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# Relationship Between Bottle Feeding and Malocclusion on Children: A Literature Review

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## Abstract

The prevalence of malocclusion in Indonesia is still very high, namely around 80% of the Indonesian population. Malocclusion is an occlusion that deviates from normal conditions, there is irregularity of the tooth or incorrect placement of dental arches outside the normal curve. Malocclusion can cause periodontal problems, impaired oral function, mastication, swallowing and psychosocial problems related to aesthetics. Malocclusion can be caused by several factors, including hereditary factors inherited from parents and environmental factors such as bad oral habits and eating patterns. One of the bad oral habits that can be a factor in malocclusion is bottle feeding. This literature review was carried out to assess the existing literature regarding the prevalence and consequences of bottle feeding (pacifier use) and malocclusions after using pacifiers among children. The condition of dental occlusion can be affected by the habit of sucking on a pacifier. The use of conventional pacifiers in most cases shows clinical features such as increased overjet, overbite, openbite, crossbite, mesial plane and distal plane. Based on the results of research conducted, it shows that malocclusion in deciduous teeth caused by using a pacifier is influenced by the duration and frequency of the child using a pacifier in a day. Pacifier use is associated with malocclusion in deciduous teeth because there are several theoretical mechanisms by which pacifier use can contribute to the development of malocclusion.

**Keywords:** Bottle feeding; Pacifier; Malocclusion; Dental Health

## 1. Introduction

The prevalence of malocclusion in Indonesia is still very high, namely around 80% of the Indonesian population [11]. By definition, malocclusion is a condition in which there is a difference, or rather a departure from the normal relation of the teeth in the same or the opposing dental arch [2]. Malocclusion can cause periodontal problems, impaired oral function, mastication, swallowing and psychosocial problems related to aesthetics. Malocclusion is also the most common dental problem that people complain about, so many people have the desire to undergo orthodontic treatment [1]. Malocclusion can be caused by several factors, including hereditary factors inherited from parents and environmental factors such as bad oral habits and eating patterns. Bad oral habits are deviant oral activities that continuously occur, and are one of the factors causing malocclusion. One of the bad oral habits that can be a factor in malocclusion is bottle feeding [1].

Bottle feeding, known as a dummy, soother, or pacifier, is a substitute medium for mother's milk nipples made from latex or silicon. Pacifiers are available in various sizes and shapes, namely conventional and orthodontic pacifiers. The practice of using pacifiers is globally common among infants and kids. Pacifiers are often utilized to soothe upset babies, enhance the comfort of both parents and babies, and deter the habit of sucking thumbs or fingers [14]. The prevalence of pacifier use among toddlers in several developed countries reaches 42.5% and the prevalence of pacifier use in developing countries, one of which is Indonesia, reaches 75%. For children under two years old, using a pacifier is still

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considered normal at the start of life because sucking is a natural instinct for children that can provide them with a sense of comfort and calm [11].

The large hole in the nipple can force the child to hold his tongue up to prevent milk from flowing back out of his mouth. Over time, children get used to placing their tongue on the palatocervical part of the maxillary anterior teeth, thus forming oral habits that can worsen malocclusions such as openbite, crossbite and overjet [11]. Based on the description above, researchers are interested in conducting a literature review to find out several factors that can influence malocclusion and its relationship with bottle feeding, especially pacifier use.

### 1.1. Malocclusion

Malocclusion is defined as a deviation from the normal alignment of teeth and the normal relationship between the dental arches, which may occur within the same arch or between opposing arches [2]. It is one of the most common dental problems worldwide and can lead to periodontal disease, impaired mastication, swallowing difficulties, speech problems, and psychosocial issues related to facial aesthetics [11].

The prevalence of malocclusion remains high, particularly among children, making it a major concern in dental public health. The etiology of malocclusion is multifactorial and involves both hereditary and environmental factors. Genetic factors include jaw size, tooth size, and skeletal growth patterns, while environmental factors include oral habits, feeding practices, and functional disturbances during craniofacial development [15].

### 1.2. Oral Habits and Their Role in Malocclusion

Oral habits are repetitive behaviors involving the oral cavity that can influence the development of the stomatognathic system. When these habits persist for a prolonged period with sufficient frequency and intensity, they may cause abnormal forces on teeth and supporting structures, resulting in malocclusion [13].

Non-nutritive sucking habits, such as pacifier use, are among the most common oral habits observed in early childhood. The impact of these habits on occlusal development depends largely on their duration, frequency, and intensity. Habits that continue beyond the early years of life are more likely to produce clinically significant occlusal changes [6].

