

## Systematic Review Revisão Sistemática

Camila de Castro Corrêa<sup>1</sup>  
Mariana da Rocha Salles Bueno<sup>1</sup>  
José Roberto Pereira Lauris<sup>2</sup>  
Giédre Berretin-Felix<sup>1</sup>

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### Descritores

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### Correspondence address:

Camila de Castro Corrêa  
Al. Octávio Pinheiro Brisola, 9-75,  
Bauru (SP), Brazil, CEP: 17012-901.  
E-mail: camila.ccorrea@hotmail.com

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# Interference of conventional and orthodontic nipples in stomatognathic system: systematic review

## *Interferência dos bicos ortodônticos e convencionais no sistema estomatognático: revisão sistemática*

### ABSTRACT

**Purpose:** Check if the type of nozzle, orthodontic or conventional, of pacifier and bottle have any influence on the changes found in the stomatognathic system caused by the maintenance of the sucking habit. **Research Strategies:** Through a systematic literature review with meta-analysis, performed from the databases Lilacs, Medline and Embase and Scholar Google, with the following key words in Portuguese and English: “malocclusion” + “Pacifiers”; “Malocclusion” + “Bottle Feeding”; “Malocclusion” + “Bottle feeding” beyond words “Orthodontic Beak” + “Conventional Beak”. **Selection Criteria:** We included studies that presented in their methods to compare groups who used pacifiers and/or bottle with conventional nozzle with groups using orthodontic nipple without temporal delimitation. **Data Analysis:** The analysis of the article in its entirety was performed systematically, ordering the relevant results in the following categories: objective, method—case studies and evaluation, results, and conclusion. **Results:** Found 1,041 jobs, from the period 1969 to 2013, 848 jobs were excluded based on the exclusion criteria and another 174 that were repetitions. A total of 19 articles were read in full of which 4 articles met the proposed inclusion criteria, and three studies were included in the meta-analysis. These results show that there are no significant differences between the orthodontic and conventional nozzles on the implications of the stomatognathic system. **Conclusion:** There is no way to conclude that there are differences as to the consequences to the stomatognathic system caused by conventional nozzles and orthodontic pacifier/bottle

### RESUMO

**Objetivo:** Verificar se o tipo de bico, ortodôntico ou convencional, de chupeta e mamadeira, tem alguma influência sobre as alterações encontradas no sistema estomatognático causadas pela manutenção do hábito de sucção. **Estratégia de pesquisa:** Por meio de uma revisão de literatura sistemática com metanálise, realizada a partir das bases de dados Lilacs, Medline e Embase e com a ferramenta de busca Google Acadêmico™, com os seguintes descritores em português e inglês: “Má oclusão” + “Chupetas”; “Má oclusão” + “Alimentação Artificial”; “Má oclusão” + “Mamadeira”, além das palavras “Bico Ortodôntico” + “Bico Convencional”. **Critérios de seleção:** Foram incluídos estudos que apresentassem em seus métodos a comparação de grupos que utilizaram chupeta e/ou mamadeira com bico convencional com grupos que utilizaram o bico ortodôntico, sem delimitação temporal. **Análise dos dados:** A análise do artigo na íntegra foi realizada de modo sistemático, com as seguintes categorias tabelando os resultados pertinentes: objetivo, método - casuística e avaliação, resultados e conclusão. **Resultados:** Foram encontrados 1.041 trabalhos, período de 1969 a 2013, desses foram excluídos 848 trabalhos, devido aos critérios de exclusão, e outros 174 que eram repetições. Foram lidos na íntegra 19 trabalhos, dos quais quatro artigos atenderam aos critérios de inclusão propostos, e três trabalhos foram incluídos na metanálise. Tais resultados expressaram que não há diferenças significativas entre os bicos ortodôntico e convencional quanto às implicações no sistema estomatognático. **Conclusão:** Não há possibilidade de concluir a existência de diferenças quanto às consequências no sistema estomatognático ocasionadas por bicos convencionais e ortodônticos de chupetas/mamadeiras.

Study carried out at the Speech-Language Pathology and Audiology Department, School of Odontology of Bauru, Universidade de São Paulo – USP - Bauru (SP), Brazil.

