Impact of two non-nutritive sucking patterns on the development of anterior open bite in children of two kindergartens in Baghdad city

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ABSTRACT

Background: Non-nutritive sucking habit (NNSH) is the main environmental causative factor that disturbs normal orofacial development. In spite of the harmful effect of pacifier as a NNSH, mothers aware from the other types of NNSH like thumb sucking far more than pacifier use. Open bite is one of the most challenging malocclusions in orthodontics due to the high prevalence of relapse after treatment, so preventing the causative factor of its occurrence is essential at early age of child life. This study aims to assess the impact of two non-nutritive patterns on the development of anterior open bite in primary dentition and to compare which of these habits mostly affect open bite development.

Materials and Methods: The sample consisted of 313 Iraqi children (135 boys, 178 girls), aged 3-5 years, enrolled at two public kindergartens in Baghdad city, the Capital of Iraq. A pre-tested questionnaire with clinical examination were used to obtain data regarding thumb sucking, pacifier and the presence of open bite. Excel sheets were used for data processing, and Chi square test was used in data analysis.

Results: There was a significant association between NNSH and the development of open bite (p value = 0.01). No gender differences in open bite prevalence were observed. The prevalence of non-nutritive sucking habits and open bite was 63.11% and 52.9% respectively with no gender difference. There was no significant differences between the effect of pacifier and thumb sucking habits on the development of an anterior open bite.

Conclusion: Both pacifier and thumb sucking at preschool age are significant causative factors that lead to development of open bite in primary dentition. Encouraging mothers to ban and discontinue pacifier and thumb sucking habits as early as possible in the child's life is a crucial factor to prevent open bite development. On the other hand if general health of the child indicates the use of pacifier, mothers should use an orthodontic pacifier and for short time

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INTRODUCTION

Non-nutritive sucking habits (NNSH) are considered as normal healthy behavior and provide the infants with a feeling of comfort, relaxation, pleasure and security during the first few years of life [(1)]. Non-nutritive sucking evidences to enhance an infant's preparedness to initiate oral feeding [(2)]. Thumb sucking and pacifier are two distinct forms of non-nutritive sucking patterns in which no food supply is introduced [(3)]. Pacifiers are non-nutritive sucking tools that are recommended to calm newborns and infants who subjected to common minor painful procedures like immunization, heel sticks and venipuncture. The use of pacifier during sleep is recommended by the American Academy of Pediatrics in the 1st year of life to prevent sudden infant death syndrome[(4)]. Mothers who have difficulties in breastfeeding use pacifiers as an effective weaning technique[(5)]. Prolonged use of pacifier has a negative impact on breast feeding, dental occlusion and may predispose to otitis media[(6,3,7)]. Thumb sucking is a habit that is expected to occur in a large percentage of infants.

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It is entirely considered as normal phenomenon when discontinued at one year of age, but can only be considered harmful when continued longer beyond infancy and predisposes to deformity of dental structures [(8,9)]. Thumb and finger habits represent the majority of oral habits[(10)]. Thumb sucking is usually associated with the infant need to satisfy the urge for contact and may disappear between the ages of 1 and 3½ years [(11)]. Prolonged NNSH significantly predisposes to occlusal deformities including anterior open bite[(12,13)] and exerts unwanted mechanical forces that prevent eruption or enhance the supra-eruption of teeth lacking contact continuously. The lower position of the tongue decreases maxillary oral influence and may widen the mandible. This disturbs the balance of pressure between tongue and perioral musculature and predisposes to a cusp-to-cusp relationship, enhancing the mandible to rotate clockwise, impeding incisor contact and promoting anterior open bite[(14)].

A loss of contact in the vertical relationship of the maxillary and mandibular dental arches is considered as open bite. This loss of contact can occur between the anterior segments (anterior open bite) or between the buccal segments (posterior open bite), and its degree can vary from patient to patient. Patients with an open

bite tendency or with an anterior open bite are considered the most challenging to treat. After overbite correction by orthodontic treatment and even after surgical orthodontic therapy, relapse of overbite at long-term follow-up is a common sequel [15,16]. Several etiologic factors are considered to be implicated in anterior open-bite, as opposed to the posterior open bite [17]. The use of pacifiers becomes most common than thumb sucking in many societies around the world [18]. The present study aimed to assess the impact of two non-nutritive patterns on the development of anterior open bite in primary dentition and to compare which of these habits mostly affect open bite development.

