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**ORIGINAL ARTICLE**

# First Thousand Days of Child Life and the Development of Risk Factors for Malocclusions

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**ABSTRACT**

**Objective:** To identify the association between individual and socioeconomic factors during the first thousand days of the child's life and the occurrence of risk behaviors for the development of malocclusions. **Material and Methods:** Cross-sectional study. A sample of 655 6-year-old schoolchildren and families was included. Interviews with mothers were performed at home. The dependent variables were risk behaviors to the development of malocclusions. Independent variables were socioeconomic conditions, aspects of gestation, birth and health of the child up to two years of age. Bivariate and multivariate analyzes were performed through Poisson regression. **Results:** Maternal education of less than eight years was independently associated with the interruption of exclusive breastfeeding until the fourth month (PR=1.58 CI 95%; 1.07; 2.37). Occupation of the mother with income [PR=1.26; 1.02; 1.56)], occupation of the father without income [PR=1.46 (1.01; 2.14)] were associated fwith interruption of breastfeeding until the sixth month. Pregnancy in adolescence [PR=0.83 (0.70; 0.98)] and nursery attendance [PR=1.15 (1.02; 1.28)] were associated with bottle use. Nursery attendance [PR=1.27 (1.01; 1.59)], hospitalization in the first 29 days of life [PR=1.34 (1.01; 1.80)], occurrence of reflux [PR=1.30 (1.01; 1.70)] were associated with pacifier using. **Conclusion:** Variables related to the period of the first thousand days of life are associated with higher risk behaviors for the occurrence of malocclusions.

**Keywords:** Child Development; Child Health; Orthodontics; Breast Feeding; Habits.

## Introduction

The cognitive and physical development of a child can be influenced by events occurring in the first thousand days of life [1], which comprise from the beginning of pregnancy until the end of the second year of life after birth. During this period, biological and socioeconomic factors can influence child's growth and development, with the potential of generating future health damages or benefits [1,2].

Intrauterine and early years events would have long-term effects on chronic diseases' morbidity and mortality. Nutritional and environmental conditions during intrauterine life and early childhood have the potential to program risks for coronary heart disease, systemic arterial hypertension, diabetes and increased cholesterol, among others, in adulthood [3].

On the other hand, the accumulation of risks during life is the result from environmental, social and behavioral exposures throughout life. Adverse childhood conditions would be the basis for increasing the risk of chronic diseases in adulthood [4].

In addition, socioeconomic conditions influence the health-disease process determination, increasing or decreasing risk and protection factors [5], which may change over time, such as educational and economic conditions. The emphasis in the First Thousand Days highlights that nutrition during the fetal period and the first 24 months after birth would be determinants of early childhood development [1]. Moreover, it suggests that nutritional deficits in this period would be associated with several consequences throughout the life cycle, such as reduced cognitive development and school performance, loss of economic productivity and increased risk of chronic diseases [6]. As chronic diseases have a long history and complex etiologies, it is recommended to study the influence of the first stages of life for a better understanding of their determination [6].

Changes in the development of craniofacial structures, which include the malocclusions, comprise a set of developmental and growth alterations of the maxillary muscles, tongue and bones that have the potential to alter the dental position and, consequently, generate aesthetic and dental occlusion functional problems in chewing and phonation [7]. Its etiology includes individual, hereditary, behavioral, and socioeconomic and cultural factors. The risk factors associated with the development of malocclusions in childhood are diverse, and sucking habits are the most reported. These can be classified as nutritious, such as those related to breastfeeding and bottle use, or non-nutritive, such as thumb or pacifier suction [8]. A systematic review that addressed the topic of breastfeeding and malocclusions [9] suggested that breastfeeding, compared to its absence, decreases the probability of developing malocclusions by 66%. Exclusive breastfeeding compared to non-exclusive breastfeeding decreased by 46%, and a longer period of breastfeeding reduced the chance of occurrence by 60% [9]. Also, significant and independent associations were observed between father's unemployment, private school, interruption of breastfeeding before the fourth month and pacifier use with certain malocclusions [10].

