

Research Report

The frequency of bottle feeding as the main factor of baby bottle tooth decay syndrome

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ABSTRACT

Background: Dental caries remains as main problem in Indonesia and its prevalence is high (90.05%). However, there is no appropriate data that can be used to analyze dental caries in toddlers, especially baby bottle tooth decay syndrome (BBTD), though the number of BBTD cases is high in some pediatric dental clinics (90% of patients visiting the clinics). Even though some factors have already been considered to be the risk factor of BBTD, the main risk factor of BBTD is still unknown, especially BBTD in Indonesia.

Purpose: This research was aimed to obtain data relating with bottle-feeding habit in 3–5 year old children in Indonesia and its caries risk. **Method:** The study was an observational research conducted with clinical examination through caries status (deft) of each child deserved by pediatric dentists and through questionnaire distributed to parents to examine the risk factor of BBTD. Observation was conducted on 62 children in the range of age 3 to 5 years old with bottle-feeding habit. **Result:** The results revealed that status of caries was various. The data showed that the frequency of bottle feeding more than twice could trigger BBTD 2.27 times higher than other factors such as the use of bottle feeding as a pacifier prior sleeping, the period of bottle-feeding, and the breast-feeding experience.

Conclusion: though milk as substrate can possibly become a factor triggering caries, the frequency of bottle-feeding is highly considered as main factor. Since it could modulated the bacterial colonization on dental surface, which affects its virulence.

Key words: the frequency of bottle-feeding, risk factor, baby bottle tooth decay syndrome

ABSTRAK

Latar belakang: Karies masih menjadi masalah utama di Indonesia. Dalam praktek sehari-hari prevalensi karies masih sangat tinggi (90.05%). Belum ada data yang memadai dalam penelaahan karies yang spesifik pada anak balita selama ini khususnya kasus sindroma karies botol (SKB) sementara itu kasus SKB ditemukan sangat tinggi di beberapa klinik gigi anak (90% dari jumlah pasien yang datang ke klinik). Beberapa faktor menjadi resiko kejadian SKB dan belum diketahui faktor resiko utama kejadian karies khususnya di Indonesia. **Tujuan:** Penelitian ini dilakukan guna mendapatkan data yang berhubungan dengan kebiasaan minum susu botol pada anak usia 3–5 tahun di Indonesia serta resiko kejadian karies yang ditimbulkannya. **Metode:** Penelitian ini merupakan penelitian observasional yang dilakukan dengan metode pemeriksaan klinis melalui pencatatan status karies (deft) setiap anak oleh dokter gigi anak serta pengisian kuesioner yang dilakukan oleh orang tua untuk menentukan faktor resiko kejadian SKB. Pengamatan dilakukan pada 62 orang anak usia 3–5 tahun yang mempunyai kebiasaan minum susu botol sesuai dengan kriteria inklusi. **Hasil:** Hasil pemeriksaan klinis dan kuesioner memberikan gambaran status karies yang bervariasi. Data yang didapat dari penelitian ini menjelaskan, bahwa frekuensi minum susu botol lebih dari dua kali menyebabkan SKB 2.27 kali lebih besar dibandingkan dengan beberapa faktor lain, seperti menjadikannya pengantar tidur, lamanya mengonsumsinya, dan riwayat minum ASI. **Kesimpulan:** Susu sebagai substrat mungkin dapat dijadikan alasan kejadian karies akan tetapi yang menjadi resiko utama kejadian adalah frekuensi

konsumsi susu botol itu sendiri. Kondisi ini dapat dihubungkan dengan modulasi substrat terhadap perkembangan kolonisasi bakteri di permukaan gigi, sehingga secara tidak langsung juga mempengaruhi virulensinya.