### 1.3. Bottle Feeding and Pacifier Use

Bottle feeding, commonly associated with the use of pacifiers or artificial nipples, is widely practiced to soothe infants and provide comfort. Sucking is a natural reflex in infants, and pacifier use is generally considered acceptable during the early stages of life. However, prolonged use of pacifiers may interfere with normal orofacial development due to differences in shape, texture, and elasticity compared to the maternal breast [14].

Artificial nipples may alter tongue posture and muscle activity during sucking. These changes can result in abnormal functional forces within the oral cavity, potentially affecting the growth of the maxilla and mandible as well as dental arch development [4].

### 1.4. Effect of Pacifier Use on Malocclusion

Several studies have demonstrated a significant association between pacifier use and the development of malocclusion in primary dentition. Common types of malocclusion linked to pacifier use include anterior open bite, increased overjet, increased overbite, posterior crossbite, and altered molar relationships [8].

The risk and severity of malocclusion increase with longer duration and higher frequency of pacifier use. Prolonged pacifier sucking can restrict normal transverse and vertical growth of the palate, leading to abnormal dental arch development and improper tooth alignment (Ling et al., 2018). Additionally, excessive pacifier use may cause hyperactivity of the buccinator muscles, resulting in transverse maxillary deficiency and posterior crossbite [6].

## 2. Material and methods

The author utilized reference journals published between 2015-2023. These articles were obtained from various online databases, including Google Scholar and PubMed, using the keywords dental erosion, soft drinks, and dental health. The selected sources consisted of national journals that met the inclusion criteria, specifically research articles or original articles.

## 3. Results and discussion

The condition of dental occlusion can be affected by the habit of sucking on a pacifier. Giving pacifier bottles to children over the age of 4-6 years can affect the occlusion of the primary teeth and jaw muscles, thus affecting the occlusion of the permanent teeth. The type of change in occlusion abnormalities depends on the habits carried out, the frequency, intensity and duration of these oral habits [7].

In line with the article put forward by Noormahmudah et al in 2022 regarding excessive use of pacifiers having an influence on the occurrence of malocclusion in the deciduous teeth, this is because the state of occlusion in the primary dentition period plays a role in the occurrence of malocclusion in the permanent dentition period. Bottle feeding beyond the age of one year will affect the occlusion of primary teeth and cause excessive activity of the buccinator muscle, thereby pressing on the maxilla and causing the deep palate, this has a bad effect on the development of permanent teeth later. The use of conventional pacifiers in most cases shows clinical features such as increased overjet, overbite, openbite, crossbite, mesial plane and distal plane. Based on the results of research conducted, it shows that malocclusion in deciduous teeth caused by using a pacifier is influenced by the duration and frequency of the child using a pacifier in a day. The duration of pacifier use is a risk factor in exacerbating malocclusion in deciduous teeth. The duration of pacifier use plays an important and most critical role in tooth movement, this is because artificial nipples, namely pacifiers, have a different shape, texture and consistency from the mother's breast tissue, so these characteristics can cause non-physiological pressure in the child's oral cavity. Long duration of pacifier use can limit normal palatal growth in the vertical and transverse directions to become abnormal and cause improper tooth alignment, cause myofunctional disorders, and then increase the opportunity for the development of posterior crossbite in children's teeth, causing an increase in overjet and overbite. The muscle strength of a child sucking milk from the mother's breast is also different from sucking a pacifier, so that the long duration of using a pacifier with different pressure can have an effect on the development of the maxillofacial system because of the uneven functional load placed on the facial muscles involved in certain food processes [11].

The research results of Hardianti and Habar (2020) also state that the duration that can cause malocclusion is 301-360 minutes per day. Using a pacifier for a long duration will cause malocclusion because it can cause pressure on the teeth which can slowly move the teeth out of the arch. Using a pacifier is a normal thing that children do until they are around 2 years old, but excessive use of a pacifier can cause serious orthodontic problems later if it continues until the period of permanent tooth eruption. Prolonged use of a pacifier can cause crowding, crooked teeth or occlusion problems. Although dental malocclusion in some cases can arise due to genetic factors, parents can help prevent children as early as possible by maintaining their oral health and eliminating bad habits so that malocclusion does not occur or can make malocclusion worse, such as increasing overjet, overbite, openbite, and posterior crossbite [6].

Lima et al (2017) also explained that the risk of malocclusion is higher in children who use pacifiers compared to children who do not use pacifiers, especially in children with anterior open bites. Based on general trends, the use of conventional pacifiers is associated with more severe anterior open bite and overjet compared with the use of orthodontic pacifiers. The frequency and intensity of pacifier use were very similar among the children studied, whereas the duration of the habit was a strong predictor of the occurrence and severity of malocclusion [8].

