

ORIGINAL ARTICLE

Prevalence of non-nutritive buccal habits in a group of preschool children in Nezahualcoyotl City, Mexico (2009)

José Francisco Murrieta-Pruneda,¹ Reyna Isabel Allendelagua Bello,¹ Luis Enrique Pérez Silva,¹ Lilia Adriana Juárez-López,¹ Celia Linares Vieyra,² Arcelia Felicitas Meléndez Ocampo,³ Violeta Zurita Murillo,³ and María Guadalupe Solleiro Rebolledo³

ABSTRACT

Background. A habit is any activity done regularly and unconsciously, which is acquired by experience. Non-nutritive buccal habits are important because they can interfere with the development of dental occlusion. The aim of this study was to evaluate the prevalence of non-eating buccal habits in a group of preschool children.

Methods. An epidemiological, cross-sectional and descriptive study to evaluate the clinical signs of non-nutritive buccal habits was performed by one previously calibrated examiner (intra-examiner kappa = 0.95). A questionnaire was completed for 211 preschool children from the information obtained in two stages: 1) parents of the children completed a questionnaire, and 2) the clinical evaluation of the children was registered by the examiner.

Results. Of the studied population, 68.2% showed at least one non-nutritive buccal habit. Onychophagia was the habit with the highest prevalence. The relationship between age and prevalence of non-nutritive buccal habits was statistically significant, whereas gender was not statistically significant.

Conclusions. There was a high prevalence of non-nutritive buccal habits not associated with the age of the child.

Key words: preschool children, prevalence, dental occlusion, non-nutritive buccal habits.

INTRODUCTION

A habit is any act acquired through experience and regularly and automatically performed. Habits may be considered behavior obtained for which the subject has little voluntary control over. Oral habits have been classified as physiological such as nasal breathing, chewing, phono-articulation and swallowing, or even non-nutritive habits such as thumb or lip sucking, breathing through the mouth and protraction of the tongue, among others.

Children, in particular, practice these anomalous habits as a way to attract attention possibly because they find themselves exposed to a violent family environment, lack of parental attention, lack of emotional maturity, or even the constant changes in the family. The importance of these habits for radical odontology is that all these oral non-nutritive habits change the position of the teeth and the relation that protects each tooth because these habits interfere with normal growth and function of the orofacial musculature.¹⁻⁴

These habits do not have a defined behavior. Their prevalence is so variable that they have been reported with rates from 0.29 in India up to 0.76 in Cuba.¹⁻⁹ In terms of their age, this type of behavior is manifested at an early stage. Some of these habits such as finger sucking and tongue habits were significantly associated with this variable. With regard to gender, these habits have been more prevalent in females,³⁻⁴ but this prevalence was not confirmed in all studies.²⁻⁹

In relation to its frequency, the habit of finger sucking is present in >50% of young children. It is so common in childhood that it is considered normal until the age of 18 months.¹⁰ The prevalence is also highly variable because

¹ Facultad de Estudios Superiores Zaragoza, Universidad Nacional Autónoma de México, Mexico, D.F., Mexico

² Universidad Autónoma Metropolitana-Xochimilco, Mexico, D.F., Mexico

³ Facultad de Odontología, Universidad Nacional Autónoma de México, México D.F., México

Correspondence: Dr. José Francisco Murrieta Pruneda
Facultad de Estudios Superiores Zaragoza
Universidad Nacional Autónoma de México
Mexico, D.F., Mexico
E-mail: francisco.murrieta@gmail.com

Received for publication: 6-28-10

Accepted for publication: 9-7-10

there have been reports with prevalence rates from 0.07 in India up to 0.72 in Sweden. This is generally more common in females. The relevance is that it has been associated frequently with the presence of anterior open bite.^{1-3,5,7,11-13} As for lip sucking, it has been shown to occur in patients with incisor malocclusions, although it may also appear as a variant or substitution for thumb sucking.¹⁰ However, its prevalence is much lower.¹⁻³

Other oral non-nutritive habits such as cheilophagia, protrusion of the tongue, biting objects, nail biting and bruxism are not as common as those described above; however, they must be taken into account in relation to their behavior and distribution for their possible impact on the development of occlusion so as not to underestimate its presence and the negative effects.¹⁴⁻⁴¹

For relevance of the development of dental occlusion, this current study was undertaken to measure the prevalence of these habits in preschool children and the possible association with age and gender.

