ORIGINAL ARTICLE

AJO-DO

The influence of breastfeeding and pacifier use on the association between preterm birth and primary-dentition malocclusion: A population-based birth cohort study

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Introduction: Little is known about the influence of biological characteristics on the occurrence of malocclusion. This study aimed to investigate the association between preterm birth and primary-dentition malocclusion and how breastfeeding and the use of pacifiers are related to this association. **Methods:** A representative sample (n = 1129) of children from the 2004 Pelotas, Brazil birth cohort study underwent a dental examination at age 5 years. Malocclusions were diagnosed according to the World Health Organization criteria, and the outcome was considered as the presence of moderate or severe malocclusion (MSM). Questionnaires including the children's oral health information were completed by the mothers. Data on socioeconomic status, breastfeeding, and preterm birth were obtained from previous follow-ups. Poisson regression analysis was conducted, followed by an interaction test. **Results:** The prevalence of MSM was 26.3% (95% confidence interval [CI], 23.6%-29.1%) in the total sample, 24.1% (95% CI, 21.5%-26.9%) in full-term births, and 42.2% (95% CI, 39.1%-45.3%) in preterm births. After adjustment, the prevalence of MSM was 42% higher in preterm births. Breastfeeding duration and pacifier use up to age 4 years modified the effect of gestational age on MSM. **Conclusions:** Preterm birth is associated with the development of MSM. Breastfeeding reduces the effect of preterm birth on MSM, and pacifier use strengthens this association. Dentists should be aware that preterm birth may be a risk factor for malocclusion in primary dentition. The findings reinforce the benefits of breastfeeding on occlusal development and the negative consequences of pacifier use. (Am J Orthod Dentofacial Orthop 2020;157:754-63)

Prospective studies of live births have contributed to a better understanding of the relationship between early exposures and lifelong health outcomes. The beginning of life is a critical period when adverse or protective effects for the development of health problems may occur.[1] However, exposures occurring later in life may modify the effect of such earlier exposures or accumulate over the course of life, affecting the health condition years later.[1] In the oral health field, there is some evidence that low birth weight is associated with delayed tooth eruption at age 12 months[2] and exclusive breastfeeding up to age 6 months is a protective factor against moderate and severe malocclusion (MSM) in primary dentition.[3] Primary-dentition malocclusions are highly prevalent and may affect masticatory pattern[4] and esthetic appearance, leading to a negative impact on quality of life later on, especially when more severe malocclusions are considered.[5]

Although consistent evidence supports an association between pacifier use[4] and malocclusion in primary dentition and the protective effect of breastfeeding on

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primary-dentition malocclusion,[3] little is known about the influence of preterm birth on the occurrence of malocclusion. Different mechanisms could explain an association between malocclusion and preterm birth. Preterm children need to adapt prematurely to life outside the womb. Owing to the immaturity of many organs, these children may suffer metabolic disorders and infections during the neonatal period, which can influence their growth and development.[6,7] Similar to other tissues and organs, the facial bones and dentition can also be influenced by preterm birth; however, the specific factors involved in this process remain unclear.[6,8] Preterm infants can also present significant changes in physical development, such as shorter stature, lower weight, smaller head circumference, and lower muscle mass, and these factors can interfere in dentition development.[9,10]

Premature children are more likely to be exposed to sucking habits and tend to be breastfed for shorter periods than full-term babies,[11] which, in turn, may affect the orofacial development, leading to the development of malocclusions.[8] Thus, studies considering the association between malocclusion and breastfeeding and pacifier use should consider prematurity as a potential confounder variable.[12] Few prospective studies are investigating the relationship between a child's developmental conditions and occlusion disorders in primary dentition.[13] This approach is especially important because of the significant increase in the prevalence of preterm births in many countries, including the United States, India, China, Nigeria, and Brazil.[14] In these countries, the rate of preterm birth has rapidly increased and can now be characterized as a public health problem.[14]

This study aimed to investigate the association between preterm birth and malocclusions in children aged 5 years from a birth cohort study and how breastfeeding and the use of pacifiers are related to this association. We hypothesized that (1) the prevalence of malocclusion among children born prematurely is higher than in full-term children, (2) breastfeeding nullifies such association, and (3) the use of pacifiers increases the magnitude of the association between malocclusion and prematurity.

