

Relationship between breastfeeding, bottle-feeding and development of malocclusion

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SUMMARY

The importance of breastfeeding to the child's psychological and physical development is evidence-based. However, scientific literature contains controversial opinions on its influence to the development of maxillofacial system. This article aims at reviewing the effects of breastfeeding and bottle-feeding to the development of malocclusion and non-nutritive sucking habits. Thirty-four articles analyzing the above mentioned associations were selected from *Pubmed* database. Breastfeeding and bottle-feeding may have different impact on the development of maxillofacial system due to unequal functional load of certain facial muscles involved in the feeding processes. Shortage of scientific research prevents from relating bottle-feeding with the development of skeletal malocclusions. Prolonged breastfeeding may have protective effect on developing posterior crossbite and anterior openbite. However, conflicting opinions have been observed. It has been stated that longer duration of breastfeeding diminishes the risk of acquiring non – nutritive sucking habits.

Key words: breastfeeding, feeding methods, malocclusion, maxillofacial development, fingersucking.

INTRODUCTION

The significance of breastfeeding to a child's health is well documented in the scientific literature as well as encouraged through mass media. The World Health Organisation (WHO) recommends exclusive breastfeeding up to 6 months of age (1-3). Mother's milk is the best food for an infant providing all nutrition, stimulating maturation of the immune system, protecting from allergies, digestion disorders, respiratory diseases, etc (1-8).

Malocclusion is a developmental disorder of maxillofacial system which has impact on the reciprocity of jawbones, teeth and facial soft tissues, inflicts functional and esthetic disturbances. Different opinions may be encountered about the factors determining malocclusion: some authors say that the essential impact on the development of skeletal and dentoalveolar anomalies is genetically determined; others believe that function plays the most important

role in the correct development of craniofacial system (1, 9-13). Suction, swallowing, mastication and speaking are those orofacial functions that not only stimulate the development and growth of maxillofacial system, but also may have impact on its growth pattern and position of teeth (13, 14).

It has been stated that the mechanics of breastfeeding and bottle – feeding differ. During the processes different facial muscles are more actively involved and that determine different impact on the growth of jaws and the development of dental arches (1, 4, 8-10, 15-18). Breastfeeding promotes harmonious development of maxillofacial system stimulating intensive orofacial muscular activity (2, 17, 22). Active suckling movements stimulate adequate lip closure and correct position of a tongue at rest (5, 8, 13, 22). Therefore it has been suggested that longer breastfeeding duration may be related with fewer occlusal abnormalities and functional disorders (3, 6, 9, 10, 16, 19).

On the other hand, scientific data claim that early gained and long – lasting harmful oral habits (eg.: finger sucking, mouth breathing) and bottle-feeding may negatively influence the development of bite (1, 4, 10, 15, 16, 23). Inadequate tonicity of the buccinator and the orbicular of the mouth muscles as well as incorrect tongue position during sucking disturbs the dynamic

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balance among tongue, cheeks and lips (12, 13, 22) leading to altered development of both jaws (8, 22). Artificial teats have a specific shape, furthermore they are made of more rigid material than breast tissue (4). Such characteristics lead to non-physiologic pressure in the oral cavity which may restrict normal transverse growth of the palate and cause inappropriate alignment of teeth subsequently (4, 11).

Scientific literature contains controversial opinions on the influence of feeding methods to the development of malocclusion and harmful oral habits. Therefore, the aim of this review is to systematize the latest scientific literature analyzing the impact of breastfeeding and bottle-feeding to the growing craniofacial system and the development of malocclusion and non-nutritive sucking habits.

MATERIAL AND METHODS

A search was performed in *Pubmed* database concerning the following question: What is the impact of breastfeeding and bottle-feeding on the development of skeletal and dentoalveolar malocclusions as well as non-nutritive sucking habits? The search was based upon the following keywords: breastfeeding, feeding methods, malocclusion, maxillofacial development, and fingersucking. Hundred and thirty-seven articles were received. In order to consider articles for inclusion in the review, they had to be perspective, retrospective or follow-up studies published in English. Moreover, the control group of exclusively breastfed subjects was mandatory. Articles referring to craniofacial anomalies (e.g. clefts, syndromes, etc)

Table 1. Scheme of literature selection

Keywords' combination	Articles received	Number of repeated articles	Number of remaining articles	Not in English and/or no abstract	Reviews / no re-search / no control group / other topics	Craniofacial deformities	Selected research
Breastfeeding + malocclusion	60		60	14	24	2	20
Feeding methods + malocclusion	56	28	28	7	13	3	5
Maxillofacial development + breastfeeding	18	14	4	1	2	1	0
Maxillofacial development + feeding methods	18	11	7	3	2	1	1
Fingersucking + breastfeeding	59	31	28	7	13		8
Fingersucking + feeding methods	49	39	10	4	6		0
Total	260	123	137	36	60	7	34

Table 2. Breastfeeding and bottle – feeding impact to the development of maxillofacial system and skeletal malocclusions