The latest nationally based data in Brazil indicate a prevalence of malocclusion of 66.7% at 5 years of age and 40.0% at 12 years [11]. In many cases, malocclusions can affect people's quality of life due to aesthetic or functional changes [7].

To improve the understanding of the determinants of malocclusions in children and, consequently, to identify behaviors that can be modified with prevention actions, it is fundamental to obtain information about behavioral, socioeconomic and cultural factors in the first thousand days of life. Understanding the interaction of these factors in this period is essential for planning health policies and prevention [2]. However, few studies consider the set of these ideas in the study of the determination of the population's oral health [12,13], especially involving malocclusions.

Thus, the objective of this study is to identify a possible association between individual and socioeconomic factors in the period of child's first thousand days of life and the determination of risk behaviors to malocclusions.

## Material and Methods

Study Design and Sample

A cross-sectional study was carried out nested in a longitudinal study called *Coorte Brasil Sul* [13] involving 6-year-old schoolchildren born in 2009 and their families, living in the city of Palhoça in the southern Brazilian state of Santa Catarina. Children were enrolled in the first year of elementary school.

The sample size was calculated using the following parameters: total population of 1,756 children; confidence level of 95%; unknown prevalence of the outcomes studied (P = 50%); relative error of 3%. The final sample size was 664 children and their families.

Data Collection

Data was collected through interviews and consultation of child's health portfolio and the Community Health Agents (CHA) records at the Basic Health Units. The interviews were carried out with the mother or, in her absence, with the main caregiver of the child, at home. The interviews were carried out by a team of researchers from *Coorte Brasil Sul* [13] and by the CHAs. The team was formally trained by the research coordinators. The interviews were performed using a questionnaire specially developed for the study. The monitoring of the application of the questionnaires was carried out through telephone calls to 5% of the total sample. A pilot study was carried out to test the proposed methodology.

The dependent variables were risk behaviors to the development of malocclusions: interruption of exclusive breastfeeding in the fourth month of child's life (since, according to Brazilian law, the mother is entitled to 4 months of maternity leave); interruption of breastfeeding in the sixth month of the child's life; use of bottle; use of pacifiers; digital suction. The independent variables were: socio-demographic conditions of the family at the child's birth (mother and father schooling and occupation at birth; stable partner at birth); conditions related to pregnancy (pregnancy age; smoking, drug and alcohol use; occurrence of infectious diseases during pregnancy); conditions related to child's birth (birth weight; Apgar 1$^{st}$ min; hospitalization in the first 29 days); child's health conditions up to two years of age (medicine using for more than 30 consecutive days; hospitalization for more than two days; antibiotic using; occurrence of infectious diseases and/or reflux; nursery attendance).

Data Analysis

Data were analyzed in the SPSS Statistics for Windows Software, version 18.0 (IBM Corp., Armonk, NY, USA). Bivariate analyzes were performed using Poisson regression with a robust estimator. Multivariate analyzes were performed for the outcomes that showed statistically significant associations in the bivariate analysis at the level of $p<0.05$ to identify independent relationships between the various variables studied. In addition, variables whose $p\leq 0.20$ values in the bivariate analysis were also included in the models to identify possible confounding variables, adjusting the analysis models. Prevalence ratios (PR) and their respective confidence intervals (95%) were estimated.

Ethical Clearance

This study was submitted to and approved by the Human Research Ethics Committee of the *Universidade do Sul de Santa Catarina* under protocol number 38240114.0.0000.5369.

## Results

The present study used data from the *Coorte Brasil Sul* study [13], whose population was composed of all 6-years-old schoolchildren enrolled in schools in Palhoça, SC, Brazil. From the total sample (n = 664) were included 655 families that had information from the household questionnaire and clinical examination in schools, which generated a response rate of 98.6%. Mothers were the main respondents to the questionnaire regarding the child (68.5%).