MATERIAL AND METHODS

An oral health study (OHS) was conducted in 2009, nested in a population-based birth cohort study in Pelotas, Rio Grande do Sul, Brazil, 2004. Mothers of all children born in the urban area of the city were included. Approximately 99% of the 4558 eligible children were included in the perinatal study. Response rates were 96%, 94%, 93.5%, and 92% at ages 3, 12, 24, and 48 months, respectively. Methodological details used in this cohort study were published elsewhere.[15]

All children of age 5 years in the cohort who were born between September and December 2004 (n = 1303) were invited to participate in the OHS. Of the 1303 eligible children, 86.6% (1129) had complete data on malocclusion and had responded to the questionnaire at age 5 years. The final sample (n = 1129) was sufficient to test associations with a statistical power of 80% and detect relevant risks equal to 1.6 or more, considering outcome prevalence (MSM)[16] corresponding to 24.0%[4] in the unexposed (full-term) infants at a significance level of 5%.

The mothers were interviewed in the first 24 hours after birth, and a structured and pretested questionnaire was completed. The questionnaire contained demographic, environmental, and socioeconomic questions as well as questions regarding characteristics of the pregnancy, labor, and the use of health services. The newborns were weighed and measured.[15]

Home visits were performed during the first month of life when the child was physically examined. The mother filled in a questionnaire including information on the use of health services, breastfeeding, nonnutritive sucking habits of the child, reproductive history, medication use, and demographic aspects. Information on socioeconomic conditions of the family was also obtained. Trained interviewers administered the questionnaires.[15]

At age 5 years, the children were dentally examined, and a structured questionnaire was answered at home by the parent or guardian. The following oral conditions were investigated: malocclusion,[16] dental caries,[16] dental plaque presence,[17] oral mucosa lesions,[18] emergence pattern of primary permanent molars,[3] and presence of black tooth stains.[19] The children were examined in their homes and seated under artificial lighting, and all recommended biosafety guidelines were strictly observed during the examination. The questionnaire for the mothers included data on the type of water used for drinking and food preparation, child's use of dental services, child's experience of dental pain and dental fear, and mother's perception of the child's oral health. Questions on the mother's oral health were also asked.

The fieldwork was carried out by 8 examiners, all postgraduate students at the Faculty of Dentistry from the Federal University of Pelotas. The examiners underwent a training and calibration exercise with 100 preschool-aged children between ages 4 and 5 years, who were not included in the sample. Simple and weighted κ reproducibility tests were used for dichotomous and ordinal variables, respectively, and the intraclass correlation coefficient was used for the nominal variables. Interexaminer κ scores for malocclusion ranged between 0.78 and 0.90, which are considered good.[20] Before the study, a pilot questionnaire (n = 50) was performed with mothers of children who were not included in the sample.

The dependent variable was the presence of MSM,[16] which was categorized as follows: (0) absence of malocclusion; (1) mild malocclusion—when there are 1 or more teeth with disturbance of position (rotation), slight crowding, or spacing, harming regular alignment; and (2) moderate or severe malocclusion—when there is an unacceptable effect on the facial appearance, a significant reduction in masticatory function, or phonetic problems observed owing to the presence of 1 or more of the following conditions in the 4 incisors: (1) maxillary horizontal overlap ≥9 mm (positive overjet); (2) mandibular horizontal overlap, anterior reverse articulation (crossbite) in ≥1 tooth (negative overjet); (3) open occlusal relationship (open bite); (4) midline deviation ≥4 mm; and (5) crowding or spacing ≥4 mm. We considered the dichotomous outcome: absence of malocclusion (no malocclusion or mild malocclusion) and presence of malocclusion (MSM).