MATERIALS AND METHODS

The scientific committee of research and development of the College of Dentistry / Mustansiriyah University approved (No.4529 on 2019/11/14) the research proposal. The sample consisted of 313 Iraqi children (135 boys, 178 girls), aged 3-5 years, enrolled at two public kindergarten in Baghdad city, the Capital of Iraq. A pre-tested questionnaire with clinical examination were used to obtain data in the present study. The children' mothers received questionnaires through principals. Parental informed consent for the child's participation is included in the questionnaires. The children included in the study were in the complete deciduous dentition phase with no history of systemic disease, no history of bad oral habit other than thumb sucking. The questionnaire contained information regarding child' name, gender, age, mother's age, mother's educational status, dummy sucking, thumb sucking, history of bad habit (nail-biting, mouth breathing). The children were examined in their own schools after permission while seated in front of the examiner. A single orthodontist (Al Duliamy) performed the clinical examination under natural illumination. Disposable mask, gloves, mouth mirror, cheek retractor, a tongue blade, and orthodontic vernier were used. The presence of anterior open bite was confirmed by clinical examination in centric occlusion as any negative overlap in the vertical plane (when the incisal surfaces of the deciduous lower central incisors below the level of the incisal surfaces of the upper central incisors [10,19]. The intra-examiner calibration was done for 20 children by having twice examinations for two-day intervals by the same examiner at the same time of the day. Agreement for all parameters was confirmed using Kappa statistic. Excel sheets were used for data processing and a descriptive analysis of the results was performed. Data were statistically analyzed using SPSS (version 21). Chi square was used for inferential data analysis. Significance was considered at P>0.05

RESULTS

Only 263 (115 male, 148 female) children were included as other children did not meet the inclusion criteria. Table 1 represents the descriptive statistics of the sample. Table 2 illustrates that 60.9% of males exhibited NNSH, while 39.13% had no NNSH; 64.8% of females exhibited NNSH, while 35.13% had no NNSH.

Table 1: Descriptive statistics and percentage of the studied sample

263 preschool children				% of NNSH	
NNSH	Male 115	Female 148	Total		
Without NNSH	45	52	97	36.88%	
Thumb sucking	23	35	58	**22.05%**	63.11%
Pacifier	47	61	108	**41.06%**	
Open bite					
Male	56 **(48.7 %)**				
Female	83 **(56.1 %)**				
Total	139 **(52.8 %)**				

Table 2: Distribution of NNSH between genders.

263 preschool children						
NNSH	Male 115			Female 148		
	NO	%		NO	%	
Without NNSH	45	**39.13%**		52	**35.13%**	
Thumb sucking	23	**20%**	60.9%	35	23.64%	64.8%
Pacifier	47	40.9%		61	41.21%	

Table 3 demonstrates that 83.7% of children with NNSH showed anterior open bite, while 16.3 % of children with NNSH exhibited no open bite.

Table 3: The association between NNSH and the presence of open bite (P>0.05).

Open bite in children with NNSH					
	OB		Free of OB		p value
NNSH	No.	%	No.	%	0.001
	139	83.7%	27	16.3%	

It was found that 77.6% of children with thumb sucking developed open bite, while 87.0 % of children with pacifier developed open bite (Table 4).

Table 4: Distribution of anterior open bite and type of NNSH.

NNSH	Open bite				p value
	OB		FREE OF OB		
Thumb S.	45	77.6%	13	22.4%	0.116
Pacifier	94	87.0%	14	13.0%	

There was no gender differences regarding NNSH and open bite (Table 5).

Table 5: Gender differences regarding NNSH and open bite

Gender	NNSH	Open bite				p value
		OB		Free of OB		
		NO	N %	NO	N %	
Male	Thumb S.	17	73.9%	6	26.1%	0.373
	Pacifier	39	83.0%	8	17.0%	
Female	Thumb S.	28	80.0%	7	20.0%	0.161
	Pacifier	55	90.2%	6	9.8%	

DISCUSSION

Orthodontic treatment need in permanent teeth is highly influenced by malocclusion in the deciduous dentition[20]. At early childhood, non-nutritive sucking habits are the main causative factors for developing occlusal abnormalities including anterior open bite [21]. In growing children, most of anterior open bites are self-correcting; therefore, the origin of open bite in these age groups is of paramount importance [22]. Abundant of studies were carried out to assess the prevalence and causative factors that predispose to anterior open bite in different populations and age groups [13, 22-29]. The present study was conducted to assess the impact of two non-nutritive sucking habits on the development of anterior open bite among preschool children in Baghdad city, the capital of Iraq**.** The prevalence of NNSH in the present study was (63%). This is considered low in comparison with the findings of Machado et al., 2014 [30], Silvestrini-Biavati etal., 2016 [25], Machado et al, 2018 [24] that were 70%, 74% and 86% respectively; and high in comparison with the results of Ngom et al., 2008 [31] ; Chitra & Vishnupriya, 2015 [32] and Percival et al., 2017 [33] that were 16-17 %, 36 % and 50% respectively. Regarding gender difference in the prevalence of NNSH, the present study showed no significant gender differences. This finding is in accordance with the study of Scavone-Jr et al., 2008 [34]; Bishara et al., 2006[35] and Alves et al., 2016 [36]; and disagrees with the study of Vasconcelos et al., 2011[37]; Chitra & Vishnupriya, 2015 [32] and Percival et al., 2017 [33].

This finding in the present study is still considered high due to the common trend of Iraqi mothers of using pacifier for calming their children during crying, weaning and other conditions. On the other hand, there is unsound idea among mothers that only thumb sucking has a harmful effect on dentition.

