Original Article

Artigo Original

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Association between harmful oral habits and the structures and functions of the stomatognathic system: perception of parents/guardians

Associação entre hábitos orais deletérios e as estruturas e funções do sistema estomatognático: percepção dos responsáveis

Keywords

Sucking Behavior
Tongue Habits
Primary Healthcare
Musculoskeletal System
Oral Health
Speech-language and Hearing Sciences

ABSTRACT

Purpose: To verify the occurrence and associate the presence and duration of harmful oral habits with the structures and functions of the stomatognathic system. **Methods:** This is a cross-sectional, exploratory study. Participants' participation was formalized by the signing of an Informed Consent Form. The non-probabilistic sample comprised 289 children aged one to 12 years assisted at a Family Health Strategy unit. The data were obtained through a questionnaire to identify harmful oral habits applied to the children's parents and/or guardians. The results were considered at 5% level of significance. The statistical analyses were performed using the SPSS 19.0 software and the chi-squared association test was employed to investigate the categorical variables. **Results:** The breastfeeding rate found was 85%; however, only 32.4% of the children were exclusively breastfed until six months of age. The most prevalent habits and those currently maintained were use of conventional bottle (28.62%) and conventional pacifier (23.18%). Significant correlation (p=0.001) was found between keeping the mouth open and oral and oronasal breathing. The presence of habits such as using orthodontic bottle (p=0.016) and orthodontic pacifier (p=0.001) was associated with the breathing mode reported. Habit duration was associated with the perception of changes in speech (p=0.046) and with malocclusion (p=0.014). **Conclusion:** The presence and duration of harmful oral habits were associated with the perception of changes in the structures and functions of the stomatognathic system regarding occlusion, breathing, and speech, accounting for a significant portion of the demand for rehabilitation.

Descritores

Comportamento de Sucção
Hábitos Linguais
Atenção Primária à Saúde
Sistema Musculoesquelético
Saúde Bucal
Fonoaudiologia

RESUMO

Objetivo: Verificar a ocorrência e associar a presença dos hábitos orais deletérios com as estruturas e funções do Sistema Estomatognático, quanto aos aspectos de fala, oclusão e respiração, na percepção dos responsáveis. **Método:** Estudo transversal, de caráter exploratório. A amostra, não probabilística, foi composta por 289 crianças de zero a 12 anos atendidas em uma unidade de estratégia de saúde da família. Os dados foram obtidos através de um questionário de identificação de hábitos deletérios aplicado com os responsáveis pelas crianças. Os resultados foram considerados a um nível de significância de 5% e as análises foram realizadas utilizando o programa SPSS versão 19.0 e o teste Quiquadrado de associação para análise das variáveis categóricas. **Resultados:** O índice de aleitamento materno foi de 85%, entretanto, apenas 32,4% foram amamentados exclusivamente até os seis meses. Os hábitos mais prevalentes e mantidos atualmente foram a mamadeira (28,62%) e a chupeta (23,18%) convencional. Houve associação significativa (p=0,001) entre o fato de a criança permanecer com a boca aberta e respirar de modo oral e oronasal. A presença de hábitos como a mamadeira (p=0,016) e a chupeta (p=0,001) ortodôntica estava relacionada ao modo respiratório relatado. O tempo de manutenção dos hábitos estava associado à percepção da presença de alterações na fala (p=0,046); e oclusais (p=0,014). **Conclusão:** A presença e a manutenção de hábitos orais deletérios mostraram-se associadas à percepção da presença de alterações nas estruturas e funções do Sistema Estomatognático de alterações de oclusão, respiração e fala, representando parcela importante da demanda por reabilitação.

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INTRODUCTION

The stomatognathic system (SS) is composed of static and dynamic structures. Its harmonious functioning relies on the balanced relationship between these structures[1]. The SS comprises the following functions: suction, swallowing, mastication, respiration, and speech, which are improved as of birth[1].

