# The Effect of Two Types Orthodontic Nipple on Orofacial Complex

Eriska Riyanti[1]*, Risti Saptarini Primarti[1], Prima Andisetyanto[1], Naninda Berliana Pratidina[1], Sylvia Yunita[1], Iwan Ahmad[1], Willyanti Soewondo[1]

1. Pediatric Dentistry Department, Faculty of Dentistry Universitas Padjadjaran, Bandung, West Java, Indonesia.

**Abstract**

To compare the effect of two types of orthodontic nipples on the orofacial complex.

A cross-sectional study was conducted using total sampling on 30 children aged 3-5 years that met the inclusion criteria. Extraoral, myofunctional and intraoral examination was performed by 3, previously calibrated examiners. Study model was measured to evaluate occlusal characteristics of primary dentition. Statistically tested using paired T-Test and Mann Whitney.

Extraoral, myofunctional, primate space, maxillary and mandibular arch form examination showed normal results for both groups. Midline shifting, primary canine relationship, flush terminal relationship and dental alignment result was varied in group 1. Meanwhile, group 2 showed normal results. Intermolar width of the two groups had a significant difference (p-value = 0.0001). The Mann Whitney test in both groups showed that overbite, overjet, and intercanine width were not related to age. Intermolar width was significantly associated with age in group 1 (p-value = 0.03957).

The use of normal flow orthodontic nipples did not have a negative effect on the orofacial complex in children aged 3-5 years compared to bigger flow orthodontic nipples. There was a significant difference between the two groups in the intermolar width.

**Clinical article (J Int Dent Med Res 2022; 15(3): 1143-1148)**

**Keywords:** Bottle Feeding, Feeding Methods, Malocclusion.

**Received date:** 15 June 2022 **Accept date:** 22 July 2022

## Introduction

The inability of the mother to breastfeed causes the need for an appliance to provide milk, i.e. milk bottle. However, the sucking mechanism in breastfed infants and bottle-fed infants is different. In directly breastfed infants, a negative pressure pulls the nipple into the oral cavity and holds both the nipple and breast in place. The tongue curves around the nipple and presses the nipple toward the palate, causing positive pressure. This positive pressure pushes the milk from the breast once the letdown reflex has occurred, one to two minutes after the sucking occurs. Average milk flow varies during direct breastfeeding, as the mother has several episodes of letdown during breastfeeding.[1,2]

The mechanism that occurs in bottle-fed babies is very different. Negative pressure is the main mechanism for obtaining milk. The artificial nipple or nipple is stiffer and less flexible than the mother's, making it difficult to apply pressure to the palate. The volume of the milk flow is determined primarily by the texture of the nipple, the size and the number of holes at the tip of the nipple.[1]

The malocclusion in children can caused psychological functional and aesthetic concerns.[3] According to a study conducted by Meyers and Hertzberg,[4] there was an increasing need for orthodontic treatment in children who were bottle-fed during infancy. Yonezu[5] found a deep bite in bottle-fed children after 24 months. The effect of bottle feeding on dentofacial development varies according to the type of nipple used. Artificial nipples that are developed according to physiological principles are called orthodontic nipples. The shape of the nipple is a curved shaft with a raised tip (Figure 1). Physiologically designed nipples exhibit good adaptation to the anatomy and physiology of sucking. This is consistent with studies conducted by Mathew[6] in 1992 and Nowak et al in 1994, showing that

***Corresponding author:***
Eriska Riyanti,
Pediatric Dentistry Department, Faculty of Dentistry Universitas Padjadjaran, Bandung, West Java, Indonesia.
E-mail: eriska.riyanti@unpad.ac.id

orthodontic nipples are more compressive than other types of nipples.[1,7]

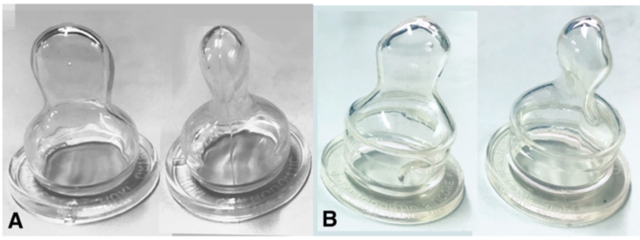


**Figure 1.** (A) Normal flow orthodontic nipples (B) Bigger flow orthodontic nipples.

Turgion-O'Brien[8] explained that rubber nipples, especially in non-physiological designs, can extend to the back of the pharyngeal wall. Milk becomes easier to release and flows faster from the mother's nipple. The physiological ramification of this difference is the lack of muscle activity required to excrete fluid. This can result in decreased development of facial muscles, including the orbicularis oris, masseter and digastric muscles. The tongue can be in the wrong position, namely forward position during swallowing and this is an attempt to regulate the rapid and continuous flow of milk.[9]

Based on this, researchers are interested in researching the effect of using two types of orthodontic nipples on the orofacial complex. This study aims to compare the effect of two types of orthodontic nipples on the orofacial complex.