Exploratory variables were mother's age in completed years (<20, 20-29, 30-39, ≥40 years); family income in reals (Brazilian currency; US$1 = R$3.15 at the time of the study) categorized into quintiles; and maternal schooling in completed years of study (≤4, 5-8, 9-11, and ≥12 years). Sex, child's birth weight (adequate = ≥2500 g and low = ≤2500 g), head circumference at birth (10th percentile), growth and development indicators at birth (height-for-age and weight-for-age *z* scores), total duration of breastfeeding (age ≤3 months, 3.1-9 months, and >9 months), and growth and development indicators at age 12 months (height-for-age and weight-for-age *z* scores) characterized the development of the child.[15] Children with *z* scores <−2 standard deviations in any of the indicators were considered to have a growth and development deficit. Respiratory problems were identified by the need for nebulization or inhaler use in the first 6 months and after age 6 months (yes or no) and presence of asthma or bronchitis diagnosis at 24 months (yes or no). The habit of sucking a pacifier up to 48 months (yes/no) and dental caries at 5 years (decayed-missing-filled index ≤3 or >3) were also considered in the analysis. Gestational age (born to term = ≥37 weeks and preterm birth = <37 weeks)[15] was considered as the main exploratory variable.

Statistical analysis

The analyses were performed using Stata version 12.0 (StataCorp, College Station, Tex). The descriptive analysis included the presentation of absolute and relative frequencies of the investigated variables. The chi-square and chi-square for linear trend tests were used to investigate the association between the outcome variable (dichotomous) and the potential associated factors when deemed necessary.

Poisson regression with robust error variance (prevalence ratio; 95% confidence interval [CI]) was used to assess the factors associated with malocclusion. For statistical analysis, a hierarchical model of approach was adopted,[21] in which the variables were ordered in their respective blocks, which determined their entrance into the model from the most distal to the most proximate variables (Fig 1). The first model level was represented by the maternal socioeconomic and demographic characteristics (family income, schooling, and mother's age at the time of the child's birth). The first model temporally preceded the second level, which comprised the perinatal variables (gestation period, type of birth, sex, birth weight, head circumference, and growth and development indicators at birth). The third level shows the characteristics of the child (breastfeeding, growth and development indicators at age 12 months, and respiratory problems). These, in turn, determine the fourth level, which includes behavioral variables (eg, pacifier sucking), and the fifth level, which includes dental caries at age 5 years.

All the independent variables that presented $P \leq 0.20$ in the bivariate analysis were included and maintained in the multivariable analysis as potential confounders. The variables were adjusted for those at the same level or the variables in previous levels. Variables with a statistical level ≤5% were considered significant. Interactions between gestational age and pacifier use and gestational age and breastfeeding duration were tested.

The project had the approval of the Ethics Committee, Federal University Pelotas, reference number 100/2009. Consent was obtained from the parent or guardian before all examinations and interviews. Children who required dental treatment were referred to the Pediatric Dental Clinic at the Federal University of Pelotas.

RESULTS

A total of 1129 children (86.6%) participated in the OHS, and the prevalence of preterm births was 11.9% (95% CI, 10.0%-13.9%). MSM in the total sample was 26.3% (95% CI, 23.6%-29.1%). The highest prevalence of malocclusion was observed in children from mothers with lower schooling levels. Preterm children showed