Suction occurs reflexively until the age of four months and is voluntarily controlled thereafter. This act influences the balance of SS structures, such as muscles and bones, favoring its development[2,3]. Swallowing is an automatic, complex, motor action that can be initiated consciously, in which a set of motor mechanisms conducts the intraoral content into the stomach[3]. Accordingly, mastication is an act that involves neuromuscular and digestive activities; it is dependent on patterns of growth, development, and maturation of the craniofacial complex, central nervous system, and occlusal guides[3]. In this context, nasal respiration, which is considered the most adequate, promotes increased intraoral pressure and, together with the tongue and the lips, maintains the balance and harmony of the craniofacial complex[3]. Regarding speech (phonation), the articulation of sounds depends on the position and mobility of the tongue, presence and position of the teeth (occlusion), mobility of the lips and cheeks, and position of the mandible, which altogether promotes adequate intraoral space for phonemic articulation and resonance[3].

Oral habits are defined as a learned neuromuscular act, which becomes unconscious, and is directly associated with the functions of the SS[4]. Oral habits are considered harmful based on some determining factors, such as duration, frequency, and intensity[5]. These determinants, associated with genetic factors, will define the occurrence, type, and severity of facial, occlusal and muscular changes[6].

Among the habits that can compromise the harmony of the SS and become deleterious, suction of bottle and pacifier, thumb sucking, Onychophagia, atypical tongue pressure during speech and swallowing, lip suction, orofacial posture, and oral breathing should be highlighted[4,7,8]. With respect to the severity of harmful oral habits (HOH), recent studies indicate prevalence of 30.8% to 70.8%, with pacifier sucking as the most frequent habit. The age range investigated in these studies ranged from four months to 13 years[6,9,10].

Prevention of orofacial impairments based on the determination of the occurrence of HOHs is considered the best focus for the development of a healthy balance between the SS structures, as well as a better possibility of health promotion in the field of Speech-language Pathology within Primary Health Care, whose strategies are still not contemplated and available to the population.

Considering the prevalence of HOH and their implications for the SS, the objective of the present study was to verify the occurrence and associate the presence and duration of HOHs with the structures and functions of the SS, especially with the aspects of speech, occlusion, and respiration, in the perception of parents and/or guardians, in children aged one to twelve years assisted at a Family Health Strategy unit.

METHODS

This is a cross-sectional, exploratory study whose aims are to investigate the occurrence and outcomes of harmful oral habits (HOH) and their impact on the structures and functions of the SS regarding the aspects of speech, occlusion, and breathing. The research was conducted at a Family Health Strategy (FHS) unit located in the northern district of the municipality of Porto Alegre, Rio Grande do Sul state, Brazil. The non-probabilistic sample consisted of 289 children aged one to 12 years assisted at that unit. The study was approved by the Research Ethics Committee of the involved Institutions under protocol nos. 329.728/13 (UFCSPA) and 509.337/14 (Porto Alegre City Hall). The parents and/or guardians of the participating children were invited to participate in the survey and signed an Informed Consent Form (ICF), as established by the ethical guidelines for human research, prior to study commencement.

Data were collected through a questionnaire to identify oral habits that was prepared for the present research based on the consulted literature[11,12] and applied to the children's parents/guardians. This questionnaire contains questions on the presence or absence of oral habits in children, habit duration, data regarding breastfeeding time, as well as possible changes associated with speech, occlusion, and breathing in the perception of parents/guardians. Data were collected in the participants' homes or in the waiting room of the FHS unit. No clinical evaluation of the structures and functions of the SS was performed; however, the report of parents/guardians was valued with regard to the presence of changes in these aspects, which were associated with the occurrence of HOHs. In addition, considering the age range between one and three years, questions regarding speech disorders were not answered. Speech disorders were those reported by the parents and/or guardians with respect to production of the phonemes /t/ /d/, /n/, /l/, /r/, /s/, and /z/, considered comprehensively as they are associated with alterations in the SS[3], and regarding occlusal changes described as "open front teeth", "crossbite", "crooked front teeth", or any other alteration reported by them. The questionnaire utilized is presented in Figure 1.

Data collection was performed by the researchers through an interview with the children's parents/guardians.

Statistical analysis

The statistical analyses were processed using the Statistical Package for Social Science (SPSS) 19.0 software (IBM, Armonk, NY, 2010). The categorical variables were initially described in absolute numbers and percentage and analyzed using the chi-squared association test. A significance level of 5% was adopted for all statistical analyses.

