

THE RELATION OF MOTHERS' NUTRITIONAL STATUS TO PRIMARY TEETH DENTAL CARIES

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ABSTRACT

Objective: According to the National Health Survey in 2013, nutritional problems in Indonesia are still a concern, and caries is the most prevalent dental disease. Primary dentition is developed during a mother's pregnancy period. Thus, mothers' nutritional status during pregnancy could determine the health of their children's primary dentition.

This study objective was to analyze the relationship between mothers' nutritional status and dental caries in their children's primary teeth.

Methods: In total, 281 children under 5-year-old were selected from a health screening in Depok Sub-District, West Java. Information about maternal nutritional status was collected through the mother and child's health book. Information about dental caries was collected through clinical examinations using the dmft index.

Result: The prevalence of mothers with poor nutritional status was 22.8%, and 55.2% of their children had caries. The occurrence of dental caries in primary dentition between children of mothers with poor and good nutritional status was significantly different ($p < 0.001$). The likelihood of getting caries was 1.85 times higher (95% confidence interval: 1.5–2.2) among children of mothers with poor nutritional status than among children of mothers with a good nutritional status.

Conclusion: Children of mothers with a poor nutritional status would likely present with dental caries and had a higher risk of dental caries compared to children of mothers with a good nutritional status.

Keywords: Nutritional status, Primary teeth, Caries.

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INTRODUCTION

Indonesia is a developing country that is still undergoing common nutritional problems. Indonesia Health Basic Research (Riskesmas) in 2013 [1] showed the prevalence of chronic energy deficiency in pregnant mothers, newborn length under 48 cm, and stunting in children younger than 5-year-old (24.2%, 20.2%, and 37.2%, respectively). Nutrients are chemical components found in food or substances in food that are beneficial for the health of living beings and necessary for people's bodies. The number and variety of nutrients varies across foods. Moreover, several factors affect the nutritional adequacy of each individual including gender, weight, height, age, physiological condition, and metabolism. Nutritional status is a health condition related to food and nutritional intake, absorption, metabolism, and excretion. Nutritional status represented by a certain variable can thus be used to indicate the balance between the input and excretion of nutrition. The measurement of nutritional status can distinguish between good and poor nutritional condition [2].

Early life experiences influence a child's adult health. More specifically, growth in early life is associated with a range of adult health outcomes [3]. The importance of early life starting from fetal development was stimulated by Barker's hypothesis in the 1980s [4]. He presumed that the development of chronic disease in adulthood is programmed before or shortly after birth. Sanders stated that such programming actually begins with the mother's nutritional state before and during pregnancy [5], which plays a critical role in her baby's birth weight and nutritional state in later life. Numerous studies assess the relationship between early childhood health and later health or between early life experience and the development of chronic diseases in adult life. The approach has been applied to diseases and conditions

such as blood pressure and hypertension, cardiovascular disease, respiratory and allergic diseases, diabetes, cancer, and psychosocial development [6]. The understanding of a disease's risk factors is the basis of the life course approach [3].

Studies that relate early life experiences to the development of dental disease are scarce, especially those relating to dental caries. Teeth are the most permanent and highly calcified structures in the body, but their formation is subject to nutritional and metabolic influences during the prenatal and postnatal periods. Mothers' health during pregnancy is important for primary dentition, as tooth bud formation starts at 4 months intrauterine. Thus, it is most probable that mothers' health during pregnancy determines their children's dental condition. Dental caries has been the most prevalent dental disease, including during the primary dentition period, and Setiawati found that the prevalence of dental caries for children aged 3–5-year-old in Jakarta was 81.2% [7]. The National Basic Health Survey in 2007 (Riskesmas 2007) also found that the national prevalence was 90% [8]. Therefore, the present study aimed to analyze the relationship between the nutritional statuses of mothers during pregnancy and the dental caries of their children's primary teeth.