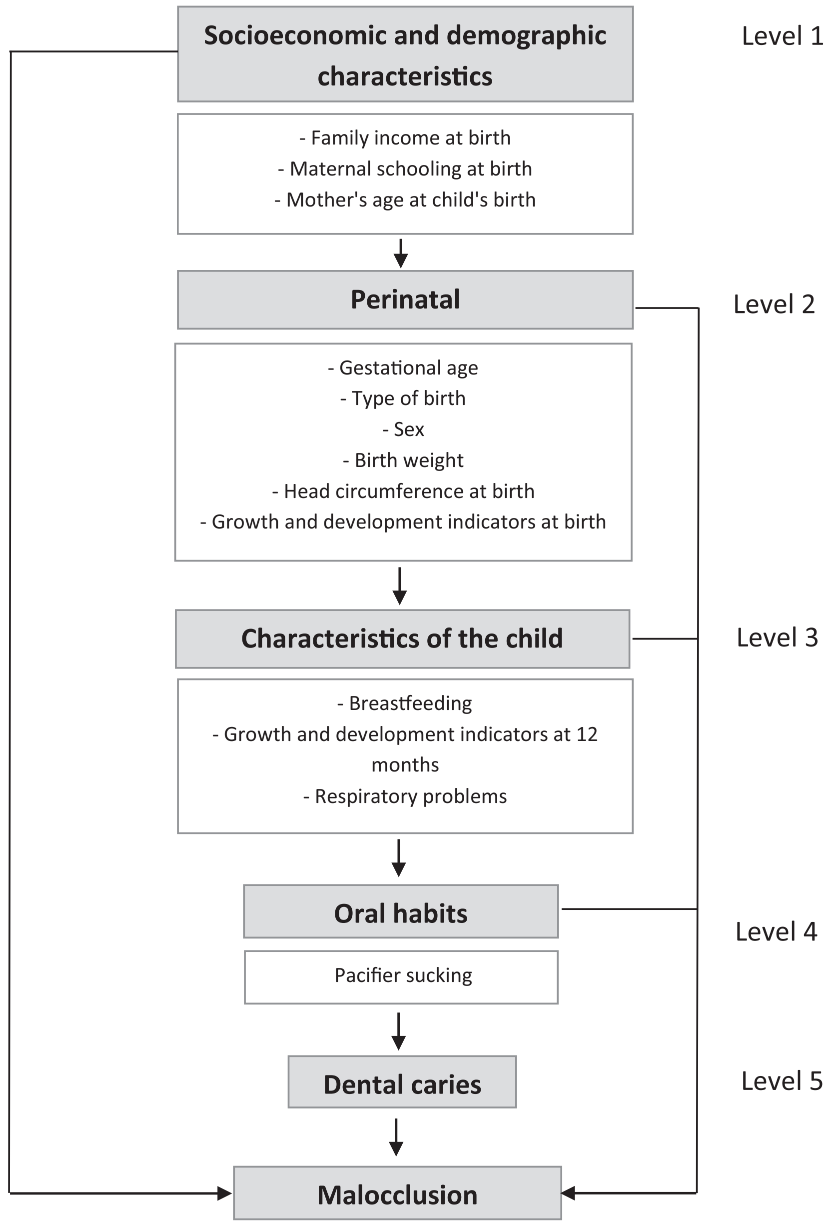

Fig 1. Hierarchical model of approach adopted. Variables were ordered in blocks, which determined their entrance into the model from the most distal to the most proximate variables. P <0.001 (P: interaction value).

approximately 2 times higher prevalence of the outcome than those children born full-term. Low birth weight, head circumference ≤10th percentile at birth, and weight-for-age and height-for-age deficits were all associated with higher prevalence of MSM. Individuals who presented a height-to-age deficit at 12 months and were medically diagnosed with asthma or bronchitis also presented higher prevalence of malocclusion. Breastfeeding duration until age 3 months and the use of pacifier up to 48 months increased malocclusion prevalence by approximately 5 and 15 times, respectively (Table 1).

After adjusted analysis, MSM prevalence was 42% higher in preterm children than in full-term children, independent of other variables in the model. The lower the mother's educational level and when head circumference was ≤10th percentile at birth, the higher the outcome prevalence. Children with lower duration of

Table I. Sample distribution according to malocclusion and study variables, Pelotas, Brazil, 2014

