

Dental Experience, Anxiety, and Oral Health in Low-income Chilean Children

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ABSTRACT

Purpose: The purpose of this study was to evaluate the relationship between early dental experiences and clinical indicators of oral health and dental anxiety upon admission to a comprehensive oral health program for six-year-old children in Chile.

Methods: One hundred twenty-nine six-year-old children were enrolled in the Recreo Family Health Center of the Municipality of San Miguel, Santiago, Chile. Oral health status was assessed based on the decayed, extracted, or filled teeth index, simplified oral hygiene index, and *Streptococcus mutans* score. Dental anxiety was assessed using the facial image scale and Frankl scale. Early dental experience was classified as: no previous dental visits; preventive control; restorative treatment; and emergency visit.

Results: Children who had previous experience of restorative treatment and emergency visits showed greater dental caries damage (Kruskal-Wallis, $P < .01$). Those who had emergency visits had the highest *S. mutans* score. There was no relationship between the type of prior dental experience and the anxiety level or oral hygiene index.

Conclusions: Invasive dental treatment resulted in greater susceptibility to dental caries damage; however, these experiences did not influence dental anxiety levels. (J Dent Child 2015;82(3):141-6)

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Dental caries is the most common chronic disease of childhood and is, therefore, of great importance to public health.¹ The caries prevalence in Chile is 17 percent in two-year-old toddlers, 50 percent in four-year-old children, and 70 percent in six-year-old children.² The severity of dental caries measured by the decayed, extracted, filled teeth index (def-t) is 0.5 in two-year-old children, 2.3 in four-

year-olds, and 3.7 in six-year-olds.² In 2011, public health service dental coverage was provided to 33 percent of two-year-old toddlers, 32 percent of four-year-old children, and 71 percent of six-year-old children.³

The American Academy of Pediatric Dentistry recommends that the first visit to the dentist should not take place later than 12 months of age.⁴ In a preventive dental visit, caregivers receive information and counseling about infant oral hygiene, fluoride, diet, oral habits, trauma prevention, and dental disease prevention. If the dental professional provides early intervention, the possibility of future caries may be reduced or eliminated.⁴⁻⁶

In this regard, the education of caregivers is essential, especially for mothers, as are dental visits during pregnancy and after the eruption of the child's first tooth.⁷ It is also recommended to provide preventive care to avoid restorative interventions in children. Composite restorations on primary teeth have a failure rate of approximately 20 percent within a period of 23.6 months due to multiple factors, such as fracture or restoration failure, secondary caries or complete loss of restoration, that make the care of young children a complex matter.⁷ While a preformed metal crown is a good option to use in primary teeth,⁸ it is not available in Chilean public health services. Therefore, early preventive measures, rather than restorative interventions, are preferred to maintain good dental health.⁹

Children's past dental experiences influence their anxiety or fear and early-onset dental fear is related to poor dental health.^{10,11} Some studies show that children with no caries or who never had dental treatment have significantly less fear than those with experience of operative dental treatment.¹² Invasive dental procedures and toothaches could be the most important causes of dental anxiety.¹²⁻¹⁴ People with dental anxiety tend to avoid going to the dentist, which may compromise their oral health.¹⁵ Dental fear in children is associated with avoidance of dental care, behavior problems, and more carious surfaces.¹⁶

In Chile, children can enroll in a comprehensive oral health program (COHP) at two years of age, although most enter the program at six years. The purpose of this study was to evaluate the relationship between early clinical experience, and clinical/microbiological indicators of oral health and dental anxiety status at entry into a COHP for six-year-old children in Chile.

METHODS

This was a cross-sectional study that was approved by the ethics committee of the School of Dentistry, University of Chile, Santiago, Chile. Participating children were receiving dental care at the Recreo Family Health

Center (CESFAM) in the municipality of San Miguel, in southern Santiago, with a population of 90,846 people, mostly of lower middle class. Informed consent was obtained from the caregivers and the children provided an assent to participate.

To calculate the sample size, the computer tool G*Power¹⁷ was used. Based on a comparison of dependent means, an estimated 0.05 alpha error, a statistical power of 0.95, and a medium (0.5) size effect were considered. The sample size calculated was 130 children.

The inclusion criteria were six-year-old Chilean children who attended a government oral health program, accompanied by a legal guardian, who could provide information regarding the child's previous dental care. The exclusion criteria were children who had cognitive deficits, neurological disorders, generalized anxiety disorder (identified in the medical record or reported by the caregiver), chronic systemic diseases and those who required advanced behavior management techniques.