SUBJECTS AND METHODS

We conducted a descriptive, observational, cross-sectional and prospective study. We were able to clinically assess 211 preschoolers between 3 and 5 years old, both male and female students from Jardín de Niños Felipe Carrillo Puerto located in the Nezahualcoyotl Municipality, State of Mexico. Authorization was requested from school authorities to carry out the project and parents were asked for their informed consent to allow their children to be included in the study, thus covering the ethical/legal aspects of the research.

Dependent variables were *finger sucking* (act of taking the finger to the mouth and administering vigorous pressure against the teeth and palate), *breathing through the mouth* (act of breathing through the mouth offsetting any difficulty in doing so nasally), *nail biting* (compulsive habit of nail biting), *tongue protrusion* (tongue biting), *cheilophagia* (lip biting), *biting objects* (habit of chewing any object), *lip sucking* (the habit of sucking the lips) and *the use of nipples and pacifiers* (habit of sucking nipples and pacifiers with frequency and for prolonged periods).

For the oral examination we used chairs, a table, flat dental #5 mirrors with no increased magnification, and examination was conducted during the day with the use of daylight. Data were recorded in an epidemiological file

card previously validated through a pilot test. Similarly, we used care related with asepsis and antisepsis, for which we used white gowns, facemasks, glutaraldehyde and disposable gloves. Detection of the different oral non-nutritive habits in preschoolers was conducted in two stages. During the first stage, a questionnaire was given to the parent, and in the second stage there was a clinical assessment of the child. A non-nutritive habit was considered to be present when the parents' information and the clinical diagnosis coincided positively.

During the clinical assessment the following criteria were taken into account:

- The external oral examination, which included the exploration of the following:
 1. The fingers, to check for cleanliness or the presence of calluses.
 2. The lips, to observe the following:
 - if the upper lip covered two thirds of the upper teeth
 - if the lip closure was performed smoothly without forcing the lower lip
 - if the lower lip was unchanged in relation to the upper lip absence or presence of skin irritation near the lower lip.
 3. The nose, in which there were two conditions observed:
 - the shape of the nostrils (round or flat)
 - if breathing remained normal when manually closing the lips
 4. The nails and cuticles of the fingers, to check for any wear or bite marks as well as any possible inflammation or infection.
 5. Oral muscles, the orbicularis and chin tuft; their size was recorded through palpation to determine their attachments as well as their tone and presence of pain.
- The internal oral examination included examination of:
 1. The tongue at rest:
 - whether it was central or laterally interposed between the arches
 - if it showed the presence of markings or scarring
 2. The palate to observe its shape.
 3. The upper incisor teeth:

if they present wear or fractures diastemas if they were protruding and for the lower incisor teeth if they were found to be lingualized or if they present with any wear or fractures

For processing and statistical analysis, data were classified, coded and tabulated based on the variables of interest in an Excel format. To evaluate the prevalence of oral habits by age and gender, their proportions were calculated. To evaluate the possible association between the prevalence of oral non-nutritive habits with gender and age, we calculated the value of Pearson's χ^2 and Mantel and Haenszel's χ^2 when the data are distributed in 2×2 contingency tables. To finish, we used the statistical software SPSS v.15.0 for Windows.

RESULTS

We examined a total of 211 preschoolers from the Jardín de Niños Felipe Carrillo Puerto, located in the Nezahualcoyotl Municipality, Mexico State. Of these, 101 were females and 110 were males. According to their age, the study population was comprised of the following: 17.1% were children <3 years of age, 36.5% were 4 years of age and 46.4% were 5 years of age (Table 1).

Of the total study population, 68.2% showed the presence of at least one oral non-nutritive habit, compared with 31.8% of preschool children who presented none. According to their age, we noted that the categories of 4- and 5-year-olds had the highest percentage of cases (29.0% and 30.0%, respectively). The relationship between these two variables had a significant result ($\chi^2 = 7.664, p = 0.02$). According to gender, males showed a higher percentage of cases of oral non-nutritive habits (35.0%), in comparison, for females it was 33.2%. However, these differences were not statistically significant ($\chi^2 = 0.101, p = 0.751$) (Table 2).

