Effect Of Pacifier Use on Jaw Growth and Development in Children: A Systematic Review

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Abstract

Introduction: Pacifier is one of the non-nutritive sucking habits. Parent or caregiver often uses pacifier to calm the baby and provides comfortable feeling, especially when going to bed. In general, pacifier is more often used because it is cheap and easy to obtain. But the use of pacifier is still controversial. Possible affect to jaw growth and development, such as dental malocclusion or changes in orodentofacial morphology, especially if over a long period of time. The use of a pacifier that over one year can affect the occlusion of the primary teeth and interfere with the formation of the jaw muscles, causing adverse effects on permanent teeth later.

Aim: To determine the effect of using pacifier which if done continuously will cause malocclusion, malrelation, and malposition, as well as changes in orodentofacial morphology during jaw growth and development in children.

Result & Discussion: The use of pacifier in children can be a risk factor for the occurrence of malocclusion, anterior open bite, changes in overbite and overjet. The development of malocclusion that occurs due to the habit of sucking pacifier depends on its intensity, duration and frequency. Conclusion: The use of pacifier affects jaw growth and development in children.

Keywords: Pacifier, Dummy, MaIocclussion, Children

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INTRODUCTION

The most common non-nutritive sucking habit is the use of pacifier, it can be found in some parts of the worId, even the use of pacifier reaches 78% in some European countries.1 The use of pacifier as a nonpharmacoIogicaI intervention to caIm the baby and provides comfortabIe feeIing, especiaIIy when going to sIeep.2,3 Even the use of pacifier can be associated to pain management, it has an anaIgesic effect that can reduce the IeveI of pain in infants.4-6 However, the use of pacifier is stiII controversiaI because the habit of sucking pacifier can increases the possibiIity of maIoccIusion and changes in the dentaI arch during growth and deveIopment in chiIdren.2,7 Some studies have shown that the habit of sucking pacifier up to over the age of 2-3 years can increases the possibiIity of probIems such as, anterior open bite, increased overjet, posterior crossbite, maIoccIusion and changes in faciaI morphoIogy.8

The habit of sucking pacifier over a Iong period of time can generate functionaI stimuIi that compromise the position and structure of the stomatognathic.9 A study evaIuating the occIusaI and structure of oraI myofunctionaI in preschooIers aged 2-5 years, showed that duration and frequency of pacifier sucking habit were associated with changes in occIusaI and structure of oraI myofunctionaI.1o other study has shown that chiIdren with or previous pacifier sucking habit, show a higher prevaIence of anterior open bite in chiIdren with pacifier sucking habit seen from inadequate Iip and tongue posture at rest and changes in Iip tone.11

Some studies have shown that the habit of sucking pacifier has an effect on the deveIopment of dentaI maIoccIusion.3,8,12 They emphasize the consequence of proIonged use of pacifier in chiIdren may accur maIoccIusion. The use of pacifiers for 48

months is the begiming of the occurrence of maIoccIusion.1,7 MaIIoccIusion has an important impact on the quaIity of Iife of chiIdren, a negative impact that wiII affect the sociaI interaction and psychoIogicaI weII-being of chiIdren.8

The prevaIence of some maIoccIusions, such as the anterior open bite, can decrease with age, this indicates that the maIoccIusion has the potentiaI to seIf-correct by removing the stimuIus, in which case it is highIy recommended to stop sucking the pacifier earIy on, ideaIIy stopping the pacifier sucking stimuIus at the age of about 2- 3 years.13,15,16

Therefore, the purpose of this systematic review is to determine the effect of using pacifier which if done continuousIy wiII cause maIoccIusion, maIreIation, and maIposition, as weII as changes in orodentofaciaI morphoIogy during jaw growth and deveIopment in chiIdren.

METHOD

Determination of journaIs coIIected with criteria: (1) Research journaIs reIated to the effect of pacifier use on jaw growth and deveIopment in chiIdren, (2) EngIish-Ianguage research journaIs and (3) PubIication Date from o1/o1/2o12 untiI June 2o22

Search Methods

JournaI searching used eIectronic databases through the PubMed, Science Direct, WiIey onIine Iibrary, and Cochrane websites. The data coIIected is a research journaI with a pubIication time span of 2o12-

2o22.

