Association between Vertical and Transverse Dental Alterations with Harmful Oral Habits in Children 3 to 6 Years Old Children of Albert Einstein Elementary School, Lima 2013

Bahamonde N[1], Arriola-Guillén LE[2], Albites U[3]

[1]Postgraduate student of Odontopediatric speciality of Universidad Científica del Sur, Peru. [2]Associate Professor of the Division of Orthodontics, Faculty of Dentistry – Universidad Científica del Sur - UCSUR and University of San Marcos – UNMSM, Lima, Perú. [3]Specialist in Odontopediatrics - Universidad Científica del Sur - UCSUR

Abstract

Persistent bad habits in children with primary teeth can be very harmful because they are the most common cause for the development of different malocclusions in permanent dentition.

Objective: to determine the association between vertical and transversal dental alterations with oral habits such as dummy sucking, use of pacifier and bottle feeding, lingual interposition and atypical swallowing in children 3 to 6 years old.

Materials and methods: this is an observational, descriptive, cross-sectional and prospective study. The study was conducted among 114 children between 3 to 6 years old from the Albert Einstein School in the district of Breña in Lima, Peru. The researcher was trained and calibrated by the adviser with the Kappa Index and obtained a rate higher than 0.7. Data was collected through questionnaires answered by the subject´s parents and the clinical exploration of the children, where the presence of bad habits was analyzed.

Results: Only significant association between the vertical conditions related to the habit of atypical swallowing was found, because of all children (114) only 3 had open bite with atypical II, and 19 of 41 children showed deep bite and atypical swallowing I.

Conclusion: Although only significant association in the case of open bite with atypical swallowing was found, it was observed that the values are increased by the use of a feeding bottle, frequency of use, tongue thrusting when speaking in relation to the vertical condition (open bite) and between cross bite and the habit of using a bottle.

Key Words: Oral habits, Dentomaxilar alterations, Deciduous dentition

Introduction

All behavior, custom or practice acquired by regular recurrence of the same or similar acts is known as habit [1]. To be exercised frequently it becomes harmful because it starts to affect the bones and dental structures of individuals.

The growth and development of maxillary structures has to be under a balanced system in which forces will be compensated to avoid alterations. However, when there is the presence of any oral habits during the development of a child with primary dentition, the pressures or forces normally exercised by components such as tongue, cheeks and lips that help maintain the balance of this development will be altered by external factors causing an imbalance in the normal pressure in the mouth, and that is how dental maxillary alterations of the stomatognatic system are caused.

Most common oral habits in children include a typical swallowing, tongue interposition when speaking and suction; this can be digital, labial or from objects like a pacifier or a feeding bottle [2].

The development of dental and maxillary alterations or deformities will depend on three factors. First, the age in which the habit starts, if it began at an early age it will be more harmful because at this stage the bone is forming and therefore more moldable. Then the duration of the habit and its frequency starts [3]. Dentomaxillar anomalies are defined as deformations of the maxillary bones followed by incorrect teeth positions [4-6]. The transversal malocclusion is oriented in the horizontal plane and is independent of the intermaxillary relationship in the sagittal and vertical levels [7]. Here you will find the cross bite, which is defined as the condition in which the upper teeth are arranged in a retroclined way in relation to the lower teeth in the posterior segment of either unilateral or bilateral [8-11].

Vertical alterations are: open bite which is defined as the lack of contact in vertical direction between the incisal edges of anterior teeth of the upper and lower arches [12-16], which can be skeletal or dentoalveolar, and deep bite which is the overlap of the upper anterior teeth on the bottom in the vertical plane [5].

Only a few studies on the subject are being conducted, but they do not relate to two variables. Therefore, the objective of this research was to determine the association between vertical and transverse dental alterations and oral habits in children from 3 to 6 years of age.

Materials and Methods

The authorization of the Ethics Committee of the Dentistry Faculty of Científica del Sur University was obtained.

The design of the study was cross-sectional. The population was formed by all the students of the Albert Einstein Elementary School (Lima, Perú) from 3 to 6 years of age enrolled in 2013 that met the selection criteria and whose parents authorized their participation in the study. The method of this research was structured observation. Permission from the headmistress was obtained and the parents were informed briefly of the objective of the study, which was anonymous and voluntary.

Corresponding author: Bahamonde Yábar Nancy, Department of Odontopediatrics, Specialist of Universidad Científica del Sur. Av. Central Mz. AL Lt. 6 Urb. Los Alamos de Monterrico, Santiago de Surco, Lima Perú; Tel: 511987711857; e-mail: nancybahamonde11@gmail.com

A pilot test was run in 15 children in order to train and calibrate the researcher with the Kappa index along with the advisor and obtained one value greater than 0.7 in atypical swallowing, lingual interposition and dento-maxillary alterations. Additionally, 10 videos were made showing the procedure for each child.