The percentage of registered cases with the finger-sucking habit was 8.5%. In terms of its distribution according to age, the category with the most frequency was that of 5-year-olds (3.8%). In relation to gender, males presented a higher prevalence in comparison to females (5.2% and 3.3%, respectively). The percentage of registered cases for the habit of lip sucking was 8.0%. According to age, the group of 4-year-olds showed a higher percentage (4.3%). Likewise, male gender was more frequent than female (5.2% vs. 2.8%) (Table 3).

Table 1. Percent distribution of preschool children (according to age and gender) in Nezahualcoyotl City

Gender	Age*						Total	
	3		4		5		n	%
Female	20	9.5	39	18.5	42	19.9	101	47.9
Male	16	7.6	38	18.0	56	26.5	110	52.1
Total	36	17.1	77	36.5	98	46.4	211	100.0

*In years completed

Table 2. Percent distribution (according to age and gender) of cases of children with non-nutritive oral habits in Nezahualcoyotl City

	Any non-nutritive oral habit				Total	
	Absent		Present		n	%
Age*	n	%	n	%	n	%
3	16	7.5	20	9.5	36	17.0
4	16	7.4	61	29.0	77	36.4
5	35	16.6	63	30.0	98	46.6
	$\chi^2 = 7.664, p = 0.02$					
Gender	n	%	n	%	n	%
Female	31	14.7	70	33.2	101	47.9
Male	36	17.1	74	35.0	110	52.1
	$\chi^2_{MH} = 0.101, p = 0.751$					
Total	67	31.5	144	68.5	211	100.0

*In years completed.

The percentage of nail biting cases was 35% and the age category that showed a higher frequency was the 5-year-olds (39 cases). In regard to gender, both females as well as males presented a similar percentage of cases (17.6% and 17.5%, respectively). Tongue protraction was observed in 6.2% of the cases: according to age, children 4 years of age (3.8%) presented this habit and according to gender, females (3.3%) showed a higher percentage (Table 4).

Prevalence of cheilophagia was 5.2%. According to age, the group of 5-year-olds (4.3%) presented the highest percentages and according to gender, females (2.8%) presented the highest percentages. As far as the habit of biting objects, the prevalence was 7.6%. The highest number of cases was observed in 5-year-old children (12 cases) compared to the absence of cases in 3-year-old children. In relation to gender, we observed that this behavior was seen in both females and males with a frequency of eight cases for each of these categories (Table 5).

Table 3. Percent distribution (according to age and gender) of cases of finger and lip sucking in Nezahualcoyotl City ($n = 211$)

		<i>Finger sucking</i>			<i>Lip sucking</i>		
		<i>Present</i>	<i>Absent</i>	<i>p</i>	<i>Present</i>	<i>Absent</i>	<i>p</i>
Gender	Female	7	94	$p = 0.425$	6	95	$p = 0.282$
	Male	11	99		11	99	
Age	3 years	4	32	$p = 0.832$	3	33	$p = 0.279$
	4 years	6	71		9	68	
	5 years	8	90		5	93	

Table 4. Percent distribution of case (according to age and gender) of onychophagia and tongue protraction in Nezahualcoyotl City ($n = 211$)

		<i>Onychophagia</i>			<i>Tongue protraction</i>		
		<i>Present</i>	<i>Absent</i>	<i>p</i>	<i>Present</i>	<i>Absent</i>	<i>p</i>
Gender	Female	37	64	$p = 0.649$	7	94	$p = 0.656$
	Male	37	73		6	104	
Age	3 years	35	1	$p = 0.0001$	1	35	$p = 0.148$
	4 years	43	34		8	69	
	5 years	59	39		4	94	

Table 5. Percent distribution (according to age and gender) of cheilophagia and biting objects in Nezahualcoyotl City ($n = 211$)

		<i>Cheilophagia</i>			<i>Biting objects</i>		
		<i>Present</i>	<i>Absent</i>	<i>p</i>	<i>Present</i>	<i>Absent</i>	<i>p</i>
Gender	Female	6	95	$p = 0.649$	8	93	$p = 0.859$
	Male	5	105		8	102	
Age	3 years	0	36	$p = 0.046$	0	36	$p = 0.037$
	4 years	2	75		4	73	
	5 years	9	89		12	86	

Of the preschool children, 7.6% demonstrated the habit of using a pacifier or a bottle. The highest percentage was shown by the group of 3-year-olds (3.8%), whereas the performance was shown to be equal for both females and males (3.8% in both categories). The habit of breathing through the mouth was present in 9.5% of the preschoolers. The group of 5-year-olds showed a higher percentage of cases (4.3%). For its part, the highest percentage of cases was presented by males (5.2%) compared to 4.3% shown by females (Table 6).