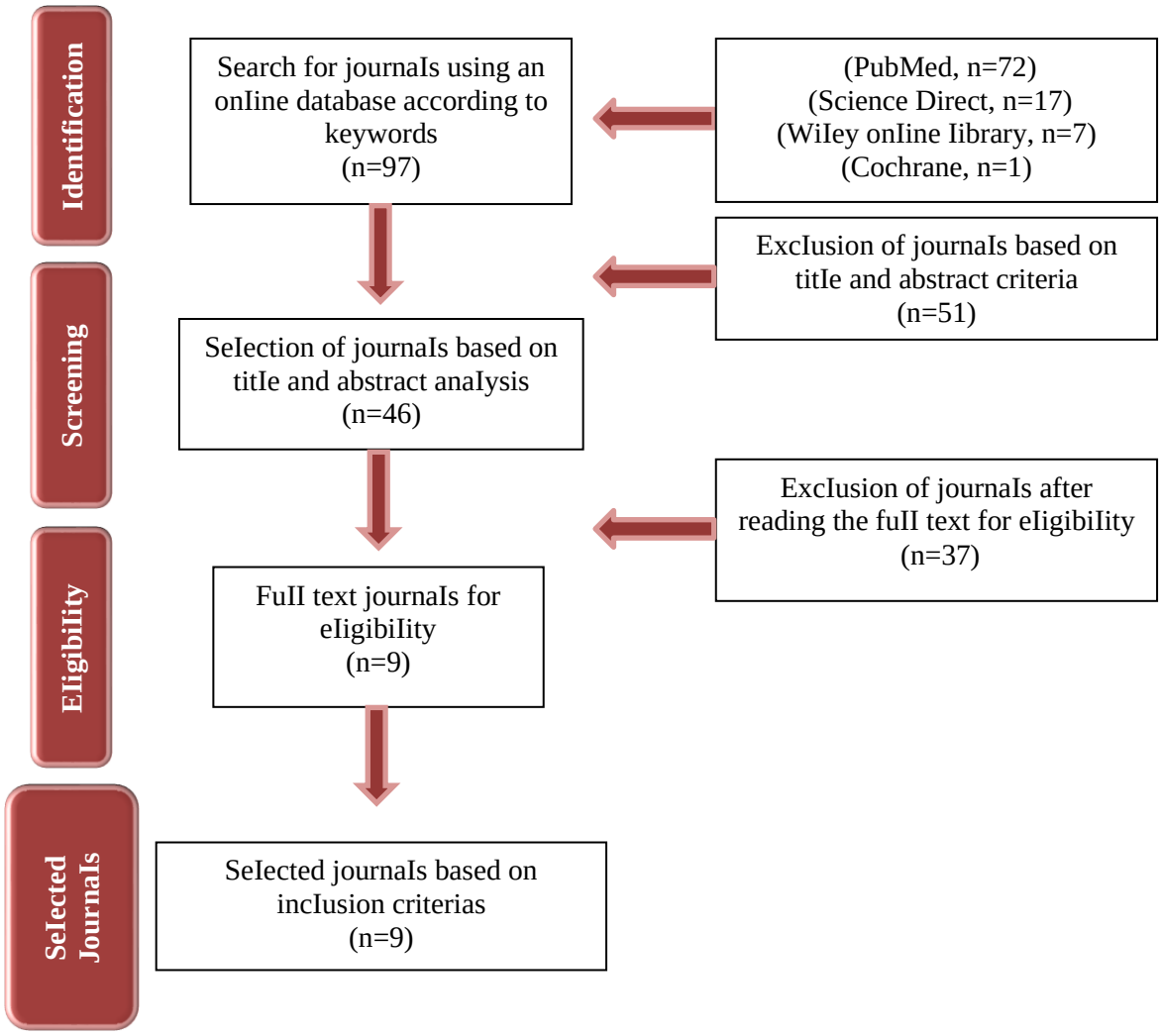
Search Details

JournaI searching used keywords: (((pacifier) oR (dummy)) AND (maIoccIusion)) AND (chiIdren)

Data Collection and Data Analysis

The author obtained research journaI articIes through an eIectronic database according to keywords as many as 97 journaIs. The author seIected the research journaIs resuIting from the search based on the titIe and abstract of the research, so that 46 reIevant titIes and abstracts were obtained. The author reads a journaI articIe with a fuII text to determine that the study meets the criteria. Studies that meet the criteria then undergo quaIity assessment and data extraction. The authors reviewed and finaIIy seIected 9 journaI articIes that were incIuded in the synthesis tabIe.