Of the total number of children included, 50.5% were female. It was observed that the median of maternal and paternal schooling at birth was 9 and 10 years, respectively. Adolescent pregnancy occurred in 20.3% of the cases. The median age of the pregnant women was 25 years. Regarding the occurrence of infectious diseases during pregnancy, 39.9% of the women reported one or more of the following pathologies: urinary tract infection (30.0%), vaginal discharge requiring treatment (22.8%), varicella (1.8%), toxoplasmosis (1.5%), pneumonia (1.2%), HIV/AIDS (0.5%), syphilis (0.5%), cytomegalovirus, measles, rubella and tetanus (both 0.3%). Diseases characteristic of pregnancy, such as hypertension (14.4%) and diabetes (4.7%), were present in 19.1% of pregnant women. The prevalence of children with low birth weight (weight less than 2,500 g) was 5.4%. The median weight was 3,250 g and the lowest and highest weights were 600g (0.2%) and 5,600g (0.2%) respectively. Concerning the occurrence of infectious diseases up to two years of age, 83.0% of the children had one or more of the following diseases: diarrhea (56.9%), tonsillitis (53.7%), ear infection (38.0%), varicella (26.3%), pneumonia (22.3%), verminosis (21.6%), infection or skin wounds (17.7%) and rubella (1.1%). Of the total children, 91.9% were breastfed and the median breastfeeding time was 12.5 months. Breastfeeding up to 12 months was observed in 50.0% of the children and up to 24 months, in 23.9%.

The prevalence of risk behaviors for malocclusions were: bottle using, 79.0%; interruption of breastfeeding up to the sixth month, 50.5%; pacifier using, 49.4%; interruption of exclusive breastfeeding until the fourth month, 26.3%; and digital suction, 8.9%.

The results of the multivariate analysis showed that the prevalence of breastfeeding interruption until the fourth month was 58% higher [PR = 1.58 (95% CI 1.07; 2.37)] among mothers with less education. The occupation of the mother with income, that is, working outside the home, and the non-occupation of the father were statistically associated with the interruption of breastfeeding until the sixth month. These and the other results are presented in Tables 1 to 4. As no statistically significant associations with digital suction were found, for this outcome, no multivariate analysis was performed. The results of the bivariate analysis are shown in Table 5.

**Table 1. Results of bivariate and multivariate analysis for the interruption of exclusive breastfeeding until the fourth month.**

| Variables | PR$_c$ | CI 95% | p-value | PR$_a$ | CI 95% | p-value |
|---|---|---|---|---|---|---|
| Mother schooling at birth | | | 0.01 | | | 0.02 |
| > 8 years | 1.00 | | | 1.00 | | |
| ≤ 8 years | 1.41 | 1.06; 1.88 | | 1.58 | 1.07; 2.37 | |
| Stable partner at birth | | | 0.20 | | | 0.89 |
| Yes | 1.00 | | | 1.00 | | |
| No | 1.36 | 0.87; 2.13 | | 0.05 | 0.50; 2.22 | |
| Smoking at pregnancy | | | 0.03 | | | 0.23 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.45 | 1.03; 2.02 | | 1.32 | 0.82; 2.11 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Birth weight | | | 0.14 | | | 0.93 |
| ≥ 2,500g | 1.00 | | | 1.00 | | |
| < 2,499g | 1.53 | 0.90; 2.60 | | 1.04 | 0.38; 2.86 | |
| Apgar 1st min | | | 0.03 | | | 0.08 |
| ≥ 8 | 1.00 | | | 1.00 | | |
| < 7 | 0.35 | 0.12; 1.04 | | 0.39 | 0.13; 1.15 | |
| Antibiotic use by child in the first two years | | | 0.04 | | | 0.07 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.36 | 1,01; 1.85 | | 1.49 | 0.97; 2.28 | |
| Child medicine using for more than 30 consecutive days | | | 0.15 | | | 0.99 |
| Yes | 1.00 | | | 1.00 | | |
| No | 0.78 | 0.56; 1.08 | | 1.00 | 0.60; 1.67 | |
| Child hospitalization for more than two days in the first two years | | | 0.20 | | | 0.42 |
| No | 1.00 | | | 1.00 | | |
| Yes | 0.80 | 0.57; 1.11 | | 1.24 | 0.73; 2.11 | |

PRc = Crude prevalence ratio from bivariate analysis; PRa = Adjusted prevalence ratio from multivariate analysis; 95% CI = 95% confidence interval.