<sup>1</sup> Departamento de Fonoaudiologia, Faculdade de Odontologia de Bauru, Universidade de São Paulo – USP - Bauru (SP), Brazil.

<sup>2</sup> Departamento de Odontopediatria, Ortodontia e Saúde Coletiva, Faculdade de Odontologia de Bauru, Universidade de São Paulo – USP - Bauru (SP), Brazil.

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## INTRODUCTION

It is known that breastfeeding provides the baby with more subsidies for survival in adverse environmental conditions<sup>(1)</sup>. As recommended by the Brazilian Ministry of Health, breastfeeding should occur for 2 years or more, being the exclusive source of nutrition for 6 months<sup>(2)</sup>. Studies have shown the many benefits of breastfeeding, such as reduced risk of asthma<sup>(3)</sup> and obesity in childhood and adolescence<sup>(4)</sup>, as well as benefitting lung function<sup>(3,5,6)</sup> and participating in the development of orofacial structures and functions<sup>(7-9)</sup>.

Literature agrees that breastfeeding for a long time is related to a lower incidence of non-nutritive sucking habits<sup>(10,11)</sup>. Thus, the use of bottles and pacifiers may result in the interruption of breastfeeding<sup>(12,13)</sup> or in it becoming complementary and non-exclusive<sup>(12)</sup>.

Harmful oral habits, such as thumb sucking or the use of pacifiers and bottles, are learned and often repeated patterns of muscle contraction<sup>(14)</sup> and may cause damage to the morphophysiology of the stomatognathic system<sup>(7-9)</sup>. Among these, the most common are malocclusion<sup>(15-17)</sup>, bruxism<sup>(18,19)</sup>, and difficulties in lip sealing, suggesting changes in the orofacial muscles<sup>(9,17)</sup>.

In addition, harmful oral habits are risk factors for mouth breathing and changes in chewing and swallowing<sup>(17,20,21)</sup>. The severity of the changes found is directly related to the frequency, duration, and intensity of the habit<sup>(22)</sup>, as well as the individual predisposition, conditioned by genetic factors<sup>(23)</sup>.

Regarding the sustainability of such habits, the contribution of the child's emotional and nutritional factors<sup>(24)</sup>, as well as the socioeconomic and cultural context, such as maternal employment, occupation of the person in the household with the higher income, and the low level of income available for family, should be emphasized<sup>(22,25)</sup>.

It is clear that harmful oral habits cause damage to the stomatognathic system, both to the bone structures and the orofacial functions. However, the differences in the impact of the use of orthodontic pacifier/bottle nozzles in comparison to conventional ones are not clear.

## OBJECTIVE

This study aimed to verify, through a systematic literature review, if the type of pacifier and bottle nozzle, orthodontic or conventional, have any influence on the changes found in

the stomatognathic system caused by the maintenance of the sucking habit.

## RESEARCH STRATEGY

This is an exploratory, descriptive study, in which we used the systematic review technique for data collection. This technique aims to identify studies already completed related to the subject of interest, evaluating their results<sup>(26)</sup>.

The search was conducted in March 2013 and updated in July 2014, without temporal delimitation, by consulting three databases—Lilacs, Medline, and Embase—as well as the use of the Google Scholar™ search engine. For the queries, we used the following DeCS/MeSH descriptors: “Má oclusão,” “Chupetas,” “Alimentação Artificial,” “Mamadeira,” “Malocclusion,” “Pacifiers,” “Bottle Feeding,” and “Nursing Bottles.” The following descriptors not included in DeCS/MeSH were also used: “Bico Ortodôntico” and “Bico Convencional,” “Orthodontic Pacifiers,” and “Conventional Pacifiers.” The search strategies used are shown in Table 1, referencing the adopted database or search engine.

The search and selection of the articles were carried out independently by two judges, who previously established inclusion and exclusion criteria. After the data extraction, they confronted their findings and resolved discrepancies by consensus.

## SELECTION CRITERIA

The studies included were those which featured, in their methods, the comparison between groups who used pacifiers and/or bottles with conventional nozzles and groups who used orthodontic nozzles. The following exclusion criteria were considered: review articles and studies that did not compare the evaluations of populations who used orthodontic nozzles and conventional nozzles. Table 2 shows the criteria adopted for the selection of scientific articles considered in the study.