## Materials and methods

Selection Criteria

This research is a descriptive study with a cross-sectional approach. The study samples were children aged 3-5 years who used normal flow orthodontic nipples or bigger flow orthodontic nipples for at least 6 months. Total sampling technique was used, with the criteria that the primary teeth had erupted completely, did not have bad oral habits, developmental or structural abnormalities of the teeth, no caries in the posterior teeth, permanent teeth and soft tissue injury. If restoration was present, it should be in good condition. Unhealthy children, have a history of systemic disease, uncooperative or have special needs, will be excluded from the study.

Ethical Aspects

This research is equipped with a research permit issued by the Bandung City Health Office, the National Unity and Political Agency of the relevant agency and has received ethical approval from the Health Research Ethics Commission of Padjadjaran University Bandung with number 137/UN6.KEP/EC/2020.

Study Protocol

The implementation phase of the research begins with screening the research sample on the population at the integrated service post in the Dago Health Center and Cipaganti Health Center, Bandung City. Researchers conducted a brief history regarding general medical history, use of orthodontic nipples, and bad habits. The researcher explained the important things related to research participation, and the parents/guardians signed the informed consent after the explanation. The researcher then performed an oral cavity examination for sample selection. The samples were then grouped according to the type of orthodontic nipple used. Group 1 is a sample with a history of using normal flow orthodontic nipples, and group 2 is a sample with a history of using bigger flow orthodontic nipples. Researchers who had previously been calibrated inter-examiner also performed extraoral, myofunctional and intraoral examinations.

Extraoral examinations performed were posture, breathing and facial development examinations. Researchers performed examinations of lips, cheeks, swallowing patterns, tongue size and tongue posture as part of the myofunctional examination. Intraoral examination was performed to eliminate samples that did not fulfil the inclusion criteria.

The researcher performed the impression of the maxilla and mandible with an elastomeric impression material (Vericom Vonflex S™ Putty Normal) and immediately casted using a stone cast. Researchers analysed the study model to see the presence or absence of primate space, midline shift, posterior crossbite, overbite, overjet, intercanine width, intermolar width, arch shape, dental alignment, primary canine relationship, and terminal plane relationship.

Statistical Analysis

Primary data were processed using Microsoft Excel® and then presented in a table with frequency and percentage along with narration. The statistical test used to see the difference between groups 1 and 2 was the paired T-Test. By using this test, the differences between the two groups can be seen. Mann Whitney statistical test is used to see the relationship between age and measurement results.

## Results

After the examination, 15 children in group 1 and 15 children in group 2 fulfil the inclusion criteria. Table 1 shows the characteristics of the sample by gender, where in group 1, there were 9 female children (60%) and 6 male children (40%). In group 2, there were 7 boys (46.667%) and 8 girls (53.33%). When viewed by age, 7 children aged 3-4 years (46.67%) and 8 children aged 4-5 years (53.37%) in group 1. In group 2, all children who participated in the study were aged 3-5 years.

Table 2 shows that all samples showed normal examination results in both groups on extra-oral examination, namely body posture, breathing, and facial development. Likewise, with myofunctional examination, namely swallowing pattern, tongue posture, tongue size, tongue attachment and lip relation, all samples showed normal examination results in both groups.

| Characteristic | Normal Flow Group | | Bigger Flow Group | |
|---|---|---|---|---|
| | Total (n) | Percentage (%) | Total (n) | Percentage (%) |
| **Gender** | | | | |
| Men | 6 | 40 | 7 | 46,667 |
| Women | 9 | 60 | 8 | 53,333 |
| **Age** | | | | |
| 3 – 4 years old | 7 | 46,667 | 15 | 100 |
| 4 – 5 years old | 8 | 53,333 | 0 | 0 |