DISCUSSION

According to what was observed in the study population, the prevalence of oral non-nutritive habits in preschool-age

children was low compared with those reported by Cepero et al.⁴ and Leon et al.⁸ for similar populations, but at the same time was higher than that observed by Kharbanda et al.,² Onyeaso and Sote,³ and Paredes et al.⁹ The observed variability in this behavior may be because these types of habits seem to be influenced by determinant factors such as lifestyle, quality of the family relationship, etc. Therefore, each subject has a different probability to develop any kind of non-nutritive habit. However, according to the age of the preschoolers, the groups of 4- and 5-year-olds presented a greater increased prevalence, a condition that proved to be significant, which shows a close relationship between this variable and the study event that showed that, as age increases, the risk of developing this type of behavior also increases. Regarding gender, prevalence was higher

Table 6. Percent distribution (according to age and gender) of the use of pacifier or nipple and mouth breathing in Nezahualcóyotl City ($n = 211$)

		Use of pacifier or nipple		p	Mouth breathing		p
		Present	Absent		Present	Absent	
Gender	Female	8	93	$p = 0.859$	9	92	$p = 0.282$
	Male	8	102		11	99	
Age	3 years	8	28	$p = 0.0001$	6	30	$p = 0.226$
	4 years	7	70		5	72	
	5 years	1	97		9	89	

in males, a behavior similar to that reported by Onyeaso and Sote³ but different from what was observed by Cepero et al.⁴ who reported a higher prevalence for females. We should keep in mind that although in this study males showed these types of habits more frequently, differences from the group of females were not significant. Therefore, the child's gender is not significant in this population because the probability of developing the habits in question is similar for both genders. On the other hand, description of the behavior of the prevalence of these habits was only carried out according to age and gender. Nevertheless, we should not underestimate the involvement of other variables that influence the likelihood of their occurrence, with the frequency of occurrence, duration, intensity with which they are executed, and the manner in which these forces are directed. We should not consider, in the analysis of this approach, those habits that are generated as a result of a deeply rooted childhood psychological disorder⁵ or those performed as a simply security function when emotional pressures become difficult to bear.⁶

In viewing the oral non-nutritive habits evaluated in the study population, the habit that occurred with the most frequency was nail biting, a prevalence that resulted in being two times greater than that observed by Shetty and Munshi in children in India.¹ Generally, the habit of finger sucking is the one that is reported most frequently.^{6,11,12} Nevertheless, this study found this to be an important difference. Regarding gender, females showed a higher frequency than males, a difference that proved to not be significant. Likewise, we observed that with an increase in age, the habit increased in frequency, a behavior that was not only according to expectations but was also statistically significant. The possible explanation for this may be related to abandonment, which is transferred to nail biting. The complexity of this habit has been the most prevalent. It is a fact that it is a hard habit to stop. It can be easy to conceal because the child bites his

nails secretly¹⁹ plus it serves to satisfy a need similar to that produced by the thumb sucking.²⁰ Nervous children show this habit frequently probably because of social and psychological maladjustment, which becomes more important than the mere presence of habit.²¹

The habit of breathing through the mouth was the second most common with a higher frequency to that reported by Shetty and Munshi¹ and Kharbanda et al.² and with less frequency according to Aleman et al.,¹⁴ Fracasso et al.¹⁸ and Agurto et al.²² According to age, it was observed more frequently in children 5 years of age and according to gender was more prevalent in males, which agrees with that reported by Kharbanda et al.² Nevertheless, there were no significant differences between the study event with age and gender so that in both cases the children showed the same probability to develop it. The low prevalence is presented according to our expectations, taking into account the ages of the children surveyed because when children are breastfed for 1 year they receive the best stimulus for nasal breathing, and in the second year the respiratory system may be mature enough for the nasal function.²³ Beyond this age any alteration in the breathing habit can be caused by these three principal reasons: obstruction, anatomy or habit. The latter is considered abnormal because it is only brought on by habit.²⁴