The titles and abstracts of the studies queried were examined to see if they met the preestablished inclusion and exclusion criteria. The full versions of the abstracts included were accessed afterward, to complete the evaluation of the study and decide for its inclusion in the study.

The analysis of the article in its entirety was carried out systematically, tabling the relevant results to the following categories: objective, method—casuistry and evaluation, results, and primary and secondary outcomes. Criticisms and observations

**Table 1.** Search strategies in databases and search engine

	SEARCH STRATEGIES	DATABASES AND SEARCH ENGINE
1	“Má oclusão” AND “Chupetas”	
2	“Má oclusão” AND “Alimentação Artificial”	Lilacs
3	“Má oclusão” AND “Mamadeira”	
4	“Malocclusion” AND “Pacifiers”	
5	“Malocclusion” AND “Bottle Feeding”	Medline, Embase
6	“Malocclusion” AND “Nursing Bottles”	
7	“Bico Ortodôntico” AND “Bico Convencional”*	
8	“Orthodontic Pacifiers” AND “Conventional Pacifiers”*	Lilacs, Medline, Embase and Google Scholar

\*Words not contained in the DeCS/MeSH descriptors list

to the works were carried out, aiming at the convergence to the objective of the present study. In addition, the studies were classified according to their type and the level of evidence, comprising 10 hierarchical levels, from level 1, with the least evidence (non-systematic literature reviews), up to level 10, with the most evidence (systematic reviews with meta-analysis of randomized controlled trials)<sup>(27,28)</sup>.

**DATA ANALYSIS**

Meta-analysis of the data was performed using the Comprehensive Meta-Analysis Software (Biostat, Inc.; Englewood, NJ, USA), considering that the articles had the same experimental design<sup>(29)</sup>.

**RESULTS**

A total of 1,079 studies were found, from 1969 to 2013. From the Medline database, 121 articles (11%) were collected; 66 from LILACS (6%); 125 from Embase (12%), and 767 studies from the Google Scholar search tool (71%). After the analysis of the studies' titles and abstracts, 886 were excluded for expressing greater emphasis on the characterization of the population with and without history of any oral habit harmful and for not presenting the comparison between groups using different nozzles, as well as 174 repeated studies. Thus, only 19 articles were analyzed in full.

Table 3 shows the results of the cross-checks, considering the databases adopted by the intersection of DeCS/MeSH descriptors and keywords used, in English and Portuguese, for the search conducted.

Of the 19 articles analyzed in full, 15 were excluded because they addressed the damage caused by harmful oral habits, and

did not include the comparison between the orthodontic and conventional nozzles. Thus, we selected four works for this study. Figure 1 illustrates the process of selection of the articles related to the organization chart of systematic search.

Of the selected studies, two were collected from Embase, one from Medline, and one from Google Scholar. Among these studies, three<sup>(30-32)</sup> were on the use of pacifiers with different nozzles and one study<sup>(33)</sup> was on the use of pacifiers and bottles. Table 1 presents the information of the selected articles as to the authorship, title, source, year of publication, volume, issue, and pagination.

Chart 1 shows that the articles considered were published, on average, 16 years ago, all in journals of the dental field, specifically Odontopediatrics.

Chart 2 details the results about the casuistry, study type, level of evidence, oral habit investigated, assessment tools adopted, results, and primary and secondary outcomes of the articles considered in this study.

Three of the studies were cross-sectional and one was a case-control, as shown in Chart 2, and they sought to investigate the habit of the use of the nozzle on the pacifier, and only one study<sup>(33)</sup> was focused on the investigation of the nozzle on the pacifier and bottle. For objective and subjective measurements of the consequences of the use of nozzles, these studies used questionnaires characterizing the history of habit, speech-language, and dental examinations.