**Table 1.** Sample Characteristic.

In the intra-oral examination, which focused more on occlusal characteristics, primate space was found, the shape of the upper and lower arches was normal in both groups. In group 1, there was a midline shift in 2 children (13.3%), and there was no midline shift in the two children. 13 children (86.7%). This looks different from group 2, where the entire study sample did not show any midline shift. The canine relationship in group 1 showed that 14 children (93.4%) were included in canine relationship class I, and one child (6.6%) was included in canine relationship class II. All samples in group 2 showed a class I canine relationship. In the characteristics of the terminal flush relationship, there were differences between the two groups. In group 1, 6 children (40%) had a terminal flush permanent second molar relationship, and 9 children (60%) showed a mesial step relationship.

| Examinations | Group 1 Total (n) | Percentage (%) | Group 2 Total (n) | Percentage (%) |
|---|---|---|---|---|
| **Body posture** | | | | |
| Normal | 15 | 100 | 15 | 100 |
| Abnormal | 0 | 0 | 0 | 0 |
| **Breathing** | | | | |
| Light Nasal Breathing | 15 | 100 | 15 | 100 |
| Heavy Nasal Breathing | 0 | 0 | 0 | 0 |
| Mouth Breathing | 0 | 0 | 0 | 0 |
| **Face Development** | | | | |
| Middle Face Deficiency | 15 | 100 | 15 | 100 |
| Lower Face Deficiency | 0 | 0 | 0 | 0 |
| Excessive Vertical Growth | 0 | 0 | 0 | 0 |
| **Swallowing Pattern** | | | | |
| Normal | 15 | 100 | 15 | 100 |
| Abnormal | 0 | 0 | 0 | 0 |
| **Tongue Posture** | | | | |
| Normal | 15 | 100 | 15 | 100 |
| Abnormal | 0 | 0 | 0 | 0 |
| **Tongue Size** | | | | |
| Normal | 15 | 100 | 15 | 100 |
| Large | 0 | 0 | 0 | 0 |
| **Tongue Attachment** | | | | |
| Normal | 15 | 100 | 15 | 100 |
| Large | 0 | 0 | 0 | 0 |
| **Lip Relationship** | | | | |
| Competent | 15 | 100 | 15 | 100 |
| Incompetent | 0 | 0 | 0 | 0 |
| **Primate Space** | | | | |
| Yes | 15 | 100 | 15 | 100 |
| None | 0 | 0 | 0 | 0 |
| **Midline Shift** | | | | |
| None | 13 | 86,7 | 15 | 100 |
| Yes | 2 | 13,3 | 0 | 0 |
| **Caninus Relationship** | | | | |
| Class I | 14 | 93,4 | 15 | 100 |
| Class II | 1 | 6,6 | 0 | 0 |
| Class III | 0 | 0 | 0 | 0 |
| **Terminal Flush Relationship** | | | | |
| Flush | 6 | 40 | 15 | 100 |
| Mesial Step | 9 | 60 | 0 | 0 |
| Distal Step | 0 | 0 | 0 | 0 |
| **Posterior Cross Bite** | | | | |
| None | 15 | 100 | 15 | 100 |
| Unilateral | 0 | 0 | 0 | 0 |
| Bilateral | 0 | 0 | 0 | 0 |
| **Lower Jaw Arch Shape** | | | | |
| Normal | 15 | 100 | 15 | 100 |
| Narrow | 0 | 0 | 0 | 0 |
| Wide | 0 | 0 | 0 | 0 |
| **Upper Jaw Arch Shape** | | | | |
| Normal | 15 | 100 | 15 | 100 |
| Narrow | 0 | 0 | 0 | 0 |
| Wide | 0 | 0 | 0 | 0 |
| **Dental Alignment** | | | | |
| Normal | 14 | 93,4 | 15 | 100 |
| Upper Jaw Crowding | 0 | 0 | 0 | 0 |
| Lower Jaw Crowding | 1 | 6,6 | 0 | 0 |

**Table 2.** Descriptive Data of Extra Oral, Myofunctional and Intra Oral Examination.

In group 2, all study samples showed a terminal flush permanent second molar relationship. The results of the dental alignment examination in group 1 showed that 14 children (93.4%) had normal results, and one child had crowding of the lower teeth. Different results occurred in group 2, where all children were included in the normal dental alignment category.

Both groups measurements of overbite, overjet, intercanine and intermolar width were tested by paired T-test to examine differences in both groups. The intermolar width of the two groups had a significant difference (p-value = 0.0001). Meanwhile, in overbite, overjet, and intercanine width, there is no difference.

