

Background

Cystic fibrosis (CF) is a chronic, progressive illness affecting primarily the respiratory and digestive systems. Bacteria such as *Staphylococcus aureus* and *Pseudomonas aeruginosa* are commonly cultured in the lungs of children with CF. The primary method of invasion is aerobic respiration, particularly the mouth. Children with CF have high calorie needs. Individuals with CF must have a low prevalence of dental caries and low risk of carcinogenicity in order to consume adequate diets. Build-up of plaque can contribute to new micro-organisms being introduced to the vulnerable lungs (Widmer, 2010).

Individuals with CF are more susceptible to oral plaque as they eat frequently to maintain sufficient energy levels. Plaque is rich in oral dextran—carbohydrates that are formed from the fermentation of sugars and polymers of glucose. Dextran-based polysaccharides contribute to the bacterial adhesion of tooth surfaces, and micro-organisms can be trapped in a long-time build-up of plaque (Moryl, 2015). CF and oral care can negatively influence each other in additional ways. Peckham et al. (2016). *Pseudomonas* and *legionella* can often be found in warm, moist areas including dental counters and the surfaces of dental tools and could be transmitted to people with CF. (Jensen et al., 1997).

The purpose of this study was to investigate oral care in children with CF and aspects of the relationship between their oral and respiratory care. I hypothesized that (I) children with CF whose parents report thinking that oral health is important would have better oral health (as measured by no oral pain), (II) there is a relationship between self-reported oral healthcare as measured by frequency of flossing, and CF health status, as measured by the number of hospitalizations in the last twelve months and (III) there is an association between CF symptoms and children's anxiety about going to the dentist.

Methods

Respondents comprised a convenience sample of the parents of children/teens with CF, at the University of Florida CF Center. Parents of all patients seen at the UF CF Center between the ages of 0-18 were considered eligible. This study was approved by the UF Institutional Review Board.

Descriptive Statistics were ran. A Lambda measure of association was utilized for analyzing dependencies between two categorical variables and how closely they were associated. Additionally, a Gamma measure of association was implemented when necessary to measure how closely two ordinal variables were associated.

The instruments used were: (1) Interview): The interview consisted of quantitative and qualitative (open ended) questions pertaining to the parent's view of the patient's oral care and to their views of their child's current oral health and respiratory health and (2) a Medical Record Data Form: a chart review form to collect objective data about the patients' lung function and hospitalizations.

Twenty-one parents and children were approached to participate in this study—thirteen accepted and eight declined. The majority of patients (8) were between 1-11 years of age and 5 patients were 12-18 years of age.



Results

(I) The relationship between patient's/parent's perceived importance of dental care and self-reported oral health status, as measured by having or not having current pain produced a weak association. As demonstrated by the low percentage reduction in error in predicting oral health status that was achieved by taking perceptions of dental care into account: the percentage reduction in error was only 20% ($\lambda = 0.20$).

(II) The relationship between self-reported oral care (as measured by flossing frequency) and number of hospitalizations in the last 12 months generates a weak negative, or inverse relationship with a $\gamma = -.25$.

(III) The relationship between the level of coughing each day as reported by the patient and anxiety felt before attending the dental appointment yielded a weak positive, or direct relationship with a $\gamma = .125$.

Table 1. Importance of Dental Care

Importance of Dental Care	Number of Participants
Not as important compared to other Healthcare Appointments	2
Moderately Important	2
Very Important	8
Extremely Important	1

Table 2. Current Oral pain as reported by the Patient

Current Oral Pain	Number of Participants
Yes	5
No	8

Table 3. Frequency of Flossing

Frequency of flossing	Number of participants
Less than daily	11
Once a day	1
Twice a day	1
Three times/day	0

Table 4. Number of Hospitalizations in 12 months

Number of Hospitalizations in 12 months	Number of participants
0	3
1	5
2	4
3	1

Table 5. Level of Anxiety of Child Prior to Visiting Dentist

How Anxious Child Is	Number of Participants
Not at all scared	9
A little scared	3
Very scared	1
Extremely scared	0

Table 6. Frequency that Child Visits the Dentist in an Average Year

Frequency of Visiting the Dentist	Number of Participants
Less than once a year	2
1-3 times a year	9
More than three times a year	2

Table 7. Reasons parent does not take child to dentist

Reason	Number of Participants
Hard to find a dentist	0
Hard to find dentist who takes my insurance	1
Don't have insurance and can't afford dentist	1

Discussion and Conclusions

Parents held a range of views on the importance of dental care. The majority of parents reported believing that dental care was "very important". Of interest, one third of parents reported that their children currently had some dental/oral pain. This surprising finding suggests that pediatric pulmonologists should routinely ask about oral pain and make every effort to refer children with CF for dental care.

(I) There was a moderate association between parents' views of the importance of dentistry and children's current oral pain. It may be that the more a parent believes in dental care, the more care the child will have, and the less pain he/she will have. There may be value in using parents' views of dental visits to guide predictions of oral pain in CF patients.

(II) We found an inverse relationship between flossing and number of hospitalizations in the last 12 months. If a patient flosses daily it may be that the patient also brushes his/her teeth daily leading to fewer caries and oral bacteria, which could affect the lungs. With a healthy mouth, a patient with CF can continue to intake the necessary calories and nutrients needed to be healthy and minimize the effects of CF. Patients who are consistent with oral care may also be consistent with pulmonary care at home, leading to fewer hospitalizations. Physicians should emphasize that good oral care at home may have a positive impact on CF symptomatology.

(III) We found a negative relationship between amount of coughing and anxiety about dental appointments. When receiving dental care the ability to breathe through the mouth is compromised. A child who has a high frequency of coughing may be nervous about attending dental visits.

Due to a small sample size, we were not able to demonstrate statistical significance and findings cannot be used to make a generalized prediction. Further studies with larger sample sizes should be considered.

The hypotheses of this studies were not confirmed, but weak associations were found. These must be viewed with caution due to small sample size and the possibility that parents gave responses they felt were socially desirable. Health professionals are advised to seriously consider the importance of oral care and in CF care and to recommend consistent dental care to patients.

References

- Jensen et al. (1997). Epidemiology of *Pseudomonas aeruginosa* in Cystic Fibrosis and the Possible Role of Contamination by Dental Equipment. *Journal of Hospital Infection*, 36,117-122.
- Moryl, Magdalena (2015). Extracellular Matrix as a Microbial Virulence Factor in the Development of Human Diseases. *Postepy Hig Med Dosw* (online), 69, 1485-1498.
- Peckham et al. (2016). Fungal Contamination of Nebulizer Devices Used by People with Cystic Fibrosis. *Journal of Cystic Fibrosis*, 15, 74-77.
- Widmer, Richard P. (2010). Oral Health of Children with Respiratory Diseases. *Paediatric Respiratory Reviews*; 11, 226-232.
- Pediatric Neurology [Digital image]. (2018). Retrieved March 11, 2018, from <https://childrens-hospital.lomalindahealth.org/our-services/pediatric-neurology>