RESULTS

The study sample was composed of 289 individuals. The data were collected through interviews with the children's parents and/or guardians. Data related to some variables of the research present variations due to the fact that the individuals were not able to recall information, as well as to the lack of responses,

INSTRUMENTO DE IDENTIFICAÇÃO DE HÁBITOS ORAIS DELETÉRIOS

Entrevistado por:_____
ESF:_____
Responsável:_____ Idade:_____
Grau de Parentesco:_____ Área:_____ Data:___/___/___
Quantas pessoas de 0 a 12 anos moram na residência?
[__] 1 [__]2 [__] 3 [__]4 [__] mais de 4 crianças

SE HOUVER CRIANÇA:
1. Nome:_____
2. Gênero: [__]Feminino [__] Masculino
3. Idade: [__] 0 a 3 anos [__] 3 a 6 anos [__] 6 a 8 anos [__] 8 a 9 anos [__] 9 a 12 anos
4. Aleitamento materno: [__] SIM [__] NÃO
5. Aleitamento materno exclusivo: [__] Menos de 6 m [__] Até 6 m [__] Mais de 6 m [__] Mais de 1 ano
6. **Atualmente Utiliza:**
[__] Mamadeira com bico comum Tempo:_____
[__] Mamadeira com bico ortodôntico Tempo:_____
[__] Bico Ortodôntico [__] SIM [__] NÃO Tempo:_____
[__] Chupa dedo Tempo:_____
[__] Rói unha Tempo:_____
7. **Já Utilizou:**
[__] Mamadeira com bico comum Tempo:_____
[__] Mamadeira com bico ortodôntico Tempo:_____
[__] Bico Ortodôntico [__] SIM [__] NÃO Tempo:_____
[__] Chupa dedo Tempo:_____
[__] Rói unha Tempo:_____
8. [__] Suga/morde o lábio Tempo:_____
9. [__] Empurra a língua para falar ou engolir Tempo:_____
10. Dificuldades / alterações na fala: [__] Sim [__] Não
11. Alterações Dentárias: [__] Sim [__] Não
12. Permanece muito tempo com a boca aberta: [__] Sim [__] Não
13. Apresenta dificuldade para engolir alimentos:
Líquidos [__] Sim [__] Não
Sólidos [__] Sim [__] Não
Pastosos [__] Sim [__] Não
14. Prefere: [__] Líquido [__] Sólido ou [__] Pastoso?
15. Faz acompanhamento com:
[__] Pediatra [__] Fonoaudiólogo [__] Otorrinolaringologista
[__] Dentista [__] Psicologia [__] Outro:_____

Observação:

Figure 1. Instrument (questionnaire in Portuguese) used in the identification of Harmful Oral Habits

Table 1. Sociodemographic characteristics of the study sample, Porto Alegre (RS), 2014

Characteristics		n	%	Total
Number of children per household	**1**	*91	52.3	289 children
	2	*61	35.1	
	3	*14	8.0	
	4	*5	2.9	
	+4	*3	1.7	
Gender	**Male**	145	50.2	
	Female	144	49.8	
Age	**0 to 3**	109	37.7	
	3 to 6	69	23.9	
	6 to 8	39	13.5	
	8 to 9	14	4.8	
	9 to 12	58	20.1	

n + * = number of households; n = number of children, age in years; % = percentage values

considering the age group involved. The sociodemographic characteristics of the population included in this survey are described in Table 1.

Of the 289 participating children, 85% (246) were breastfed. Two hundred forty-one participants recalled breastfeeding duration, which was exclusive in 97.1% (234) and non-exclusive in 2.9% of the children, according to the parents/guardians' reports. Exclusive breastfeeding duration was as follows in percentage and number of children: <6 months, 49.1% (115); 6 months, 32.4% (76); >6 months, 13.2% (31); and >1 year, 5.1% (12).