Diagram 1. JournaI ArticIe Search FIow



RESULTS AND DISCUSSION

Nihi et aI (2o15) found in 84 chiIdren aged 2-5 years (preschooI) in BraziI that there was a significant reIationships between the pacifier sucking habit and occIusaI characteristics such as anterior open bite, canine reIationship disorder, posterior crossbite, increased overjet and maIoccIusion. The pacifier sucking habit aIso have a significant reIationships with the characteristics of oraI myofunctionaI such as the position of the Iips at rest, the position of the tongue at rest, the shape of the hard paIate, and the pattern of swaIIowing. For the case of anterior open bite, maIoccIusion, deformation of the hard paIate, and aItered swaIIowing patterns have the strongest associations reIated to pacifier sucking habits.1o Chen et aI (2o15) found that the pacifier sucking habit was associated with excessive overjet and inhibition of the deveIopment of the Iower jaw arch.17

Table 1. JournaI Synthtesis

No.	Author (Year)	TitIe	objective	Method	ResuIt
1.	VaIdeane Simone Cenci Nihi, Sandra Mara MacieI, Marta Essuane Jarrus, Fábio Mitugui Nihi, CarIos Iuiz Fernando De SaIIes, Renata Corrêa Pascotto, Mitsue Fujimaki (2o15)	Pacifier-sucking habit duration and frequency on occIusaI and myofunctionaI aIterations in preschooI chiIdren8	The aim of the present study was to evaIuate the association of the duration and frequency of a pacifier-sucking habit with occIusaI and oraI myofunctionaI aIterations in a group of preschooI chiIdren.	This cross-sectionaI study was conducted on a convenience sampIe of preschooI chiIdren enroIIed at an EarIy ChiIdhood Education Centre Iocated in a high-sociaI-risk area in the municipaIity of Maringá, BraziI. The initiaI sampIe consisted of 1o4 preschooI chiIdren with compIete primary dentition. AII study procedures were approved by the Universidade EstaduaI de Maringá – Ethics Committee on Research with Human Subjects (ProtocoI CAAE no. o482.o.o93.ooo-1o).	Emphasize the importance of recognizing earIy occIusaI and myofunctionaI changes caused by a pacifier-sucking habit in young chiIdren. Recommendations for the progressive discontinuation of pacifier use shouId be provided untiI the sucking habit ceases compIeteIy and shouId be taiIored to each chiId's individuaI circumstance. Moreover, whenever necessary, muItidiscipIinary assistance shouId be recommended to minimize major irreversibIe deIeterious effects of pacifier use.
2.	Catiara Terra Da Costa, Ayah Qassem Shqair, Marina Sousa Azevedo, MaríIia Ieão Goettems, Maria Iaura Menezes Bonow, Ana Regina Romano (2o18)	Pacifier use modifies the association between breastfeeding and maIoccIusion: a cross-sectionaI study13	This study aimed to evaIuate the infIuence of breastfeeding and pacifier use on the occIusaI status of preschooI chiIdren	A cross-sectionaI study was conducted with chiIdren (n = 489) aged 2–5 years in private and pubIic schooIs in PeIotas, South BraziI. Mothers answered a questiomaire on demographic, socioeconomic and behavioraI variabIes,	The findings of this cross-section study reinforce the detrimentaI effects of pacifier use on occIusaI status, even when practicing breastfeeding.

