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RELATIONSHIP BETWEEN CHILDREN'S DECAYED, EXTRACTED AND FILLED TEETH INDEX (CEO-D) AND MATERNAL DECAYED, MISSING AND FILLED TEETH INDEX (DMFT- INDEX): PART 1

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Abstract: Caries affects people's quality of life and can cause occlusal mutilation. Due to its multifactorial nature, it is necessary to know its epidemiology and issues relating to its transmissibility and pathophysiological aspects. The aim of this study was therefore to assess the relationship between the caries experience of children enrolled at the Dom Virgilio CMEI and their mothers' oral health status, comparing the child's DMFT index with the maternal DMFT index. To this end, the clinical records of 102 children and 23 mothers were evaluated. The analysis revealed that the 102 children were aged between 0 and 6 years old, with an average CEO-d index of 1.3, while in the 1 to 2 age group the average CEO-d was 0.23 and the children aged between 5 and 6 had an average CEO-d value of 2.7. The records of the 23 mothers revealed that the average age was 41 years and 6 months and the average DMFT was 6.34. The sample of data on the 23 children and their mothers was divided into 2 groups: Group 1 children without caries (CEO-d=0) and maternal DMFT and Group 2 children with caries (CEO-d>0) and maternal DMFT. The data was subjected to the normality test and then submitted to the Mann-Whitney test, which showed that there was a statistically significant difference between children's CEO-d and maternal CPO-d in group 1, while in group 2 there was no statistically significant difference between children's CEO-d and maternal CPO-d. The data collected was inconclusive in terms of transmissibility, but suggests that the time factor has a direct effect on the experience of childhood caries, as well as mothers with active caries favoring greater colonization by streptococcus of the mutans and sobrinus group. It is necessary to develop studies with larger sample groups and with a methodology that favors the evaluation of other factors such as eating habits, hygiene and even genetic testing of the strains of cariogenic microorganisms found in mothers and their children.

Keywords: Caries. Epidemiology. Transmission. Prevention.

INTRODUCTION

Caries is a multifactorial, infectious, transmissible and diet-dependent disease that produces demineralization of dental structures, which can compromise enamel, dentin and/or cementum, progressing slowly until the tooth is completely destroyed (1, 2). Thus, caries results from a chronic process, which appears after some time of the presence and interaction of factors: time, susceptible tooth, diet and microorganisms (1), with the main etiological factor of caries being bacteria from the *Streptococcus mutans* and *Streptococcus sobrinus* groups (3).

According to Professor Philip D Marsh, caries occurs when the intraoral environment changes, altering the homeostasis of the resident oral microbiota and the host. As a result, if prolonged changes occur in this local environment, such as a decrease in salivary pH, the ingestion of carbohydrates and sugars, a decrease in salivary flow, and changes in the composition of the biofilm, this favors the growth of acidogenic and aciduric species, leading to the carious process (4).

Law et al 2007, in their study, evaluated the main factors involved in colonization by the groups of cariogenic bacteria, *Streptococcus mutans* (SM) and *Streptococcus sobrinus* (SS) in children and reported that this infection varies from 30% in edentulous children aged 3 months to over 80% in children aged 24 months. The authors also comment that SM is transmitted to children through their mothers, and that the risk of transmission increases in cases where mothers have high salivary levels of SM followed by frequent inoculations. Other factors that can interfere with MS colonization may be bacterial virulence, host-related and environmental issues. Thus, they concluded that the interaction between

these factors determines the success of MS colonization in children, and it is necessary to include timely control of the colonization of cariogenic bacteria in children's mouths (5).

Another study carried out in Brazilian nurseries showed that 81.25% of the children had *S. mutans* genotypes corresponding to those of their mothers, and that 83.33% had *S. sobrinus* genotypes similar to those of their mothers (3).

Klein et al (2004) stated that it is important to know the strains of SM because the virulence of microorganisms is variable and directly interferes with the evolution of the dental caries index, which can be more or less aggressive (6). Subramaniam (2019) also studied *Streptococcus mutans* strains in mother-child pairs with children affected by early childhood caries and revealed that less than 50% of mother-child pairs showed similarity in the distribution of *Streptococcus mutans* strains (7).

