

Dental Enamel Alterations in Preschool Children from Salvador-Ba: Occurrence and Associated Factors

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ABSTRACT

Objective: To describe the prevalence and distribution of Developmental Defects of Enamel (DDE) in children aged 3 to 5 years old in the city of Salvador-BA-Brazil, and to identify potential associated factors, considering socioeconomic, pregnancy, care characteristics childbirth and child behavior. Methodology: This cross-sectional study investigated the DDE in children aged 3 to 5 years, who attended municipal public daycare centers and Family Health Units, in 2018. The oral examination was carried out and it was applied a questionnaire to the respondent about characteristics of children and families. Descriptive and multivariate regression analyzes were performed, assuming a confidence level of 95%. Results: 1591 preschoolers were examined, with a mean age of 54 months. Most children were male (50.41%) and had brown or black skin color (93.34%). The prevalence of DDE was 9.24%. In the multivariate analysis, it was found that the male sex had a negative association with the DDE, while the age greater than or equal to 54 months and the presence of caries in the primary dentition showed a positive association with the DDE. Conclusion: DDEs are shown to be an important oral disease among preschool-age children to be monitored in the city of Salvador-BA, and strongly associated with dental caries.

Keywords

Epidemiology, Preschoolers, Developmental Defects of Enamel.

Introduction

Developmental Defects of Enamel (DDE) are associated with disorders that occur in the process of ameloblastic development, still in intrauterine life. Thus, during the formation of dental structures, a number of factors can change the quality and/or quantity of enamel [1-4].

Among the ameloblastic alterations present, hypoplasias and opacities are the most prevalent. Opacity is a qualitative defect involving an alteration in the translucency of enamel and may appear clinically as white, yellow, or brown. Hypoplastic enamel is a quantitative defect associated with reduced enamel thickness [5], especially in pits and fissures. On the other hand, diffuse opacity

appears as a whitish stain that does not have clear limits [4,6,7]. It is worth noting that color changes in tooth enamel have several aesthetic consequences, and can cause socialization problems in children [8].

In Brazil, the prevalence of enamel alterations in primary dentition varies between 23.9% and 77.3% [4,6,7,9-11]. Studies show numerical differences between the regions of the country, such as children in the Southeast, which have a prevalence of 22.8%, in contrast to the child population in the Northeast region, with studies showing a prevalence of around 49% of DDE. According to a study carried out in Tanzania, the prevalence of DDE among children was 33.3%, whereas among Spanish children the prevalence was even higher (40.2%) [5].

The factors associated with DDE in the primary dentition are related to socioeconomic conditions, nutritional problems in the

child and episodes of infection in childhood. However, problems presented during pregnancy, prematurity, low birth weight, and breastfeeding characteristics, such as its duration, may also be associated with enamel defects in deciduous teeth [2,3,9].

The presence of enamel defects may be related to the development and progression of caries, leading to early loss of tooth structure, tooth sensitivity, malocclusion and esthetic problems. Such consequences can influence the quality of life of the affected individual.

The scarcity of research in Brazil, especially in the Northeast region on this topic is evident, as well as public policies aimed at understanding the occurrence and factors associated with DDE in childhood. In view of this, the present study aims to describe the prevalence and distribution of DDE in the primary dentition of children aged 3 to 5 years old in the city of Salvador-BA, as well as its potential associated factors, considering socioeconomic, pregnancy, care characteristics childbirth and child behavior.

Methodology

A cross-sectional epidemiological study was developed, from August to December of 2018 in children aged between 36 - 71 months (3 to 5 years old) from Salvador-BA. This municipality is the state capital with approximately 3 million residents, and is administratively divided into 12 health regions (sanitary districts).

It should be noted that the sample distribution was proportional to the total number of children enrolled in municipal public day care centers in each health district. Day care centers and health facilities were the data collection sites and were randomly selected in each of the districts. At the time of the oral examinations, all children of the population age were evaluated.

During data collection, three professors of Public Health from the Dentistry course at the Federal University of Bahia and another 08 students, all of them calibrated, were responsible for oral examinations and interviews. The inter-examiner calibration took place in a public day care center, with 30 children aged 3 to 5 years examined by the collection team. Intra-examiner calibration, in turn, was measured during data collection, when 10% of the exams were repeated 7 days after the first evaluation. The Kappa coefficient and the concordance index were then used (inter- and intra-examiner concordance indexes equal to or greater than 90% and Kappa equal to or greater than 0.85 for all DDEs).

During the oral examinations, the children remained seated, under natural light, with the aid of a mouth mirror, a periodontal probe from the World Health Organization (WHO) and personal protective equipment. Changes in dental enamel were evaluated based on criteria defined by the Oral Health, Research and Epidemiology Commission of the International Dental Federation (FDI, 1992).