The outcomes assessed were socioeconomic level, child dental anxiety, oral health status, and previous dental experience. All assessments were made at the time of admission to the comprehensive oral health program. The socioeconomic level was determined by asking caregivers about their monthly family income. If it was below the minimum monthly salary (approximately \$400 U.S.), they were identified as low income, according to the Chilean socioeconomic classification.¹⁸

To measure dental anxiety, the Facial Image Scale (FIS) and Frankl behavior rating scale (FBRS) were applied. The FIS, can be applied to three- to 18-year-old patients.¹⁹ It consists of a row of five faces ranging from great happiness to sadness; the child is asked to indicate which face most relates to how they feel at the time by a member of the research team prior to each dental session.

The FBRS²⁰ assesses the patient's behavior in the dental chair at the time of treatment. The dentist classifies the patient's behavior from definitely negative to definitely positive. This scale was used at the end of each session by the treating dentists. Both the FIS and FBRS were validated by the Delphi technique and expert consensus.²¹

To assess the oral health of the patient, the treating dentists were calibrated by the research team to determine the def-t index and simplified oral hygiene index (OHI-S).²² The def-t index and OHI-S inter-observer agreement was evaluated through a clinical examination of children. The indices were recorded by the dentist in the dental chair using dental mirror and probe at the time of the patient's entry in the COHP.

In addition to that, unstimulated saliva samples were collected in test tubes for five minutes by the researchers for microbiological analysis of the *Streptococcus mutans*

score in the microbiology laboratory of the School of Dentistry, University of Chile. The samples were cultured in yeast-extract cysteine sucrose bacitracin for 48 hours at 37 degrees Celsius. The *S. mutans* score was determined using a Zeiss stereomicroscope (Stemi 2000C, Zeiss, Edmund Optics Inc., Barrington, New Jersey, USA). The number of *S. mutans* considered indicative of high risk caries was 10^5 per ml of saliva.²³

The last dental visit the patient had was recorded through the report of the caregiver as emergency visit (EV), preventive control (PC), restorative treatment (RT), or no prior dental visit (NV). The PC group was defined by a first dental visit at two years of age when the child started in a COHP. This program includes clinical assessment, dental education, and tooth restoration if caries is detected. The RT group was defined by a dental session for caries treatment after two years of age for a child who did not participate in the COHP. The EV group was defined by a dental visit to address a dental emergency.

To analyze data, the Kruskal-Wallis test (non-normal distribution of data, Shapiro-Wilk $P < .05$) was used. Statistically significant differences were set at five percent ($P \leq .05$) and a 95 percent confidence interval.

RESULTS

The sample comprised 73 boys (57 percent) and 56 girls (43 percent) who presented a mean deft of 3.1 (± 2.89 standard deviation). Twenty two percent of the children attended the Recreo CESFAM for the first time, 52 percent attended for PCs, 15 percent children had RT sessions and 11 percent attended due to EV (Table 1). There were no statistically significant differences for any oral health or dental anxiety indicators between genders.

The NV and PC groups had lower def-t rates than the other children (Kruskal-Wallis = 23.32, $P < .001$; Table 1). However, the PC group presented a signifi-

cantly lower caries score than NV group, while the RT and EV groups had high scores (Kruskal Wallis = 14.079, $P = .003$). The highest percentage of caries-free children was in the PC group (69 percent), followed by the NV group (26 percent). In the EV group, a small percentage of caries-free children (six percent) was also observed. Regarding OHI-S, no differences were noted for the various types of dental experiences. The EV and RT groups showed a higher *S. mutans* score than the other two groups (Kruskal-Wallis = 10.8, $P > .01$; Table 2).

Most children had low levels of dental anxiety: 59 percent did not present any, and 35 percent had mild to moderate anxiety. The mean FIS score was 1.66, and the FBRS score was 3.17, both considered low dental anxiety levels. A moderate and inverse correlation was found between the two instruments (Spearman equals -0.35 , $P < .001$); in other words, the measurement of dental anxiety was consistent between the cognitive (FIS) and behavioral (FBRS) dimensions of dental anxiety. There was no relationship between the type of previous dental experience and anxiety measured by both the FIS and FBRS (Table 3).

Table 2. Streptococcus Mutans Score In Relation to Previous Dental Experience

Dental experience	Streptococcus mutans (CFU)
	Mean \pm (SD)
Preventive control	.77 x10 ⁵ \pm 2.3x10 ⁵
Restorative treatment	1.6 x10 ⁵ \pm 3.8x10 ⁵
No prior dental visit	.81 x10 ⁵ \pm 1.8x10 ⁵
Emergency visit	3.2 x10 ⁵ \pm 4.3x10 ⁵
Total	1.2 x10⁵\pm2.9x10⁵
P-value	>.01

Table 3. Dental Anxiety in Relation to Previous Dental Experience

Dental experience	Dental anxiety facial image scale	Frankl scale
	Mean \pm (SD)	Mean \pm (SD)
Preventive control	1.61 \pm 0.91	3.21 \pm 0.6
Restorative treatment	1.89 \pm 1.19	3.05 \pm 0.52
No prior dental visit	1.64 \pm 0.95	3.25 \pm 0.58
Emergency visit	1.66 \pm 0.89	3 \pm 0.37
Total	1.66\pm0.95	3.17\pm0.56
P-value	<.85	<.26