Finally, a study carried out by Latifi-Xhemajli et al (2021) on maternal-infant *Streptococcus mutans* infection, and the mutual interaction of potential risk factors that interfere in this relationship, concluded that maternal *Streptococcus mutans* infection in children was higher when mothers were infected with 10^3 *S. mutans/ml* of saliva. Thus, mothers with high levels of *S. mutans* increase the risk of their children acquiring *Streptococcus mutans* from the age of five months (8).

Thus, in order to prevent caries, it is necessary to develop strategies to control it, based on actions aimed at dietary practices that are favorable to preventing the disease, as well as preventing its transmission from mother to child (9), developing regular oral hygiene habits, rationalizing sugar consumption, using fluoride as a supplement and applying sealant to fissures.

Therefore, knowing the epidemiological reality of caries in a population is of paramount importance for planning preventive and curative actions aimed at preserving the individual's oral health. Epidemiological surveys have therefore become essential tools in the public health service (10,11).

In view of this reality, a university extension project was created (a partnership between the Faculty of Dentistry of the Integrated Group and the municipal health department of Campo Mourão) called: Projeto Sorridente (Smiling Project), whose main objective was to carry out an epidemiological survey of caries in a population of children assisted by the municipal children's education center CMEI Dom Virgílio, located in the Fortunato Perdoncini housing complex in Campo Mourão-PR, which evolved to include mothers since the literature demonstrates a relationship of transmission of caries from mother to children, with questions being raised about which factors would be implicated in the process of transmission and development of caries (12, 13, 14).

Therefore, in order to establish effective public health policies, precise information is needed on the epidemiology of the disease and its pathophysiology, taking into account its socio-cultural aspects (7, 15). The aim of this study was to evaluate the records of children assisted by the Dom Virgílio CMEI and their mothers' medical records in order to obtain the rate of decayed, extracted and filled teeth (CEO-d) in children and compare it with the rate of decayed, lost and filled teeth (CPO-d) in mothers. To relate children's caries experience to their mothers' oral health status. To understand the epidemiological picture of caries in the population evaluated and to develop caries control strategies.

METHOD

The literature review was carried out using the descriptors: caries, epidemiology, transmission and prevention using the pubmed, scielo and google academic databases. Articles were selected according to their relevance to the topic. Next, we consulted the records of the children and mothers who took part in the smiling project, extracting information on the CEO-d and CPO-d indices. It should be noted that all participants in the smiling extension project had previously signed an informed consent form (ICF) in order to be included in the project, when they were over 18 years old, and the children had their ICF signed by their parents or legal guardians. An assessment of the children's and their mothers' records revealed that of the 102 children, only 37 had their mothers' support for the outreach project. Of the 37 mothers, 14 did not have their odontograms filled in. The sample for this study therefore consisted of 23 pairs of records of children and their mothers. This sample was divided into two groups: Group 1: children without caries (CEO-d = 0) and their mothers, and Group 2: children with caries (CEO-d > 0) and their mothers. Once the CEO-d (child) and CPO-d (maternal) indices had been assessed, the data was subjected to the Shapiro-Wilk normality test, which revealed that the data was not normally distributed, and the Mann-Whitney statistical test was applied for the intra-group comparison relating CEO-d to CPO-d. The Mann-Whitney test was also used to compare the CEO-d indices of the children and the DMFT indices of the mothers in the two groups, in order to determine the sample similarity between the groups. The overall CEO-d index of the CMEI children was also subjected to statistical analysis considering the different age groups using the Kruskal-Wallis analysis. This study was registered on the Brazil Platform and approved by

the ethics committee of the platform and the Integrated University Center, CAAE: 81678223.0.0000.0092.

