Self-Reported Oral Health Problems and Risk Factors Associated with 3–6-year-old Children Nutritional Status in Indonesia

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Abstract

Nutritional problems are among the essential aspects significantly affecting the health status of children. Oral health problems, especially untreated dental caries that keeps increasing among children can cause malnutrition.

This study aimed to determine the association of self-reported oral health problems and other risk factors with nutritional status of children aged 3-6 years in Indonesia. A cross-sectional study of 27,022 children aged 3-6 years old in Indonesia was conducted through self-reported oral health problems and data from 2018 National basic health survey. Chi-square analysis revealed significant correlation (p<0,05) between self-reported oral health problems with nutritional status categorized by body mass index (BMI) based by age using Z-score. There were 836 (7,72%) underweight children, 8.302 (76,68%) normally-weighing children, 752 (6,95%) overweight children, and 936 (8,65%) obese children who had self-reported oral health problems.

The bivariate analysis also showed significant statistical correlation between age of children, mother's educational level, father's employment status, the economic status of family, children and mother's dietary practice, accessibility to health care facilities, and diarrhea to children aged 3-6 years nutritional status (p-value <0,05) while there was no significant correlation between nutritional status and gender.

Clinical article (J Int Dent Med Res 2022; 15(1): 190-198)

Keywords: Self-reported oral health, nutritional status, children, malnutrition, dental caries.

Received date: 10 December 2021 **Accept date:** 07 January 2022

Introduction

Indonesia got through important events on its journey to become a middle-income country, including a significant decrease in child mortality.[1-2] However, there has been no improvement in the nutritional status of children. Nutritional status in Indonesia can be seen from the prevalence of malnutrition in 2018 which was 17.7%, wasting 3.9% and underweight 13.8%.[2] Millions of children in Indonesia are still at risk of high stunting, wasting, and the 'double burden' of malnutrition in which there are deficiency and excess of nutrition. The double burden of malnutrition affects not only the society but also the economy. Malnutrition can lead to ongoing poverty[2-4] so that the current priority of Indonesia's development in the health sector is addressing nutritional problems in children. Despite the fact that poverty contributes to malnutrition, the knowledge and practices of childcare and child-feeding were still inadequate.[5-6]

Infectious diseases and oral health problems can also affect the growth and development of children, including nutritional status.[5-7] Self-reported health status is considered a valid, acceptable method for the assessment of the prevalence of diseases in the general population.[8] In the field of dentistry, self-reported information is an economically feasible option for measuring oral health conditions in population-based multidisciplinary surveys and diminishes the need for time-consuming clinical exams. Moreover, self-reports have the potential to be a useful method for monitoring oral health conditions and trends over time, which is

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important to the planning and evaluation of public health policies.[9] Self-reporting of health conditions, as a measure of collecting health information, is gaining acceptance in many oral epidemiological surveys due to its convenience, lower cost compared to clinical assessment, ease of incorporation into health surveys and its basis on one's perception of health and disease.[10-12] The most common dental health problem reported in children which can affect the health and development of children's teeth was dental caries.[13] The 2018 National Basic Health Research states that the prevalence of active caries in Indonesia is 82.6% on average, 90.2% in the 3-4 year old age group, 65.5% in 12 year old, 32.6% in 15 year old, 92.2% in age 35-44 years and 95% in the age group over 65 years. It can be concluded that the 3–6-year age group, wherein the children still have primary or deciduous teeth, are included in the third highest age group with dental caries problems.[2]

There is still a debate regarding the associations between dental caries and nutritional status. Accumulating evidences suggest that dental caries had an impact on the nutritional status and growth of children while findings of other studies revealed that there was no relationship between them.[7,14-15] Meanwhile, the nature of these associations remains controversial both in terms of their direction and the underlying mechanism.[16]

Self-reported oral health problems could be assumed as one of risk factors to children's nutritional status. Socio-demographic, behavioral factors and infectious diseases also have strong evidences of contribution to the impaired nutritional status. Furthermore, age is a factor that greatly determines the amount of protein needed, especially in the group of toddlers who were still in their infancy. Related to gender factor, more females have malnutrition. Diarrhea as one of common infectious diseases in children can cause impaired absorption of nutrients as well. Other external factors that can affect nutritional include education, knowledge, income, dietary practices, and accessibility to health care facilities. Hence, this study examined and determined self-reported oral health problems and other risk factors that associate with nutritional status of children aged 3-6 years old using RISKESDAS 2018 data.

