MALOCCLUSION TRAITS AND SUCKING HABITS IN PRESCHOOL CHILDREN: A CROSS-SECTIONAL STUDY

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Palavras-chave: Má Oclusão. Chupetas. Pré-escolar. Comportamento de Sucção. Estudos Transversais.

RESUMO

Objetivo: O objetivo foi estimar a prevalência de maloclusões avaliadas em conjunto e separadamente em mordida aberta anterior, sobressaliência acentuada e mordida cruzada posterior, e a possível associação entre elas e os hábitos de sucção e amamentação. **Métodos**: Estudo transversal foi realizado com 472 pré-escolares de 24 a 60 meses e seus pais (taxa de resposta de 86,6%). Três dentistas treinados (Kappa > 0,70) examinaram as crianças para mordida aberta anterior, sobressaliência acentuada e mordida cruzada posterior e os pais responderam a um questionário indicando a presença de amamentação, uso de mamadeira, uso de chupeta, sucção de dedo e tempo de hábito. **Resultados**: A prevalência de maloclusões foi de 38,8%. A sobressaliência acentuada foi o mais prevalente (30,3%), seguido da mordida cruzada posterior (8,9%) e da mordida aberta anterior (7,4%). A regressão de Poisson não ajustada mostrou que as crianças que não foram amamentadas apresentaram 63,0% maior prevalência de maloclusão quando comparadas com aquelas que foram amamentadas (RP 1,63, IC95% 1,06-2,50). A duração do uso de chupeta em meses foi o único hábito que permaneceu no modelo ajustado associado à mordida aberta anterior (RP 1,10, IC 95% 1,05-1,14, p < 0,000) e sobressaliência acentuada (RP 1,03, IC 95% 1,01-1,05, p = 0,004). Para mordida cruzada posterior nenhum hábito mostrou associação no modelo ajustado. Todos os modelos foram ajustados por idade e sexo. **Conclusão**: A sobressaliência acentuada é a maloclusão mais prevalente. O tempo do uso de chupeta está associado à presença de maloclusão, mordida aberta anterior e sobressaliência acentuada. Nenhum dos hábitos investigados está associado à mordida cruzada posterior.

Keywords: Malocclusion. Pacifiers. Preschool. Sucking Behavior. Cross-Sectional Studies

ABSTRACT

Objective: The aim was to evaluate the prevalence of malocclusion traits altogether and separate in anterior open bite, accentuated overjet and posterior cross-bite, and the possible association between them and sucking habits and breastfeeding. **Methods**: A preschool-based cross-sectional study was conducted with 472 children aged 24-60 months and their parents (response rate 86.6%). Three trained dentists (Kappa > 0.70) examine children for anterior open bite, accentuated overjet and posterior cross-bite and parents answered a questionnaire indicating the presence of breastfeeding, bottle usage, pacifier usage, finger sucking and the length of usage of all these habits. **Results**: The prevalence of malocclusion traits was 38.8%, Accentuated overjet was the most prevalent (30.3%) followed by posterior cross-bite (8.9%) and anterior open bite (7.4%). The unadjusted Poisson regression showed that children who were not breastfed had 63.0% more prevalent malocclusion traits when compared with those who were breastfed (RP 1.63, 95%CI 1.06-2.50). Length of pacifier usage in months was the only habit remained in the adjusted model associated with anterior open bite (RP 1.10, 95%CI 1.05-1.14, p < 0.000) and accentuated overjet (RP 1.03, 95%CI 1.01-1.05, p = 0.004). For posterior cross-bite none habit showed association in the adjusted model. All models were adjusted for age and sex. **Conclusion**: Accentuated overjet is the most prevalent malocclusion trait. Length of pacifier usage is associated with the presence of malocclusion traits, anterior open bite and accentuated overjet. None of the investigated habits is associated with posterior cross-bite.