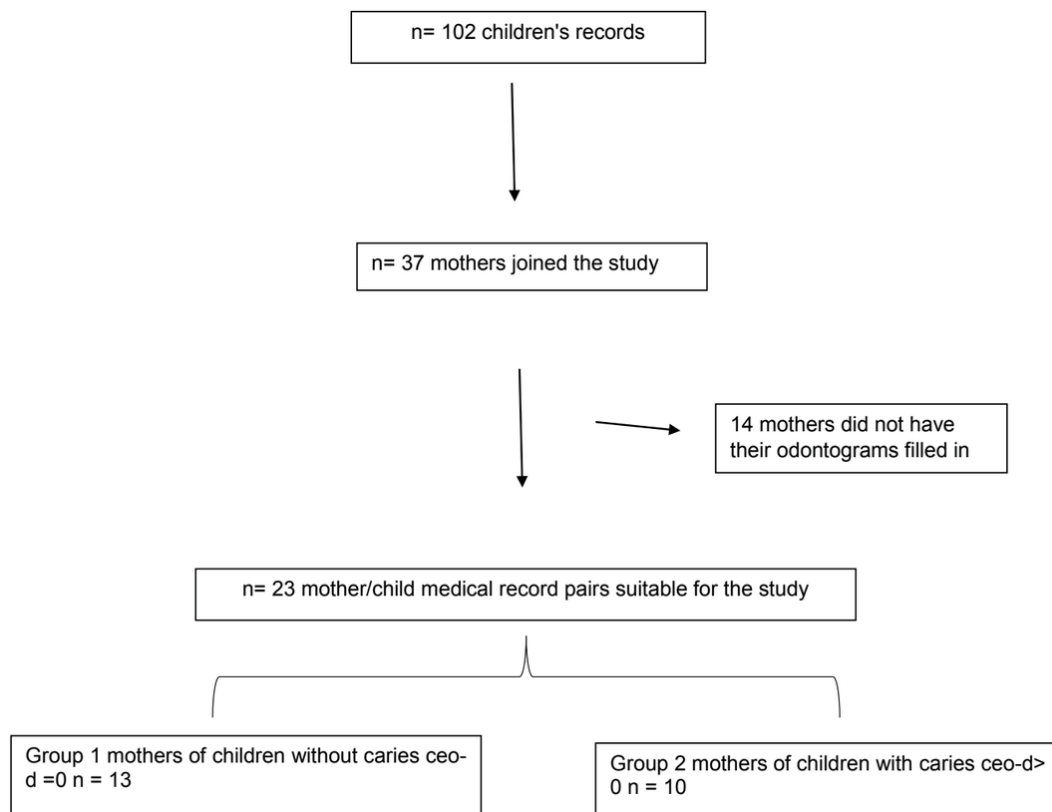
RESULTS

A total of 102 records of children aged between 0 and 6 years were assessed, with an overall index of decayed, extracted and filled teeth (CEO-d) of 1.3. The CEO-d per age group varied as follows: from 0 to 1 year CEO-d = 0.0, from 1 to 2 years CEO-d = 0.23, from 2 to 3 years CEO-d = 0.37, from 3 to 4 years CEO-d = 1.94, from 5 to 6 years CEO-d = 2.70, as shown in Graph 1. A statistical analysis was carried out using the Kruskal-Wallis test of the CEO-d indices between the age subgroups, showing that the CEO-d indices were statistically equal with a p-value of < 0.05.

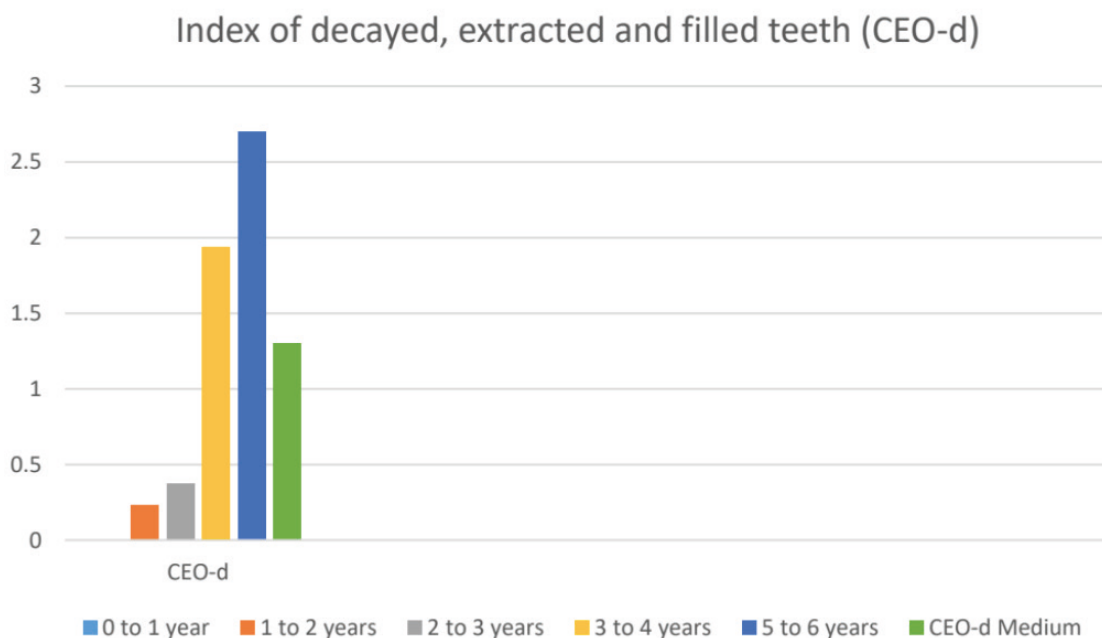
The records of 23 mothers were examined, with a mean age of 41 years and 6 months and a mean DMFT of 6.34.