Author	Study Methods	Study Results
Sanchez-Molins et al., 2010	N=197; lateral cephalograms were compared of children who were exclusively breastfed and bottle-fed;	Breastfed children have more correct vertical and sagittal mandible relationship with maxilla and cranial base.
Fabac et al., 1992	N=272; 3 years +/-2 months; exclusively breastfed for 6 months compared with bottlefed;	Statistically significant link between feeding patterns and increased overjet.
Jabbar et al., 2011	N=911; 3-6 years; breastfed and bottle-fed children were compared;	No statistically significant differences between mentioned groups assessing molar and canine relationships and increased overjet.
Ganesh et al., 2005	N=153; 3-5 years; exclusively breastfed children were compared with mixed-fed;	
Warren and Bishara, 2002	N=119; from birth to 4-5 years; bottle-fed children were compared with <6 months/ 6-12 months / >12 months exclusively breastfed infants;	
Luz et al., 2006	N=249; 5-11 years; compared <6 months and >6 months breastfed infants;	No statistically significant relationship between longer breastfeeding duration and skeletal class II malocclusion development.

were excluded. Thirty-four articles corresponded to our requirements. Three of them were of vast volume perspective follow-up studies where children had been observed from birth to 6-8 years of age. Other articles covered retrospective cross-sectional studies. The summarised scheme of literature selection is presented in Table 1. Further exclusion criteria were adjusted when analysing the relationship between feeding methods and dentoalveolar malocclusions. To make evaluation as objective as possible, studies have been selected, where children with non-nutritive sucking habits were excluded.

RESULTS

Breastfeeding and bottle-feeding impact to the development of maxillofacial system and skeletal malocclusions has been analyzed in 6 studies (Table 2). Influence of feeding methods to the development of dentoalveolar malocclusions with the exclusion of children having non-nutritive habits is summarized in Table 3. Eighteen articles have been found in the database where the impact of feeding methods to the development of non-nutritive sucking habits and functional disorders is analyzed (Table 4).

Table 3. Breastfeeding and bottle-feeding impact on the development of dentoalveolar malocclusions. Children having non-nutritive sucking habits were excluded.

Author	Study Methods	Study Results
Peres et al., 2007	N=359; from birth up to 6 years; compared <9 months and >9 months breastfed infants;	Statistically significant relationship between breastfeeding and the development of posterior crossbite.
Kobayashi et al., 2010	N=503; 3-6 years; bottle-fed compared with <6 months / 6-12 months / >12 months exclusively breastfed infants;	
Warren & Bishara, 2002	N=119; from birth till 4-5 years; bottle-fed compared with <6 months / 6-12 months / >12 months exclusively breastfed infants;	No statistically significant relationship between breastfeeding and posterior crossbite.
Ganesh et al., 2005	N=153; 3-5 years; compared exclusively breastfed children with combined-fed;	
Romero et al., 2011	N=503; 3-6 years; bottle – fed compared with <6 months / 6-12 months / >12 months exclusively breastfed infants;	Statistically significant relationship between breastfeeding and the development of anterior openbite.
Warren & Bishara, 2002	N=119; from birth till 4-5 years; bottle-fed compared with <6 months / 6-12 months / >12 months exclusively breastfed infants;	No statistically significant relationship between breastfeeding and anterior openbite.
Ganesh et al., 2005	N=153; 3-5 years; compared exclusively breastfed children with combined-fed;	

Table 4. Breastfeeding and bottle-feeding impact on the development of non-nutritive sucking habits and functional disorders

Author	Study Results
Luz et al., 2006; Romero et al., 2011; Montaldo et al., 2011; Leite-Cavalcanti et al., 2007; Vasconcelos et al., 2011; de Albuquerque et al., 2010; Scavone-Jr et al., 2008; Ngom et al., 2008; Peres et al., 2007; Melink et al., 2010; Moimaz et al., 2008; Larsson, 2001; De Holanda et al., 2009; Aarts et al., 1999	The longer duration of breastfeeding, the fewer chances of developing non-nutritive sucking habits.
Peres et al., 2007	No statistically significant relationship between shorter than 9 months breastfeeding duration and the use of dummy.
De Holanda et al., 2009; Moimaz et al., 2008; Aarts et al., 1999	No statistically significant relationship between longer breastfeeding duration and thumb sucking.
Ovsenik et al., 2007	Non-nutritive sucking habits up to 5 years of age and bottle-feeding are statistically significantly related with atypical swallowing pattern and more severe malocclusions in permanent dentition.
Carrascoza et al., 2006; Trawitzki et al., 2005	Bottle-feeding is statistically significantly associated with mouth breathing.