Clinical evaluation of habits

The evaluation of digital or lip sucking habit, use of pacifier and bottle in children was first made through questions to parents to determine whether the child presents this habit and for how long. Then, to verify data from parents, we performed the clinical examination to observe and analyze the shape of the upper and lower arches, check if there was narrowing in the area of the canines and deciduous molars, verify the presence of proclination of the front upper teeth and narrowing and deepening of the palate. In the case of lower lip suction we also discussed whether there was presence of hypotonic upper lip and hypertonic lower lip, retro inclination of the lower incisors, protrusion of the upper anterior teeth.

To evaluate habits such as atypical swallowing and lingual interposition when speaking, a clinical evaluation was carried out followed by videotaping each child. For atypical swallowing the child was asked to take a sip of water and swallow it, the examiner placed her right hand on the upper lip of the child at the moment of swallowing to allow the clinician to separate the lips and observe the position of the tongue. It was verified if there was perioral mime, lip pressure and lack of contraction of the masseter muscle as signs associated with atypical swallowing.

And to verify the presence of lingual interposition when speaking we observed and recorded the fonoarticulation of patients as were repeating certain words like "mama", "papa", "dedo", "sesenta", "sesenta y seis", "zapato" involving bilabial phoneme (p/b/m), linguoalveolares (t/d/n/l) and fricatives (s/z/ch).

Clinical evaluation of dento-maxillary characteristics

In order to file the results questionnaires data was collected from the child (name, age, sex, etc.) and recorded the habit which presented as well as the dento-maxillary characteristics observed. Open bite was indicated if there was no anterior tooth contact while the posterior teeth are found in occlusion, Deep bite when more than two thirds of the lower incisors vestibular surface was covered by the upper incisors and Cross bite when there was a crisscross or overflow in transverse direction of the upper posterior teeth on the lower, this can be classified in further unilateral or bilateral and anterior cross bite.

Statistical analysis

Data analysis initiated of univariate form for the variable dento-maxillary alterations and qualitative evaluations of the frequencies and percentages according to oral habits (a typical swallowing, digital suction and tongue interposition) according to sex. Bivariate analysis was then performed to associate the variable dento-maxillary alterations according to oral habits in each variable co using a Chi-square test. The significance level was 0.05.

Results

It was found that only significant association existed between the habit of atypical swallowing and alterations in a vertical direction. However, we found increased values relating the upright condition associated with different habits. *Table 1* analyzed vertical condition and the bottle feeding habit. It was observed that 3 children that presented the habit had open bite, and of 41 children with deep bite only 29 showed the habit. Among the 3 children who had open bite and the habit at the same time, only 2 were male and 1 female sex. There was no significant association.

Table 2 related vertical condition with the frequency of bottle feeding and found that of 3 children with open bite, 2 used the bottle more than 2 times a day and 1 used it once a day.

Table 3 examined the association between the vertical condition and the habit of atypical swallowing. Three kids presented open bite with atypical swallowing type II, and out

Table 1. *Association between vertical condition and bottle feeding habit in 3 to 6 years old children from Albert Einstein Elementary school. Lima 2013.*

Sex	Vertical condition	Use of bottle feeding					
		Absent		Presente		Total	
		n	%	n	%	n	%
In general	Open bite	0	0.00	3	100.00	3	100.00
	Deep bite	12	29.30	29	70.70	41	100.00
	Normal bite	27	38.60	43	61.40	70	100.00
	Total	39	34.20	75	65.80	114.00	100.00
Male	Open bite	0	0.00	2	100.00	2	100.00
	Deep bite	6	30.00	14	70.00	20	100.00
	Normal bite	19	51.40	18	48.60	37	100.00
	Total	25	42.40	34	57.60	59	100.00
Female	Open bite	0	0.00	1	100.00	1	100.00
	Deep bite	6	28.60	15	71.40	21	100.00
	Normal bite	8	24.20	25	75.80	33	100.00
	Total	14	25.50	41	74.50	55	100.00
P=0.273 (in general) P=0.139 (male) P=0.789 (female) Pearson Chi square Test							

Table 2. *Association between vertical condition and bottle feeding frequency habit in 3 to 6 years old children from Albert Einstein Elementary School. Lima 2013.*