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INTRODUCTION

Malocclusion development depends on the interactions of factors such as genetics and environmental.[1] It is not new that sucking habits like pacifier usage and finger sucking may influence on the growth imbalance and change what would be a normal occlusion.[2] Attempts were made to diminish this interference like pacifier and bottle nozzle shape, conventional versus orthodontic, although it is still not possible to affirm that the orthodontic shape would protect stomatognathic system.[3]

Conversely it has been proposed that the usage of pacifier may be encouraged due to its beneficial effects on reducing the risk of sudden infant death syndrome[4] even though no randomized controlled trail could confirm this assumption.[5] Nevertheless the prevalence of anterior open bite (AOB) among 24-36 months old children pacifier users ranges from 17 to 96% and the prevalence of posterior cross-bite (PCB) 27 to 88%.[6] And in contrast, among those who were not pacifier users, the malocclusion prevalence reaches only 3%.[7]

There is still controversy related to pacifier usage and breastfeeding. Breastfeeding could be even difficult due to the usage of pacifier[8] or its usage could have no impact on prevalence or duration of breastfeeding at six months of age.[9] In fact, two meta-analyses had suggested that breastfeeding offers protection against malocclusion in children[10] decreasing its risk in primary dentition.[11]

Though sucking habits are still controversial and published recommendations on its usage are contradictory.[12] It has been proposed that malocclusion associated with sucking habits are subjected to its frequency, duration and intensity of usage.[13] Therefore, the objective of the study was to investigate the possible associations of malocclusion and sucking habits and breastfeeding. Also to verify the prevalence of malocclusion traits combined and evaluated separately in AOB, accentuated overjet (AO) and PCB. The study hypothesis was that it would be a direct relation among malocclusion and sucking habits so that children with sucking habit would present more malocclusion traits. It was also hypothesized that children who were breastfeed would have less malocclusion traits.

MATERIALS AND METHODS

The project was submitted to Plataforma Brasil and the Ethics Committee at The Federal University of Santa Catarina approved it under the number 343.658. All the subjects, children and parents, signed the Informed Consent previously the data collection. The research is reported following the Strobe Guidelines.[14]

Sample selection and calculation

A school-based cross-sectional study was designed to estimate the prevalence of malocclusion traits and to test the association of sucking habits with malocclusion traits in children aged 24-60 months enrolled in public preschools at Florianópolis, Brazil and their parents. The human development index in the city is 0.847 and there were 72 public preschools in 2014, when data were collected (March-September).[15] The estimated population in this age range in the city is considered to be 6349 children.[15]

The sample size calculation was based on a previous study[7] using the comparison of two proportions: 27.8% prevalence of children with posterior cross-bite and using pacifier and 14.6% prevalence of children with increased overjet and no pacifier usage. The calculus was made with the aid of the G*Power 3 analysis (version 3.1, University Dusseldorf, Germany). The considered test power was 90.0% with a standard error 0.3 reaching 454 participants. To compensate for possible losses 20% was added so that the stipulated sample was 545 pairs of child/parent.

All public preschools in the municipality could participate in the study. So children in each classroom were randomly selected. Attempts were made to have the same proportion on each age range in the study.

The inclusion criteria were children enrolled in public preschool and presenting primary teeth. Children were excluded if the behavior during the examination was not collaborative, if they had erupted permanent teeth and/or if they have had previous orthodontic treatment.

Training exercise and pilot study

Three trained dentists performed the oral exams. Coefficient of Kappa was used reaching value >0.7 (inter and intra-examiner). The training was developed in two phases: first theoretic and after 15 days, practical; and a specialist in pediatric dentistry was considered the gold standard. The pilot study was carried out in a preschool near the University with 27 children to test the methodology. Those who participated in the pilot study were not included in the final sample. The pilot study consisted also in testing the questionnaire specially designed for this research. Parents from children participating in the pilot study received and answered the questionnaire, which was deemed appropriate, and no changes were made.