The questionnaire was addressed to the children's mothers or guardians contained child identification and sociodemographic

data: gender (male/female), age (36-55 months/over 55 months), skin color (white/others), among others. Aspects of pregnancy were researched, such as maternal exanthematous disease during pregnancy, disease during pregnancy and time of birth, delivery data were also collected (type of delivery, child turned purple at birth and whether the child needed to be hospitalized). In the end, the questions were directed to behavioral habits (breastfeeding time, healthy eating) and the problems presented by the child (dental caries and DDE).

Data were typed in EXCEL and analyzed in STATA. Descriptive analyzes of all investigated conditions were performed. Pearson's Chi-Square test was used in exploratory analyzes of potential factors associated with DDE, observing a significance level of 5%. Robust Poisson regression was used to estimate prevalence ratios and their respective 95% Confidence Intervals, considering the presence of DDE as a dependent variable and the other variables as independent. In the multivariate analysis, the stepwise forward method was adopted to include these variables in the final adjusted models. Independent variables with a p-value <0.20 in the univariate analysis were incorporated, and those with a p-value <0.05 were kept in the final models.

The survey was approved by the Research Ethics Committee of the Faculty of Dentistry of the Federal University of Bahia (Brazil) (CAAE78351317.0.0000.5024).

Results

1591 children were examined, with a mean age of 54 months. In table 1, it can be seen that most children were 54 months of age or older (50.66%), were male (50.41%) and had brown or black skin color (93.34%).

Table 1: Absolute distribution and percentage of preschoolers in the city of Salvador-BA, according to socioeconomic characteristics. Salvador-BA, 2018. (n=1591).

| Variables | n | % |
|--|------|-------|
| Age | | |
| < 54 months | 785 | 49.35 |
| ≥ 54 months | 806 | 50.66 |
| Gender | | |
| Male | 802 | 50.41 |
| Female | 789 | 49.59 |
| Skin Color | | |
| White | 106 | 6.66 |
| Black or Brown | 1485 | 93.34 |
| Maternal education | | |
| Complete elementary school or more | 1289 | 81.02 |
| Incomplete elementary school or less | 302 | 18.98 |
| Paternal education | | |
| Complete elementary school or more | 1220 | 76.68 |
| Incomplete elementary school or less | 371 | 23.32 |
| Numbers of persons in the house | | |
| Until 4 | 1210 | 76.05 |
| More than 5 | 381 | 23.95 |
| Conditions of the house | | |
| Satisfactory (dry house) | 1292 | 81.21 |
| With humidity | 299 | 18.79 |

Analyzing the socioeconomic characteristics, both mothers and fathers had at least elementary school as their level of education. Most of the children lived in households with up to 4 people (76.05%) and in a dry house (81.21%) (Table 2).

Regarding the evaluation of pregnancy, most mothers stated that it was not planned (56.82%). Normal delivery predominated (59.59%) and without the occurrence of maternal diseases during the development of the fetus (85.54%). It was also found that 82.97% of the children were born at term, not requiring additional hospitalization (80.89%), nor turning purple at birth (90.89%). As for food, most of them did not eat healthy (88.25%) and 11.75% had some type of disease. The prevalence of DDE stands out at 9.24% (Table 2).

Table 2: Absolute distribution and percentage of preschoolers in the city of Salvador-BA, according to characteristics of pregnancy, childbirth, behavioral characteristics and child ailments. Salvador-BA, 2018. (n=1591).

| Variables | n | % |
|--|-------|-------|
| Maternal exanthematous disease in pregnancy | | |
| No | 1530 | 96.17 |
| Yes | 61 | 3.83 |
| Maternal illness in pregnancy | | |
| No | 1361 | 85.54 |
| Yes | 230 | 14.46 |
| Type of pregnancy | | |
| Planned | 687 | 43.18 |
| Not planned | 904 | 56.82 |
| Time of birth | | |
| Full-term | 1320 | 82.97 |
| Premature or post-term | 271 | 17.03 |
| Type of birth | | |
| Normal birth | 948 | 59.59 |
| Cesarian birth or other | 643 | 40.41 |
| Child turned purple at birth | | |
| No | 1446 | 90.89 |
| Yes | 145 | 9.11 |
| Child needed to be hospitalized | | |
| No | 1287 | 80.89 |
| Yes | 304 | 19.11 |
| Breastfeeding time | | |
| ≥ 6 months | 1027 | 64.55 |
| < 6 months | 564 | 35.45 |
| Healthy eating | | |
| Yes | 292 | 18.35 |
| No | 1299 | 81.65 |
| Illness in the child | | |
| No | 1404 | 88.25 |
| Yes | 187 | 11.75 |
| Presence of Dental Caries | | |
| No | 1011 | 63.54 |
| Yes | 580 | 36.46 |
| Presence of DDE | | |
| No | 1,444 | 90.76 |
| Yes | 147 | 9.24 |

In the univariate analysis, searching potential factors associated with DDE, it was found that these conditions were positively

associated with gender (p=0.039), age of preschoolers (p=0.012) and skin color (p=0.096) (Table 3).