Based on the data (Table 3), the Mann Whitney test results showed that overbite, overjet, and intercanine width were not related to age in both groups. In contrast, intermolar width was significantly related to age in group 1 (p-value = 0.03957).

| Variable | Group 1 | | | | | | Group 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | r | t value | p-value | character | Linkages | Explanation | r | t value | p-value | character | Linkages | Explanation |
| Overbite | ,17 | 0,62 | 27,409 | Non-Sign | 2,84 | not related | ,33 | 1,25 | 11,684 | Non-Sign | 10,71 | Not related |
| Overjet | ,22 | 0,82 | 21,252 | Non-Sign | 4,96 | not related | ,04 | 0,15 | 44,332 | Non-Sign | 0,16 | Not related |
| Canine Width | -,19 | -0,69 | 25,071 | Non-Sign | 3,55 | not related | ,06 | 0,21 | 41,916 | Non-Sign | 0,33 | Not related |
| Intermolar Width | ,47 | 1,90 | 3,957 | Sign | 21,82 | Related | -,25 | -0,93 | 18,442 | Non-Sign | 6,25 | Not related |

**Table 3.** Age Relation with Overbite, Overjet, Canine Width, Intermolar Width.

## Discussion

In this study, all study subjects in both groups 1 and 2 showed nasal breathing. This is different from the study by Lopes[10], whereas as many as 76 (55.1%) of a total of 138 children who were bottle-fed showed oral breathing habits. In the study, bottle feeding statistically increased risk factors for mouth breathing. The difference in the results of this study was caused by differences in the operational definition of children who breastfed from a bottle. Lopes[10] did not mention the duration of the use of the feeding bottle and the type of nipple used.

Several studies have shown that there is a relationship between head position and functional respiratory requirements.[11,12] The sternocleidomastoid muscle, which functions to raise the head, contracts more.[13] As a result, the head is positioned up about 6°, thereby increasing the anterior vertical height of the face but reducing the vertical height posteriorly.[11,13] Subjects in both groups did not show any changes in body posture. This is related to the absence of research subjects who breathe through the mouth.

In this study, the entire sample has primate space which is beneficial because primate space is one indicator that the development of permanent teeth is in a suitable condition. This distance is important to accommodate the difference between the size of the primary and permanent teeth and the formation of occlusion. The space or distance in the primary teeth can be divided into two types: primate space and developmental space. The primate space occurs between the primary maxillary lateral incisors and canines, and between the primary mandibular first molars and canines, while the developmental space lies between the maxillary and mandibular incisors.[14]

The results of the midline shift examination showed that as many as 13.3% of the group 1 samples experienced a shift in the median line. This condition occurred in 2 study samples, and both occurred in the mandible. Possible etiology of this median line discrepancy is the distance between teeth, the size ratio between primary and permanent teeth, bad habits such as thumb sucking or tongue thrusting, and imbalance of masticatory muscle activity.[15]

Canine relationship in all samples shows class I canine relationship dominates in group 2 as much as 100% and in group 1 as much as 93.4%. 1 sample in group 1 had a class II canine relationship, i.e. the position of the incisal tip of the maxillary canines was more anterior than the mandibular interdental canines and mandibular first molars. Class I canine relationship is the ideal canine relationship, i.e. when the incisal tip of the maxillary canine is on the mandibular interdental canine and the mandibular first molar or first premolar of the permanent teeth.[16] The results in Table 2 showed that both in group 1 and group 2, there was no negative impact on the canine relationship of the primary teeth.

The results of the terminal flush relationship examination showed that 100% of the group 2 samples had a terminal flush primary molar relationship, which is a condition when the distal portion of the maxillary second molar is parallel to the distal portion of the mandibular second primary molar. The molar relationship of primary teeth can predict future permanent molar occlusion as well as potential malocclusion.[17]

When the primary second molar is lost, the maxillary and mandibular molars tend to shift mesially by utilizing the Leeway space. Still, the mandibular molars usually move mesially more than the maxillary molars. This difference in movement results in a normal transition from a flush terminal plane relationship in mixed dentition to a class I relationship in the permanent dentition.[17]

The results of this study showed that only 40% of the group 1 samples had a flush terminal plane primary molar relationship. In comparison, the other 60% were in a mesial step condition, i.e. when the distal part of the maxillary primary second molar is more distal than the distal part of the maxillary second molar on lower jaws. This condition can still produce an ideal permanent molar relationship condition, which is class 1.