Data collection and analysis

Data were collected using clinical examination and questionnaires send to parents. Three trained dentists examined children in the preschool ambient with the aid of a flashlight and appropriate protective sterilized equipment.

Children remained sited in front of the examiner in a knee-to-knee position allowing good mouth visualization. All malocclusion traits were evaluated with children in maximum habitual intercuspation (MHI). The anterior open bite (AOB) was measured with a millimeter probe perpendicular to the occlusal plane using the distance between the incisal edges of the upper and lower central incisors and was evaluated in present (≥3 mm) and absent (AOB <3 mm, presence of overbite or anterior end-to-end bite).[16] Overjet was measured using a millimeter probe positioned parallel to the occlusal plane and was classified in class III (when negative), end-to-end bite, <3 mm and ≥3 mm. For the analysis purpose, class III was grouped with ≥3 mm so that it was evaluated as accentuated overjet (AO) ≥3 mm and absent (overjet <3 mm and end-to-end bite).[17] This decision was made because only seven children presented class III. Posterior cross-bite (PCB) was classified as absent, when normal transverse relationship between maxillary and mandibular posterior teeth was observed, or present (uni or bilateral), when at least two of the maxillary molars occluded in lingual relation to the lower molars.[18] Each malocclusion trait was analyzed individually and as malocclusion present (AOB, AO and/or PCB present) and absent and then compared.

Questionnaires send to parents had questions concerning breastfeeding, bottle usage, pacifier usage and finger sucking habit. Also, parents responded the length of usage of all these habits in months.

Data were analyzed descriptively and with unadjusted and adjusted Poisson regression with Statistical Package for Social Sciences (SPSS version 21.0; SPSS Inc, Chicago, IL, USA). Confidence intervals (95%CI) and prevalence ratios (PR) were calculated. The significance level was set at 5%. The model was adjusted for age and sex. All the variables presenting p value < 0.05 in the bivariate analysis remained in the adjusted model. Continuous variables were analyzed as such and as categorical variables.

RESULTS

From the 72 preschools invited to participate (all public preschools in the city) 46 accepted. Those schools that did not accept to participate explained that they had already a nutrition research group working with children. Parents received the invitation with the Informed Consent and after the signing children and parents took part on the research. The response rate was 86.6%, from the 545 pairs of child/parent invited, 472 returned the consent and questionnaires and were examined. Though the needed sample was maintained. The reasons of the losses were children absent in the day the dentists performed the examinations, children who had forgotten to bring the questionnaires and blanked answers in the questionnaires. Table 1 brings the descriptive characteristics of the sample. Most of children were breastfed, although only almost a quarter were exclusively breastfeed, almost three quarters were bottle-fed and almost half of them used pacifier. The prevalence of malocclusion traits was 38.8% being accentuated overjet the most prevalent (30.3%). In the unadjusted analysis only finger sucking was not associated with all types of malocclusion traits as could be seeing in Table 2. The longest children were breastfed were 50 months. Length of pacifier usage and length of finger sucking remained associated with all types of malocclusion traits in the adjusted model (RP 1.03, 95%CI 1.01-1.05 and RP 1.02, 95%CI 1.01-1.04, p=0.001 respectively). Each month using pacifier increased the prevalence of malocclusion traits in 3.0% and each month of finger sucking increased malocclusion traits in 2.0% adjusted for age, sex, breastfeeding, length of breastfeeding, bottle usage, length of bottle usage, pacifier usage and length of finger sucking usage. Analyzing the different types of malocclusion traits, most of the independent variables were associated with AOB and AO in the unadjusted models. For PCB only pacifier usage and length of pacifier usage were associated in the unadjusted model as could be seeing in Table 3, though they lost the significance in the adjusted model. Length of pacifier usage in months was the only habit remained in the adjusted model associated with AOB (RP 1.10, 95%CI 1.05-1.14, p < 0.000) and AO (RP 1.03, 95%CI 1.01-1.05, p = 0.004). There were children still using pacifier in the moment of the data collection, which means 60 months.