Table 3: Prevalence of DDE according to sociodemographic variables. Salvador-BA, 2018. (n=1591).

| Variables | DDE Absent | | DDE Being | | P-value | |
|---------------------------------|--------------------------------------|------|-----------|-----|---------|-------|
| | n° | % | n° | % | | |
| Gender | Male | 716 | 89.28 | 86 | 10.72 | 0.039 |
| | Female | 728 | 92.27 | 61 | 7.73 | |
| Age | < 54 months | 727 | 92.61 | 58 | 7.39 | 0.012 |
| | 54 months or more | 717 | 88.96 | 89 | 11.04 | |
| Skin color | White | 101 | 95.28 | 5 | 4.72 | 0.096 |
| | Black or Brown | 1343 | 90.44 | 142 | 9.56 | |
| Maternal education | Complete elementary school or more | 1169 | 90.69 | 120 | 9.31 | 0.842 |
| | Incomplete elementary school or less | 275 | 91.06 | 27 | 8.94 | |
| Paternal education | Complete elementary school or more | 1109 | 90.90 | 111 | 9.10 | 0.724 |
| | Incomplete elementary school or less | 335 | 90.30 | 36 | 9.70 | |
| Numbers of persons in the house | Until 4 | 1097 | 90.66 | 113 | 9.34 | 0.807 |
| | More than 5 | 347 | 91.08 | 34 | 8.92 | |
| Conditions of the house | Satisfactory | 1173 | 90.79 | 119 | 9.21 | 0.934 |
| | With humidity | 271 | 90.64 | 28 | 9.36 | |

In the univariate analysis, related to the characteristics of childbirth, pregnancy, behavioral characteristics and child disorders, it was observed that, with the exception of dental caries (p=0.016), none of the covariates was positively associated with enamel changes in preschool children (Table 4).

Table 4: Prevalence of DDE according to characteristics of pregnancy, childbirth, behavioral characteristics and child ailments. Salvador-BA, 2018. (n=1591).

| Characteristics of pregnancy, childbirth, behavioral characteristics and disorders of the child | DDE Absent | | DDE Being | | P-value | |
|---|-------------------------|------|-----------|-----|---------|-------|
| | n° | % | n° | % | | |
| Maternal exanthematous disease in pregnancy | No | 1389 | 90.78 | 141 | 9.22 | 0.870 |
| | Yes | 55 | 90.16 | 6 | 9.84 | |
| Maternal illness in pregnancy | No | 1237 | 90.89 | 124 | 9.11 | 0.667 |
| | Yes | 207 | 90.00 | 23 | 10.00 | |
| Type of pregnancy | Planned | 625 | 90.98 | 62 | 9.02 | 0.797 |
| | Chance | 819 | 90.60 | 85 | 9.40 | |
| Time of birth | Full-term | 1196 | 90.61 | 124 | 9.39 | 0.639 |
| | Premature or post-term | 248 | 91.51 | 23 | 8.49 | |
| Type of birth | Normal birth | 852 | 89.87 | 96 | 10.13 | 0.138 |
| | Cesarian birth or other | 592 | 92.07 | 51 | 7.93 | |

| | | | | | | |
|--|-----------|------|-------|-----|-------|-------|
| Child turned purple at birth | No | 1313 | 90.80 | 133 | 9.20 | 0.856 |
| | Yes | 131 | 90.34 | 14 | 9,66 | |
| The child needed to be hospitalized | No | 1173 | 91.14 | 114 | 8.86 | 0.279 |
| | Yes | 271 | 89.14 | 33 | 10.86 | |
| Breastfeeding time | ≥ 6 month | 925 | 90.07 | 102 | 9.93 | 0.673 |
| | <6 month | 519 | 92.02 | 45 | 7.98 | |
| Healthy eating | Yes | 259 | 88.70 | 33 | 11.30 | 0.178 |
| | No | 1185 | 91.22 | 114 | 8.78 | |
| Dental Caries | No | 931 | 92.09 | 80 | 7.91 | 0.016 |
| | Yes | 513 | 88.45 | 67 | 11.55 | |
| Illness in the child | No | 1271 | 90.53 | 133 | 9.47 | 0.378 |
| | Yes | 173 | 92.51 | 14 | 7.49 | |

In the multivariate analysis, it was found that the male gender presented a negative association with the DDE, while the age greater than or equal to 54 months and the presence of caries in the primary dentition showed a positive association with DDE (Table 5).