The presence of the finger sucking habit was also low, although it was higher compared with the studies reported by Shetty and Munshi¹ and Kharbanda et al.² and much less according to the findings of Farsi and Salama,⁶ Da Costa and Orenuga¹¹ and Larsson.¹² In terms of age, we observed a higher frequency of this habit in 5-year-old children and, according to gender, it was more prevalent in males. This does not coincide with Kharbanda et al. who found a higher prevalence in females.² In this case there was also an association between variables, which is why there was a similar likelihood to develop in other catego-

ries. It is worth noting that finger sucking is considered to be a sensory/motor relationship resulting from stimulus-response as part of a normal reflex. It may be possible to affirm, in principle, that any pleasure or satisfaction to the child eventually becomes a habit, based on certain circumstances.²⁰ The thumb sucking habit begins during the first year of life and often continues until the child is 3 or 4 years old.¹⁰ Persistence of this habit in the preschool-age child may be due to conditions of fatigue, sleepiness or boredom; therefore, it becomes a way to adapt to their environment.²⁵ Hence, it is considered a sign of distress and emotional instability in children.¹⁰ Although the prevalence of this habit was different than expected, in most of the studies reviewed it was reported as the most prevalent. It is noteworthy that this difference reinforces that we should not assume the behavior of any epidemiological event because it may be influenced in a different manner by multiple factors, manifesting itself in a different way among individual subjects and population groups.

The lip sucking habit also showed a low frequency and was more common in 4-year-old children. In this regard, there are no published studies with which to compare this prevalence because the clinical assessment of this habit has not been considered. However, in this study this habit was considered because it often occurs in dental incisor malocclusions, but it may also appear as a variant or substitute for thumb sucking.¹⁶ Therefore, the preschool-age population is not able to present it, as was previously observed. In fact, it was more frequently included than some other oral non-nutritive habits such as tongue protrusion, cheilophagia and the habit of biting objects.

As for the habits of biting objects and using a pacifier or nipple, they were presented with the same frequency. This prevalence was lower compared with that reported for countries such as India,¹ Cuba,^{4,26} and Chile.²² This may be due to socioeconomic and cultural differences, which may have an important influence on the development, frequency and duration of non-nutritive sucking. The existence of other factors associated with this behavior should also be taken into account such as maternal age (older mothers), mother's educational level and absence of older siblings.²⁵ We must also consider that there are children who not only used a pacifier or nipple but also were biters, especially when the habit continues after the appearance of primary dentition. When this natural impulse to bite is not treated, it results a search for satisfaction.¹⁹

According to the age range, the use of pacifiers or bottle was more frequent in the 3-year-old age group, a similar behavior to that reported by Cepero et al.⁴ The relevance of this result lies in a clear relationship to the exposure time to the risk because it has been estimated that it must be present for at least 2 years to have an effect on the maxilla and 3 years to increase the intercanine mandibular width,²⁷ a behavior that falls within the range indicated by Shetty and Munshi.¹

With regard to gender, both the habit of pacifier/bottle and the habit of biting objects behaved similarly in males and females, different from that found by Shetty and Munshi¹ than for the habit of biting objects, which reported a higher prevalence in females. Nevertheless, this difference is not relevant to the analysis because the reported differences between males and females were not statistically significant. The question that should be asked is the following: why is this habit relevant in the 3- to 5-year-old age range? What is the significance of how children of this age acquire this habit and is it due to their inherent need to chew once the first set of teeth were lost? There are children who reinforce the habit of biting with the use of a pacifier. The habit then progresses to the teddy bear's rubber ear, and so on. That is why in more advanced stages this can be observed in children who tend to bite pencils, the handle of a toothbrush or other objects.¹⁹

Finally, the oral non-nutritive habits with the lowest prevalence were tongue protrusion and cheilophagia, with results that were lower than those reported by Shetty and Munshi.¹ As for the 4- and 5-year-old age groups, they show the highest frequencies. In regard to gender, tongue protrusion and cheilophagia resulted to be the most common habit in females. In the same manner, results regarding these two habits were not related to age and gender. Notably, like lip sucking, we found no previous studies with which to compare these results because these studies did not take into account the clinical assessment of their presence.²⁸⁻⁴¹

REFERENCES

1. Shetty SR, Munshi AK. Oral habits in children: a prevalence study. *J Indian Soc Pedod Prev Dent* 1998;16:61-66.
2. Kharbanda OP, Sidhu SS, Sundaram K, Shukla DK. Oral habits in school going children of Delhi: a prevalence study. *J Indian Soc Pedod Prev Dent* 2003;21:120-124.