Sex	Vertical condition	Bottle feeding frequency									
		Absent		Once a day		1 – 2 times a day		More than 2 times a day		Total	
		n	%	n	%	n	%	n	%	n	%
In general	Open bite	0	0.00	1	33.30	0	0.00	2	66.70	3	100.00
	Deep bite	12	29.30	3	7.30	11	26.80	15	36.60	41	100.00
	Normal bite	27	38.60	5	7.10	17	24.30	21	30.00	70	100.00
	Total	39	34.20	9	7.90	28	24.60	38	33.30	114	100.00
Male	Open bite	0	0.00	0	0.00	0	0.00	2	100.00	2	100.00
	Deep bite	6	30.00	1	5.00	6	30.00	7	35.00	20	100.00
	Normal bite	19	51.40	2	5.40	6	16.20	10	27.00	37	100.00
	Total	25	42.40	3	5.10	12	20.30	19	32.20	59	100.00
Female	Open bite	0	0.00	1	100.00	0	0.00	0	0.00	1	100.00
	Deep bite	6	28.60	2	9.50	5	23.80	8	38.10	21	100.00
	Normal bite	8	24.20	3	9.10	11	33.30	11	33.30	33	100.00
	Total	14	25.50	6	10.90	16	29.10	19	34.50	55	100.00
P=0.378 (in general) P=0.300 (male) P=0.179 (female) Pearson Chi square Test											

Table 3. *Association between vertical condition and a typical swallowing habit in 3 to 6 years old children from Albert Einstein Elementary School. Lima 2013.*

Sex	Vertical condition	Atypical swallowing							
		Absent		Atypical swallowing I		Atypical swallowing II		Total	
		n	%	n	%	n	%	n	%
In general	Open bite	0	0.00	0	0.00	3	100.00	3	100.00
	Deep bite	22	53.70	19	46.30	0	0.00	41	100.00
	Normal bite	29	41.40	41	58.60	0	0.00	70	100.00
	Total	51	44.70	61	53.50	2	1.80	114	100.00
Male	Open bite	0	0.00	0	0.00	2	100.00	2	100.00
	Deep bite	10	50.00	10	50.00	0	0.00	20	100.00
	Normal bite	12	32.40	25	67.60	0	0.00	37	100.00
	Total	22	37.30	36	61.00	1	1.70	59	100.00
Female	Open bite	0	0.00	0	0.00	1	100.00	1	100.00
	Deep bite	12	57.10	9	42.90	0	0.00	21	100.00
	Normal bite	17	51.50	16	48.50	0	0.00	33	100.00
	Total	29	52.70	25	47.50	1	1.80	55	100.00
P=0.000 (in general)									
P=0.000 (male)									
P=0.000 (female)									
Pearson Chi square Test									

of 41 children with deep bite only 19 had atypical swallowing type I. ($p<0.001$) Of the group of children with open bite and atypical swallowing type II only 2 were male and 1 female. In the group of children with deep bite 20 were males where only 10 showed atypical swallowing type I, and among the 21 girls only 9 presented the habit. ($p<0.001$). In this case, there was significant association.

Table 4 associated vertical condition with tongue interposition during talking. It was observed that out of 41 children three had open bite and this habit and only 26 showed deep bite and has the habit. Of the 70 children with normal bite just 40 presentes the habit.

It wasn't found significant results for the relationship between alterations in the horizontal direction and oral habits except in the case of use of bottle feeding.

Table 5 analyzed the link of cross bite with the use of bottle. Out of 4 children with unilateral posterior crossbite, 3 used bottle (2 males and 1 female). The two kids with bilateral posterior crossbite were males, and 3 children-one boy and two girls-with anterior crossbite also had the habit of bottle feeding.

This goes hand in hand with the frequency of bottle feeding habit as confirmed in *table 6*. It was found that of the 4 children with unilateral posterior crossbite, 1 used bottle more than twice a day; 2 used it 1-2 times a day and only 1 used once a day. The 2 children with bilateral posterior crossbite did not present the habit, and out of 3 children with

***Table 4**. Association between vertical condition and tongue interposition while speaking habit in 3 to 6 years old children from Albert Einstein Elementary School. Lima 2013.*