Materials and methods

This study received approval from the Ethics Committee of the Faculty of Dentistry, Universitas Indonesia (certificate number: 28/Ethical Exempted/FKGUI/XII/2021).

This study was an observational cross-sectional study that determined the associations between self-reported oral health problems and risk factors (gender, age, mother's educational level, father's employment status, economic status of the family, children and mother dietary practice, accessibility to health care facilities, and diarrhea) of children aged 3-6 years nutritional status categorized by BMI by age (underweight, normal, overweight, and obese). The secondary data were obtained based on RISKESDAS 2018 data in Indonesia. The questionnaire survey for RISKESDAS 2018 was conducted in 26 provinces and 106 regencies/cities in March 2018 by a trained enumerator. The survey observed probability proportional to size sampling, using linear systematic sampling with a two-stage approach. The data was taken from interviews. A questionnaire survey was administered to all household members of the participants. 27,022 subjects that met the inclusion criteria were used in this study. Nutritional status of children was obtained by measuring weight using a digital scale that has a precision of 0.1 kg, and the height was measured using a height measuring instrument with a precision of 0.1 cm converted into standardized values (Z-score) using the 2005 WHO anthropometric standards. Self-reported oral health problems were obtained from the participants, the parents of children aged 3-6 years, using dichotomous answers (Yes/No) to the questions: "In the past year, have you had any problem of (a) Tooth decay, cavities or pain? (b) Missing tooth due to extraction or falling out by itself? (c) Tooth that has been filled due to cavity?". Those who answered "Yes" to any of these questions were considered to have reported oral health problems. The questionnaire also assessed the sociodemographic background, including sex, mother's level of education, and father's employment status. The behavioral factors were also assessed by the question about children and mothers' dietary practices, including consumption of healthy and risky foods or drinks. The accessibility to healthcare facilities and the history of diarrhea in children were also assessed.

The family economy status data was obtained from a National socio-economic survey.

Data management and data analysis were conducted using SPSS ver. 25. The data was weighed to approximate the situation on a national scale. Variables were transformed before analysis. Univariate analysis was conducted to determine the characteristics of the participants and bivariate using chi-square analysis were used to determine the associations among the variables.

Results

The majority of subjects were children with normal nutritional status of 75.28%, followed by 9.44% of children with obese nutritional status, 7.88% being underweight, and 7.4% being overweight. From the self-reported oral health problems, 40.06% reported to have oral health problems. Based on sociodemographic characteristics, most of the research subjects were in the 36-48 months age group (46.49%) with the most gendered male. The education level of the parents observed was mother's level of knowledge, dominated by the status of not completing elementary school (SD/MI) equivalent to 43.18%. The employment status of parents represented the largest was fathers in the group "other" at 39.27% compared to status of not working, student, PNS/TNI/POLRI/BUMN/BUMD, private employees, entrepreneurs, farmers/laborers, fishermen, and laborers/driver/housekeeper. The work status of "still in school" came in second at 34.53%. Meanwhile, the economic status of most families was in the quintile 1 group, which is very poor at 31.44%.

Behavioral characteristics were studied to see the healthy and risky dietary behavior of children and family members, in this case is the mother. From the univariate analysis, it was found that the highest distribution was 87.39% of research subjects who did not consume healthy food, followed by 53.94% who consumed risky foods more than once a day. Mother's dietary behavior also showed the same results, dominated by mothers who did not consume healthy food at 87.39% and consumption of risky foods more than once a day at 53.13%. The accessibility to healthcare facilities was determined by the ease of reaching health facilities which were puskesmas, private doctors, clinics and hospitals. The largest result was the category of easy access to healthcare facilities at 72.74%. Based on infectious diseases, diarrhea is directly related to children's nutritional intake. The largest the distribution of subjects for this question is that they do not experience diarrhea by 91.27%.

