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Research Report

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

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ABSTRACT

Background*: Tooth decay or caries still becomes the main problem in Indonesia. In daily life, the prevalence of caries is still high (90.05%). However, there is still not appropriate data that can be used to analyze caries in toddlers, especially baby bottle tooth decay syndrome (BBTD), though the number of BBTD cases is still 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 not known, especially BBTD in Indonesia.* ***Purpose****: This research is aimed to obtain data relating with bottle-feeding habit in 3-5 year old children in Indonesia as well as the risk of caries emerged.* ***Method****: This research is an observational research conducted with clinical examination method through caries status (deft) of each child noted by pediatric dentists as well as through questionnaire distributed to parents in order to the risk factor of BBTD. Observation then is conducted on 62 children in the age of 3-5 years old with bottle-feeding habit meeting inclusive criteria.* ***Result****: The results of clinical examination and questionnaire show that status of caries is various. The data obtained then explains that the frequency of bottle feeding that is more than twice can trigger BBDT 2.27 times bigger than other factors like the role of bottle feeding as a pacifier when falling asleep, the length period of bottle-feeding, and the history of breast-feeding.* ***Conclusion****: Though milk as subtract can possibly become a factor triggering caries, what becomes the main factor actually is the frequency of bottle-feeding itself. The reason is because of the modulation of subtract related with the development of bacterium colonization on dental surface, so it indirectly also 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 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 mengonsumsi, dan riwayat minum ASI.* **Kesimpulan:** *Susu*

sebagai subtrat 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

Tooth Decay or Caries still becomes a dental health problem among children in Indonesia. The prevalence of caries among toddlers in Indonesia even is about 85%, while in general it is about 90.05%.[1–3] Based on the data, it can be indicated that the program of public health improvement conducted by the government for long time is considered to be failed since the prevalence of caries is still high. However, this epidemiologic description is not only found in developing countries, but also found in industrial countries.[4–12] Based on World Health Organization's report in 2003, moreover, it is known that the prevalence of caries among children was about 60–90%.[13] As a result, caries, specifically known as nursing bottle syndrome (NBT) or baby bottle tooth decay (BBTD) syndrome, becomes one of major concerns for medical experts, and many researches on it even have already been conducted and improved.[6] Furthermore, 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 in areas around indicate that the number of BBTD patients in pediatric dental clinics is still high. The introductory researches conducted in three hospitals (2 in the center of Jakarta and 1 in the suburb of Jakarta) even showed that the proportion of children who suffer this infection disease was about 95%. Based on the observation result, it is known that 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 even is various. Nevertheless, as reported by some researches, the patients of BBTD are dominated by toddlers who consume milk.[16, 17]

However, that nursing bottle causes BBTD is still debatable. In one side, milk can become liquid which protects the process of demineralization in enamels.[18,19] On the other hand the effect of milk carcinogenetic is improved in mice used as experimental models as the increasing of sugar, minimally about 2%.[20] Those differences then consider as an obstacle in determining whether milk cause BBTD in toddlers who have bottle-feeding habit or not since 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 analyze baby bottle tooth decay (BBTD) syndrome that generally attack toddlers in daily life. The process of tooth decay started in the toddler ages actually can affect the growth and the development of those toddlers themselves.[15]

MATERIAL AND METHOD

This research is a cross sectional study. It means that the subjects of the research are obtained from non-probability sampling method with consecutive sampling technique. Based on the method, the number of the subjects obtained then is about 62 toddlers who not only are in the age of 3-5 years old, but also have erupted milk tooth and bottle-feeding habit. Clinical examination then is conducted. Furthermore, in order to obtain further information, questionnaire is also distributed to those children's parents. The questionnaire concerns on the information not only about the history of breast feeding like the length period of breast feeding, but also about bottle-feeding habit like the role of bottle-feeding, the length period of bottle-feeding, and the frequency of bottle-feeding per day and per night. And, equipment used during clinical examination is intra oral with sufficient light.

Afterwards, the status of caries is noted based on World Health Organization standard.[22,23] The analysis of prevalence ratio then is conducted to examine any risk factors of bottle-feeding habit. Finally, this research has already been approved by the research ethic commission of Dentistry Faculty, Universitas Indonesia. And, the parents of those children involved in this research have already been informed and asked for their written approval.

RESULT

Based on consecutive method, 62 children are considered as the subjects of the research since they met some inclusion criteria. The distribution of the subjects as seen in Table 1, shows that the distribution of male children (61.3%) is bigger than that of female children (38.7%). The age interval of the samples is also known between 3–5 years old with the various numbers of teeth, 20–24 teeth, but the biggest proportion of subjects' teeth is about 20 teeth (85.5%).

Moreover, it is known that most of those subjects (72.6%) suffer caries which is similar to baby bottle tooth decay (BBTD) syndrome, while the rest (27.4%) is free from caries though they have bottle-feeding habit. It is

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		
BBDT 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
Total	**62**	**100**

*Once of bottle-feeding equals to 200 cc

also known that the deft score of all subjects approximately is about 466 teeth. If those teeth are classified into some groups based on the number of decayed tooth, it is known that 27.4% is free from caries, 40.3% has caries in 1–5 of their teeth, and 32.3% has caries in more than 5 teeth.