DISCUSSION

Impact on maxillofacial system and skeletal malocclusions

Several authors suggested that breastfeeding stimulates correct vertical and sagittal intermaxillary relationships (1, 19, 21) while exclusive bottle-feeding may be related with the development of skeletal malocclusions because of inadequate muscular stimuli for proper mandibular development (8, 19, 24-26). Controversial conclusions of analyzed articles could be related with methodological differences of these studies. It should be pointed out that they are mainly retrospective cross-sectional studies and should be estimated considering limitation of such studies. Moreover, it is complicated to relate directly one particular etiological factor to the subject as development of maxillofacial system may be influenced by many adjoining factors (24). Considering that skeletal malocclusions may have a strong genetic predisposition, it would be useful to evaluate the relationship between the phenotypes of parents' and their children and feeding methods. However none of analysed studies aimed at researching that issue. Although the tendency of decreasing overjet with prolonged breastfeeding was observed (19), the latest research are insufficient to relate breastfeeding with the prevention of skeletal malocclusions (1).

Impact on dentoalveolar malocclusions

Anterior openbite and posterior crossbite are mostly analyzed dentoalveolar malocclusions considering the impact of breastfeeding and bottle-feeding.

Posterior crossbite is defined as reverse inter-relationship of one or more posterior teeth unilaterally or bilaterally in bucco-lingual direction (4). Without early treatment, it may determine asymmetric development of craniofacial system and may increase the risk of temporomandibular joint (TMJ) dysfunction in later age (12, 13, 27). Scientific literature contains controversial research on this subject. Conflicting results may be related with the presence of non-nutritive sucking habits because they also have impact on the development of dentoalveolar complex (2) and it becomes complicated to assess the positive effect of breastfeeding to the prevention of crossbite (2, 5, 20). However, Viggiano et al. and Larsson independently stated that the prevalence of posterior crossbite in breastfed children remained low compared with bottle-fed, even if the former had non-nutritive sucking habits (11, 28). Conflicting opinions remain even in se-

lected research, where children having non-nutritive sucking habits were excluded. Warren et al. hypothesized that only prolonged breastfeeding (perhaps 2 years or longer) may have positive effect on preventing malocclusion (20). However, a tendency of increasing maxillary intercanine and intermolar widths with longer breastfeeding duration should be mentioned (19). What is more, Kobayashi et al. concluded that children who were exclusively breastfed for more than 1 year had 20-fold lower risk for developing posterior crossbite compared with exclusively bottle-fed (2).

Anterior openbite is diagnosed when there are no vertical contacts between upper and lower incisal edges (11). Concerning this particular occlusal abnormality, no statistically significant relationship was observed when comparing breastfed and bottle-fed children (19, 20), except for one study (5). Presumably non-nutritive sucking habits as opposed to feeding methods during the first months of life have the determinant impact on the development of anterior openbite (4, 9). The occurrence of this malocclusion appears to be related to local deformation of dental arches (related to the use of a pacifier) than to altered activity of orofacial muscles (4). On the other hand, Romero et al. statistically significantly found that bottle-fed children had a 9-fold greater chances of having anterior openbite compared with exclusively breastfed for longer than 12 months (5).

There have been difficulties encountered comparing the articles because of the methodological differences such as the study design, different sample size as well as variables studied. Controversial results may have arisen from such limitation as the representative of researched population, socio-economic and cultural differences, recall bias and relatively small number of subjects in a group of breastfed longer than 12 months.

Impact on the development of non-nutritive sucking habits

Non-nutritive sucking (e.g.: pacifier, finger sucking) and functional disorders (e.g.: mouth breathing, atypical swallowing) are referred to etiological factors of malocclusion (12, 17, 29). Statistically significantly determined that the longer the breastfeeding duration the lower the risk of acquiring non-nutritive sucking thereby the prevalence of associated malocclusion decreases as well (3). This relationship was proved by other researchers as well (1, 4, 5, 10, 13, 17, 28-34). Luz et al. stated that children breastfed for less than 6 months have a fourfold higher risk of developing non-nutritive

sucking habits (1) and that appears to be a risk factor for further habit development after an age of 1 year (10). It is thought that breastfeeding has a positive psychological effect on the infant, ensures sense of security, warmth and satisfies an instinctive need to suck, therefore, longer breastfed children are less keen on satisfying their needs with non-nutritive sucking habits (1, 3, 8, 10). Functional disorders of bottle-fed children may be associated with altered sucking function which leads to inadequate craniofacial development (7, 22). Exclusive bottle-feeding has increased over the past decades, a tendency to prolong the use of a bottle may be observed as well (3, 7, 17, 27). Such habits must be considered as major aetiological factors for the development of malocclusions not only in primary dentition, but in mixed dentition period as well (27).

Future parent should be informed about positive impact of breastfeeding to the development of maxillofacial system and dentition as well as

lower prevalence of non-nutritive sucking habits. It would help to encourage breastfeeding (3, 5, 10, 15, 17, 18).

CONCLUSIONS

Shortage of scientific research prevents us from relating bottle-feeding with the development of skeletal malocclusions.

A positive impact of breastfeeding has been stated to the prevention of the development of dentoalveolar anomalies, especially to posterior crossbite.

Future studies assessing the relationship between malocclusion and different feeding methods considering the phenotypes of parents' and their children, would provide useful data on perception of the etiology of analysed malocclusions.

Longer period of breastfeeding makes the risk of non-nutritive sucking habits lower.

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