**Statistical results**

To perform the meta-analysis, we considered the three cross-sectional studies<sup>(30-32)</sup>. Each one presented a sample divided into three groups: subjects with no history of using conventional

**Table 2.** Inclusion criteria adopted for this study for the selection of scientific articles included

	INCLUSION CRITERIA ADOPTED
Population	Children with a history of harmful oral habits, pacifier, and/or bottle
Intervention	Use of conventional and orthodontic nozzles on a pacifier and/or bottle
Comparison	Comparison of the use of conventional and orthodontic nozzles
Primary outcome	Stomatognathal system disorders caused by the use of different nozzles

**Table 3.** Results of search strategies per database, with the number of articles found and those considered for inclusion in this study

	1 "Má oclusão" AND "Chupetas"	2 "Má oclusão" AND "Alimentação Artificial"	3 "Má oclusão" AND "Mamadeira"	4 "Malocclusion" AND "Pacifiers"	5 "Malocclusion" AND "Bottle Feeding"	6 "Malocclusion" AND "Nursing Bottles"	7 "Bico Ortodôntico" AND "Bico Convencional"	8 "Orthodontic Pacifiers" AND "Conventional Pacifiers"
(L) Found	16	20	29				1	
(L) Included	0	0	0				0	
(M) Found				33	44	44		0
(M) Included				1 <sup>(R)</sup>	0	1		0
(E) Found				55	60	1		10
(E) Included				1	0	0		1
(GS) Found							767	
(GS) Included							1	

L = Lilacs; M = Medline; E = Embase; GA = Google Scholar

(\*) Words not contained in the DeCS/MeSH descriptors list

<sup>(R)</sup> Repeated article, found in more than one database

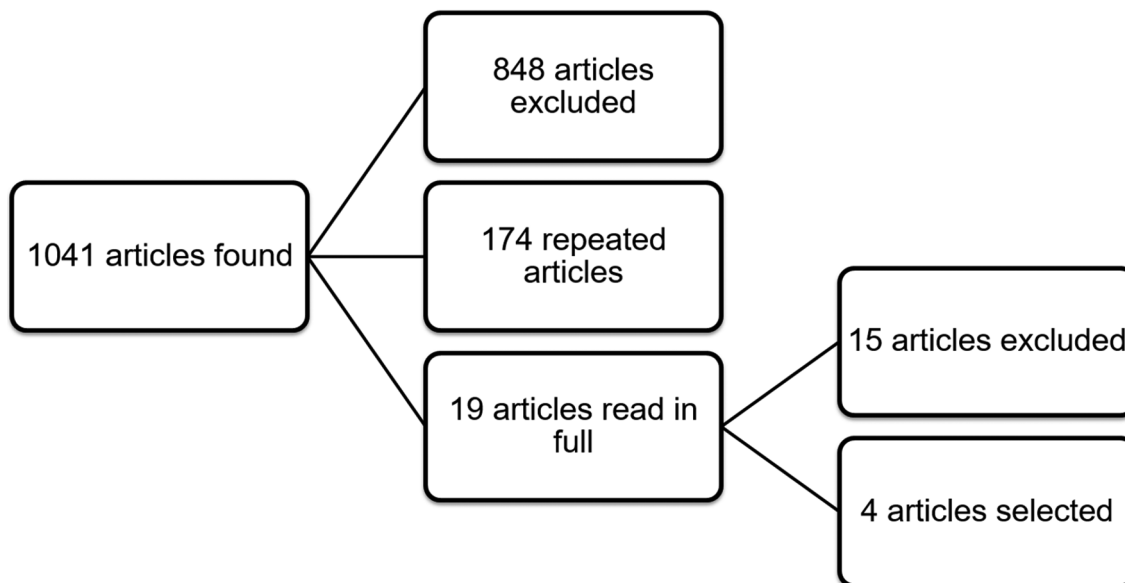


Figure 1. Organizational chart of the systematic review search process

Chart 1. Presentation of the results of the selected articles through search of literature review

