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Maternal breastfeeding, parafunctional oral habits and malocclusion in adolescents: A multivariate analysis☆

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ABSTRACT

Objective: Malocclusion may result in esthetic impairment and functional disorders such as bad chewing, speech and swallowing, with a negative impact on quality of life. There is uncertainty regarding the effects of breastfeeding on dentofacial malocclusions. The purpose of the study was to evaluate the relationship between maternal breastfeeding and dental malocclusions and facial characteristics in adolescents with permanent dentition.

Methods: Probabilistic sampling of 2060 12- to 15-year-old students in a cross-sectional study was used. Malocclusion, as defined by Angle, and facial characteristics were the dependent variables. The duration of breastfeeding was the main independent variable. Other covariates were tested as effect modifiers or confounders. The associations were estimated using the odds ratio (OR) in multinomial logistic regression analysis ($\alpha = 5\%$).

Results: There was an association between a short duration of breastfeeding (less than 6 months) and Angle class II (OR = 3.14; 95% CI: 1.28–7.66) and class III (OR = 2.78; 95% CI: 1.21–6.36) malocclusion only in students with a prolonged history of bruxism. A higher occurrence of severe convex profile (OR = 3.4; 95% CI: 0.63–18.26) and a lower occurrence of cancave profile (OR = 0.43; 95% CI: 0.21–0.88) were also observed only among adolescents who had been breastfed for a short period and exposed to a long periods of mouth breathing.

Conclusions: These findings support the hypothesis that breastfeeding alone seems not to be directly associated with malocclusions, but it may have a synergetic effect with parafunctional oral habits on the development of occlusofacial problems. It is recommended that deleterious oral habits be avoided, especially by children who were breast-fed for less than 6 months.

1. Introduction

Satisfactory maternal breastfeeding has been associated with growth and development of the maxillomandibular complex [1–7]. This association can be a consequence of neuromuscular stimuli resulting from the act of sucking the nipple, which increases perioral tonus [1] and favors the correct arrangement of the structures responsible for chewing, swallowing, nose breathing and phonation [6–11]. However, it has been speculated that such stimuli, when produced abnormally, could generate bone reactions [7,12], with possible repercussions in the inadequate maxillary growth [13]. Hence, although the pattern of growth and development of facial bones is strongly associated with genetic factors [7], it is believed that the environment can affect this process [14]. Changes in the pattern of growth and development of craniofacial bones can in turn lead to poor relationships between the dental elements, reflected in dental malocclusions [12]. For this reason, failure to breast-feed/breastfeeding for a short period (FB/BSP) may be related to occlusofacial abnormalities [15]. This relationship may be a result of the influence of perioral muscular activity on the craniofacial growth and development process [5,6,16,17] or because parafunctional oral habits (POH) are more common in people exposed to FB/BSP [1,18–21].

There are many evidences on the effect of the POH in malocclusion. Bottle feeding [22], digit and pacifier sucking [22–26], mouth breathing [27] and bruxism [28,29] have been associated to alteractions on the shape and size of the jaws and to higher prevalences of malocclusion. Nevertheless, reports in the literature regarding breastfeeding and occlusofacial problems

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differ in their findings. Studies have failed to confirm this association empirically [1,19,20,30]. This may be because they use mainly univariate analytical techniques and therefore do not take into account confounding or interactions between variables [20], because they use relatively small [1,20] or convenience samples or because they evaluate the effects of this practice on deciduous dentition [19]. The aim of this study was therefore to evaluate, using multivariate analysis, the relationship between maternal breastfeeding and dental malocclusions and facial characteristics in adolescents with permanent dentition.

2. Methods

2.1. Study design and sample design

The study was a cross-sectional one, and the reference population consisted of 12- to 15-year-old adolescents enrolled in secondary schools in Salvador, BA, Brazil. Probabilistic stratified two-stage cluster sampling was used. The schools were the primary sampling units, and the students the secondary units. The proportion of students from public and private schools was maintained in the sample.

It was estimated that a sample of 1580 individuals would have an 80% chance of detecting a 10% difference in the prevalence of malocclusion – estimated at around 35% [31] – between the exposed and unexposed groups (α = 5%) in the proportion 1:1 with a design effect equal to 2. However, to compensate for possible non-responses and losses and the need to subdivide the database to control interactions, the study population was increased by 30% to 2060 adolescents.