Kata kunci: Frekuensi minum susu botol, faktor resiko, sindroma karies botol

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INTRODUCTION

Dental caries remains as a dental health problem among children in Indonesia. The prevalence of caries among toddlers in Indonesia is approximately 85%, while caries prevalence in general is approximately 90.05%.¹⁻³ The data indicated that the public health improvement programs conducted by the government for long time is considered to be failed. However, this epidemiologic description is not only found in developing countries, but also found in industrial countries.^{4,12} World Health Organization in 2003 reported that the prevalence of caries among children reached 60–90%.¹³ As a result dental caries, especially nursing bottle syndrome (NBS) or baby bottle tooth decay (BBTD) syndrome, becomes one of major concerns for medical experts, and many research have already been conducted.⁶ Since baby bottle tooth decay (BBTD) syndrome usually attacks toddlers, it is also known as nursing caries, baby bottle tooth decay, rampant caries, labial caries, and maxillary anterior caries.¹⁴

In addition, clinical phenomena found in Jakarta and surrounding areas indicate that the number of BBTD patients in pediatric dental clinics is high. The preliminary research conducted in three hospitals (two in urban area and one in rural area of Jakarta) showed that the proportion of children who suffer dental caries was about 95%. Based on that result, we knew that even though milk is considered as the source of nutrients for those children, not all of children with bottle-feeding habit are suffering caries. The number of tooth decay cases in children who suffer BBTD is various. Nevertheless, as reported by some researcher, the patients of BBTD are dominated by toddlers who consume milk.^{16,17}

However, there is a controversy that nursing bottle feeding could cause BBTD. Milk reported could prevent demineralization process in enamels.^{18,19} On the other hand Bowen²⁰ reported that the sugar additional (2% minimum) can increase the cariogenicity of milk. It proved in the experiment using mice. Those differences then consider as an obstacle in determining whether milk could cause BBTD in toddlers who have bottle-feeding habit. Most of children in urban areas rely on bottle milk as the source of nutrients.²¹ Therefore, the further analysis of the condition in Indonesia, especially in Jakarta, is needed to study baby bottle tooth decay (BBTD) syndrome that mostly attack toddlers. The process of tooth decay which started in early ages could affect the growth and development of children.¹⁵ The study was aimed to examine the bottle-feeding habit in 3-5 year old children in Indonesia and its caries risk.

MATERIAL AND METHOD

This research was a cross sectional study. The subject of study was obtained from non-probability sampling method with consecutive sampling technique. The subject were 62 children in the range of age 3 to 5 years old, with primary teeth have erupted and have bottle-feeding habit. Clinical examination was conducted in children and to obtain further information, questionnaire was distributed to their parents. The questionnaire searched the information of the breast feeding experience (period of breast feeding), and the bottle-feeding habit (the usage, period, and frequency of bottle-feeding). Clinical examination was done under sufficient light.

Afterwards, the status of caries was noted based on World Health Organization standard.^{22,23} The analysis of prevalence ratio then was conducted to examine any risk factors of bottle-feeding habit. The study had been approved by the research ethic commission of Faculty of Dentistry, University of Indonesia, and the subjects' parents had been informed and asked for their written approval prior to the study.

RESULT

Based on consecutive method, 62 children were considered as the subjects of the research since they met some inclusion criteria. The distribution of the subjects as seen in Table 1, showed that the distribution of boys (61.3%) was bigger than that of girls (38.7%). The age interval of subjects was in between 3 to 5 years old with the various numbers of teeth erupted (20 to 24 teeth), but most of subject had 20 teeth erupted (85.5%).

Most of subjects (72.6%) suffer caries which was similar to baby bottle tooth decay (BBTD) syndrome, while the rest (27.4%) was free from caries though they had bottle-feeding habit. The *def* score of all subjects approximately 4.66 teeth. The teeth were classified into some groups based on the number of decayed tooth, it revealed that 27.4% were free from caries, 40.3% one to five teeth had caries, and 32.3% had caries in more than five teeth.

The questionnaire result showed that 83.9% subjects stopped breast feeding since their first year. Most of them (66.1%) still continue drinking milk with bottle. The children who drinking 4 times or more a day reach 46.8% and 53.2% subjects had bottle-feeding once a night, while 32.3% of them had bottle-feeding twice a night. Moreover, 9.7% of them had bottle-feeding three times a night, while