Variables	Total	Malocclusion		P*
		No	Yes	
Sex, n = 1020				0.051
Male	543 (53.2)	414 (76.2)	129 (23.8)	
Female	477 (46.8)	338 (70.9)	139 (29.1)	
Maternal age, y, n = 1019				0.856†
<20	187 (18.4)	138 (73.8)	49 (26.2)	
20-29	493 (48.4)	365 (74.0)	128 (26.0)	
30-39	312 (30.6)	228 (73.1)	84 (26.9)	
≥40	27 (2.7)	20 (74.1)	7 (25.9)	
Family income at birth (R$‡) quintiles, n = 1020				0.110†
5° (1081-10,000)	209 (20.5)	168 (80.4)	41 (19.6)	
4° (701-1080)	165 (16.2)	119 (72.2)	46 (27.9)	
3° (411-700)	234 (22.9)	168 (71.8)	66 (28.2)	
2° (261-410)	174 (17.1)	122 (70.1)	52 (29.9)	
1° (0-260)	238 (23.3)	175 (73.5)	63 (26.5)	
Maternal schooling, y, n = 997				<0.001†
≥12	114 (11.4)	99 (86.8)	15 (13.2)	
9-11	352 (35.3)	265 (75.3)	87 (24.7)	
5-8	398 (39.9)	271 (68.1)	127 (31.9)	
≤4	133 (13.3)	94 (70.7)	39 (29.3)	
Gestational age, n = 1020				<0.001
Term birth	899 (88.1)	682 (76.9)	217 (24.1)	
Preterm birth	121 (11.9)	70 (57.8)	51 (42.2)	
Type of delivery, n = 1020				0.132
Vaginal	523 (51.3)	375 (71.7)	148 (28.3)	
Cesarean section	497 (48.7)	377 (75.9)	120 (24.1)	
Birth weight, g, n = 1020				<0.001
≥2500	932 (91.4)	705 (75.6)	227 (24.4)	
<2500	88 (8.6)	47 (53.4)	41 (46.6)	
Head circumference at birth, percentile, n = 1019				<0.001
>10 (>32.3 cm)	911 (89.4)	691 (75.8)	220 (24.2)	
≤10 (≤32.3 cm)	108 (10.6)	60 (55.6)	48 (44.4)	
Weight-for-age at birth, SD, n = 1019				<0.001
≥−2	946 (92.8)	714 (75.5)	232 (24.5)	
<−2	73 (7.2)	37 (50.7)	36 (49.3)	
Height-for-age at birth, SD, n = 1012				<0.001
≥−2	896 (88.5)	678 (75.7)	218 (24.3)	
<−2	116 (11.5)	69 (59.5)	47 (40.5)	
Weight-for-age at 12 mo, SD, n = 998				0.535
≥−2	969 (97.1)	718 (74.1)	251 (25.9)	
<−2	29 (2.9)	20 (69.0)	9 (31.0)	
Height-for-age at 12 mo, SD, n = 994				0.024
≥−2	928 (93.4)	684 (74.8)	234 (25.2)	
<−2	66 (6.6)	41 (62.1)	25 (37.9)	
Nebulization or asthma nebulizer medication (up to 6 mo), n = 1000				0.520
No	105 (10.5)	80 (76.2)	25 (23.8)	
Yes	225 (22.5)	160 (71.1)	65 (28.9)	
Do not know	670 (67.0)	499 (74.5)	171 (25.5)	
Nebulization or asthma nebulizer medication (after 6 mo), n = 1000				0.164
No	163 (16.3)	117 (71.8)	46 (28.2)	
Yes	346 (34.6)	246 (71.1)	100 (28.9)	
Do not know	491 (49.1)	376 (76.6)	115 (23.4)	
Asthma or bronchitis (24 mo), n = 1010				0.008
Never or sometimes	800 (79.2)	606 (75.8)	194 (24.2)	
Always	210 (20.8)	140 (66.7)	70 (33.3)	
Any breastfeeding, mo, n = 1019				<0.001†
>12	365 (35.8)	333 (91.2)	32 (8.8)	
9.1-12	86 (8.4)	64 (74.4)	22 (25.6)	

Table I. Continued

Variables	Total	Malocclusion No	Malocclusion Yes	P*
6.1-9	97 (9.5)	72 (74.2)	25 (25.8)	
3.1-6	160 (15.7)	98 (61.3)	62 (38.8)	
0-3	292 (28.7)	174 (59.6)	118 (40.4)	
Never	19 (1.9)	10 (52.6)	9 (47.4)	
Pacifier sucking (48 mo), n = 1002				<0.001
No	614 (61.3)	587 (95.6)	27 (4.4)	
Yes	388 (38.7)	153 (39.4)	235 (60.6)	
dmfs, n = 1020				0.646
0-3	708 (69.4)	519 (73.3)	189 (26.7)	
>3	312 (30.6)	233 (74.7)	79 (25.3)	

Note: Values are represented as number (percentage) unless otherwise noted.
SD, standard deviation; dmfs, decayed-missing-filled index.
*Chi-square; †Chi-square test for linear trend; ‡R$1 = US$ 0.38.

breastfeeding and those who used a pacifier at age 4 years showed an outcome prevalence almost 4 and 11 times higher than those without these characteristics, respectively (Table II).