**Table 2. Results of bivariate and multivariate analysis for interruption of breastfeeding until the sixth month.**

| Variables | PRc | CI 95% | p-value | PRa | CI 95% | p-value |
|---|---|---|---|---|---|---|
| Occupation of mother at birth | | | <0.01 | | | 0.03 |
| No income | 1.00 | | | 1.00 | | |
| With income | 1.32 | 1.12; 1.57 | | 1.26 | 1.02; 1.56 | |
| Occupation of father at birth | | | 0.12 | | | 0.04 |
| With income | 1.00 | | | 1.00 | | |
| No income | 1.32 | 0.97; 1.78 | | 1.46 | 1.01; 2.14 | |
| Stable partner at birth | | | 0.11 | | | 0.95 |
| Yes | 1.00 | | | 1.00 | | |
| No | 1.27 | 0.98; 1.65 | | 1.02 | 0.60; 1.72 | |
| Smoking at pregnancy | | | 0.14 | | | 0.34 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.18 | 0.96; 1.46 | | 1.13 | 0.87; 1.47 | |
| Drug use during pregnancy | | | 0.10 | | | 0.40 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.59 | 1.11; 2.28 | | 1.30 | 0.70; 2.43 | |
| Infectious diseases in pregnancy | | | 0.02 | | | 0.14 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.22 | 1.03; 1.45 | | 1.16 | 0.95; 1.43 | |
| Nursery attendance in the first two years | | | <0.01 | | | 0.10 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.29 | 1.07; 1.55 | | 1.20 | 0.97; 1.48 | |
| Antibiotic use by child in the first two years | | | <0.01 | | | 0.28 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.29 | 1.07; 1.55 | | 1.14 | 0.89; 1.46 | |
| Infectious diseases in child in the first two years | | | 0.05 | | | 0.64 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.28 | 0.97; 1.68 | | 1.08 | 0.77; 1.53 | |
| Reflux in the child in the first two years | | | 0.06 | | | 0.34 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.23 | 1.01; 1.50 | | 1.13 | 0.88; 1.46 | |

PRc = Crude prevalence ratio from bivariate analysis; PRa = Adjusted prevalence ratio. from multivariate analysis; 95% CI = 95% confidence interval.

**Table 3. Results of bivariate and multivariate analysis for bottle use.**

| Variables | PRc | CI 95% | p-value | PRa | CI 95% | p-value |
|---|---|---|---|---|---|---|
| Father schooling at birth | | | 0.36 | | | 0.41 |
| > 8 years | 1.00 | | | 1.00 | | |
| ≤ 8 years | 0.95 | 0.86; 1.05 | | 0.95 | 0.86; 1.06 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Occupation of mother at birth | | | 0.11 | | | 0.74 |
| No income | 1.00 | | | 1.00 | | |
| With income | 1.06 | 0.98; 1.15 | | 1.01 | 0.91; 1.13 | |
| Stable partner at birth | | | 0.10 | | | 0.48 |
| Yes | 1.00 | | | 1.00 | | |
| No | 1.12 | 1.00; 1.26 | | 1.11 | 0.83; 1.48 | |
| Pregnancy age | | | <0.01 | | | 0.03 |
| ≥ 20 years | 1.00 | | | 1.00 | | |
| 10 to 19 years | 0.84 | 0.75; 0.96 | | 0.83 | 0.70; 0.98 | |
| Smoking at pregnancy | | | 0.10 | | | 0.92 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.09 | 0.99; 1.20 | | 1.00 | 0.99; 1.15 | |
| Alcohol use during pregnancy | | | 0.07 | | | 0.28 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.16 | 1.03; 1.29 | | 1.09 | 0.92; 1.29 | |
| Nursery attendance in the first two years | | | <0.01 | | | 0.01 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.14 | 1.05; 1.25 | | 1.15 | 1.02; 1.28 | |
| Infectious diseases in child in the first two years | | | 0.01 | | | 0.15 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.20 | 1.04; 1.38 | | 1.14 | 0.95; 1.36 | |
| Antibiotic use by child in the first two years | | | 0.01 | | | 0.81 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.11 | 1.00; 1.22 | | 1.01 | 0.90; 1.13 | |