Sex	Vertical condition	Tongue interposition					
		Absent		Present		Total	
		n	%	n	%	n	%
In general	Open bite	0	0.00	3	100.00	3	100.00
	Deep bite	15	36.60	26	63.40	41	100.00
	Normal bite	30	42.90	40	57.10	70	100.00
	Total	45	39.50	69	60.50	114	100.00
Male	Open bite	0	0.00	2	100.00	2	100.00
	Deep bite	4	20.00	16	80.00	20	100.00
	Normal bite	15	40.50	22	59.50	37	100.00
	Total	19	32.20	40	67.80	59	100.00
Female	Open bite	0	0.00	1	100.00	1	100.00
	Deep bite	11	52.40	10	47.60	21	100.00
	Normal bite	15	45.50	18	54.50	33	100.00
	Total	26	47.30	29	52.70	55	100.00
P=0.296 (in general) P=0.174 (male) P=0.560 (female) Pearson Chi square Test							

***Table 5.** Association between transversal condition and bottle feeding habit in 3 to 6 years old children from Albert Einstein Elementary School. Lima 2013.*

Sex	Transversal condition	Bottle feeding					
		Absent		Present		Total	
		n	%	n	%	n	%
In general	Unilateral posterior cross bite	1	25.00	3	75.00	4	100.00
	Bilateral posterior cross bite	2	100.00	0	0.00	2	100.00
	Normal bite	36	34.30	69	65.70	105	100.00
	Anterior cross bite	0	0.00	3	100.00	3	100.00
	Total	39	34.20	75	65.80	114	100.00
Male	Unilateral posterior cross bite	1	33.3	2	66.70	3	100.00
	Bilateral posterior cross bite	2	100	0	0.00	2	100.00
	Normal bite	22	41.5	31	58.50	53	100.00
	Anterior cross bite	0	0	1	100.00	1	100.00
	Total	25	42.4	34	57.60	59	100.00
Female	Unilateral posterior cross bite	0	0	1	100.00	1	100.00
	Bilateral posterior cross bite	14	26.9	38	73.10	52	100.00
	Normal bite	0	0	2	100.00	2	100.00
	Anterior cross bite	14	25.5	41	74.50	55	100.00
P=0.135 (in general) P=0.312 (male) P=0.582 (female) Pearson Chi square Test							

anterior crossbite only 2 used it more than twice a day and only 1 used it 1-2 times a day.

Discussion

Months before this research took place a pilot test was conducted in order to train and calibrate the researcher and reduce the possibility of error in the diagnoses. The resulting evaluation represents the children who met the selection criteria in the Breña district in Lima, however it may be that the outcome of this study is only an approximation of what really happens in the city of Lima due to the great miscegenation present in the city.

This work did not find strict associations between the vertical and transversal conditions, and oral habits. But in the case of vertical condition, specifically open bite, there was a relationship with the use of bottle feeding and the frequency of its use, where it was observed that children who used bottle for 2 or more times a day developed open bite. There was no significant association in this result, but high values were noticed in terms of habit - condition association. This may be due to that children begin to use bottle from the first year of life or before, which creates a habit that affects the dental structures that are still in the process of positioning in the mouth. Ovsenik [17] claimed that the use of bottle contributes to a pattern of abnormal swallowing that can have negative influences on the occlusion which is under development.

The same result was obtained among kids that presented open bite and developed atypical swallowing type II; in addition to children with deep bite who also showed atypical swallowing type I. It was determined the existence of a significant association between the upright condition and the habit of atypical swallowing ($p < 0.001$), since the presence of open bite is conductive to a pattern of different swallowing that is forced to adapt to the environment in order to exert the action correctly. Similarly, a link was found between the upright condition and the habit of lingual interposition, where 3 children with open bite had the habit and 21 children of 41 with deep bite. Proffit [18] mentioned that an open bite can also be caused by the continuous positioning of the front part of the tongue between the incisal edges of the lower incisors and the palatal surface of the maxillary incisors.

Different studies have found a relationship between suction habits and malocclusions such as open bite, unilateral cross bite, etc. as Katz et al. [19] that evaluated the relationship between suction habits and malocclusion in 330 Brazilian children from 4 years of age. The results showed that a 67.9% of children had suction habits at some moment of their lives. Open bite was found in 36.4% of cases and 12.1 % showed posterior cross bite.

Agurto et al. [3] found that in children with bad habits the most frequent anomalies were open bite in 38% and cross bite in 28%, etc. where 62% corresponded to suction habits and in the cases with tongue interposition the result was 42.7% in resting, 45.9% in swallowing and 11.3% in phonation.

Those results differ from this study because less relationship with vertical condition and habits as digital suction was found, including frequency and time, pacifier use and lip suction. The results for the link of transversal condition and habits occurred in low ratio except in cases of bottle feeding, where it was found that children with unilateral posterior cross bite and anterior cross bite had the habit. This also applied to the frequency of bottle feeding and the habit of atypical swallowing.