DISCUSSION

The study results suggest that length of pacifier usage is associated with malocclusion traits irrespective of the presence and length of breastfeeding. Confirming one of the study hypothesis and refuting the other one. It is important to highlight that most of children presented more than one sucking habit simultaneously and only few were exclusively breastfeed and this in turn could influence the outcomes.

Data on the prevalence of malocclusion traits in this study (38.8%) diverges from a national Brazilian survey were 63.3% of children aged 60 months presented malocclusion. In that study, among cities, the higher the prevalence of breastfeeding at 12 months of age the lower the prevalence of malocclusion at 60 months.[19] Maybe those differences are due to participant age. In the present study there were children younger than 60 months. Although studies had found breastfeeding could protect children from developing

Table 1: *Descriptive characteristics of malocclusion and sucking habits (n=472).*

Variables	n	%
Sex		
Male	249	52.8
Female	223	47.2
Age		
2-3	203	43.0
4-5	269	57.0
Breastfeeding		
Yes	432	91.5
No	40	8.5
Bottle use		
No	125	26.5
Yes	347	73.5
Pacifier use		
No	242	51.3
Yes	230	48.7
Finger sucking		
No	443	93.9
Yes	29	6.1
Malocclusion		
Absent	289	61.2
Present	183	38.8
Anterior open bite		
< 3 mm	437	92.5
≥ 3 mm	35	7.5
Accentuated overjet		
< 3 mm	329	69.7
≥ 3 mm	143	30.3
Posterior crossbite		
Absent	430	91.1
Uni/bilateral	42	8.9
Associated habits		
Breastfeeding only	103	21.8
Breastfeeding+ Bottle use	113	23.9
Breastfeeding+ Bottle use+ Pacifier use	176	37.2
Breastfeeding+ Bottle use+ Pacifier use+ Finger sucking	6	1.2
Breastfeeding+ Bottle use+ Finger sucking	14	2.9
Breastfeeding +Pacifier use	17	3.6
Breastfeeding+ Pacifier use+ Finger sucking	1	0.2
Breastfeeding+ Finger sucking	2	0.4
Bottle use+ Pacifier use	27	5.7
Bottle use+ Finger sucking	4	0.8
Bottle use+ Pacifier use+ Finger sucking	2	0.4
Bottle use only	5	1.0
Pacifier use only	1	0.2
None	1	0.2
Length of habit	**Mean (months)**	**SD**
Breastfeeding	14.5	12.1
Bottle use	22.3	16.6
Pacifier use	13.9	16.3
Finger sucking	1.6	7.4
Habit	**Malocclusion**	
	Absent (n= 289; 61.2%)	**Present (n= 183; 38.8%)**
Breastfeeding		
Yes	273 (63.2)	159 (36.8)
No	16 (40.0)	24 (60.0)
Bottle use		
Yes	196 (56.5)	151 (43.5)
No	93 (74.4)	32 (25.6)
Pacifier use		
Yes	104 (45.2)	126 (54.8)
No	185 (76.4)	57 (23.6)
Finger sucking		
Yes	12 (41.4)	17 (58.6)
No	277 (62.5)	166 (37.5)

Note: SD - Standard deviation.

malocclusion traits,[11] in this research this association lost significance in the adjusted model.

Generally finger sucking brings worst outcome in the development of malocclusion traits in children when compared to pacifier usage[20] considering that it is easier to loose the pacifier habit. In this study finger sucking was neither associated with malocclusion traits combined nor when they were evaluated separately maybe because of the small number of children presenting the habit. Although it is important to observe that the sample size calculation was based on the pacifier habit and maybe the small number found of children with finger sucking habit in due to this fact. Besides that, only length of finger sucking was associated with malocclusion. Also, it was observed that none of the sucking habits were associated with PCB perhaps because the length of the habits combined with children's growth patterns were not enough to contribute to the development of this kind of malocclusion. Although is not possible to affirm this since facial growth patterns were not assessed, which could be considered a limitation of the study.