PRc = Crude prevalence ratio from bivariate analysis; PRa = Adjusted prevalence ratio from multivariate analysis; 95% CI = 95% confidence interval.

**Table 4. Results of bivariate and multivariate analysis for pacifier using.**

| Variables | PRc | CI 95% | p-value | PRa | CI 95% | p-value |
|---|---|---|---|---|---|---|
| Occupation of mother at birth | | | 0.01 | | | 0.34 |
| No income | 1.00 | | | 1.00 | | |
| With income | 1.23 | 1.04; 1.44 | | 1.10 | 0.89; 1.37 | |
| Pregnancy age | | | 0.03 | | | 0.38 |
| ≥ 20 years | 1.00 | | | 1.00 | | |
| 10 to 19 years | 0.79 | 0.63; 0.99 | | 0.87 | 0.65; 1.17 | |
| Number of prenatal appointments | | | 0.10 | | | 0.31 |
| ≥ 6 | 1.00 | | | 1.00 | | |
| < 5 | 1.23 | 0.98; 1.56 | | 1.15 | 0.83; 1.59 | |
| Smoking at pregnancy | | | 0.02 | | | 0.09 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.27 | 1.05; 1.53 | | 1.22 | 0.96; 1.56 | |
| Nursery attendance in the first two years | | | 0.02 | | | 0.03 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.22 | 1.02; 1.45 | | 1.27 | 1.01; 1.59 | |
| Hospitalization in the first 29 days | | | 0.01 | | | 0.05 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.48 | 1.17; 1.88 | | 1.34 | 1.01; 1.80 | |
| Reflux in the child in the first two years | | | <0.01 | | | 0.05 |
| No | 1.00 | | | | 1,00 | |
| Yes | 1.31 | 1.09; 1.57 | | 1.30 | 1.01; 1.70 | |
| Infectious diseases in child in the first two years | | | 0.03 | | | 0.70 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.28 | 0.99; 1.66 | | 0.93 | 0.67; 1.30 | |
| Child medicine using for more than 30 consecutive days | | | 0.10 | | | 0.75 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.18 | 0.98; 1.42 | | 0.95 | 0.73; 1.24 | |
| Antibiotic use by child in the first two years | | | <0.01 | | | 0.19 |
| No | 1.00 | | | 1.00 | | |
| Yes | 1.31 | 1,10; 1.57 | | 1.18 | 0.91; 1.52 | |

PRc = Crude prevalence ratio from bivariate analysis; PRa = Adjusted prevalence ratio. from multivariate analysis; 95% CI = 95% confidence interval.