Differences may be due not only to the frequency and time of the habit, as stated by Rákosi et al. [20] in 1998. Rresults can differ, since all effects caused by this dysfunction will depend on their frequency, the position of the finger or fingers, the intensity of the force exerted and duration, but also the number of subjects in these studies, since in a larger population is more likely to find more cases of harmful oral habits or malocclusions, while this study included 114 children, indicating little variation in the group.

Finally, from this research work can be derived that oral habits do not affect different types of bite in the vertical and transversal plane, but they have a direct influence in the case of open bite when it is related to atypical swallowing and other habits such as bottle feeding, use of pacifier or tongue interposition. This is why the diagnosis of habits and malocclusions are of utmost importance in the professional practice of the dentist, and must be made at an early age to avoid major dental alterations.

Conclusions

There is significant association between the vertical conditions associated with the habit of atypical swallowing in 3 to 6 years old children from the Albert Einstein Elementary School.

The values are increased for the habits of use and frequency of bottle feeding, tongue interposition while speaking in relation to the condition of open bite and between the transverse condition and the habit of bottle feeding.

A relationship between dento-maxillary conditions and the presence of habits according to sex, male or female, was not found.

References

1. Dictionary of the Royal Academy of the Spanish language.
2. Vellini F (Editor). Ortodoncia, diagnóstico y planificación clínica (2nd edn). Ed Artes médicas Sao Paulo Brasil. 2004.
3. Agurto P, Díaz R, Cádiz O, Bobenrieth F. Frecuencia de malos hábitos orales y su asociación con el desarrollo de anomalías dentomaxilares en niños de 3-6 años de área Oriente de Santiago. *Revista Chilena De Pediatría*. 1999; **70.**
4. Trotman A. Oclusal disharmonies in the primary dentition of black and white children. *International Journal of Dentistry for Children*. 1995; **6**: 55-65.
5. García G. Ajuste Oclusal en niños. México, D.F. 2002.
6. Alves C, Nogueíra G. Ortodoncia y Ortopedia funcional de los Maxilares. Sao Paulo: *Artes Médicas*. 2002; **16**: 223-244.
7. Mata J, Zambrano F, Quiros O, Maza P. Expansión rápida de maxilar en maloclusiones transversales: Revisión bibliográfica. *Revista Latinoamericana De Ortodoncia y Odontopediatría*. 2009.
8. Moyers E (Editor) Manual de Ortodoncia (4th Edn.) Buenos Aires 1998; **5**: 548.
9. Magnusson B. Odontopediatría; Enfoque sistemático. Ed. Salvat. 1985; **5**: 243-263.
10. Lorente P. Clasificación y tratamiento de las maloclusiones transversales: Mordidas Cruzadas Unilaterales (MCU). *Revista Española De Ortodoncia*. 2002; **42**: 196-210.
11. Lorente P. Clasificación y tratamiento de las maloclusiones transversales: Mordidas Cruzadas Bilaterales (MCB). *Revista Española De Ortodoncia*. 2002; **42**: 182-195.
12. Thilander B, Wahlund S, Lennartsson B. The effect of early interceptive treatment in children with posterior cross bite. *European Journal of Orthodontics*. 1984; **6**: 25-34.
13. Melsen B, Stensgaard K, Pedersen J. Sucking habits and their influence on swallowing pattern and prevalence of malocclusion. *European Journal of Orthodontics*. 1979; **1**: 271-280.
14. Sano S, Strazzeri M, Rodriguez G, Duarte D. Ortodoncia en la dentición decidua – diagnóstico, plan de tratamiento y control. Amolca. 2004.
15. Mirahi E. A review of anterior open bite. *British Journal of Orthodontics*. 1978; **5**: 7-21.
16. Ellis E. Components of adult class II open bite occlusion. *Journal of Maxilofacial Surgery*. 1985; **42**: 92-105.
17. Ovsenik M. Incorrect orofacial functions until 5 years of age and their association with posterior cross bite. *Journal of Dentofacial Orthodontics*. 2009; **136**: 375-381.
18. Proffit R (Editor). Ortodontia contemporánea (3rd edn). Rio de Janeiro: Guanabara Koogan. 2002; **5**: 105-137.
19. Katz C, Rosemblatt A, Godim P. Nonnutritive sucking habits in Brazilian children: effects on deciduous dentition and relationship with morphology. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2004; **126**: 53-57.
20. Rakosi T, Graber T, Petrovic A (Editors). La maloclusión de mordida abierta. Ortopedia dentofacial con aparatos funcionales (2nd edn.) España: Harcourt Brace. 1998: 491-504.