According to the numerical data, the average overbite, overjet, intercanine width, and intermolar distance measurements between groups 1 and 2 showed no difference. However, statistically, it shows that there is a difference in the intermolar distance. This is in line with the results of research from Aznar et al. which showed a shortening of the intermolar distance in bottle-fed children compared to breastfeeding.[18]

In groups 1 and 2, there is no difference in overbite distance. This is because the flow of milk from the bottle to the child's oral cavity cannot come out by itself, so sufficient sucking is needed from the muscles around the face to suck and milk can come out. The movement of the masseter muscles around the face will compensate with a compressive movement towards the anterior, allowing for pressure to occur in the region of the anterior teeth. The mandibular anterior teeth will be more pressed apically, allowing the maxillary teeth to eruption. This mechanism causes a deep bite on the anterior teeth. The flow of milk released from the type 1 and type 2 nipples can be controlled by the movement of the masseter muscles in children and this does not cause differences in the two groups.

There was also no statistical difference between overjet in groups 1 and 2. This mechanism occurs because the orbicularis oris muscles can compensate for the movement of the masseter muscles during sucking movements in children. The suction that occurs does not cause the movement of pressing the maxillary anterior teeth to be more forward. The child's ability to control the flow of breast milk while drinking milk develops according to the age at which the child is bottle-fed. This is in accordance with research conducted by Warren and Bishara,[19] overjet is influenced by the activity of the orbicularis oris muscle, which runs circularly and connects to the buccinator muscle. The function of this muscle has a physiological power to provide continuous light pressure on the anterior teeth. In addition, the orbicularis oris muscle forms a lip seal that must be maintained during rest. The function and activity of the orbicularis oris muscle work antagonistic to the mentalis muscle.[20]

Several studies conducted by Viggiano et al.[20] showed a narrowing of the intercanine width in bottle-fed children. However, this was not found in children who drank milk with 1 and 2. In both groups statistically, the size of the intercanine width was not different. This situation occurs because one of the growth points in the upper jaw is in the canine area.

The statistical analysis shows a significant difference in the intermolar width in groups 1 and 2. Group 1 has a slightly larger intermolar width than group 2. This may be due to pressure from the masseter muscles during the sucking process. Descriptively, the average intermolar width of the bigger flow group was 37.9 mm, and the normal flow was 39.3 mm. Narrowing of the intermolar width can lead to a tendency for posterior crossbite to occur. This can progress to narrowing of the maxillary arch. The milk flow from a bottle with a bigger flow has easier power to come out so that the child does not need to suck strongly. The intermolar width can determine the presence of constriction in the maxilla.[18]

In this study, no posterior or anterior crossbite was found. This is in accordance with research conducted by Bishara et al.[21] and Legovic and Ostric[22] then Simpson and Cheung[23] which stated that statistically, there was no relationship between the method of drinking milk and the development of the arch of the jaw. Because many factors can cause malocclusion, namely exogenous and endogenous factors that still require further research. In groups 1 and 2, there was no crossbite because there was no hyperfunction of the buccinator muscles.

The statistical analysis (Table 3) on the relationship between children's age with overbite, overjet, intercanine width, and intermolar width in the bigger flow group showed no relationship between the two variables. In contrast, in group 1 showed that there was a significant relationship between age and the development of intermolar width. This supports the paired t-test statistical analysis results, which showed a difference in the intermolar width in group 1 and 2.

The use of a normal flow nipple (group 1) has the advantage that milk flow that comes out can be adjusted to the suction power of the child. The soft, flexible, and smaller nipples design can reduce the occurrence of disturbances in the child's oral cavity.

The limitation of this study is the limited number of samples due to the COVID-19 pandemic situation that occurred during the research process. This situation causes limited research activities, and the research sample is a vulnerable age group that has not been vaccinated. This research also did not compare with children without bottle feeding and did not consider how long the children sucking bottle feeding.

## Conclusions

The use of normal flow orthodontic nipples did not have a negative effect on the orofacial complex in children aged 3-5 years compared to normal flow orthodontic nipples. There was a significant difference between the two groups in the intermolar width.

## Acknowledgements

This research was supported by PT. Ikapharmindo Putramas.

## Declaration of Interest

The authors report no conflict of interest.