AUTHOR	TITLE	SOURCE	YEAR OF PUBLICATION	VOLUME ISSUE PAGES
MEYERS; HERTZBERG	Bottle-feeding and malocclusion: Is there an association?	American Journal of Orthodontics and Dentofacial Orthopedics	1988	v. 93, n. 2, p. 149-152
ADAIR; MILANO; DUSHKU	Evaluation of the effects of orthodontic pacifiers on the primary dentitions of 24- to 59-month-old children: Preliminary study	Pediatric Dentistry	1992	v. 14, n. 1, p. 13-18
ZARDETTO; RODRIGUES; STEFANI	Effects of different pacifiers on the primary dentition and oral myofunctional structures of preschool children	Pediatric Dentistry	2002	v. 24, n. 6, p. 552-60
MESOMO; LOSSO	Evaluation of the effects of orthodontic and conventional pacifiers on the primary dentition	JBP Revista Ibero-americana de Odontopediatria & Odontologia do bebê	2004	v. 7, n. 38, p. 360-4

and orthodontic nozzles (control), subjects who used the conventional nozzle, and subjects who used the orthodontic nozzle. Thus, Table 4 shows the junction of these groups from the three studies, as well as the total sample and the number of subjects that presented open bite (OB) and cross-bite(CB).

The degree of heterogeneity was calculated by the I<sup>2</sup>, which showed I<sup>2</sup> = 0% for OB and I<sup>2</sup> = 3.5% for CB. In both cases, low values were obtained, indicating that the heterogeneity did not compromise the meta-analysis. Publication bias was calculated by the Egger test, which showed no statistically significant bias for OB (p = 0.487) and for CB (p = 0.216).

Graph 1 shows the result of the meta-analysis for the OB of the occurrence ratio of the orthodontic nozzle compared to the conventional nozzle. It was observed that the result favors a lower occurrence of OB with the use of orthodontic nozzles (OR = 0.650), but without statistical significance (p = 0.328).

Graph 2 shows the results of the meta-analysis for CB of the occurrence ratio of orthodontic nozzle compared to conventional nozzle. It was observed that the result favors a higher incidence

of CB with the use of orthodontic nozzles (OR = 1.949), but without statistical significance (p = 0.118).

**DISCUSSION**

According to the results obtained, it can be observed that there is a shortage of scientific publications concerning the interference of nonnutritive sucking habits, performed with conventional and orthodontic nozzles, in the orofacial structures and functions. Despite the gap in the literature on the subject, this issue has a significant impact on the scientific community and statements are made as to the preferred use of the orthodontic nozzle, even without scientific proof of such conduct.

For this study, a population of children with a history of harmful oral habits was selected, with the use of orthodontic nozzles compared with the use of conventional nozzles, analyzing their implications on the stomatognathic system. Such study design resulted in a number of articles published in scientific journals being excluded, especially due to the lack

**Chart 2.** Presentation of the information related to each article selected, considering casuistry, type of study, level of evidence, habits investigated, evaluation tools used, results, and primary and secondary outcomes, obtained through search of literature review

