before, at, or just after mealtime.	1	2	3	4	5	Yes	No
12. Eats only ground, strained or soft food.	1	2	3	4	5	Yes	No
13. Gets up from table during meal.	1	2	3	4	5	Yes	No
14. Lets food sit in his/her mouth and does not swallow.	1	2	3	4	5	Yes	No
15. Whines or cries at feeding time.	1	2	3	4	5	Yes	No
16. Eats vegetables.	1	2	3	4	5	Yes	No
17. Tantrums at mealtimes.	1	2	3	4	5	Yes	No
18. Eats starches (for example, potato, noodles)	1	2	3	4	5	Yes	No
19. Has a poor appetite.	1	2	3	4	5	Yes	No
20. Spits out food.	1	2	3	4	5	Yes	No
21. Delays eating by talking.	1	2	3	4	5	Yes	No
22. Would rather drink than eat.	1	2	3	4	5	Yes	No
23. Refuses to eat meals but requests food immediately after the meal.	1	2	3	4	5	Yes	No
24. Tries to negotiate what s/he will eat and what s/he will not eat.	1	2	3	4	5	Yes	No
25. Has required supplemental tube feeds to maintain proper nutritional status.	1	2	3	4	5	Yes	No
Parent:							
26. I get frustrated and/or anxious when feeding my child.	1	2	3	4	5	Yes	No
27. I coax my child to get him/her to take a bite.	1	2	3	4	5	Yes	No
28. I use threats to get my child to eat.	1	2	3	4	5	Yes	No
29. I feel confident my child gets enough to eat.	1	2	3	4	5	Yes	No
30. I feel confident in my ability to manage my child's behavior at mealtime.	1	2	3	4	5	Yes	No
31. If my child does not like what is being served, I make something else.	1	2	3	4	5	Yes	No
32. When my child has refused to eat, I have put the food in his/her mouth by force if necessary.	1	2	3	4	5	Yes	No
33. I disagree with other adults (for example, my spouse the child's grandparents) about how to feed my child.	1	2	3	4	5	Yes	No
34. I feel my child's feeding pattern hurts his/her general health.	1	2	3	4	5	Yes	No
35. I get so angry with my child at mealtimes that it takes me a while to calm down after the meal.	1	2	3	4	5	Yes	No

(Crist, 2001)

Part 2: Questions about you and your child

1. What is your age in years? _____
2. What is your relationship to this child? Mother Father Other_____
3. What best describes your marital status?
 Married Single Divorced Widowed Other_____
4. Was your child born with a gestational age of less than 37 weeks?
Yes No Don't Know
5. Which of the following best describes you ethnical background? Check all that apply.
 White
 Black of African American
 American Indian or Alaska Native
 Asian
 Native Hawaiian or Other Pacific Islander
 Hispanic or Latino
 Other: _____
6. Which of the following best describes this child's racial background? Check all that apply.
 White
 Black or African American
 American Indian or Alaska Native
 Asian
 Native Hawaiian or Other Pacific Islander
 Hispanic or Latino
 Other: _____
7. What is the highest level of schooling you have completed?
 Less than high school
 High school/GED
 Some college of vocational training
 4-year college degree
 Graduate or professional schooling
8. How many total children/dependents are living in your home? _____
9. When was this child's birth order in relation to their siblings?
 1st 2nd 3rd 4th 5th 6th 7th 8th Other: _____
10. Did you ever seek help from a medical professional for feeding difficulties for this child after their first year of birth? Yes No
11. Has this child currently been diagnosed by a medical professional for any of the following eating disorders?
 PICA
 Rumination Disorder
 Anorexia Nervosa
 Avoidant/Restrictive Food Intake Disorder
 Bulimia Nervosa
 Binge Eating Disorder
 Other: _____

FOR RESEARCH PERSONNEL ONLY

ID# _____ Weight (kg): _____ Height (cm): _____

Part 3: To be completed by examiner

1. List top 3 medical DDX from Axium with feeding implications:

a. _____

b. _____

c. _____

2. Child's weight (kg): _____

3. Child's height (cm): _____ X .01 = (m): _____

4. Calculate BMI: kg: _____ / m²: _____ = _____

5. Date of Birth: _____ age (yr/months): _____

6. Date of dental treatment: _____

7. Insurance status:

DSHS/Apple/Medicaid

Private Insurance

No insurance (self-pay)

Other: _____

8. Sex: Male Female

9. DMFT: _____ dmft: _____