## References

1. Dowling DA, Tycon L. Bottle/Nipple Systems. Nursing for Women's Health. 2010;14:61–6.
2. Garliner D. Myofunctional Therapy. 1st ed. Philadelphia: WB Saunders Company; 1978.
3. Albajalan OB, Alazzawi NO, Mukti NA, Samsudin A. The Relationship Between Sex and Age on Dental Arch Change in the Reverse Twin Block Appliance on Dental Study Model Measurements: A Randomized Clinical Trial. J int Dent Med Res. 2020;13:229–35.
4. Meyers A, Hertzberg J. Bottle-feeding and malocclusion: Is there an association? American Journal of Orthodontics and Dentofacial Orthopedics. 1988;93:149–52.
5. Yonezu T, Kadoya M, Yakushiji M. Effects of prolonged breast- and bottle-feeding on occlusal characteristics in the primary dentition. Pediatric Dental Journal. 2005;15:176–9.
6. Mathew OP. Breathing patterns of preterm infants during bottle feeding: role of milk flow. J Pediatr. 1991;119:960–5.
7. Jyoti S, Gp P. Nutritive and Non-Nutritive Sucking Habits - Effect on the Developing Oro-Facial Complex; A Review. 2014;4:203.
8. Turgeon-O'brien H, Lachapelle D, Gagnon P, Larocque I, Maheu-Robert L. Nutritive and nonnutritive sucking habits: a review. ASDC journal of dentistry for children. 1996;63 5:321–7.
9. Charchut SW, Allred EN, Needleman HL. The effects of infant feeding patterns on the occlusion of the primary dentition. J Dent Child (Chic). 2003;70:197–203.
10. Lopes TSP, Moura LFAD, Lima MCMP. Association between breastfeeding and breathing pattern in children: a sectional study. Jornal de Pediatria. 2014;90:396–402.
11. Winarti TM, Rikmasari R. Kebiasaan postur tubuh yang buruk yang mengganggu kesehatan sendi temporomandibula Bad posture habits that interfere with health of temporomandibular joint. J Dentomaxillofac Sci. 2011;10:196.
12. Neiva PD, Kirkwood RN, Mendes PL, Zabjek K, Becker HG, Mathur S. Postural disorders in mouth breathing children: a systematic review. Braz J Phys Ther. 2018;22:7–19.
13. Kusuma ARP. Bernafas Lewat Mulut Sebagai Faktor Ekstrinsik Etiologi Maloklusi (Studi Pustaka). Majalah Ilmiah Sultan Agung. 2022;48:12–31.
14. Sun KT, Li YF, Hsu JT, Tu MG, Hung CJ, Hsueh YH, et al. Prevalence of primate and interdental spaces for primary dentition in 3- to 6-year-old children in Taiwan. Journal of the Formosan Medical Association. 2018;117:598–604.
15. Christensen RT, Fields HW, Christensen JR, Beck FM, Casamassimo PS, McTigue DJ. The Effects of Primary Canine Loss on Permanent Lower Dental Midline Stability. 40:6.
16. Morcos SS, Patel PK. The vocabulary of dentofacial deformities. Clin Plast Surg. 2007;34:589–99.
17. Srinivasan D, Loganathan D, Kumar SS, Louis CJ, Eagappan S, Natarajan D. An Evaluation of Occlusal Relationship and Primate Space in Deciduous Dentition in Kancheepuram District, Tamil Nadu, India. J Pharm Bioallied Sci. 2017;9:S45–9.
18. Aznar T, Galán AF, Marín I, Domínguez A. Dental arch diameters and relationships to oral habits. Angle Orthod. 2006;76:441–5.
19. Warren JJ, Bishara SE. Duration of nutritive and nonnutritive sucking behaviors and their effects on the dental arches in the primary dentition. American Journal of Orthodontics and Dentofacial Orthopedics. 2002;121:347–56.
20. Viggiano D. Breast feeding, bottle feeding, and non-nutritive sucking; effects on occlusion in deciduous dentition. Archives of Disease in Childhood. 2004;89:1121–3.
21. Bishara SE, Nowak AJ, Kohout FJ, Heckert DA, Hogan MM. Influence of feeding and non-nutritive sucking methods on the development of the dental arches: longitudinal study of the first 18 months of life. Pediatr Dent. 1987;9:13–21.
22. Legović M, Ostrić L. The effects of feeding methods on the growth of the jaws in infants. ASDC J Dent Child. 1991;58:253–5.
23. Simpson WJ, Cheung DK. Developing infant occlusion, related feeding methods and oral habits. Part II: discussion and conclusions. Dent J. 1976;42:135-137,142.