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The Impact of Feeding Pattern on Malalignment Status in Relation to Salivary Adiponectin among Primary School Children in Baghdad City, Iraq

Alyaa S Noori*, Ban S Diab

Department of Pedodontic and Preventive Dentistry, College of Dentistry, University of Baghdad, Iraq

ABSTRACT

Background: There are a confirmed the relationships between duration of breastfeeding and the occurrence of malocclusion among different age groups. Early prevention of any developing malocclusion could have a major impact on any individual's life course and help to avoid lengthy and orthodontic treatment.

Method: The sample includes 225 children from primary school in Iraq aged from 8-9 years. Feeding pattern of the children was assessed by a questionnaire which divided the children into three categories (purely breast feeding mixed feeding, and purely formula feeding). Malalignment of the teeth is measured according to WHO in 1997 which include both spacing and crowding of anterior teeth from canine to another canine for both upper and lower jaw. Salivary adiponectin levels were measured according to the manufacturer instruction of human adiponectin ELISA kit.

Result: the crowding in one arch (score 1) is higher in formula feeding group than breast feeding group with opposite result for both arch crowding (score 2). For spacing score the presence of on arch spacing (score 1) is higher in in breast feeding than with opposite picture was found in formula feeding group. The mean of salivary adiponectin was higher among formula feeding group than in breast feeding and the correlation between S. adiponectin and malalignment scores was negative in breast feeding group and positive in formula feeding group for both crowding and spacing scores. At the same time all the data were not significant.

Conclusion: Feeding pattern of children in infancy had an effect on teeth alignment and on level of salivary adiponectin.

Key words: Feeding pattern, Salivary adiponectin, Malalignment.

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Corresponding author: Alyaa S Noori

e-mail✉: ali.mario28@yahoo.com

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INTRODUCTION

Breast feeding is one of most effective ways to assure child good health and survival, failure in breast milk supply during the first six months of life participate to more than million preventable child death each year. There are well established benefits to the mother and to the child's growth, mental development and immunological system [1]. Breastfeeding is beyond just nutrition; it is an essential and crucial factor for the proper growth and development of the body as well as the stomatognathic and orofacial musculature therefore, "breastfeeding is the best orthopedic appliance one can offer to get an adult's face in terms of harmonious development, which is imperative for the good development of the entire craniofacial complex during the most important period of the newborn life" [2]. Malocclusion can impair quality of life in children [3] and adults [4]. Orthodontic treatment has been shown to create rapid and longer-term improvements on patient's quality of life, including emotional and social well-being [5]. Based on these findings early prevention of any developing malocclusion could have considerable influences on individual's life course and assist to avert orthodontic treatment. The hypothesis that breastfeeding can influence craniofacial development is based on the potential morphological sequels of breastfeeding compared with formula feeding and on the malleability of structures

of oral cavity during craniofacial growth and development. Suckling movements that occur during breastfeeding, contrary to the sucking movements during bottle-feeding, involve tongue peristaltic movements around the nipples of the breast that can guide morphology of the palate by rounding and flattening it [6]. These movements also help harmonization and development of the peripheral oral musculature which important for efficacious swallowing [7]. Additionally, development of oral functions simplifies a correct primary teeth eruption process with functional tooth interdigitation. There is some evidence that tongue and lip movements during breastfeeding induce the infant to draw breast milk through peristaltic action [8], allowing for proper maturation and function of the oral musculature necessary for swallowing and suitable growth and development of the maxillo-mandibular complex [7]. In contrast, when formula feeding infants set their tongues in relatively inferior positions, lips do not come together as tightly (depending on the material, shape and size of the artificial nipple). In those cases, lips are probably to produce less oral motor stimulation, due to fluid flow can be easily stimulated via light lingual pressure. These factors may lead to primary malocclusion developmental caused by combination of a constricted maxillary dental arch with a deeper palate, and sometimes, a more retro positioned mandible linked to posterior displacement of the tongue base [9].

Two systematic reviews estimate the topic of breastfeeding and malocclusion the first id done by Peres et al. [10], their conclusions were based especially on studies on the primary dentition. This review concluded that breastfeeding was linked to lower risk of malocclusions. The other review by Abreu et al. [11] focused on the association between formula feeding vs. breastfeeding and its effect on malocclusion of mixed and permanent dentition. In contract to the result of the first systematic review, this review indicate that there was not enough evidence to advocate an association between breast-feeding, formula-feeding and malocclusion occurrence in mixed and permanent dentitions.