The results of the statistical analysis of the CEO-d and DMFT-d indices revealed that the data collected showed an abnormal distribution pattern according to the Shapiro-Wilk test. Thus, the child CEO-d and maternal DMFT indices for groups 1 and 2 were subjected to the Mann-Whitney test, considering a value of $p < 0.05$, which revealed statistically significant differences between the child CEO-d and the maternal DMFT for group 1, resulting in $p = 0.00001$. For group 2, the Mann-Whitney test determined that there were no statistically significant differences between infant CEO-d and maternal DMFT, with $p = 0.22628$. As shown in Tables 1 and 2.

The DMFT index of the children in group 1 was also compared with the DMFT index of the children in group 2 using the Mann-Whitney test, which showed that there was a statistically significant difference between them. When comparing the DMFT indices between the mothers of the two groups, the Mann-Whitney test revealed that there was



Study design



Graph 1: Graphical representation of the increase in the number of cavities as the age of the children increases.

Child/age	C	E	O	CEO-d	Mother	C	P	O	CPO-d
1/ 1 a	0	0	0	0	1	0	1	12	13
2/ 1 a	0	0	0	0	2	3	0	0	3
3/ 1 a	0	0	0	0	3	0	4	0	4
4/ 2 a	0	0	0	0	4	0	0	1	1
5/ 5 a	0	0	0	0	5	4	0	0	4
6/ 3 a	0	0	0	0	6	4	4	0	8
7/ 3 a	0	0	0	0	7	3	1	4	8
8/ 2 a	0	0	0	0	8	0	0	4	4
9/ 3 a	0	0	0	0	9	1	2	0	3
10/ 3 a	0	0	0	0	10	0	6	0	6
11/ 3 a	0	0	0	0	11	9	6	2	17
12/ 3 a	0	0	0	0	12	0	5	2	7
13/ 4 a	0	0	0	0	13	0	7	0	7
Average 3.4 years				0					6,5

Table 1: Group 1 It can be seen that six mothers had active caries. When the Mann-Whitney test was applied, the value of $p=0.00001$, with $p<0.05$, revealed that there were statistically significant differences between the child CEO-d and maternal CPO-d groups.

Child/age	C	E	O	CEO-d	mother	C	P	O	CPO-d
1/ 2 a	1	0	0	1	1	1	0	8	9
2/ 4 a	5	0	0	5	2	5	2	2	9
3/ 4 a	4	0	0	4	3	0	0	1	1
4/ 4 a	1	0	0	1	4	1	2	3	6
5/ 5 a	7	0	0	7	5	3	0	0	3
6/ 4 a	10	0	0	10	6	2	1	0	3
7/ 4 a	3	0	0	3	7	0	6	6	12
8/ 3 a	4	0	0	4	8	4	0	0	4
9/ 3 a	1	0	0	1	9	6	0	1	7
10/ 4 a	5	0	0	5	10	1	6	1	7
Average 3.7 years				4,1					6,1

Chart 2: Group 2 It can be seen that eight mothers had active caries. After applying the Mann-Whitney test, the value of $p=0.22628$, with $p>0.05$ revealed that there were no statistically significant differences between the child CEO-d and maternal CPO-d groups at $p>0.05$.

no statistically significant difference between the maternal DMFTs, with the maternal DMFT indices being statistically the same for the mothers of both groups.

Comparing tables 1 and 2, it can be seen that in group 2 there is a predominance of children older than those in group 1. It can also be seen that group 2 has a higher number of mothers with active caries compared to the number of mothers with active caries in group 1.

DISCUSSION

There is a consensus in the literature that caries is a multifactorial chronic condition with great potential to cause suffering and aesthetic-functional damage to the individual, and is associated with *Streptococcus mutans* (SM) and *Streptococcus sobrinus* (SS) (1, 2, 3).

Several authors agree that the transmission of MS and SS occurs vertically, with mothers, on average between 50% and 83% of the

time, being the main source of MS and SS contamination for children (1, 6, 16, 17).