3. Onyeaso CO, Sote EO. Prevalence of buccal habits in 563 Nigerian preschool children age 3-5 years old. *Niger Postgrad Med J* 2001;8:193-195.
4. Cepero SZJ, Hidalgo-Gato I, Duque ERJ, Pérez QJA. Intervención educativa en escolares de 5 y 6 años con hábitos bucales deformantes. *Rev Cubana Estomatol [online]* 2007;44(4).
5. Podadera Valdés Z, Ruiz Núñez D. Prevalencia de hábitos bucales y anomalías dentomaxilofaciales en niños de 3 a 6 años de edad; 2002-2003. *Rev Cubana Estomatol [online]* 2004;41(2).
6. Farsi NM, Salama FS. Sucking habits in Saudi children: prevalence of contributing factors and effects on the primary dentition. *Pediatr Dent* 1997;19:28-33.
7. Warren JJ, Bishara SE, Steinbock KL, Yonezu T, Nowak AJ. Effects of oral habits' duration on dental characteristics in the primary dentition. *J Am Dent Assoc* 2001;132:1685-1693.
8. León CK, Maya HB, Vega GM, Mora PC. Factores de riesgo asociados con anomalías de oclusión en dentición temporal. Área III. *Rev Cubana Estomatol [online]* 2007;44(4).
9. Paredes GV, Paredes CC. Prevalencia de los hábitos bucales y alteraciones dentarias en los escolares de Valencia (España). *An Pediatr Barc* 2005;62:261-265.
10. Canut Brusola JA. Ortodoncia clínica y terapéutica. Barcelona: Ed. Masson; 2001. pp. 237-241.
11. DaCosta OO, Orenuga MA. The digit sucking habit and related factors: observations from a Child Dental Health Clinic in Nigeria. *Afr J Med Med Sci* 2003;32:167-171.
12. Larsson E. Sucking, chewing, and feeding habits and the development of crossbite: a longitudinal study of girls from birth to 3 years of age. *Angle Orthod* 2001;71:116-119.
13. Tomita NE, Bijella VT, Franco LJ. The relationship between oral habits and malocclusion in preschool children. *Rev Saude Publica* 2000;34:299-303.
14. Alemán SP, González VD, Díaz OL, Delgado DY. Hábitos bucales deformantes y plano poslácteo en niños de 3 a 5 años. *Rev Cubana Estomatol [online]* 2007;44(2).
15. Solano RE, Mendoza MA. Tratamiento temprano de la maloclusión. In: Barbería LE, Boj QJ, Catalá PM, García BC, Mendoza MA, eds. *Odontopediatría*. España: Ed. Masson; 2001. pp. 369-374.
16. Chaconas Spiro J. Ortodoncia. México: Ed. El Manual Moderno; 1982. pp. 98-199.
17. Hirschfeld L, Geiger A. Pequeños movimientos dentarios en odontología general. Buenos Aires: Ed. Mundi; 1969; pp. 66-68, 131-137.
18. Fracasso ML, Rios D, Provenzano MG, Goya S. Efficacy of an oral health promotion program for infants in the public sector. *J Appl Oral Sci* 2005;13:372-376.
19. Alves Cardoso RJ, Nogueira Gonçalves EA. Actualización en ortodoncia y ortopedia funcional de los maxilares. Brasil: Ed. Artes Médicas Latinoamérica; 2002. pp. 68-72.
20. Hogeboom FE. *Odontología infantil e higiene odontológica*. México: Ed. UTEHA; 1958. pp. 223-253.
21. Moyers RE. *Manual de Ortodoncia*. Argentina: Ed. Panamericana; 1998. pp. 156-160.
22. Agurto VP, Díaz MR, Cadiz DO, Bobenrieth KF. Frecuencia de malos hábitos orales y su asociación con el desarrollo de anomalías dentomaxilares en niños de 3 a 6 años del área Oriente de Santiago. *Rev Chil Pediatr* 1999;70:121-127.
23. Ohanian M. *Fundamentos y principios de la ortopedia dento-maxilo-facial*. Colombia: Ed. AMOLCA; 2002. pp. 105-108.