If a student was not found in the school, even after three attempts, the information relating to that student would be considered lost. Students with a history of orthodontic/orthopedic treatment were excluded from the study (n = 4). For students to take part in the study, their parents or guardians had to sign the voluntary informed-consent form. The project was approved by the Research Ethics Committee under reference no. 012-04/CEP-ISC-UFBA on July 6, 2004.

2.2. Definition of the variables

Type of facial profile and presence of dental malocclusion were the dependent variables. Dental malocclusions were classified into three categories according to the Angle classification: '*normal occlusion or class I malocclusion*'; '*class II malocclusion*'; or '*class III malocclusion*' [12]. Facial profile was classified as '*normal*' (*straight/mildly convex*), '*severely convex*' or '*concave*' [12].

Duration of breastfeeding was the main independent variable and was classified according to the information provided by the mother or guardian as either '*never breast-fed/breast-fed until the age of six months*' or '*breast-fed for more than six months*'.

The covariates were duration of bottle feeding ('0–12 *months*' or '>12 *months*'); family income ('<2 *minimum monthly wages*', '2–5 *minimum monthly wages*' or '>5 *minimum monthly wages*'); level of education ('*low*' – illiterate to primary education not completed, '*average*' – primary education completed to secondary education completed, or '*high*' – graduation not completed to postgraduate completed); age ('12 *to* 13′ or '14 *to* 15 *years*'); sex ('*male*' or '*female*'); color ('*black*' or '*non-black*'); stunting ('*yes*' or '*no*'); loss of permanent teeth ('*yes*' or '*no*'); mouth breathing, digit sucking, pacifier sucking and bruxism (both classified as '*never had/had these habits but stopped before the age of six years*' or '*had these habits until after the age of six years*'). The age of 6 years was chosen as the cut-off for oral habits as the first permanent teeth erupt at this age [32].

The indicator height-for-age (h/a) was used for the anthropometric assessment. The AnthroPlus® program was used with the reference curves recently advocated by WHO [33], and individuals were classified as having stunting or a moderate height-for-age deficit (z-score more than 2SD below the reference population); a mild height-for-age deficit ($-2\text{SD} \leq z\text{-score} < -1\text{SD}$); or a normal/high/very high height-for-age ($z\text{-score} \geq -1\text{SD}$). Because of the low prevalence of stunting and moderate height-for-age deficit in the sample (4.58%, n = 88), it was decided to group all types of malnutrition (as measured by the height-for-age index) together in a single category, and the adolescents were classified as having '*normal height-for-age*' ($z\text{-score} \geq -1\text{SD}$) or '*some degree of height-for-age deficit*' ($z\text{-score} < -1\text{SD}$). Color was self-reported in accordance with the recommendations of the Brazilian Institute for Geography and Statistics [34], and because of the small number of Asians or indigenous natives, these were excluded from the analysis (n = 19).

2.3. Data collection

To ensure the internal validity of the study, a pilot study was set up and the intra- and inter-examiner agreements were determined by kappa analysis. Only those examiners with agreements ≥0.85 were included in the collection team. The students were examined in their schools, in good natural light using sterilized or disposable material. Occlusion was assessed in accordance with the WHO protocol [35]. Anthropometric measurements were taken twice using a double-blind method following the WHO recommendations [36]. The mean of the two measurements was used as the final measurement, and an inter-examiner variation in height of up to 0.1 cm was accepted [37]. Data were collected from July to October 2004.

2.4. Data analysis

A descriptive analysis was carried out, in which the differences in the distribution of the study covariates in the dependent variable categories were assessed using the chi-square test and a trend test (α = 5%). The associations between the dependent and independent variables were estimated using the odds ratio (OR) in multinomial logistic regression analysis. A confidence interval of 95% was used as the criterion for statistical inference. A backward modeling approach was used, and variables with a p-value of 0.2 or less were selected for the multivariate models. The likelihood ratio test was used to assess interaction (α = 5%). Variables that resulted in deviations of more than 10% in association measures between breast-feeding and malocclusion when removed from the model were considered confounders of the association of interest [38].

Estimates took into account the complex selection of the study sample. Standard errors were corrected, design effect (deff) was estimated, and the stratification variable and variable representing the primary sample units were incorporated in the analysis so that the intra-cluster correlation was taken into account [39]. In addition, as the selection probability was not the same for adolescents of different ages and also depended on the school in which they were enrolled – students in smaller schools having a greater probability of being selected – the estimates were weighted by the inverse of the selection probability for each adolescent [39]. The variables age and school were used for the weighting. Stata SE® version 9.0 was used for the analysis.

3. Results

Three private schools were substituted because they declined to take part in the study. Of the questionnaires sent to students 100%