The interaction test showed that both the duration of breastfeeding (Fig 2) and the use of a pacifier until age 4 years (Fig 3) modified the effect of gestational age on MSM. Breastfeeding for >9 months attenuated but did not nullify the risk of MSM in preterm children. Prevalence of MSM almost doubled in preterm children who breastfed for a maximum of 3 months compared with those born full-term (Fig 2). Pacifier use increased the risk of malocclusion both in preterm and full-term children, significantly more in preterm children. The outcome prevalence was similar in those born preterm and full-term, as long as no pacifier was used until age 4 years (Fig 3).

DISCUSSION

In children born preterm, MSM was found to be more prevalent even after adjustment for pacifier use and breastfeeding for a short period. Breastfeeding longer than 9 months reduced but did not eliminate the risk of malocclusion in preterm children. By contrast, pacifier use seemed to have a more harmful effect of MSM in infants born preterm compared with full-term infants. Few studies that tested the association between malocclusion in primary dentition and preterm birth found no significant difference; however, most of the studies were cross-sectional.[9,22] When mixed dentition was considered, greater prevalence of occlusal problems such as those related to sagittal relationships (molar and canine) and occlusal asymmetry[23] were found in preterm children. In addition, the presence of 2 or more types of malocclusion (open bite, posterior crossbite, anterior crossbite, crowding, and spacing, among others)[10] and only anterior open bite[24] were also associated with preterm children.

It is known that preterm infants can also present significant changes in physical development, such as shorter stature, lower weight, smaller head circumference, and lower muscle mass. They may also show impaired psychological, difficulties in concentration, hyperactivity, and poor school performance.[25] These factors can interfere in dentition development.[9,10] It is important to note that preterm children can experience a catch-up growth phase after birth, characterized by an increase in weight, height, and head circumference at an accelerated rate.[24] This recovery is defined when a *z* score ≥ -2 standard deviation is obtained and it occurs at approximately 12 months of age.[26] Although growth catch-up can occur until the end of childhood, the short- and long-term effects of preterm birth on growth and development of the orofacial structures remain unclear.[9]

The results of this study also showed an association between MSM and breastfeeding duration, which corroborate findings from other studies[4,7] showing that breastfeeding may prevent malocclusion, potentially via the appropriate development of the jaws and the muscles involved in the suckling process of breast milk. Maternal milk is the focus of several studies because of its nutritional and immunologic value and its importance on the child's psychosocial development. Breastfeeding involves intense muscular activity, which promotes both craniofacial and dentofacial development, and it plays an important role in the formation of the hard palate. This results in fewer malocclusions and adequate dental alignment.[3]

The prevalence of malocclusion in preterm infants who were breastfed for a maximum of 3 months was

Table II. Crude and adjusted prevalence ratios (PR) between malocclusion and independent variables according to the adopted hierarchical model (n = 1020)