24. Pujana J, Pujana I, Takane M. *Oclusión, tratado de teoría y práctica para el odontólogo*. México: Ed. UNAM (FES Iztacala); 2004;188-193.
25. Muñoz Escobar F. *Odontología Pediátrica*. Colombia: Ed. AMOLCA; 2004. pp.448-465.
26. De Figueiredo WR, Ferelle A, Issao M. *Odontología para el Bebé*. Brasil: Ed. AMOLCA; 2000. pp. 76,78,84.
27. Fynn S. *Odontología Pediátrica*. México: Ed. Interamericana; 1997. pp. 131-139.
28. Heimer MV, Tornisiello Katz CR, Rosenblatt A. Non-nutritive sucking habits, dental malocclusions, and facial morphology in Brazilian children: a longitudinal study. *Eur J Orthod* 2008;30:580-585.
29. Katz CR, Rosenblatt A, Gondim PP. Nonnutritive sucking habits in Brazilian children: effects on deciduous dentition and relationship with facial morphology. *Am J Orthod Dentofacial Orthop* 2004;126:53-57.
30. Katz CR, Rosenblatt A. Nonnutritive sucking habits and anterior open bite in Brazilian children: a longitudinal study. *Pediatr Dent* 2005;27:369-373.
31. Duncan K, McNamara C, Ireland AJ, Sandy JR. Sucking habits in childhood and the effects on the primary dentition: findings of the Avon Longitudinal Study of Pregnancy and Childhood. *Int J Paediatr Dent* 2008;18:178-188.
32. Warren JJ, Slayton RL, Bishara SE, Levy SM, Yonezu T, Kanellis MJ. Effects of nonnutritive sucking habits on occlusal characteristics in the mixed dentition. *Pediatr Dent* 2005;27:445-450.
33. Bishara SE, Warren JJ, Broffitt B, Levy SM. Changes in the prevalence of nonnutritive sucking patterns in the first 8 years of life. *Am J Orthod Dentofacial Orthop* 2006;130:31-36.
34. Góis EG, Ribeiro-Júnior HC, Vale MP, Paiva SM, Serra-Negra JM, Ramos-Jorge ML, Pordeus IA. Influence of nonnutritive sucking habits, breathing pattern and adenoid size on the development of malocclusion. *Angle Orthod* 2008;78:647-654.
35. Ngom PI, Diagne F, Samba Diouf J, Ndiaye A, Hennequin M. Prevalence and factors associated with non-nutritive sucking behavior. Cross sectional study among 5- to 6-year-old Senegalese children. *Orthod Fr* 2008;79:99-106.
36. Macena MC, Katz CR, Rosenblatt A. Prevalence of a posterior crossbite and sucking habits in Brazilian children aged 18-59 months. *Eur J Orthod* 2009;31:357-361.
37. Onyeaso CO, Isiekwe MC. Oral habits in the primary and mixed dentitions of some Nigerian children: a longitudinal study. *Oral Health Prev Dent* 2008;6:185-190.
38. Warren JJ, Bishara SE. Duration of nutritive and nonnutritive sucking behaviors and their effects on the dental arches in the primary dentition. *Am J Orthod Dentofacial Orthop* 2002;121:347-356.
39. Peres KG, Barros AJ, Peres MA, Gomes VC. Effects of breastfeeding and sucking habits on malocclusion in a birth cohort study. *Rev Saude Publica* 2007;41:343-350.
40. Leite-Cavalcanti A, Medeiros-Bezerra PK, Moura C. Breast-feeding, bottle-feeding, sucking habits and malocclusion in Brazilian preschool children. *Rev Salud Publica (Bogota)* 2007;9:194-204.
41. Tanaka OM, Vitral RW, Tanaka GY, Guerrero AP, Camargo ES. Nailbiting, or onychophagia: a special habit. *Am J Orthod Dentofacial Orthop* 2008;134:305-308.