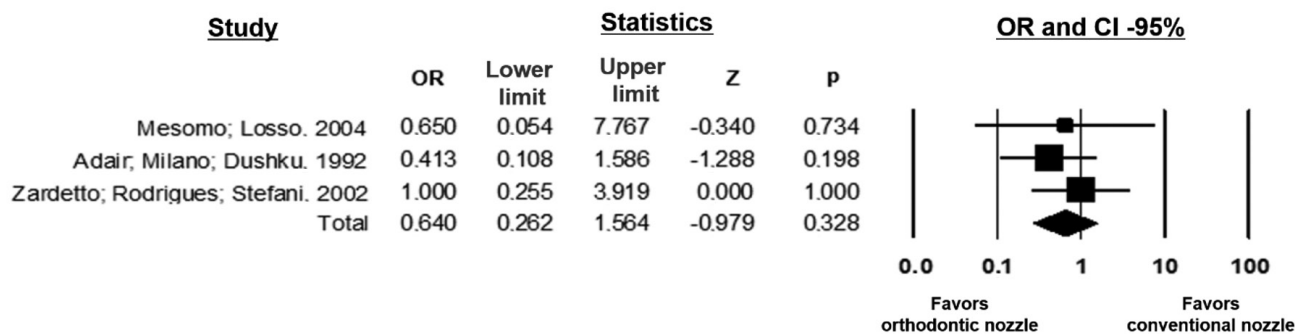
ARTIGO CIENTÍFICO (autor, ano)	CASUÍSTICA (número da amostra e faixa etária)	TIPO DE ESTUDO E NÍVEL DE EVIDÊNCIA <sup>(27,28)</sup>	HÁBITO INVESTIGADO	INSTRUMENTOS DE AVALIAÇÃO	RESULTADOS	DESFECHO PRIMÁRIO	DESFECHO SECUNDÁRIO
MEYERS; HERTZBERG, 1988	454 children aged 10 to 12	Case-control 6	Pacifier and bottle	Questionnaire on history of habits and orthodontic treatment	There was no statistical difference in the type of pacifier/bottle nozzle on malocclusion and orthodontic treatment need.	There was a growing trend in the need for orthodontic treatment according to the time of use of the bottle, regardless of the nozzle.	New studies are suggested to examine individuals directly, not only by questionnaire, to confirm the results.
ADAIR; MILANO; DUSHKU, 1992	79 children aged 2 to 5	Cross-sectional 5	Pacifier	Questionnaire on history of habits and orthodontic treatment	Highest mean of increased overbite and open bite in the conventional pacifier group; Highest mean of increased overjet in orthodontic pacifier group; No significant differences	The two types of pacifier nozzles implied in occlusal changes, with no significant relationship between them.	From this study, new studies were suggested with most numerous samples, in addition to the consideration of more rigorous evaluations, comparing children who had the habit and stopped with those who kept their habit continuously.
ZARDETTO; RODRIGUES; STEFANI, 2002	61 children aged 3 to 5	Cross-sectional 5	Pacifier	Questionnaire of habit and evaluation of occlusion and orofacial myofunctional structures.	Highest mean of posterior cross-bite in the conventional pacifier group; There was no difference between the results of the children who used orthodontic nozzles and those who used conventional nozzles.	The two types of nozzle resulted in changes to the occlusion and to the orofacial structures.	Further study are necessary to investigate the effects of pacifier in the orofacial structures and functions
MESOMO; LOSSO, 2004	119 children aged 3 to 6	Cross-sectional 5	Pacifier	Questionnaires on history of the habit and evaluation of the occlusion.	Presence of cross-bite associated with the use of conventional pacifier in 21%, with the use of orthodontic pacifier in 50%, and 8% in the group with no habit.	Open bite was observed in children with prolonged pacifier habit, regardless of the type of pacifier (orthodontic or conventional).	Not presented.

**Table 4.** Presentation of the groups in the three cross-sectional studies, total sample, and occlusal changes found

STUDY	TOTAL SAMPLE	CONTROL			CONVENTIONAL			ORTHODONTIC		
		Total	OB	CB	Total	OB	CB	Total	OB	CB
MESOMO; LOSSO, 2004	119	63	4	5	42	40	9	14	13	7
ADAIR; MILANO; DUSHKU, 1992	79	25	1	4	27	8	5	27	4	7
ZARDETTO; RODRIGUES; STEFANI, 2002	61	27	0	0	14	7	2	20	10	2

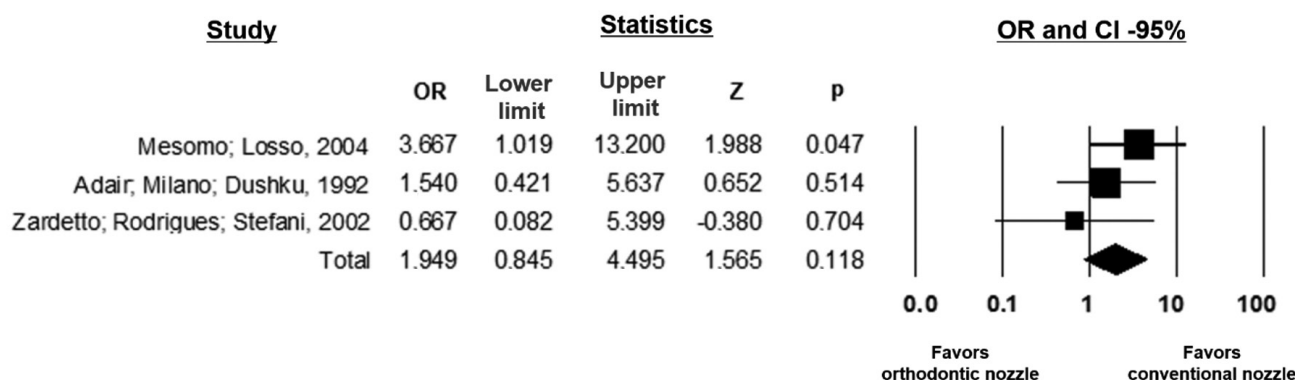
OB = open bite; CB = cross-bite





**Caption:** OR = odds ratio; CI = confidence interval

**Graph 1.** Results of the meta-analysis for open bite (OB) of the occurrence ratio of orthodontic nozzle compared to conventional nozzle