In this sense, the degree of MS and SS contamination of the maternal oral cavity (number of MS and SS/ml of saliva) influences the greater risk of contamination of the child's mouth and thus the greater risk of developing caries (8).

The data from this study corroborate the literature on the importance of epidemiological surveys for population diagnosis of the incidence of caries and their relevance in developing caries prevention and control strategies (9, 10,11).

By analyzing children's CEO-d indices, this study suggests that the time factor is a variable that interferes with the increase in the number of decayed teeth as children get older. However, it is necessary to expand the sample and monitor the evolution of the CEO-d index periodically.

Comparing the relationship between the child CEO-d and maternal DMFT indices in groups 1 and 2, it can be seen that in group 1, maternal DMFT did not statistically show a cause/effect relationship with child CEO-d. However, when evaluating group 2, there was a statistically significant difference between maternal DMFT and child DSC. When comparing groups 1 and 2, it can be seen that group 1 is made up of younger children and that the number of mothers with active caries is numerically lower when comparing the ages of each child and the occurrence of active caries of each mother in group 2.

According to the literature, for caries to develop, there needs to be an interaction between microorganisms, cariogenic substrate, teeth, saliva and time for carious lesions to develop, so the groups evaluated do not allow us to demonstrate that maternal DMFT interfered with children's caries experience, as only the presence of carious lesions was evaluated, so it is necessary to create more parameters for comparison such as mothers' socioeconomic

status, family hygiene habits, eating habits, salivary pH, and identification of the bacterial strains of mothers and their children (4).

However, when evaluating the child CEO-d of the 102 children and the CEO-d of the 23 children in groups 1 and 2, it can be seen that the time factor, in terms of increasing age, suggests a tendency for caries experience to increase as they develop. The time factor in the individual's life chronology seems to make sense when evaluating maternal DMFTs, as the mothers had a statistically similar DMFT index while the children in groups 1 and 2 had statistically different DMFT indices, where the age difference between the children in groups 1 and 2 becomes a variable to be considered.

As for caries prevention and control, the literature shows that prevention is the best way to combat and control caries, but it is a complex issue that involves patients and/or caregivers possessing preventive knowledge together with the development of healthy eating habits, hygiene and access to public or private dental services (9).

The genetic factor is also a variable that should be taken into account, since in cases of vertical transmission, the mothers' caries experience and their development of antibodies to cariogenic bacteria are complex variables to assess and seem to interfere with the children's caries experience (3). According to the literature, the CEO-d and DMFT-d indices are useful tools for establishing a situational diagnosis of caries in deciduous and permanent dentitions, guiding strategies for its prevention and control (10,11).

Thus, prevention strategies such as a permanent supervised brushing program associated with instructions on healthy eating and oral hygiene habits to be carried out in the home and school environment continue to be alternatives in caries prevention and alternatives such as atraumatic restorations are important in the implementation of caries control and health promotion programs (12, 13).

FINAL CONSIDERATIONS

This study revealed that the overall index of decayed, extracted and filled teeth (CEO-d) is equal to 1.3. The CEO-d by age group varied as follows: from 0 to 1 year CEO-d = 0.0, from 1 to 2 years CEO-d = 0.23, from 2 to 3 years CEO-d = 0.37, from 3 to 4 years CEO-d = 1.94, from 5 to 6 years CEO-d = 2.70 among the 102 children assisted at CMEI Dom Virgílio. When evaluating the records of the 23 mothers, the average age was 41 years and 6 months and the average DMFT was 6.34.

When comparing the child's CEO-d and the mother's DMFT-d, it was not possible to establish a relationship between the caries experience of the children and their mothers in group 1. In group 2, on the other hand, it was observed that the child's CEO-d with a record

of active caries corresponded with the mother's DMFT, observing the presence of active caries.

However, the data collected was inconclusive as to the transmissibility of caries from mother to child. It was observed that the time factor has a direct effect on children's caries experience, since as children get older, their caries experience also increases. It is necessary to evaluate other parameters relating to the transmissibility and development of caries between children and their mothers: such as salivary pH, plaque index and serotyping and counting of *mutans* group *Streptococcus*.

Strategies for caries control and prevention must include guidance for mothers on the transmission of cariogenic bacteria, preventive care and also the implementation of atraumatic restorative techniques to control active caries and balance the oral environment.

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