Based on the questionnaire result, it is known that 83.9% of the subjects have already stopped breast feeding since they are one year old. But, most of them (66.1%) still continue drinking milk with bottle. The children who drinking 4 times or more a day reach 46.8%. 53.2% of subjects have bottle-feeding once a night, while 32.3% of them have bottle-feeding twice a night. Moreover, 9.7% of them have bottle-feeding three times a night, while only 3.2% of them have bottle-feeding four times a night. It also known that most of those subjects (72.6%) rely on bottle-feeding as pacifier when they fall asleep, while the rest (27.4%) do not.

Table 2. The estimation of prevalence ratio (PR) as the risk estimation of BB T D 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 ≥ twice per day**	62	2,27	2,17–2,37
The risk of BBDT in children whose frequency of bottle-feeding is ≥ 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
++ ≈1: causing neutral effect
** once of bottle-feeding equals to 200 cc

In addition, for profiling those children with bottle-feeding habit as shown in Table 1, the analysis of prevalence ratio (PR) is then conducted as seen in Table 2. Based on Table 2, it is known that relying on bottle-feeding when falling asleep cannot always improve the risk of BBTD since the score of PR is 1.03 times with the interval of reliability between 0.91–1.15. In details, it is known that the frequency of bottle-feeding ≥ 2 times a day can improve the risk of BBTD 2.27 times with the interval of reliability between 2.17–2.37, while the frequency of bottle-feeding ≥ 2 times a night can improve the risk of BBTD 1.16 times with the interval of reliability between 1.04–1.28. Moreover, if it is analyzed based on the age when they stopped breast feeding, the prevalence of caries is almost 1. It means that this factor does not always affect the number of caries occurred. Nevertheless, it is known that breast feeding can become protection against BBDT.

DISCUSSION

The history of BBDT is needed to be examined in this research 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 research to analyze further the specific damage occurred in their milk teeth. Therefore, if the tooth decay has already attacked their lower anterior teeth, they cannot involve as the subjects of this research since this condition can cause bias result, which indicates caries with other pattern.

Moreover, only children in the age of 3–5 years old are chosen to be the subjects of this research since their milk teeth are still in the phase of growth,[24] thus, it means that only those whose milk teeth are still persistend can involve in this study. It is aimed to obtain the description of caries caused by bottle-feeding habit. As we know, the condition of teeth in those children generally can reflect sufficient remineralization and demineralization processes. As a result, we can hypnotize that the unbalancing condition can be considered as a triggering factor of caries, without caries condition can reflect the balancing 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 toddlers around 3–5 years old is not as progressive as that in toddlers under 3 years old.[25] The substitution of anterior teeth in children above 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 is also known that the length period of bottle-feeding habit is only 0.96. It means that the length period of bottle-feeding is not considered as the only factor causing BBDT.

Furthermore, based on the distribution of the data, it is known that the number of male children who have bottle-feeding habit is not the same as that of the female children. Nevertheless, it cannot affect this research since caries is not an infectious diseases affected by sex.[26–29] Even though there is a research that distinguishes the dental health treatment based on sex, 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 mouth cavity. But, if 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 3–5 years old.

It is known that 85.5% of the subjects have met the criteria to become the samples of the research since the total number of their teeth is 20 (Table 1). The rest of them (14.5%) have more 20 teeth. However, this condition does not affect the research since only permanent molar teeth are erupted, and it can not affect the diagnosis of baby bottle tooth decay syndrome.

The examination conducted on children who have bottle-feeding habit shows 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. If it is analyzed based on the pattern of baby bottle tooth decay syndrome which is linier with the order of dental eruption, it then can be concluded that most of children with baby bottle tooth decay syndrome will 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 them (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.

Based on the data, it is known that 66.1% of the subjects in this research still get bottle-feeding. The proportion of children who rely on bottle-feeding as they fall asleep even is as same as that of children who suffer caries. In general, it is known that 45 children or 72.6% of samples have this bottle-feeding habit. But, if it is analyzed further, it is known that not all of those children who have bottle-feeding habit during falling asleep 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 BBDT 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 improve the risk of caries for about 2.27 times, while the frequency of bottle-feeding twice or more a night can improve the risk of caries for about 1.16 times.[31]

Therefore, caries occurred in BBTD cases can also be examined from the history of their bottle-feeding habit. Most of them got breast feeding until they were one year (83.9%). It means that they stopped having breast feeding since their first tooth erupted or before it is erupted. Therefore, the correlation between breast feeding and BBDT 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 does not affect caries occurred during the observation. 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, what becomes the main factor actually is the frequency of bottle-feeding itself. The reason is because of the modulation of subtract related with the development of bacterium colonization on dental surface, so it indirectly also affects its virulence.

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