METHODS

The cross-sectional study was carried out as a health screening at five Posyandus in Beji and Tanah Baru Sub-districts, Depok, West Java. Posyandu is a primary health-care vehicle based on integrated mother and child health care at the sub-district level. The health post is organized by Puskesmas (Community Health Center) staff but run by local health cadres. In total, 335 mother-child pairs were enrolled at baseline. Children under 5-year-old and their mothers who had a

complete health book were selected for the study. Information about the mothers' nutrition during pregnancy was collected through the health books. Maternal mid-arm circumference was recorded to determine nutritional status during pregnancy. Information about dental caries was collected using the dmft index through a clinical oral examination. Calibration was carried out for the dmft index and gained 0.78 (substantial agreement) for inter-rater reliability. The study protocol, letter of informational consent, and other supporting documents were approved by the Universitas Indonesia Faculty of Dentistry Ethical Review Board before their use. Written informed consent was obtained from all mothers before their enrollment.

RESULTS

Figure 1 showed the prevalence of children with dental caries was much higher in mothers who had poor nutritional status during pregnancy (86%), compared to mothers with normal nutritional status during pregnancy (46%).

In total, 281 of 335 mother-child pairs were entered for analysis. The subject characteristics are described in Table 1.

The children's average age was 30 months, ranging from 6 to 59 months, and the mothers' average age was 30.4 (standard deviation [SD]=5.6) years. The distribution of child subjects based on gender was almost equal between male and female. The mothers' social backgrounds were mostly moderate regarding education level (61.2%), and most were not working (88.5%).

The prevalence of mothers and children with poor nutritional statuses was 22.8% and 28.1%, respectively. More than half of the children had dental caries (55.2%), with an average decay value of 2 and ranging from 0 to 20 teeth. The mean Z score for height/age of -1.16 (SD=1.9) was considered normal as was the mean measurement of maternal mid-arm circumference (Table 2).

There was a significant difference in dental caries in primary dentition between mothers with poor and good nutritional statuses (p<0.001).

Table 1: Distribution of sample characteristics

Variable	n (%)	Mean
Age		
Child		30.0 (6-59)
Mother		30.4 (5.6)
Child gender		
Female	138 (49.1)	
Male	143 (50.9)	
Mothers' educational level		
Junior high	90 (32.4)	
High school-diploma	170 (61.2)	
At least strata 1	18 (6.5)	
Mothers' occupation		
Not working (housewives)	247 (88.5)	
Working	32 (11.5)	

Table 2: Dental caries and nutritional status

Variable	n (%)	Mean
Child's nutritional status		Z-Score height/age
Stunting	79 (28.1)	-1.16 (-8.5-8.9)
Normal	202 (71.9)	
Child dental caries		
Present	155 (55.2)	2 (0-20)
Free	126 (44.8)	
Mother's nutritional status		Maternal mid-arm circumference
Undernourished	64 (22.8)	25.3 (SD 2.9)
Normal	217 (77.2)	

SD: Standard deviation

The proportion of children with primary dental caries whose mothers had a poor maternal nutritional status compared to the proportion of children whose mothers had a good maternal nutritional status was 85.9% and 46.1%, respectively. The risk of getting caries was 1.85 times higher (95% confidence interval [CI]: 1.5-2.2) among children of mothers with a poor nutritional status than among children of mothers with a good nutritional status (Table 3).

DISCUSSION

Oral health is closely related to general health, and the mother's nutritional status during pregnancy can affect her child's tooth growth process during the fetal growth period. Thus, mothers' nutritional status in pregnancy can determine the dental and oral health of their children. The present study in Beji Sub-District showed this result. The significant relation between mothers' nutritional status in pregnancy and their children's dental caries in their primary teeth was very strong. The risk of getting dental caries was 7.1 times higher (95% CI: 1.5-2.2) among children of mothers with a poor nutritional status than among children of mothers with a good nutritional status. A similar result was demonstrated in a study in Brazil that used low birth weight as an indicator of mothers' health during pregnancy. The study proved that children with a low birth weight tend to have dental caries (80.4%) due to the abnormal growth of teeth calcification compared to children with a normal birth weight (9.9%) [9].