The most important result of the study is the association of length of pacifier usage with malocclusion traits combined, with AOB and AO corroborating with previous study.[7,11,18] It is important to address that class III malocclusion was grouped with overjet e ≥ 3 mm in the present study because of the small number of observed children with this malocclusion type and this could have influenced the result increasing the percentage of AO. A recent systematic

Table 2: *Unadjusted and adjusted Poisson regression models for independent variables associated with all malocclusion types combined. Florianopolis/SC*

Variables	Malocclusion			
	Unadjusted		Adjusted	
	PR (IC95%)	P value	PR (IC95%)	P value
Age (years)				
1-3	1	0.72	1	0.51
4-5	1.05 (0.78-1.40)		1.10 (0.81-1.48)	
Sex				
Male	1	0.79	1	0.94
Female	1.03 (0.77-1.39)		0.99 (0.73-1.33)	
Breastfeeding				
Yes	1	0.026*	1	0.40
No	1.63 (1.06-2.50)		0.81 (0.50-1.31)	
Length of breastfeeding	0.98 (0.96-0.99)	0.004*	1.00 (0.99-1.02)	0.46
No	1	0.006*	1	0.31
Yes	1.70 (1.16-2.48)		0.72 (0.38-1.36)	
Length of bottle usage	1.01 (1.00-1.01)	0.030*	0.99 (0.97-1.00)	0.35
No	1	<0.000*	1	0.94
Yes	2.32 (1.70-3.18)		1.02 (0.54-1.93)	
Length of pacifier usage	1.02 (1.01-1.03)	<0.000*	1.03 (1.01-1.05)	0.001
No	1	0.079		
Yes	1.56 (0.95-2.57)			0.001
Length of finger sucking	1.01 (1.00-1.03)	0.030*	1.02 (1.01-1.04)	

*Note: Adjusted for age and sex. All length measured in months. *p value < 0.05 indicates statistical significance.*

Table 3: *Unadjusted and adjusted Poisson regression models for independent variables associated with different types of malocclusion separately. Florianopolis/SC*

Variables	Anterior open bite (AOB)				Accentuated overjet (AO)				Posterior crossbite(PC)			
	Unadjusted		Adjusted		Unadjusted		Adjusted		Unadjusted		Adjusted	
	PR (IC95%)	P value	PR (IC95%)	P value	PR (IC95%)	P value	PR (IC95%)	P value	PR (IC95%)	P value	PR (IC95%)	P value
Age (years)												
1-3	1	0.50	1	0.21	1	0.80	1	0.95	1	0.52	1	0.42
4-5	0.79 (0.41-1.55)		1.52 (0.77-2.99)		0.95 (0.68-1.33)		1.01 (0.72-1.41)		1.22 (0.65-2.28)		1.29 (0.68-2.410	
Sex												
Male	1	0.24	1	0.24	1	0.92	1	0.57	1	0.33	1	0.33
Female	1.48 (0.76-2-90)		0.65 (0.31-1.34)		0.98 (0.70-1.36)		0.90 (0.64-1.27)		1.35 (0.73-2.48)		1.35 (0.73-2.48)	
Breastfeeding												
Yes	1	0.073			1	0.041*	1	0.44	1	0.800		
No	2.23 (0.92-5.38)				1.65 (1.02-2.68)		0.81 (1.47-1.38)		1.13 (0.40-3.18)			
Length of breastfeeding	0.93 (0.89-0.97)	0.001*	0.99 (0.94-1.03)	0.65	0.98 (0.97-0.99)	0.015*	1.00 (0.98-1.02)	0.61	0.97 (0.95-1.00)	0.114		
Bottle usage												
No	1	0.014*	1	0.44	1	0.016*	1	0.43	1	0.278		
Yes	5.94 (1.42-24.77)		0.48 (0.07-3-11)		1.70 (1.10-2.61)		0.74 (0.36-1.55)		1.53 (0.70-3.30)			
Length of bottle usage	1.02 (1.00-1.05)	0.008*	0.98 (0.95-1.01)	0.38	1.01 (1.00-1.02)	0.034*	0.99 (0.98-1.01)	0.69	1.00 (0.98-1.02)	0.880		
Pacifier usage							1	0.56				
No	1	<0.000*	1	0.57	1	<0.000*	1.24 (0.59-2.60)		1	<0.000*	1	0.37
Yes	17.36 (4.16-72.34)		1.82 (0.21-15.15)		1.95 (1.38-2.76)				3.85 (1.84-8.06)		0.56 (0.15-2.00)	
Length of pacifier usage	1.08 (1.06-1.11)	<0.000*	1.10 (1.05-1.14)	<0.000*	1.02 (1.01-1.03)	<0.000*	1.03 (1.01-1.05)	0.004*	1.03 (1.02-1.05)	<0.000*	1.02 (0.99-1.06)	0.11
Finger sucking												
No	1	0.552			1	0.033*	1	0.79	1	0.329		
Yes	1.43 (0.43-4.67)				1.79 (1.04-2.05)		0.85 (0.25-2.85)		0.37 (0.05-2.70)			
Length of finger sucking	1.01 (0.98-1.05)	0.392			1.01 (1.00-1.03)	0.018*	1.02 (0.98-1.06)	0.21	0.98 (0.92-1.03)	0.501		