**Table 5. Results of the bivariate analysis between socio-demographic aspects, pregnancy, birth and child health in the first thousand days of the child's life and digital sucking.**

| Variables | Digital Suction | | p-value |
|---|---|---|---|
| | No N (%) | Yes N (%) | |
| Mother schooling at birth (n=655) | | | 0.20 |
| ≤ 8 years | 172 (89.5) | 20 (10.5) | |
| > 8 years | 386 (92.5) | 31 (7.5) | |
| Father schooling at birth (n=609) | | | 0.81 |
| ≤ 8 years | 198 (92.1) | 17 (7.9) | |
| > 8 years | 280 (91.5) | 26 (8.5) | |
| Occupation of mother at birth (n=641) | | | 0.08 |
| With income | 288 (89.1) | 35 (10.9) | |
| No income | 247 (77.4) | 71 (22.6) | |
| Occupation of father at birth (n=614) | | | 0.72 |
| With income | 533 (90.9) | 53 (9.1) | |
| No income | 26 (92.9) | 2 (7.1) | |
| Stable partner at birth (n=640) | | | 0.79 |
| No | 44 (89.8) | 5 (10.2) | |
| Yes | 538 (91.0) | 53 (9.0) | |
| Nursery attendance in the first two years (n=566) | | | 0.25 |
| Yes | 302 (93.2) | 22 (6.8) | |
| No | 219 (90.5) | 23 (9.5) | |
| Pregnancy age (n=641) | | | 0.80 |
| 10 to 19 years | 119 (91.5) | 11 (8.5) | |
| ≥ 20 years | 464 (90.8) | 47 (9.2) | |
| Number of prenatal appointments (n=589) | | | 0.63 |
| ≥ 6 | 485 (90.8) | 49 (9.2) | |
| < 5 | 51 (92.7) | 4 (7.3) | |
| Alcohol use during pregnancy (n=629) | | | 0.06 |
| Yes | 34 (82.3) | 7 (17.7) | |
| No | 537 (91.3) | 51 (8.7) | |
| Smoking at pregnancy (n=636) | | | 0.07 |
| Yes | 81 (86.2) | 13 (13.8) | |
| No | 498 (91.9) | 44 (8.1) | |
| Drug use during pregnancy (n=642) | | | 0.99 |
| Yes | 10 (90.9) | 1 (9.1) | |
| No | 574 (90.9) | 57 (9.1) | |
| Infectious diseases in pregnancy (n=611) | | | 0.84 |
| No | 346 (91.4) | 21 (8.6) | |
| Yes | 214 (91.8) | 30 (8.2) | |
| Gestational age (n=499) | | | 0.74 |
| < 37 weeks | 27 (86.7) | 4 (13.3) | |
| 37 to 41 weeks | 349 (90.2) | 38 (9.8) | |
| ≥ 42 weeks | 27 (87.6) | 4 (12.9) | |
| Way of delivery (n=491) | | | 0.72 |
| Cesarean | 183 (90.1) | 20 (9.9) | |
| Vaginal | 257 (89.2) | 31 (10.8) | |
| Child gender (n=655) | | | 0.71 |
| Male | 302 (90.1) | 24 (9.9) | |
| Female | 302 (89.1) | 27 (10.9) | |
| Birth weight (n=479) | | | 0.63 |
| < 2,499g | 24 (92.3) | 2 (7.7) | |
| ≥ 2,500g | 405 (89.4) | 48 (10.6) | |
| Apgar 1st min (n=395) | | | 0.33 |
| < 7 | 27 (87.1) | 4 (12.9) | |
| ≥ 8 | 334 (91.7) | 30 (8.3) | |
| Reflux in the child in the first two years (n=642) | | | 0.06 |
| Yes | 80 (85.1) | 13 (14.9) | |
| No | 504 (91.8) | 45 (8.2) | |

| | | | |
|---|---|---|---|
| Infectious diseases in child in the first two years (n=572) | | | 0.84 |
| Yes | 433 (91.1) | 42 (8.9) | |
| No | 89 (91.8) | 8 (8.2) | |
| Child antibiotic using for more than 30 consecutive days (n=633) | | | 0.23 |
| Yes | 359 (89.9) | 40 (10.1) | |
| No | 217 (92.7) | 17 (7.3) | |
| Child medicine using for more than 30 consecutive days (n=641) | | | 0.50 |
| Yes | 95 (89.5) | 11 (10.5) | |
| No | 490 (91.6) | 45 (8.4) | |
| Child hospitalization for more than two days in the first two years (n=650) | | | 0.72 |
| No | 535 (90.3) | 10 (9.7) | |
| Yes | 58 (91.4) | 47 (8.6) | |
| Hospital admission of the child in the first 29 days (n=491) | | | 0.37 |
| No | 451 | 5 (14.7) | |
| Yes | 32 | 3 (9.9) | |