Primary teeth begin to form during the 4th week of the fetal growth period, and the mineralization process starts during the 12th week. This is a critical phase because the matrix apposition process of constructing the structure of the primary teeth's hard tissue occurs. Besides a lack of macronutrients, micronutrients also play an important role. Vitamin A deficiency can lead to anemia and blindness. Since Vitamin A is important for epithelial integrity and differentiation, a Vitamin A deficiency can affect the activity of ameloblast cells in forming dental enamel. In Indonesia, 37.1% of pregnant women and 28.1% of infants were anemic [1]. Vitamin D is also known to play a role in a person's immune process and is required for the regulation of the metabolism of calcium and phosphorus, which is essential for the growth of teeth and bones. Other micronutrients that are important in developing the dental enamel structure are calcium, phosphorus, and magnesium [10].

Vitamin D is also needed for the metabolism of calcium and phosphorus during the matrix apposition process of the primary teeth during the prenatal period. Therefore, a micronutrient deficiency may affect the integrity of the primary teeth. Schroth showed that Vitamin D consumption during the prenatal period affects the ECC development of children (p=0.04) and the decay score of children (p=0.0002) [11].

Other studies have shown that a high intake of calcium during pregnancy can reduce the risk of caries in children's primary teeth (p=0.03) [12]. A deficiency of protein and energy (calories) during pregnancy can also increase the risk of salivary gland dysfunction and

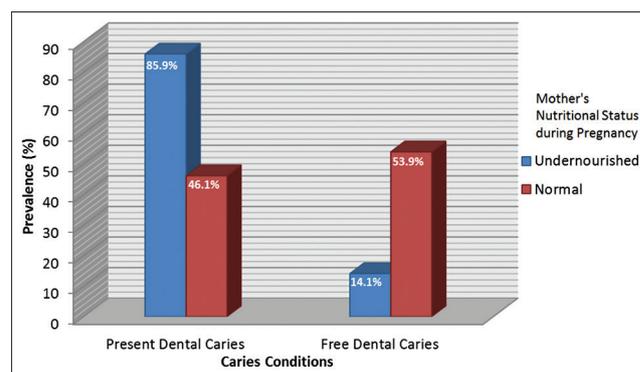


Fig. 1: Relation of maternal nutritional status and child's dental caries

Table 3: Relation of mothers' nutritional statuses and children's dental caries

Variable	Dental caries			PR (95%)	p
	Present	Free	Total		
Mother's nutritional Status (maternal mid-arm circumference)				1.85 (1.5-2.2)	0.001
Undernourished	55 (85.9)	9 (14.1)	64 (100)		
Normal	100 (46.1)	117 (53.9)	217 (100)		
Total	155 (55.2)	126 (44.8)	281 (100)		

enamel hypoplasia for children, which can impact the development of caries in the children's primary teeth [13].

Other than the mothers' nutritional status during the prenatal period, the first 2 years of children's nutritional status may also affect their dental and oral health because the development of primary molars and canines is ongoing. The occurrence may be influenced by the intake of essential nutrients (such as calcium and phosphorus) that affect the teeth's calcification process, which begins around birth and continues until eruption. The children's nutritional status in this research was measured by a height/age Z-score. This study showed a 28.1% prevalence of stunted children under 5-year-old. This study also limited the relation of nutritional status only from the mother and not during the child's 1st years after birth, as the child's environment and behavior may play a more important role than postnatal nutritional status in the occurrence of dental caries.

CONCLUSION

This study proved that the children of mothers with a poor nutritional status during pregnancy are more likely to have dental caries in their primary teeth compared to the children of mothers with a good nutritional status during pregnancy. Since the study was cross-sectional, the causal relationship was inadequate. The occurrence might be due to a lack of micronutrients that are essential to dental enamel development during pregnancy. A follow-up to this study is planned, which will be carried out to reconfirm this study's results using cohort data from child growth and development research in Bogor that the Ministry of Health's Center of Research and Development is conducting. To further improve the study design, some nutrient levels in the dental enamel of loosened primary teeth will be examined.

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