Table 5: Final model of multivariate logistic regression analysis for DDE in preschoolers in Salvador-BA, 2018. (n=1591)

| Variables | Without DDE RP | With DDE RP | CI 95% | P-value |
|---------------------------|----------------|-------------|-------------|---------|
| Gender- male | 1.0 | 0.73 | 0.53 – 0.99 | 0.05 |
| Age more than 54 months | 1.0 | 1.42 | 1.03 – 1.99 | 0.04 |
| Presence of dental caries | 1.0 | 1.39 | 1.02 – 1.91 | 0.04 |

Discussion

The research evaluated the prevalence of DDE and factors associated with this oral alteration in the primary dentition. The prevalence of DDE found was 9.24%, associated with older age and being male. Also noteworthy is the positive association between the occurrence of dental caries and the presence of DDE.

Participants in this study totaled 1591 children. Approximately half of the children investigated were male (50.41%), as in other surveys [5,12,13]. Regarding the age group, the mean age of the children participating in the study was 54 months, unlike the study carried out in 2017 in South India, where the mean age found was 48 months [12]. In a survey carried out in Diamantina (MG), a greater number of girls with an average age of 48.23 months was observed [2].

It was also observed that 82.97% of the children in this study were born at term, not requiring hospitalization (80.89%), nor turning purple at birth (90.89%). In a national survey on labor and birth, it was found that the prematurity rate for Brazil was 11.5%, with 74% being late preterm [8-10]. In Germany, the prevalence of preterm births is 8.7% and has remained constant over the last 10 years, but the prevalence of extreme preterm births (before the 28th week of pregnancy) has increased by 65% in that country [13].

The prevalence of DDE found in this study (9.24%) was lower than that observed by other authors in Brazil and abroad. Andrade et al. [1] in their study carried out in Teresina-PI, found a prevalence of

33.7% of DDE in five-year-old children, whereas in children from a quilombola community in the south of the state, its prevalence was even higher (42.2%) [7], as well as Tourino et al. [5], in Ijaci-MG, where half (50.0%) of preschoolers surveyed had DDE. Osorio-Tovar et al. [15] in Bogotá, proved that 74.2% of preschoolers had DDE, while research in the United States showed its occurrence in 50.0% of children in the country [4,7,14,15].

Among the socioeconomic characteristics analyzed, there was a positive relationship between age and sex of the child with DDE, as well as other authors. As for the sex of the child, there is no consensus on the existence of a relationship between this variable and the prevalence of DDE. It is suggested that the increase in DDE in boys is caused by a greater nutritional need due to faster growth, making males more susceptible than females to DDE formation [4,6].

Literature has shown a positive association between characteristics of pregnancy and childbirth care, low birth weight and maternal breastfeeding, with the presence of DDE [6,12], although this association was not observed in this work. It is known that the child's prematurity is related to the presence of enamel defects in the primary dentition. Children born before 37 weeks of gestation were 2.6 times more susceptible to DDE when compared to children born at term [4].

It is noteworthy that the relationship between DDE and the presence of caries has been observed, as was observed in this investigation. A systematic review on the subject identified a 2.2-fold increased risk of caries in babies with DDE [9,15]. The increased susceptibility of teeth affected by DDE to caries is probably due to enamel defects presenting as retentive and irregular sites, favoring the occurrence of biofilm and cariogenic bacteria. Furthermore, defective enamel is less resistant to bacterial acids, causing demineralization to progress more rapidly compared to normal enamel [14].

Child nutritional status is another factor commonly associated with DDE. Based on the literature, deficiencies in calories, proteins and vitamins can affect tooth enamel formation. Analyze the association between a child's nutritional status and the development of enamel defects should, however, with caution, as its assessment should be performed after the estimated period of enamel formation [3].

This study used an epidemiological approach, through a cross-sectional study, to investigate the occurrence and factors associated with DDE in the primary dentition. It is recognized that cross-sectional investigations are not ideal for analyzing the causality of diseases, considering their inability to assess the advance of exposure variables in relation to the health problem investigated. In addition, variables from the gestational history and the child's life condition were self-reported by the mother or guardians, which may have been affected by memory bias. However, the sample size and its representativeness for the municipality were relevant.

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