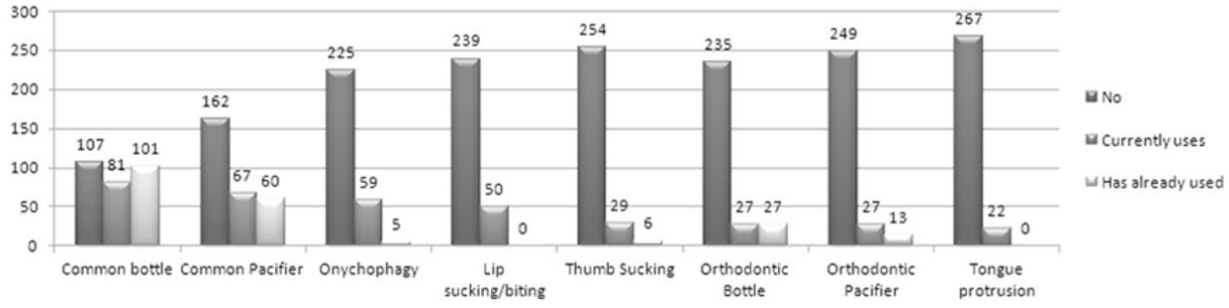
Prevalence of the different types of HOH found in the child population is shown in Graphic 1. Considering a total of 281 children, 19.6% (55) of them present some type of speech disorder. Of the 283 participants, 33.2% (94) reported that their children present some type of malocclusion.

When questioned if their children keep their mouths open for a long time, 28.4% (78) of a total of 275 participants reported that this occurs during the day and/or at night. Concerning perception about breathing mode, that is, oral, nasal, or oronasal, of the 240 children who had the questionnaire responded, 57.5% (138) presented preferential nasal respiration, 22.9% (55) showed preferential oral breathing, and 19.6% (47) presented preferential oronasal respiration. Significant statistical difference (p=0.001) was observed between the report of keeping the mouth open for a long time and breathing mode. The correlation between keeping the mouth open and the report of type of respiration is described in Table 2.

The results show significant statistical difference between the use of conventional bottle (p=0.012) or never having used conventional pacifier (p=0.014) and oronasal respiration. In addition, correlation between current use of orthodontic bottle (p=0.016) and oronasal breathing was also significant. The results show that the non-use of orthodontic pacifier is associated with nasal breathing, its current use is related to oronasal respiration, and having previously used it is associated with oral breathing (p=0.001). Table 3 shows the correlation between time of use of common pacifier and the report of malocclusion.

The correlation between never having used conventional pacifiers and absence of malocclusion was statistically significant (p=0.054).

Comparison between the report of presence of speech, occlusal and respiratory changes with the presence of oral habits, analyzed by the Pearson's chi-square test, showed significant correlation (p=0.056) between the presence of speech



Graphic 1. Occurrence of Harmful Oral Habits (n=289)

disorders and the use of conventional bottle. Similarly, there was significant statistical correlation between speech disorders and onychophagia (p=0.017).

As shown in Tables 3 and 4, significant correlation was found between the time of use of conventional pacifier and the presence of changes in speech (p=0.046) and occlusion (p=0.014), with the use of pacifier for less than one year associated with the absence of these alterations and its use for up to four years associated with the presence of these changes. Significant statistical difference was found between duration of thumb sucking and prevalence of speech disorders (p=0.012), that is, maintaining this habit for up to four years is associated with the presence of speech disorders. There was significant correlation between tongue protrusion while speaking or swallowing for up to three years and prevalence of speech disorders (p=0.016). The results showed significant correlation between the age ranges of three to six years and six to eight years and the presence of changes in speech (p=0.001) reported by the parents/guardians. Likewise, the age range of six to eight years is associated with the presence of malocclusion (p=0.011).