Table 1. Profile of children, as the subjects of the research, who have bottle-feeding habit

	n (person)	%
Sex		
Male	38	61.3
Female	24	38.7
The total number of teeth		
20	53	85.5
21	3	4.8
23	2	3.2
24	4	6.5
Diagnosed BBTD syndrome		
BBTD syndrome	45	72.6
Free of caries	17	27.4
Number of caries teeth		
Free of caries	17	27.4
1–5 teeth	25	40.3
> 5 teeth	20	32.3
The length period of breast-feeding		
Until 1 year old	52	83.9
Until 2 years old	7	11.3
Until 3 years old	1	1.6
Never	2	3.2
The length period of bottle-feeding		
Still on going	41	66.1
Until 2 years old	9	14.5
Until 3 years old	12	19.4
Frequency of bottle-feeding per day*		
Once	3	4.8
Twice	9	14.5
3 times	21	33.9
4 times or more	29	46.8
The role of bottle feeding		
As pacifier	45	72.6
Not as pacifier	17	27.4
Frequency of bottle-feeding per night*		
Once	33	53.2
Twice	20	32.3
3 times	6	9.7
4 times or more	2	3.2
None	1	1.6

*Once of bottle-feeding equals to 200 cc

only 3.2% of them had bottle-feeding four times a night. It revealed that most of subjects (72.6%) rely on bottle-feeding as pacifier prior sleeping, while the rest (27.4%) did not.

In addition, for profiling those children with bottle-feeding habit as shown in Table 1, the analysis of prevalence ratio (PR) was then conducted as seen in Table 2. It showed that nursing bottle-feeding prior sleep could not always increase the risk of BBTD since the score of PR was 1.03 times with the interval of reliability was in between 0.91 to 1.15. In details, it showed that the frequency of bottle-feeding ≥ 2 times a day could increase the risk of BBTD

2.27 times with the interval of reliability between 2.17 to 2.37, while the frequency of bottle-feeding ≥ 2 times a night could increase the risk of BBTD 1.16 times with the interval of reliability in between 1.04 to 1.28. Moreover, analysis based on the age when they stopped bottle feeding, the prevalence of caries was almost 1. It means that this factor did not affect the number of caries occurred. Nevertheless, it appeared that breast feeding could give protection against BBTD.

Table 2. The estimation of prevalence ratio (PR) as the risk estimation of BBTD in children who have bottle-feeding habit

Analyzed Group	n (subject)	Prevalence Ratio (PR)	Interval of Reliability 95%
The risk of BBTD in children having bottle-feeding as pacifier	62	1.03	0.91–1.15
The risk of BBTD in children having bottle-feeding until in the age of 3 years old or more	62	0.9 ⁺⁺	0.48–1.02
The risk of BBTD in children whose frequency of bottle-feeding is \geq twice per day**	62	2.27	2.,17–2.37
The risk of BBTD in children whose frequency of bottle-feeding is \geq twice per night**	62	1.16	1.04–1.28
The risk of BBTD in children having breast-feeding	62	0.716 [*]	0.6–0.83

* < 1: causing protection effect

++ \approx 1: causing neutral effect

** once of bottle-feeding equals to 200 cc

DISCUSSION

The history of BBTD is needed to be examined in this study in order to categorize kinds of caries occurred in those children which can possibly be caused by bottle-feeding habit or by other factors. The categorization is also needed in this study to analyze further the specific damage occurred in their primary teeth. Therefore, if the tooth decay has already attacked their lower anterior teeth, they could not involve as the subjects of this study since this condition can cause bias result, which indicates caries with other pattern.

Moreover, only children in the range of age of 3 to 5 years old were chosen to be the subjects of this study since their primary teeth were still in the phase of growth,²⁴ thus, it means that only those whose primary teeth are still persisted

can involve in this study. It is aimed to obtain the description of caries caused by bottle-feeding habit. Healthy tooth reflect sufficient remineralization and demineralization processes. So we assumed that the unbalancing condition can be considered as a trigger factor of caries. Caries free can reflect the balance condition between remineralization and demineralization processes.

However, the similar condition cannot be expected to be found in children under three years old. This statement is also supported by the research using cariostat as the predictor of caries which found that the increasing of caries in children around 3–5 years old is not as progressive as that in children under 3 years old.²⁵ The succession of anterior teeth in children older than five years old has generally been occurred,²⁴ thus, the possibility of the involvement of anterior teeth becomes bias. Based on the analysis result of prevalence ratio in Table 2, it showed that the period of bottle-feeding habit was only 0.96. It means that the period of bottle-feeding is not considered as the only factor causing BBTD.