**Caption:** OR = odds ratio; CI = confidence interval

**Graph 2.** Results of the meta-analysis for cross-bite (CB) of the occurrence ratio of orthodontic nozzle compared to conventional nozzle

of comparison between the implications of orthodontic and conventional nozzles.

It was found, in the excluded articles, that there is a focus on the consequences of breastfeeding as the exclusive source of nutrition of a period of 6 months, according to the guidelines of the Brazilian Ministry of Health, with the consequences of its replacement for artificial feeding, using the bottle, regardless of the nozzle adopted. These articles evidence the recommendation for the use of orthodontic nozzle, but no investigation or citation about the damages to the craniofacial bone structure, teeth, and orofacial functions and structures.

The studies included in this review were published in journals of the Odontopediatrics field, between 1988 and 2004, three of which had a cross-sectional design, and one was a case-control study. Cross-sectional studies have a high descriptive potential and ease of representativeness of the population, making it possible to investigate the association between exposure to a particular factor and change. As for case-control studies, they are conducted with patients with and without diseases, seeking only the history of the exposure factor<sup>(34)</sup>.

In addition, the studies selected consider children in age ranges between the deciduous and mixed dentition, and the study

admitted a population aged between 10 and 12 years, focusing on the investigation of the need for orthodontic treatment, from the performance of harmful oral habits with orthodontic or conventional nozzles<sup>(33)</sup>.

It is noteworthy that this study<sup>(33)</sup> investigated the relationship between the use of nozzles on a pacifier and baby bottle, and used only the application of a questionnaire as an evaluation tool. The study itself ends with the suggestion that further studies are conducted by means of clinical evaluation of the subjects. The authors considered the possibility of bias in the responses of the participants, as well as the limitation of the questions asked. A gap that can be observed, for example, is that it is not known whether children (31.1%) with no indication of orthodontic treatment showed a need to this treatment.

The other studies<sup>(30-32)</sup> investigated the comparison of the use of orthodontic and conventional nozzles considering only subjects with a history of pacifier use, and applied a questionnaire as an evaluation tool, as well as conducting clinical evaluation as to the dental occlusion. From these three studies, only one investigated myofunctional orofacial aspects, in addition to the occlusal conditions, and an evaluation was conducted by a single audiologist, collecting qualitative data<sup>(31)</sup>.

The use of equipment for quantitative measurements should be considered, as well as the addition of investigations on orofacial functions, in order to link the execution of harmful habits with early weaning (interference in the nutritive sucking function) as an example<sup>(12,13)</sup>.

Regarding the methodological rigor, it was observed that a study conducted the calibration of examiners and intra- and interexaminers validation<sup>(30)</sup>, while the other two studies conducted to data collection through one examiner, who was blind about the history of pacifier-sucking habit<sup>(31,32)</sup>.

It is noteworthy that the three studies that conducted clinical evaluations divided their sample into three groups: with history/use of conventional pacifiers, with history/use of orthodontic pacifier, and no history of pacifier use<sup>(30-32)</sup>.

The articles selected in this study agree that there are occlusal and orofacial implications to the structures in the two types of nozzles, but with no statistical differences between them. The meta-analysis also showed no statistically significant difference between the two types of nozzle, either to OB, or to CB. Thus, studies with greater methodological rigor regarding the sample evaluation tools are needed, in addition to the need for further applied studies with a representative sample.

## CONCLUSION

Faced with the shortage of articles published in indexed journals and the results of the analysis, it was observed that there is no possibility to conclude whether there are differences as to the consequences to the stomatognathic system from using different pacifier/bottle nozzles.

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#### Author contributions

*Authors CCC, MRSB, JRPL e GB-F worked together in all stages of development of the manuscript.*