## Discussion

A better understanding of the influence of the early stages of life on the determination of behaviors relevant to the future health of children is fundamental for the organization and planning of public policies aimed at improving the population's health and life condition [2]. The present study deals with the study of the causes, that is, the conditions that determine the risk factors for events and health problems. Thus, its main focus was the study of conditions related to the first thousand days of the child's life on behaviors that may increase the risk of developing malocclusions. During this period, both biological and socioeconomic factors influence the growth and development of children, which may generate future harm or benefits to their health [14]. Adverse exposures at critical periods in an individual's life course may result in deleterious health effects throughout life. Thus, the accumulation of risk becomes a determinant of population health [15].

Risk factors associated with the development of malocclusions in childhood are diverse, and sucking habits are the most reported [16]. These can be classified as nutritious, such as those related to breastfeeding and bottle-feeding, or non-nutritive, such as pacifier use and digital sucking [8].

In the present study, lower maternal education was independently associated with the interruption of exclusive breastfeeding until the fourth month. The association between maternal education level and breastfeeding has already been demonstrated [17], pointing out that women with more years of schooling give more value to exclusive breastfeeding. The 2013 Brazilian National Health Survey also showed a higher prevalence of exclusive breastfeeding in families whose head had higher levels of education [18]. Thus, the present study corroborates the results of the literature by pointing to a 58% higher prevalence of exclusive breastfeeding interruption until the fourth month among women with eight years or less of study.

Regarding the mother's occupation, those with income had a 26% higher prevalence of breastfeeding interruption until the sixth month. Such association was not observed for the interruption of exclusive breastfeeding until the fourth month. Another study [19] showed that abandoning exclusive breastfeeding was associated with the fact that Brazilian mothers have to return to work in the fourth month. The opposite occurred with the father, in which the lack of income was associated with the interruption of breastfeeding in the sixth month, with a 46% higher prevalence than those with income at birth. The father's absence from formal work may be related to the mother's need to go to work and provide family support, which could explain the inverse relationship between the variables.

The other socio-demographic, gestational and child health variables were not statistically associated with interruption of breastfeeding in the fourth and sixth months. Also, Machado et al. [19] did not find an association between the interruption of exclusive breastfeeding with maternal age, income, number of people in

the household, smoking and alcohol consumption. Similarly, they found no association with prematurity, birth weight, mode of delivery and parity. However, in studying the reasons for breastfeeding cessation at two months of age, they reported postpartum depression and the occurrence of traumatic birth.

The prevalence of bottle use found in this study was 79%. According to the Brazilian Ministry of Health [20], about 60% of children under one-year-old are bottle-fed. However, bottle-feeding may impair continued breastfeeding [21], which in turn may optimize the risk of the development of malocclusions. Among the variables studied, teenage pregnancy was associated with lower bottle use. This could represent the greater availability of the adolescent mother to provide attention to the child. However, it is noteworthy that teenage pregnancy is related to the postponement or impairment of the mother's education and lower chance of professional qualification and absolute financial dependence of the family [22]. Conversely, another study pointed to the relationship between the greater use of bottle feeding in children with adolescent mothers and those with nipple trauma, whose maternal grandparents were at home and who used pacifiers. The authors reinforced the negative influence of the bottle on breastfeeding technique [23].

The prevalence of bottle use was also associated with the child nursery attendance in the first two years. Higher prevalence can be explained by the fact that this is the most common method of providing food to children in these institutions, which refers to the limited number of employees and the difficulty of feeding them using other utensils, such as the cup [24]. Other socioeconomic variables related to pregnancy and child health were not independently associated with bottle use. However, a study [25] demonstrated that work outside the home, primiparity, low birth weight, not having breastfed in the first hour and having another type of milk or tea on the first day at home was associated with bottle, independently.