Adiponectin (also known adipocyte complement related protein) is an adipocyte-derived hormone, which regulates glucose and lipid metabolism, improves fatty acid oxidation and insulin sensitivity also suppress hepatic glucose production (anti-atherogenic and anti-diabetic and) [12]. Besides that, adiponectin has potent anti-inflammatory properties modifying the vascular endothelium such as preventing pre-atherogenic plaque formation and inhibiting local pro-inflammatory signals, inhibiting arterial wall thickening. In addition to its mentioned above peripheral actions, adiponectin has a central action in the regulation of energy homeostasis, stimulating food intake and in reducing energy expenditure [13]. The researcher have explained that circulating adiponectin occurs in three distinct isomeric forms: Trimeric "low molecular weight", hexameric "medium molecular weight" and "high molecular-weight" (HMW) adiponectin, each of which have different biological activities, including suppression of inflammation, improvement of insulin sensitivity and metabolic control. Among these isomeric forms, HMW adiponectin is the most active form in exerting metabolic functions [14]. Serum adiponectin level has a negative correlation with the degree of adiposity. In humans, it was demonstrated that low levels of serum adiponectin are associated with obesity, cardiovascular disease, type 2 diabetes and dyslipidemia [13]. Martin et al. [15] and Bronsky et al. [16] were the first researchers that describe the presence of immunoreactive adiponectin in human breast milk. The expression of Adipo-R1 in the small intestine of neonatal mice [17] and the expressions of Adipo-R1 and Adipo-R2 in human colon epithelium [18] suggested that not only adipocyte derived adiponectin but also adiponectin in breast milk and cord blood might play a key role in infant growth and development. Adiponectin in breast milk also involved in energy balance regulation, may play a role in the regulation of growth and development in the neonatal period and infancy, and could influence the programming of energy balance regulation in childhood and adulthood [19].

Adiponectin is also produced locally in the oral cavity by salivary glands. As such, adiponectin plays a role in the oral immune response and oral inflammation. The positive relationship between levels of adiponectin in plasma and oral fluids makes oral fluid an attractive bio-specimen that could be used as an alternative to blood in tests

measuring adiponectin [20]. As far as there is no previous Iraqi study concerning the effect of breast feeding on the teeth malalignment related to salivary adiponectin the aim of the present study was to assess the impact of feeding pattern on teeth alignment related to salivary adiponectin among primary school children in Iraq.

MATERIAL AND METHOD

A study sample pooled from primary school children in Baghdad city (Rusafa Sector), all the children between 8 and 9 years were included. The children parents were informed about the aim of the study and were freely allowed to accept the examination. Informed consent and approval had been obtained. The total children examined by the researcher was 672 child, after exclusion of children with mixed feeding and unreliable questionnaire, the study sample consist of 225 children distributed into two groups who included 89 male and 136 female. Feeding pattern of the children was assessed by a questionnaire which divided the children into three categories (purely breast feeding, mixed feeding, and purely formula feeding). The reliability of the questionnaire was assessed by resending the questionnaire to the parent 1 month after the first time and only the questionnaires with repeated answers were taken.

In the first part of the study questionnaire were distributed to all children through the schools, self-administered by the parents and returned back to the researcher to assess feeding pattern of children. Oral examinations were done under standardized conditions according to the basic methods of oral health surveys of World Health Organization 1997. Malalignment of the teeth is measured include both spacing and crowding of anterior teeth from canine to another canine for both upper and lower jaw according to the criteria of WHO 1997 [21]. A subsample was selected randomly (44 from the breast feeding group and 44 from formula feeding group) from the whole sample, salivary sample were collected from them for biochemical analysis The collection of unstimulated saliva from the children was done by drooling passively to the tube of collection by using timer for five minute according to University of Southern California school of Dentistry guidelines for saliva collection [22]. After the process of collection of saliva. The salivary samples were centrifuged for approximately twenty minute at (1000 RPM) at 2-8℃. Collect the supernatant into clean test tubes then all samples were stored at temperature about -20℃. the salivary adiponectin levels was measured according to the manufacturer instruction of human adiponectin ELISA kit.

RESULTS

The data of the present study showed that 28.8% of sample is at age 8 years distributed into 7.55% of sample is male and 18.88% is female also 15.55% from this age is breast feeding which is higher than formula feeding group which represent about 13.77%. Also the age 9 years represent 71.11% from the sample 48.44% from them are breast feeding higher than the other group which represent 22.66 also at this age female percent 39.11 which is higher than male at the same age as shown in the Table 1. Results concerning malalignment status illustrates that the crowding in one arch (score 1) is higher in formula feeding group than breast feeding group with opposite result for both arch crowding (score 2). For spacing score the presence of on arch spacing (score 1) is higher in in breast feeding than with opposite picture was found in formula feeding group although the statistical analysis show no significant association between feeding pattern with crowding and/or spacing score as shown in Table 2. Table 3 illustrate the concentration of salivary adiponectin in saliva according to feeding pattern that compere between breast feeding and formula feeding groups. The table shows that the differences between the two groups were not significant. The result was the same concerning each gender however the mean of salivary adiponectin was higher among formula feeding group than in breast feeding. The sperman correlation between salivary adiponectin and tooth alignment score among two feeding group are displayed in the Table 4. The table shows the direction of relation was negative in breast feeding group and positive in formula feeding group for both crowding and spacing scores. At the same time all the data were not significant.