Furthermore, based on the distribution of the data, it appeared that the number of boys who had bottle-feeding habit is not the same as that of girls. The result make sense since caries is not an infectious diseases which affected by gender.^{26–29} Even though there is a research that distinguishes the dental health treatment based on gender, there is still no significant difference in result.^{25,30} Actually, as an infectious disease caused by bacteria, the incubation and colonization of bacteria tends to be determined by micro environment inside oral cavity. But, even though this micro condition is also influenced by internal factors like hormonal factor, it will not affect too much on children in the age of 3 to 5 years old.

Eighty five point five percents of the subjects have met the criteria to become the samples of the study since the total number of their teeth was 20 (Table 1). The rest of them (14.5%) had more than 20 teeth. However, this condition did not affect the study since the erupted teeth were permanent molars, and it did not affect the diagnosis of baby bottle tooth decay syndrome.

The examination conducted on children who have bottle-feeding habit showed that 72.6% of them suffer baby bottle tooth decay with various numbers of caries (1–15) teeth and with the mean score of *deft* 4.66 teeth. It means that every child has caries in their four teeth. Pattern of baby bottle tooth decay syndrome which is linier with the order of dental eruption, concluded that most of children with baby bottle tooth decay syndrome get caries in their four anterior teeth of upper jaw, and it is not different from what happens with non Caucasian children in the age of 4–5 years old in countries with good health program.³¹ However, caries in the upper incisive can not only cause infection for those children, but can also affect their aesthetics, especially concerning with their self-esteem.

If compared with the research involving five year old children in China which population is similar to Indonesia's in the term of biosocioculture, the mean score of *deft* is

almost similar (the mean of *deft* 3 from 780 children).²⁶ Similarly, the mean score of *deft* in Riyadh, Saudi Arabia is 5.²⁷ Nevertheless, the mean score of *deft* in 0–5 year old children is different as shown in the research conducted in Brazil, which is 1.53. This condition can possibly occur since based there is a correlation between the length of age interval and caries occurred, which means that the increasing of caries occurs as the increasing of age.³² It is also supported by the result of a research involving toddlers in Depok in 1992 which mean score of *deft* is 4.67 teeth.²⁵ It indicates that there has not been significant change in the mean of *deft* for the last two decades.

Actually, tooth decay suffered by most of children (72.6%) is possibly caused by many factors. One of them is related with the activity of parents in urban areas that tends to be busy and have not enough time to meet their children. Like in Indonesia, this phenomenon also occurs in some countries, except in developed countries in which promotion and prevention programs that have already been developed can reduce the unawareness of parents toward their children.³³ Therefore, it can be concluded that bottle-feeding habit is considered to be an important factor triggering caries.

The result showed that 66.1% of the subjects in this study have bottle-feeding habit. The proportion of children who use bottle-feeding prior sleep is the same with the proportion of children who suffer caries. In general, it is known that 45 children (72.6%) have this bottle-feeding habit, but, not all of the children who have bottle-feeding habit prior sleep get caries. Based on the result of prevalence ratio in Table 2 it is known that those who rely on bottle-feeding as pacifier when falling asleep do not always get caries since the interval of reliability is between 0.91–1.15. Nevertheless, based on the observation of 55 kindergarten students in Italia, it is known that bottle-feeding habit can cause caries.²⁸ Similarly, researches conducted in North Brisbane and Montreal is also showed that BBTD emerged in children who rely on bottle-feeding when falling asleep.^{34,35} Moreover, based on the research conducted in Australia, it is known that the frequency of bottle-feeding twice or more a day can increase the risk of caries for about 2.27 times, while the frequency of bottle-feeding twice or more a night can increase the risk of caries for about 1.16 times.³¹

The occurrence of BBTD can be examined from the experience of bottle-feeding habit. Most of the children got breast feeding until they were one year old (83.9%). It means that the weaning of breast feeding start after first primary tooth erupted or just before the eruption of primary tooth. Therefore, the correlation between breast feeding and BBTD can be eliminated. It is also supported by the score result of the prevalence ratio, which is about 0.716. It means that 60–83% of subjects have breast feeding as a protection against caries or breast feeding did not affect caries occurrence during the study. This result is similar to the result of the cross sectional research conducted on children in the age of 2–5 years old in the United States of

America in 1576 which concludes that the length period of breast feeding cannot be considered as the single risk factor of caries.⁴

Therefore, it can be concluded that though milk as subtract can possibly become a factor triggering caries, the frequency of bottle-feeding is highly considered as main factor. Since it could modulated the bacterial colonization on dental surface, which affects its virulence.

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