Variables	*Crude PR (95% CI)*	P	*Adjusted PR (95% CI)*	P*
Level 1: socioeconomic				
Family income at birth (R$) quintiles		0.101	†	
5° (1081-10,000)	Reference			
4° (701-1080)	1.42 (0.98-2.05)			
3° (411-700)	1.44 (1.02-2.02)			
2° (261-410)	1.52 (1.07-2.18)			
1° (0-260)	1.35 (0.95-1.92)			
Maternal schooling, y		<0.001		<0.001
≥12	Reference		Reference	
9-11	1.88 (1.13-3.11)		1.88 (1.13-3.11)	
5-8	2.42 (1.48-3.97)		2.42 (1.48-3.97)	
≤4	2.23 (1.30-3.83)		2.23 (1.30-3.83)	
Level 2: perinatal				
Gestational age		<0.001		0.011
Term birth	Reference		Reference	
Preterm birth	1.75 (1.37-2.22)		1.42 (1.08-1.87)	
Type of delivery		0.133	‡	
Vaginal	Reference			
Cesarean section	0.85 (0.69-1.05)			
Sex		0.052		0.112
Male	Reference		Reference	
Female	1.23 (1.00-1.51)		1.18 (0.96-1.45)	
Birth weight, g		<0.001	‡	
≥2500	Reference			
<2500	1.91 (1.49-2.46)			
Head circumference at birth, percentile		<0.001		0.006
>10 (>32.3 cm)	Reference		Reference	
≤10 (≤32.3 cm)	1.84 (1.45-2.34)		1.48 (1.12-1.95)	
Weight-for-age at birth, SD		<0.001	‡	
≥-2	Reference			
<-2	2.01 (1.55-2.60)			
Height-for-age at birth, SD		<0.001	‡	
≥-2	Reference			
<-2	1.66 (1.30-2.14)			
Level 3: child characteristics				
Any breastfeeding, mo		<0.001		<0.001
>9	Reference		Reference	
3.1-9	2.83 (2.09-3.83)		2.97 (2.20-4.00)	
Never breastfeeding-3	3.41 (2.57-4.53)		3.22 (2.43-4.28)	
Height-for-age at 12 mo, SD		0.015	§	
≥−2	Reference			
<−2	1.50 (1.08-2.09)			
Nebulization or asthma nebulizer medication (up to 6 mo)		0.062	§	
No	Reference			
Yes	0.97 (0.94-1.00)			
Asthma or bronchitis (24 mo)		0.006	§	
Never or sometimes	Reference			
Always	1.37 (1.09-1.72)			
Level 4: oral habits		<0.001		<0.001
Pacifier sucking (48 mo)				
No	Reference		Reference	
Yes	13.77 (9.44-20.09)		11.93 (8.05-17.69)	

PR, prevalence ratio; *SD*, standard deviation.
*Adjusted for the same-level variables and the variables of previous levels; [†]Excluded after adjusting for maternal education; [‡]Excluded after adjusting for maternal education and the level 2 variables; [§]Excluded after adjusting for maternal education, gestational age, sex, head circumference, and the level 3 variables.

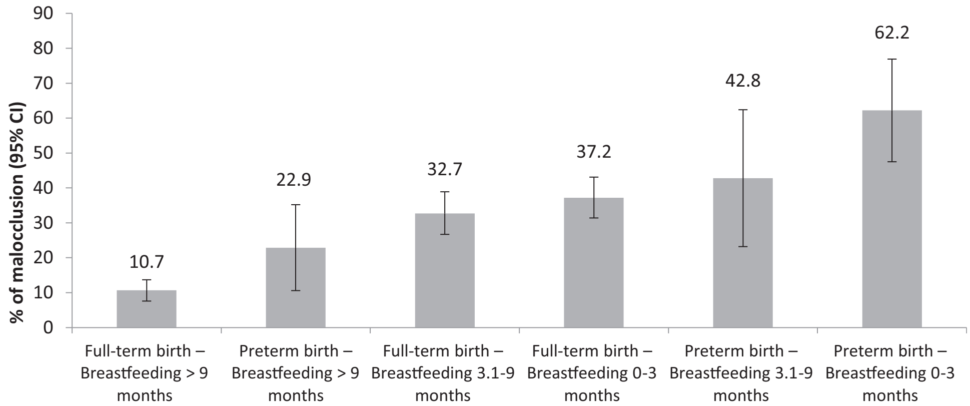

Fig 2. Prevalence of malocclusion according to gestational age and duration of breastfeeding in children aged 5 years, with 95% CIs. The interaction test showed that the duration of breastfeeding modified the effect of gestational age on MSM: breastfeeding for $>$9 months attenuated the risk of MSM in preterm children. Pelotas, Brazil, 2014. P $<$0.001 (P: interaction value).

almost 3 times higher than in those who were breastfed for $>$9 months. Moreover, breastfeeding for $>$9 months decreased the prevalence of malocclusion among preterm infants, which was similar to the prevalence of malocclusion in infants in the full-term group. The findings observed in our study corroborate the results of a recent systematic review that concluded that breastfeeding reduces the risk of malocclusions[27] and also emphasize the importance of health promotion measures focusing on a common risk approach, such as encouraging breastfeeding from the first few hours.