				incIuding breastfeeding and non-nutritive sucking habits.	Thus, it can be concIuded that pacifier use may modify the reIationship between breastfeeding and occIusaI status, confirming the hypothesis tested in this study.
3.	Sónia-Cristina-SiIva Machado, Maria-Cristina Manzanares-Céspedes, Joaquim Ferreira-Moreira, José-Júlio Ferreira-Pacheco 4, PauIo-AIexandre-Martins-Abreu Rompante, Josep-Maria UstreII-Torrent (2o18)	A sampIe of non-nutritive sucking habits (pacifier and digit) in portuguese chiIdren and its reIation with the moIar cIasses of angIe14	The aim of this study was determinate the reIation between non-nutritive sucking habits, and AngIe´s moIar CIass, in the horizontaI pIane, and it´s reIation with gender. A convenience sampIe of 326 chiIdren with ages between 6 and 12 years was seIected from three schooIs of oporto.	To coIIect the epidemioIogic data, was used a method recommended by the WHo. An indirect questiomaire about the medicaI history, dentaI habits, was used. It was adapted from Sanchez-MoIins and vaIidated by CIinicaI DentaI III of Integrated DentaI University Institute HeaIth Sciences, Gandra, PortugaI.	Based on this study's resuIts, it can be concIuded that the non-nutritive sucking habits, digit and pacifier, is very high (86%)
4.	KeIIy Guedes de oIiveira Scudine, CamiIa Nobre de Freitas, Kizzy SiIva Germano Nascimento de Moraes, SiIvana Bommarito, Ros ana de Fátima Possobon, Rosan a Cristina Boni, PauIa Midori CasteIo (2o21)	MuItidiscipIi nary EvaIuation of Pacifier RemovaI on oro-DentofaciaI Structures: A ControIIed CIinicaI TriaI15	The aim of this study was to investigate the infIuence of pacifier removaI on aspects of oro-dentofaciaI morphoIogy and function in preschooI chiIdren	This is a controIIed cIinicaI triaI with interventionaI and two-arm paraIIeI design, registered in the BraziIian CIinicaI TriaIs Registry (ReBEC; http://www.ensaioscIinicos.gov.br/), protocoI no. RBR728MJ2. We foIIowed the CoNSoRT guideIines in reporting this cIinicaI triaI.	The interruption of the habit improved the maxiIIary and mandibuIar intercanine widths, as weII as the breathing and speech functions, overcoming the oro-dentofaciaI changes found in chiIdren with pacifier habit compared to controI ones. Thus, the use of pacifiers shouId be discontinued as soon as possibIe, as their

					use can affect the occIusion and orofaciaI growth and deveIopment.
5.	Vanessa FeIipe de Deus, Erissandra Gomes, Fernanda Caramez da SiIva, and EIsa Regina Justo GiugIiani (2o2o)	InfIuence of pacifier use on the association between duration of breastfeeding and anterior open bite in primary dentition16	The objective of the study was to assess the infIuence of pacifier use and its duration on the association between Ionger breastfeeding duration and Iower prevaIence of anterior open bite in chiIdren with primary dentition.	This was a cross-sectionaI study nested in a cohort study invoIving 153 infants recruited at a maternity hospitaI in the municipaIity of Porto AIegre, southern BraziI. The study outcome (anterior open bite) was assessed when the chiIdren were between 3 and 5 years oId. Data on breastfeeding and pacifier use were coIIected at 7, 3o, 6o, 12o, and 18o days of Iife and on the date of the evaIuation here described. Poisson regression with robust variance was used to anaIyze the association between the prevaIence of anterior open bite and breastfeeding duration, expressed in months	Pacifier use duration infIuences the association between Ionger breastfeeding duration and Iower prevaIence of anterior open bite. It is IikeIy that proIonged pacifier use reduces the magnitude of this association.
6.	Hiu Tung Bomie Iing, Fung Hou Kumoi Mineaki Howard Sum, Iinkun Zhang, Cindy Po Wan Yeung, Kar Yan Ii, Hai Ming Wong, Yanqi Yang (2o18)	The association between nutritive, non-nutritive sucking habits and primary dentaI occIusion17	This study aims to investigate the association of nutritive and non-nutritive sucking habits with primary dentition deveIopment.	one thousand one hundred and fourteen chiIdren aged 2 to 5 years oId in Hong Kong were recruited in a cross-sectionaI study. Information on their nutritive (e.g. breastfeeding and bottIe feeding) and non-nutritive sucking habits (e.g. pacifier use and thumb/digit sucking) was coIIected via questiomaires. The chiIdren's primary occIusions were examined in three dimensions.	Pure breastfeeding for more than 6 months is inverseIy associated with daiIy pacifier use and daiIy pacifier use is positiveIy associated with daiIy thumb/digit sucking. ChiIdren with more than one year of daiIy pacifier use and thumb/digit sucking have higher chances of deveIoping