Frequency of pacifier use is a risk factor in worsening malocclusion in deciduous teeth. The results of research by Hardiyanti and Habar, (2020) show that the frequency of children's sucking habits is from 2 times a day to 4 (11.4%), 3 times a day to 7 (20.0%), 4 times a day to 9 (25.7%) and the highest habit of children sucking a pacifier was 5 times a day, namely 15 children (42.9%). Increasing frequency of pacifier use can cause various types of malocclusion because high pacifier use can lead to a tendency for hyperfunction of the buccinator muscle which causes growth deficiency in the transverse direction [6].

Thomas et al (2018) stated that breastfeeding beneficially affects primary occlusion when practiced for at least 6 months. Breastfeeding was a protective factor against malocclusions. The odds of association increased with breastfeeding duration. Irrespective of duration, breastfeeding had a protective association with open bite. For those who were breastfed for up to 6 months, breastfeeding protected against overjet, open bite, posterior crossbite, and crowding. Breastfeeding for 12 months or longer was associated with lower odds of overjet, open bite, and posterior crossbite [15].

A cross-sectional study by Costa et al (2018) found that the beneficial effects of breastfeeding on the occlusal status are altered when a dummy is used, increasing the risk of developing malocclusion. Children who used a pacifier and never breastfed had a greater chance of developing moderate/severe malocclusion. The protective effect of exclusive breastfeeding against malocclusion has been demonstrated. Furthermore, studies that were previously published have

demonstrated a strong correlation between the development of malocclusion and dummy use. Results confirm that children who were exclusively breastfed for 6 months and never used a pacifier had a lower frequency of moderate/severe malocclusion than other children [5].

According to an analytical observation study conducted by Hardiyanti et al regarding the relationship between non-nutritive sucking habits and malocclusion in 2020 among 35 kindergarten children aged 3-5 years, it was stated that there was a relationship between children who used pacifiers or pacifiers at the age of 3-5 years and the occurrence of malocclusion. The severity of malocclusion due to pacifier habits is influenced by the duration and frequency of the child's habit. Bad oral cavity habits that last 6 hours/day, if the frequency is high enough with sufficient intensity will cause malocclusion [6].

Ling's research is also in line with the results of duration analysis which is very similar to frequency analysis. Children who used a pacifier daily for more than 1 year had higher odds of having an anterior open bite (logistic regression: p = 0.000; adjusted OR = 15.171, 95% CI 5.298–43.446) and significantly lower odds of overbite more than half of the lower incisors (logistic regression: p = 0.045; adjusted OR = 0.577, 95% CI 0.340–0.890) than those who never had the habit of using a pacifier every day [9]. Apart from anterior open bite, Schmid et al (2018) stated that pacifiers can also cause posterior crossbite which causes disharmony in the development of orofacial structures. Schmid et al also concluded that pacifiers with nipples with narrow necks (physiological nipples) were less likely to cause open bites than conventionally shaped pacifiers (non-physiological nipples) [14]. Moreover, Chen et al (2017) reported in their research that pacifier-sucking behavior continued past one year of age was linked to both an absence of lower arch developmental space (P = 0.03) and severe overjet (P = 0.01) [9].

Ramesh et al (2016) conducted research using a cross-sectional method regarding the relationship between non-nutritive sucking habits and the emergence of malocclusion. In this research they gave questionnaires to the parents of 230 children as subjects and obtained the results that 21% of children had a pacifier habit, 61% of children sucked fingers, 3% sucked fingers and pacifiers, and 15% sucked other objects. The conclusion is that non-nutritional sucking habits have a relationship with the emergence of malocclusions. Malocclusions that can arise are increased overjet, overbite, openbite and crossbite [13].

## 4. Conclusion

Based on the results of this literature review, it generally states that pacifier use is associated with malocclusion in deciduous teeth because there are several theoretical mechanisms by which pacifier use can contribute to the development of malocclusion in the form of less muscle activity to extract milk from the bottle. This will result in decreased development of muscles involved in sucking which can act as a functional matrix for inadequate mandibular growth, the presence of the tongue acting solely to control the outflow of milk during bottle feeding and bottle-fed children having an increased prevalence of inappropriate swallowing patterns. It is normal or the habit of sticking out the tongue and more than 60% of children who are mostly bottle-fed experience mouth breathing which can interfere with occlusion, so this is what causes several types of malocclusion in children.

## Compliance with ethical standards

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No conflict of interest to be disclosed.

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