In this study, pacifier use modified the effect of preterm birth on malocclusion, narrowing the gap between the groups of children who used a pacifier until 48 months, independent of the gestational age. Although the pacifier is offered to children to comfort and calm them, it can interfere with correct sucking of the breast in the postpartum phase and contribute to the so-called "nipple confusion phenomenon," that is, the newborn positions his tongue incorrectly to suck the breast, leading to early weaning.[28] The use of a pacifier also reduces the number of times a child feeds per day, and consequently, there would be less breast

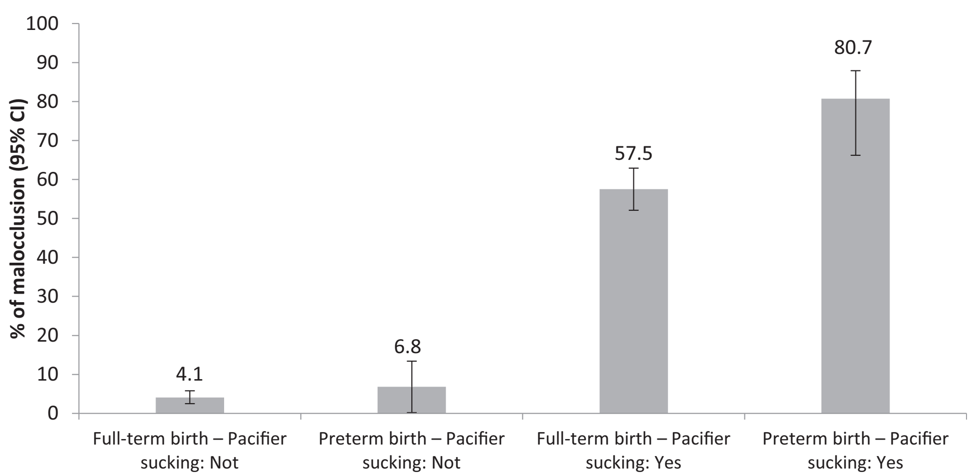

Fig 3. Prevalence of malocclusion according to gestational age and pacifier use in children aged 5 years, with 95% CIs. The interaction test showed that the use of pacifier until age 4 years increased the risk of malocclusion both in preterm and full-term children and was significantly greater among preterm children. Malocclusion prevalence was similar in those born preterm and full-term as long as no pacifier was used until age 4 years. Pelotas, Brazil, 2014.

stimulation and less milk produced, leading to short breastfeeding duration. When evaluating the benefits and risks of pacifier use, a systematic review observed a negative impact of pacifier use on breastfeeding.[29] Changes in dental arch parameters and their consequences on certain occlusal traits may persist beyond the cessation of pacifier use.[30]

This study had some limitations. Although multivariate models were used, the study was still susceptible to residual confounding, because other confounding factors not included may have influenced the associations tested. By contrast, the longitudinal design of a birth cohort study makes the data on exposures less prone to memory bias. Studies with these characteristics, which investigated gestational age as a risk factor for malocclusion in children, are unknown. In addition, the high level of agreement among the examiners and the high response rate ensured good internal validity of the study. This study considered the main potential confounders that are well established in the literature.

We highlight that malocclusions occurring in primary dentition are strongly associated with orthodontic treatment needed in permanent dentition.[31] Therefore, the prevention of malocclusion development in primary dentition may impact the need for dental treatment in the future, thus reducing the financial impact on the individual and the public health system. Findings suggest that preterm birth is a factor to be considered in the development of malocclusion in primary dentition. This study places pediatric dentistry in a broader perspective in investigating preterm birth, and its influences on malocclusion, a prevalent oral disorder.

CONCLUSIONS

Preterm birth is a risk factor for malocclusion in primary dentition. Breastfeeding for >9 months attenuates the risk of MSM in preterm children, whereas pacifier use was associated with an increasing risk of MSM both in preterm and full-term children.

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