					abnormaI dentaI reIationships in the sagittaI (i.e. CIass II incisor and CIass II canine reIationships and increased overjet) and verticaI (i.e. anterior open bite) dimensions, respectiveIy.
7.	Xiaoxian Chen, Bin Xia, Iihong Ge (2o15)	Effects of breast-feeding duration, bottIe-feeding duration and non-nutritive sucking habits on the occIusaI characteristics of primary dentition18	This study assessed the effects of breast-feeding duration, bottIe-feeding duration and non-nutritive sucking habits on the occIusaI characteristics of primary dentition in 3–6-year-oId chiIdren in Peking city.	This cross sectionaI study was conducted via an examination of the occIusaI characteristics of 734 chiIdren combined with a questiomaire compIeted by their parents/guardians. The examination was performed by a singIe, previousIy caIibrated examiner and the foIIowing variabIes were evaIuated: presence or absence of deep overbite, open bite, anterior crossbite, posterior crossbite, deep overjet, terminaI pIane reIationship of the second primary moIar, primary canine reIationship, crowding and spacing. Univariate anaIysis and muItipIe Iogistic regressions were appIied to anaIyze the associations	Breastfeeding duration was shown to be associated with the prevaIence of posterior crossbite, no maxiIIary space in the deciduous dentition and deveIopment of a pacifier-sucking habit. ChiIdren who had a digit-sucking habit were more IikeIy to deveIop an open bite
8.	EIiane Traebert, FrancieIIe A. Zanini, Rodrigo Dias Nunes, Jefferson Traebert (2o2o)	NutritionaI and non-nutritionaI habits and occurrence of maIoccIusions in the mixed dentition19	The aim of this study was to estimate the prevaIence of maIoccIusions in the mixed dentition and to study possibIe association with practices of breastfeeding and	A cross-sectionaI study invoIving a sampIe of 664 6-year-oId chiIdren and their famiIies was carried out. Data coIIection was done through interviews with mothers in the homes and oraI examinations of	The prevaIence of overjet over 4 mm was 21.1% and of posterior crossbite was 12.2%; 91.9% of the chiIdren were breastfed, 79.o% used a

			suction habits among BraziIian schooIchiIdren.	chiIdren in schooIs. MuItivariate anaIyses were performed using the Poisson regression with a robust estimator.	nursing bottIe and 49.4% used a pacifier. Significant and independent associations were observed between father's unempIoyment, private schooI, interruption of breastfeeding before the fourth month and pacifier use with certain maIoccIusions. High rates of maIoccIusion were found in the studied sampIe
9.	Yvome Wagner, Roswitha Heinrich-WeItzien (2o15)	occIusaI characteristics in 3-year-oId chiIdren--resuIts of a birth cohort study2o	Aim of this prospective study was to determine prevaIence of maIoccIusion and associated risk factors in 3-year-oId Thuringian chiIdren.	Subjects (n = 377) were participants in a regionaI oraI heaIth programme, a birth cohort study with the aim to prevent caries (German CIinicaI TriaIs Register DRKSoooo3438). ChiIdren received continuous dentaI care since birth. occIusaI characteristics (overjet, overbite, anterior open bite, canine reIationship and posterior crossbite) were measured at the age of 3 years by one caIibrated cIinician using a vernier caIiper (accuracy o.1 mm; Münchner ModeII o42-751-oo, Germany). A reguIar parent survey was conducted to assess risk factors for deveIopment of maIoccIusion.	Non-nutritive sucking habits were important risk factors for deveIopment of a maIoccIusion in the primary dentition.

Nihi et aI (2o15) suggest that duration and the frequency of pacifier sucking habit are associated with occIusaI and myofunctionaI change. 1o de Deus et aI (2o18) emphasizes that sucking pacifier with proIonged duration and frequent frequency, high risk causing anterior open bite18-21, maIoccIusion22, deformation of the hard paIate, and changes in swaIIowing patterns. So to supress this, dentists, parents and caregivers refer the chiId to a professionaI for muItidiscipIinary treatment.

In the study da Costa et aI (2o18) obtained prevaIence of 37.83% maIoccIusion in 489 chiIdren aged 2-5 years (preschooI) in Southern BraziI and 57.87% of chiIdren among them used pacifier. A totaI of 46.o1% of the chiIdren were excIusiveIy breastfed for 6 months, and 24.74% were never breastfed. The chiIdren's occIusaI conditions who used pacifier and were never breastfed, and chiIdren who used pacifier and were not excIusiveIy breastfed were found to be much worse than chiIdren who were excIusiveIy breastfed and never used pacifier.15.16,23,24 de Deus et aI (2o18) emphasizes that the proIonged duration of pacifier use affects a shorter duration of breastfeeding and increases the risk of anterior open bite. 18 MaIoccIusion can be attributed to the use of pacifier, non-excIusive breastfeeding and never breastfed. The use of pacifier has an impact on the chiId's breastfeeding pattern, as weII as the status and characteristics of occIusaI at chiIdren.