Table 2. Correlation between keeping the mouth open and the report of type of breathing, Porto Alegre (RS), 2014

Type of breathing	Keep the mouth open for a long time				N	*p*
	YES	%	NO	%		
	n		n			
Nasal	12	5.24	120	52.40		
Oral	34	14.84	20	8.73	229	<0.001
Oronasal	17	7.42	26	11.35		
Total	63	27.50	166	72.48		

p = level of significance; n =absolute number; N = sample size; % = percentage values

Table 3. Correlation between time of use of conventional pacifier and the report of malocclusion, Porto Alegre (RS), 2014

Type of habit	Duration	Dental malocclusion				N	χ^2 *Pearson p*
		YES	%	NO	%		
		n		n			
Common pacifier	<1 year	4	3.30	16	13.22	121	.014
	Up to 4 years	9	7.43	3	2.47		

p = level of significance; n =absolute number; N = sample size; % = percentage values

Table 4. Correlation between duration of harmful oral habits and the report of speech disorders, Porto Alegre (RS), 2014

Type of habit	Duration	Speech disorder				N	χ^2 *Pearson p*
		YES	%	NO	%		
		n		n			
Common pacifier	<1 year	1	0.84	19	15.96	119	.046
	to 4 years	6	5.04	5	4.20		
Thumb sucking	<1 year	0	_	12	36.36	33	.012
	to 2 years	4	12.12	3	9.09		
Tongue protrusion	<1 year	1	5.55	7	38.88	18	.016
	to 3 years	3	16.66	0	_		

p = level of significance; n =absolute number; N = sample size; % = percentage values

DISCUSSION

Although the present study did not address socioeconomic issues, the population investigated is vulnerable, characterized mostly by families with one, two, or three children. The data of this survey corroborate those of other studies, that show that, although prevalence of breastfeeding is considerable, maintenance of exclusive breastfeeding during the first six months of life is a challenge[13-15]. In this sense, the practice of exclusive breastfeeding is recommended until the sixth month of life and may be supplemented with other foods after this period[16].

Scientific data are divergent as to the association of socioeconomic and demographic factors with duration of HOH. Some studies have shown that socioeconomic conditions, maternal age, and parents' schooling directly influence natural breastfeeding rates and the prevalence of HOHs. According to some authors, mothers with higher schooling and income tend to breastfeed their children naturally and avoid the presence of deleterious habits[13]. However, a cohort study conducted with Brazilian children identified high prevalence of prolonged non-nutritive sucking habits, especially in better developed regions, and that perinatal variables such as birth weight, prematurity, and maternal age at birth were not associated with prolonged habits. In contrast, short duration of breastfeeding and bottle sucking duration were consistently associated with higher prevalence of prolonged non-nutritive sucking habits. In addition, it has been observed that eating habits and nutritive sucking at the beginning of life seem to be predictors of these habits at school-age[17].

Among the factors that contribute to early weaning are socio-cultural and economic matters, the use of artificial nipples, and non-nutritive sucking, especially the use of pacifiers, which may pose a risk for HOHs[14,18]. Studies have evidenced high prevalence of HOHs in different populations; however, the frequency of different types of habits changes according to the study, with the use of bottle and pacifier, onychophagia, and thumb sucking as the most commonly reported[6,9,10,12,19].

The data on changes in speech and/or occlusion described by the children's parents and/or guardians are similar to the prevalence found in studies conducted with specific populations, usually schoolchildren or children assisted in basic health services, which mostly described speech disorders in 24.3% to 33.7% of individuals[20,21], malocclusion in 30% to 45% of samples, and HOHs in over 70% of participants[6,12,22,23].

Statistical correlations were verified between not keeping the mouth open and nasal breathing as well as between keeping the mouth open and oral and oronasal respiration. Accordingly, respiratory disorders such as oral breathing can be characterized as habitual, due to the altered tone of the muscles that lift and maintain the mandible in its correct position, or to mechanical obstruction[24]. These behaviors can be caused by the presence of HOHs or even be considered as one of them[25]. During the functional examination of respiration, the posture of the lips, the mandible, and the presence of any sealing point of the oral cavity are verified; therefore, only the fact that children keep their mouths open does not mean that they are breathing through

it[24], but maintaining this posture for a long time is indicative of alteration. It is worth noting that diagnostics of the respiratory mode (which involves clinical evaluation by a specialized professional) was not conducted in the present study; however, the perception of parents/guardians about the characteristics and the way children breathe in their daily lives was valued.