Table 1: The distribution of the children by age and gender according to feeding pattern.

Age	Gender	Feeding pattern					
		Breast feeding			Formula feeding		
		N	% of group	% of sample	N	% of group	% of sample
8	M	9	25.71	4	8	26.67	3.55
	F	26	74.29	11.55	22	73.33	9.77
	T	35	100	15.55	30	100	13.33
9	M	52	47.71	23.11	20	39.22	8.88
	F	57	52.29	25.33	31	60.78	13.77
	T	109	100	48.44	51	100	22.66
Total		144	100	64	81	100	36

Table 2: The distribution of the children with crowding and/or spacing score according to feeding pattern.

Teeth Alignment		Feeding pattern				Chi-square	p
		Breast feeding		Formula feeding			
		N	%	N	%		
Crowding	Score 1	95	65.97	58	71.6	0.756	0.385
	Score 2	49	34.03	23	28.4		
Spacing	Score 1	109	75.69	52	64.2	3.367	0.067
	Score 2	35	24.31	29	35.8		

Table 3: The concentration of salivary adiponectin in saliva according to feeding pattern.

Salivary adiponectin	Feeding pattern				T	Df	p
	Breast feeding		Formula feeding				
	mean	SE	mean	SE			
M	5.469	1.48	5.435	1.315	1.136	56	0.261
F	4.933	1.06	6.591	0.984	0.015	28	0.988
T	5.164	0.868	6.302	0.804	0.962	86	0.339

Table 4: Sperman Correlation between salivary adiponectin and tooth alignment score according to feeding pattern.

	Salivary adiponectin			
	Breast feeding		Formula feeding	
	R(spearman)	p	r	p
Crowding	-0.09	0.561	0.025	0.869
Spacing	-0.076	0.622	0.128	0.407

DISSCUSSION

A large number of studies confirmed the relationships between duration of breastfeeding and the occurrence of malocclusion among different age groups [23]. The results of the present study show no significant association between feeding pattern with crowding and/ or spacing however one arch crowding and two arch spacing is higher in formula feeding children than breast feeding This explained by several theoretical mechanisms by which formula feeding might contribute to the development of malocclusion: (1) Less muscle action is need to extract formula milk from a bottle, resulting in decreased muscles development that concerned in sucking, which may act as a functional matrix for inappropriate mandibular growth; (2) The tongue acts only to control the milk drain during bottle-feeding and formula-fed children have an increased prevalence of abnormal swallowing patterns or tongue thrusting habits [24] (3) More than 60% of the children who were predominantly bottle-fed demonstrate mouth breathing or mixed breathing behavior, which may compromise occlusion [25]. Adiponectin was successfully detected in the saliva, although lower levels were observed. Salivary adiponectin, was significantly correlated with its plasma levels, Adiponectin in breast milk involved in energy balance regulation, may play a role in the regulation of growth and development in the neonatal period and infancy, and could influence the programming of energy balance regulation in childhood and adulthood [19]. Adiponectin is also produced locally in the oral cavity by salivary glands. As such, adiponectin plays a role in oral inflammation and the oral immune response [20]. The present study as the results reported that the difference between the two groups in

salivary adiponectin levels was not significant. However the mean of salivary adiponectin was higher among formula feeding group than in breast feeding this result reflected that first year of life is a critical window of infant developmental programming and show a differential effect of concentrations and doses of human milk adiponectin on development of infant. Given the appetite and body composition regulating effects of adiponectin, there is a potential to improve the outcome for infant through interventions, such as the continuation of breastfeeding during the first year of life and beyond, which may facilitate favorable developmental programming and reduce risk of obesity later in life.

CONCLUSION

The result from the current study revealed that feeding pattern in infancy influence the alignment of teeth, early prevention of developing malocclusion help to avoid lengthy orthodontic treatment. It is important to increase the knowledge in the community about the importance of breastfeeding to the dental health and occlusion and to develop educational programs to aware mothers, girls, and the entire community about the importance of breastfeeding in the development of normal occlusion in addition to its benefit to the general health.

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