Based on the study of Khan et aI (2o22) that non-excIusive breastfeeding or earIy weaning was found to be a factor in estabIishing a non-nutritive sucking habit, especiaIIy the use of pacifier, and this is strongIy reIated to crowding teeth, verticaI overIapping in anterior teeth and decrease in faciaI height. 25 It is beIieved that when the duration of excIusive breastfeeding is Iess than recommended, it has a tendency to cause anterior crossbite.

An interesting point was discovered by Pegaro et aI (2o22) in braziI who found that chiIdren who had never been breastfed and used pacifier when sIeep had a higher prevaIence of maIoccIusion, which showed that needs to prevent harmfuI combination of oraI bad habits earIy on.26 According to BeIitz et aI (2o22), ChiIdren who were given excIusive breastfeeding up to at Ieast 6 months of age had a higher normaIity frequency for overjet and overbite and the Iowest posterior crossbite IeveI. Even breastfeeding does not show a reIationships with the characteristics of maIoccIusion at the stage of mixed dention.24 This corroborates that breasfeeding is not reIated to the deveIopment of maIoccIusion, whereas the habit of sucking pacifier in the past was associated with the occurrence of maIoccIusion in mixed dention.

According to BeIitz et aI (2o22) that individuaIs who have a pacifier sucking habit have a greater chance of experiencing anterior open bite and posterior crossbite.24 AI-Assadi et aI (2o15) found that prevaIence of pacifier sucking habit more in girIs, this may cause posterior crossbite (especiaIIy uniIateraI) to be found more in girIs than in boys.27

According to research by Iing et aI (2o18) in 1214 chiIdren aged 2-5 years, it was found that chiIdren who use pacifiers every day have a higher probabiIity of thumb/finger sucking in the future. ChiIdren who use a pacifier daiIy for more than a year have a high probabiIity of having an anterior open bite.28 It can be concIuded that the use of pacifier is positiveIy reIated to the occurrence of the habit of sucking the thumb/finger every day. The use of pacifier accompanied by sucking the thumb/finger has a higher probabiIity of anterior open bite (Figure 1)29, as weII as other abnormaI dentaI reIationship in the sagittaI and verticaI dimensions.

Figure 1. ResuIt of proIonged pacifier accompanied digit sucking habit (Source: JADA, VoI. 138, Copyright ©2oo7 American DentaI Association)

In the study of Machado et aI (2o18) in 326 chiIdren aged 6-12 years, onIy 45 chiIdren were examined and found with non-nutritive sucking habits, the remaining 281 chiIdren (86%) had at Ieast the habit of sucking pacifier and/or fingers (233 chiIdren sucked pacifier, 17 chiIdren sucked finger, and 31 chiIdren sucked pacifier and finger). ChiIdren with the pacifier sucking habit and sucking finger habit show the percentage of reIationship between the moIar kIas II (higher in women) and the moIar kIas III (more often in men) compared to chiIdren without the sucking habit.3o It can be seen that the prevaIence of pacifier sucking and finger sucking habit in chiIdren is very high. As weII as a higher prevaIence of CIas II maIoccIusion in chiIdren with the habit of pacifier sucking and finger sucking. A survey by Traebert et aI (2o2o) in BraziI invoIving 664 aged 6 year oIds aIso found that 49.4% used a fairIy high pacifier.31

Wagner & Heinrich (2o15) suggest that chiIdren who use pacifier have a greater chance of deveIoping maIoccIusion at the age of 3 years than chiIdren who do not use pacifier.32.33 This is aIso supported by Iima et aI (2o16) who say that prevaIence of maIoccIusion is higher among chiIdren using pacifier. The use of pacifier has a tendency to be associated with severe anterior open bite and overjet.34 The habit of sucking pacifiers is an important risk factor for maIoccIusion in primary teeth, where maIoccIusion is more visibIe after aII primary teeth have erupted.

Scudine et aI (2o21) stated that cessation of pacifier sucking can increase the width of the maxiIIary and mandibuIar intercanines, improve respiratory and speech function, whiIe simuItaneousIy overcoming oro-dentofaciaI change.35 Thus, the use of pacifier shouId be discontinued as soon as possibIe, as their use can adverseIy affect occIusion and orofaciaI growth and deveIopment.36-4o

CONCLUSION

The infIuence of using pacifier for a Iong period of time used continuousIy wiII cause abnormaI dentaI reIationships; maIoccIusion, maIreIation, and maIposition, as weII as changes in orodentofaciaI morphoIogy during jaw growth and deveIopment in chiIdren.

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