The prevalence of anterior open bite in the present study was 52.9%, which is considered low in comparison with 64.2% according to Luzzi et al., 2011[38] and high in comparison with findings of de Deus et al., 2020 [39]; Katz et al., 2004[40]; Alves et al., 2016 [36] and Romero et al., 2011[13] that were 44%, 36.4%, 35.4% and 22.4% respectively. These differences in the findings may be due to differences in sample size, age group and ethnic origin of the studies' sample. Moreover, the present study showed no correlation between anterior open bite and gender, that is in accordance with the result of Ize-Iyamu & Isiekwe, 2012 [41]. According to the findings of the present study, there was a significant correlation between the NNSH and the development of an anterior open bite. This in accordance with the findings of Katz et al., 2004[40]; Katz & Rosenblatt, 2005 [42]; Oliveira et al., 2010 [43]; Romero et al., 2011 [13] and Fialho et al, 2014 [12] studies.

Regarding the type of NNSH, the present study showed no significant differences between the pacifier and thumb sucking habits on the development of an anterior open bite. This is in agreement with findings of Oliveira et al., 2010 [43] and Colombi et al., 2017[44]. The explanation of open bite development is the unusual swallowing behavior by tongue thrust swallowing during pacifier sucking [45]. Although the sample size of the present study does not represent Baghdad children, the findings support the previously available information about the effects of NNSH on occlusion, and confirm that the pacifier has similar harmful effects on occlusion, as there are more studies about thumb sucking than pacifier use effects (Schimid et al., 2018). Therefore, the present study raises an additional finding to educate Iraqi mothers and society to be aware of the harmful effects of pacifier use due to the common trend that mothers give their children pacifiers for various reasons.

CONCLUSION

Both pacifier and thumb sucking are significant causative factors that may lead to development of anterior open bite in primary dentition. Efforts should be taken to encourage the community, especially the mothers to ban and discontinue thumb sucking and pacifier habits as early as possible in the child's life to prevent open bite development. It is the responsibility of orthodontists and dentist to acknowledge mother that pacifier has the same harmful effect that of thumb sucking on impeding the normal development of child occlusion. If general health of the child indicates the use of pacifier, mothers should use an orthodontic pacifier and for short time.

Conflict of interest: None.

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الخلاصة

الخلفية: عادة المص غير الغذائية (NNSH) هي العامل المسبب البيئي الرئيسي الذي يؤثر سلبا على النمو الطبيعي للفم والوجه. على الرغم من التأثير الضار للهاية باعتبارها احدى عادات المص غير الغذائية ، تخشى الأمهات من الأنواع الأخرى لتلك العادات مثل مص الإبهام أكثر بكثير من خطر استخدام اللهاية. العضة المفتوحة هي واحدة من أصعب حالات سوء الإطباق في تقويم الأسنان بسبب ارتفاع معدل انتشار الانتكاس بعد العلاج ، لذا فإن منع العامل المسبب لحدوثها أمر ضروري في سن مبكرة من حياة الطفل. هدف الدراسة: تقييم تأثير نمطين لعادتين غير غذائيتين على ظهور العضة المفتوحة الأمامية في الأسنان الأولية ومقارنة أي من هذه العادات تؤثر في الغالب على ظهور العضة المفتوحة. المواد والطرق: تكونت العينة من 313 طفل عراقي (135 ولد ، 178 بنت) تتراوح أعمارهم بين 3-5 سنوات ، مسجلين في روضتين عامتين في مدينة بغداد عاصمة العراق. تم استخدام استبيان تم اختباره مسبقًا مع الفحص السريري للحصول على بيانات تتعلق بمص الإبهام واللهاية ووجود العضة المفتوحة. تم استخدام أوراق Excel لمعالجة البيانات ، واستخدم اختبار Chi square في تحليل البيانات. النتائج: كان هناك ارتباط معنوي بين عادات المص غير الغذائية وتطور العضة المفتوحة (قيمة p = 0.01). لم يلاحظ أي فروق بين الجنسين في انتشار العضة المفتوحة. كان انتشار عادات المص غير الغذائية مرتفعاً (63.11٪) مع عدم وجود فرق بين الجنسين. لم يكن هناك فرق كبير بين انتشار عادات مص الإبهام واللهاية. الاستنتاجات: تعتبر كل من اللهاية ومص الإبهام في سن ما قبل المدرسة من العوامل الهامة المسببة في ظهور العضة المفتوحة في الأسنان الأولية. إن تشجيع الأمهات على حظر ووقف عادات مص الإبهام واللهاية في أقرب وقت ممكن في حياة الطفل هو عامل حاسم لمنع تطور العضة المفتوحة. من ناحية أخرى، إذا كان من الضروري للصحة العامة للطفل تستوجب استخدام اللهاية ، يجب على الأمهات استخدام لهاية تقويم الأسنان ولفترة قصيرة.