Correlation was observed between oronasal respiration and the fact of never having used conventional bottle or pacifier. This may be justified by the fact that, although these children have not used conventional bottle and/or pacifier, they may present other habits, such as the use of orthodontic bottle. This inference is confirmed in our findings, considering that the current use of orthodontic bottle has shown significant correlation with oronasal breathing. Moreover, the use of orthodontic pacifier is also associated with the respiratory mode reported. Accordingly, the use of pacifier and bottle may cause inadequacy in the muscles of the SS, resulting in the absence of lip seals, which may become a pattern, facilitating oral breathing[26]. These habits may lead to inadequate positioning of the tongue at rest, being protrusive and with greater dorsal mobility, and may also lead to inadequate patterns of swallowing[26].

A recent literature review study reports that, based on the publications, HOHs cause damage to the SS as for the bone structures and orofacial functions, but the authors conclude that differences are not clear between the use of orthodontic pacifiers or bottles compared with the use of their conventional types regarding repercussion on the SS[27].

The muscles involved in the sucking process act less during artificial feeding, especially the orbicular muscles, which do not need to contract to obtain milk, as well as the musculature of the tongue, which performs inadequate movements during sucking and swallowing[2]. Although orthodontic nipples seem to cause smaller changes in the SS compared with those caused by conventional nipples according to the data obtained in this study, they showed correlation to the oral and oronasal respiratory modes, as well as their absence correlated to nasal breathing.

The correlation between the presence of HOHs and speech disorders in the children investigated can be based on the fact that adequate speech pattern also depends on the harmony of the SS structures for correct articulation and resonance[3], and that, according to some studies, the presence of HOHs negatively influences this system[5-7,9,12,22]. In this study, no distinction was made between the types of speech disorder, considering that it was based only on the report of parents/guardians; however, it is known that phonetic alterations occur mainly owing to tongue anteriorization between the arches, changing the production of linguo-dental (/t/, /d/, /n/, /l/) and linguo-alveolar (/s/ and /z/) phonemes[28]. The data showed that speech disorders are associated with the presence of onychophagia, which can be justified by the discomfort, anxiety, and stress that this problem causes in children, considering that it often results from emotional tension[29].

Analysis of the correlation between duration of HOHs and the functions of the SS showed that the maintenance of these habits for up to two and four years was associated with reports of changes in speech and occlusion. In this context, considering the structures and functions of the SS, removal of habits is recommended preferably before the age of two, considering that as of this age it is possible to observe some inadequacy, which may be either myofunctional orofacial or occlusal, especially anterior open bite[26].

The results showed significant correlation between age range and the presence of changes in speech and occlusion. This information corroborates findings of other studies[10,21] and deserve attention because changes during these ages usually require intervention for the correction and rehabilitation of functions. Therefore, these habits should be avoided in cases where there is no need for the use of bottle and/or pacifier, as their presence should be monitored in order to prevent them from becoming deleterious. These data corroborate those obtained in most studies addressing the theme; however, we highlight the correlation not only between the presence of HOHs, but also between their duration, and the functions and structures of the SS in the perception of parents/guardians.

It is also worth noting the possibility of recall bias, considering that the current age of the children may have interfered with the recollection of facts. Furthermore, this research is limited by the absence of assessment, and it is important to consider that many parents/guardians have no knowledge on normality and alteration. Nevertheless, further studies should conducted to monitor the relationship between duration of HOHs and the structures and functions of the SS.

It worth emphasizing the importance of studies on the theme, considering that it represents an important part of the demand for rehabilitation in different areas of health service, especially in Speech-language Pathology.

CONCLUSION

The data herein presented evidence the high prevalence of oral habits in children. The most commonly observed oral habits were suction of conventional bottle and pacifier, onychophagia, lip suction, and thumb sucking. We conclude that a habit may become harmful if mantained for at least two years. However, duration of harmful oral habits is associated with the perception of changes in the structures and functions of the SS, mainly those associated with occlusion and breathing and speech functions, with a demand for rehabilitation, considering that these disorders are included in public health.

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Author contributions

TSP participated in the project design, data collection, study development, and writing of the manuscript; FO was the study co-adviser, collaborated in the project design, study guidance, and analysis and revision of the manuscript; MCAFC was the study adviser, responsible for the project design and its submission to the Research Ethics Committee, study guidance, and analysis and revision of the manuscript.