According to the Brazilian Ministry of Health [22], about 43% of children under one year of age use pacifiers. The prevalence was independently associated with nursery attendance in the first two years, hospitalization in the first 29 days of life and reflux occurrence in the first two years of age. One study [25] showed that pacifier use was associated with the mother's work outside the home, primiparity, the child not having breastfed in the first hour and having tea on the first day at home. In the present study, hypothetically, this association could be explained by the introduction of the pacifier by the mother to meet the demand for suction on her return to work, in case of interruption of breastfeeding. On the other hand, the pacifying effect of the pacifier is recognized [26]. Also, it is a cultural phenomenon in which pacifiers are easily accepted by parents and relatives and used by children [27]. Moreover, the association between a higher prevalence of pacifier using and sick children, represented here by the variables hospitalization in the first 29 days and occurrence of reflux, could be understood in this context. Interestingly, the variables related to infectious diseases and drug use were not associated, which implies the need for further studies to elucidate such relationships.

Likewise, a study [21] warns about the interference of pacifier using as well as bottle feeding on continued breastfeeding. Findings [28] suggest that the use of pacifiers and/or bottles may be associated with unfavorable behaviors during breastfeeding, especially bottle feeding. However, a systematic review [29] failed to demonstrate an adverse relationship between pacifier using and duration or exclusivity of breastfeeding. In addition, caution is advised against contraindications as two meta-analyzes [30,31] showed the protective effect of pacifier using in sudden death syndrome. According to Zimmerman [32], several mechanisms have been explored to explain the protective effect of pacifiers, but none is universally accepted. Improvement in the ability to breathe through the mouth if the nasal airway becomes clogged and the position of the tongue, if it is positioned in retroposition that may lead to obstructive apnea and asphyxia, are possible explanations for the protective effect. In addition, the influence of pacifier use on sleeping position may also contribute to its protective

effect [30]. The potential deleterious effects of pacifier use, including changes in the development of craniofacial structures, suggest that it should be of limited duration. Thus, use up to one year of age is recommended, which includes the peak period for the risk of infant death syndrome [31]. However, research should continue to include pacifiers and bottles as variables of interest to better understand the eventual causality related to unfavorable breastfeeding outcomes [32].

A limitation of this study refers to its design. Although with data from a cohort study, the analysis performed here had a cross-sectional design, which made it possible to study the associations between the different phenomena but did not allow the establishment of a cause-effect relationship. It is a matter of respecting the indication of the design used, which is not intended to seek etiology. Thus, cross-sectional studies present several contributions, such as those presented here. Another situation is related to data collection, which involved numerous field researchers, which could impact the results with the eventual introduction of measurement biases. However, care was taken to avoid them, such as the formal training of the CHA. There were 30 hours of theoretical-practical activities to improve the data collection skills in the households, fundamental for this research. Another aspect to consider is that the combination, frequency and duration of the studied habits were not considered, imposing the need for caution in the analysis and interpretation of the results.

On the other hand, the quality control exercised by the research team, the good response rate and the use of validated indicators make it possible to minimize possible biases in all stages of the research, providing good internal and external validity to the study.

## Conclusion

Significant associations were found between variables related to the period of the first thousand days of life and risk behaviors for the development of malocclusions. Maternal education of less than eight years was independently associated with the interruption of exclusive breastfeeding until the fourth month. The occupation of the mother with income and occupation of the father without income were independently associated with interruption of breastfeeding until the sixth month. Pregnancy in adolescence and nursery attendance were independently associated with bottle use. Nursery attendance, hospitalization in the first 29 days of life and occurrence of reflux were independently associated with pacifier using. No significant associations were observed with digital sucking.

## Authors' Contributions

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## Conflict of Interest

The authors declare no conflicts of interest.

## Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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