Table 1. Oral Health Status in Relation to Previous Dental Experience

Dental experience	Sample		def-t	Caries	OHI-S
	n	%	Mean \pm (SD)	Mean \pm (SD)	Mean \pm (SD)
Preventive control	67	52	2.32 \pm 2.53	1.89 \pm 2.18	1.31 \pm 0.69
Restorative treatment	19	15	5.42 \pm 2.81	3.68 \pm 2.86	1.31 \pm 0.6
No prior dental visit	28	22	2.53 \pm 2.92	2.53 \pm 2.92	1.46 \pm 0.73
Emergency visit	15	11	4.66 \pm 2.52	3.86 \pm 2.29	1.68 \pm 0.73
Total	129	100	3.1\pm2.89	2.52\pm2.57	1.38\pm0.69
P-value			<.001	.003	<.25

DISCUSSION

This study aimed to assess the relationship between early dental experience and clinical/microbiological indicators of oral health status and dental anxiety at the time of admission to a comprehensive oral health program for six-year children. Few children who attended due to EV had a def-t index of zero. The emergency in these cases was most likely not related to dental caries but to other causes, such as dental trauma. The PC group had a significantly lower prevalence of caries and comprised the highest percentage of children without caries. The *S. mutans* score showed that the RT and EP groups had a higher caries risk than PC and NV groups.

This result could be because a number of prevention strategies were used in PCs. During these visits the caregiver is educated in all areas of child care, including nutrition, oral health, hygiene, use of fluoride, deleterious habits, and dental care access in Chile.

Our results are consistent with those of Wennhall et al.,²⁴ who showed that an early start in oral health programs has significant benefits in the prevention of caries and that the more children attend dental exams, the lower the incidence of caries. In this study, children attending the dentist for the first time at six years of age did not exhibit significant differences in def-t scores compared to children who had previous PCs. However, there was a significant difference in the caries component, with higher values for the NV group (median: 2.53) than in the PC group (median: 1.89). Therefore, while the values for the def-t index were similar, children who never had a dental visit had poorer oral health than children who attended PCs, highlighting its importance.

Children who had restorative and emergency treatment had high def-t rates of 5.42 and 4.66, respectively. In addition to that, both groups had the highest number of caries present at to the start of the program (Table 1). This could be attributable to many factors. First, it has been observed that restorations in children are highly likely to fail after 23 months, either because of fractures, secondary caries, or complete loss of the restoration. This failure occurs mainly when the patient has high caries risk, which leads to less material adhesion to the tooth surface, significantly lowering restoration survival.⁶ This failure rate can explain the fact that children who had dental procedures in the past had a high caries rate when admitted into the comprehensive oral health care program, as the initial restorative procedure could have failed, allowing for the development of caries.

The second possible explanation is that no behavioral change related to dental care happened in these groups. Dental restorations are not enough to improve or maintain oral health. Education and specific prevention procedures (e.g., fluoride use and sealants) are important in caries incidence reduction.²⁵ In the RT and EV groups,

it is likely that, due to lack of time during dental visits, the children may not have received education about prevention. However, in this study, it was not possible to assess the quality of the preventive intervention because of the methodology, which is clearly a limitation.

The last possible factor that might explain the high def-t rate in children with previous EV or RT is that they may have experienced increased stress,¹² favoring the development of dental anxiety. Dental anxiety is related to poor dental health status.¹⁶ In some cases, children who have a high frequency of dental visits are less fearful than those without prior dental experience because the latter have more severe decay and probably more toothaches.^{10,26} Perhaps if the prior dental experience is not painful, it does not lead to dental anxiety development. Children who have multiple sessions with the dentist before undergoing RT have less anxiety about dental care than children with prior invasive dental experience.^{10,27}

Given the important relationship between dental anxiety and dental caries experience, it was expected that the same relationship would be observed in this study. However, although the levels of dental anxiety could actually explain differences in the def-t index among children who had preventive dental care and those who had RT, no differences were observed in dental anxiety at the start of COHP. In Chile, the first dental examination is usually performed at two years of age; perhaps if the worldwide trend to establish the first dental visit at one year of age was followed,²⁸ a greater number of children would be caries-free at six years, which is a health objective in Chile for 2020.

CONCLUSIONS

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

1. Prior dental experiences of six-year-old children were directly related to their dental caries experience.
2. Children who had preventive visits and those who had never seen a dentist before had low rates of dental caries.
3. The *Streptococcus mutans* score was higher for children who had a dental emergency visit.
4. The simplified oral hygiene index and dental anxiety levels showed no statistically significant differences among the types of previous dental experiences.

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