*Note: Adjusted for age and sex. All length measured in months. *p value < 0.05 indicates statistical significance.*

review observed that irrespective of the pacifier shape, children that had the habit of sucking pacifier experienced higher prevalence of malocclusion traits when compared to those that did not had the habit.[21] Auto correction of AOB is reported to occur if the habit is abandoned up to 4-6 years of age,[22] although the American Academy of Pediatric Dentistry recommends children stopping sucking habits up to 36 months old or younger.[23] Nevertheless it is important to address that breastfeeding could reduce the risk of developing maloclusion,[11] although in the present study this association was not found.

Although it was not the scope of this study, literature suggests that in order to minimize the consequences of pacifier usage on the children's occlusion, it is important to limit hours of usage to a maximum of 4-6 a day.[13]

The study has limitations that restrict generalizations. All those related to the cross-sectional design that does not allow cause-effect conclusions since evaluate cause and outcome in the same moment. Besides, only public preschools participated in the sampling so it does not represent all children in the city. Population socioeconomic characteristics were not investigated, although it is known that the city has a good human development index, it is not enough to affirm that it represents all socioeconomic strata with all its implication considering that Brazil has significant social differences. Another important limitation is that only duration of the habits were investigated and it is known that the frequency and intensity have influence on malocclusion development. Plus, facial growth patterns, genetics, timing and sequence of primary teeth eruption were not evaluated. Finally, another limitation was that parents could have had difficulty remembering details of their children sucking habits.

The study also has strengths, the adequate sample size calculation and sampling method, pilot study and trained examiners with an adequate diagnostic method. Longitudinal studies evaluating duration, frequency and intensity of the sucking habits are still needed to better determine in what extend they may influence in malocclusion traits.

Health professionals in charge of children generally guide advice to parents on breastfeeding and sucking behaviors so the better their knowledge on the subject the better information they will be able to pass. In this sense the study reinforce the importance of breastfeeding[11] and the rational usage of pacifier.[23] When its usage could not be avoided, it is essential to limit the usage only when children are going to sleep, keeping it in mouth for the maximum of 6 hours a day[22] and encourage the abandonment up to 36 months of age,[23] when it is still possible to recover the normal occlusion.

CONCLUSION

AO is the most prevalent malocclusion trait. Length of pacifier usage is associated with the presence of malocclusion traits, AOB and AO. None of the investigated habits is associated with PCB.

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