The correlation analysis showed that self-reported oral health problems, age, mother's educational level, father's employment status, family economic status, children and mother dietary behavior, accessibility to health care facilities, and history of diarrhea had significant correlation (p-value < 0,05) to nutritional status of children aged 3-6 years using indicator BMI by age. There were 836 (7,72%) underweight children, 8.302 (76,68%) normally-weighing children, 752 (6,95%) overweight children, and 936 (8,65%) obese children who had self-reported oral health problems. The gender of children from the study had no significant correlation.

Discussion

The findings showed a significant correlation between self-reported oral health problems with the nutritional status using BMI by age of children aged 3-6 years. Although the accuracy of self-reported oral health in the previous study was poor, the alternative self-reporting methods may have practical use in epidemiological settings such as in Indonesia.[8] Self-reporting may serve as an advantageous screening instrument by providing a rapid and inexpensive method to determine those who need referral for further examination.[10-17] These findings was supported by a study in Los Angeles aimed to develop child and parent reporting toolkits to screen active caries and caries experience in children and adolescents because this toolkits can help parents to immediately seek further medical treatment from experts for their children.[18]

There are various logical mechanisms for the association of dental problems especially dental caries with underweight and poor growth of children.[19] First, untreated caries and the infection that occurs can cause pain and discomfort and later reduce food intake because eating becomes an unpleasant activity in children.[20] Second, dental caries can cause descreased appetite and sleep disturbances that

give an impact on children's growth and development in overall. Disrupted sleep can affect the production and growth of glucocorticoid. Chronic inflammation from pulpitis and tooth abscess affects metabolic pathways involving cytokines. Recent emerging evidence suggests that children with dental caries have higher levels of pro-inflammatory cytokines. Cytokines act as mediators of inflammation, infection and immunological processes as they increase when the severity of dental caries increase. Pro-inflammatory cytokines generate peroxide-generating-free radicals, prostaglandin E2, interleukin 6, tumor necrotizing factor, alpha and cysteine leukotrienes, potent agents in the inflammatory response that are significantly associated with increased nutritional risk.[19,21]

A study by Chloe Tsang demonstrated the risk factors and the onset of dental caries which starts during the first 2 years. The majority of Nepalese children aged 5-6 years have untreated dental caries, and 1 in every 5 children suffers from severe caries and mouth sores that can lead to disrupted eating, sleep, and concentration at school as well as a significant association between severe early childhood caries and chronic & acute malnutrition, similar to other dental studies in low- and middle-income countries.[16] Chronic malnutrition in early childhood is strongly associated with poorer cognitive and educational outcomes throughout childhood. Regarding the relationship between dental caries and obesity from previous studies, there is evidence of an inverse relationship between the two, where obesity has a significant influence on the incidence of dental caries. Several studies found that overweight and obese children had a significantly more dental caries experience compared to children with normal weight.[22,23] According to the previous study that showed the association between oral health problems mainly dental caries and children nutritional status, self-reported oral health problems could be the option for early diagnosis of dental caries to prevent malnutrition in children and to develop preventive program for oral health and malnutrition problem.

Other predictive factors that are age of children, mother's educational level, father's employement status, family economic status, children and mother dietary behavior, accessibility to health care facilities and history of diarrhea had significant relationship to children aged 3-6 years nutritional status using indicator BMI by age. These findings are similar to previous study conducted by Davod Ahmadi on children in Ethiopia. Age is known as a strong determinant of the nutritional status of toddlers because at that age in the life cycle, growth is not as fast as in the golden period, but toddlers have high motor activity.[24] The number of toddler activities, if not balanced with nutritious intake, will affect the growth and development of toddlers. Geda's study which examined children aged 6-59 months in Ethiopia found that the results of parental education, dominated by mother's education, had a strong influence on the nutritional status of children.[25]

The father's employment and family economic status, which is categorized based on overall household expenditure compared to income, shows a significant relationship to the nutritional status of children. These findings is similar to a study conducted by Karkuki et al in Nepal, which proved that children with poor nutritional status were more common in groups of families with low economic status. Meanwhile, Sasmita et al found that there was no correlation between family economic status and dental caries.[26-27] The study of Yirga also found socio-economic status as the proxy variable of the healthcare facilities utilization and low sanitation that eventually led to be a cause of diarrhea to occur in the increase of the malnutrition status of children in India.[28] The dietary practice of children and mother also affected the intake of nutrition. Moreover, the consumption of unhealthy foods such as processed foods and sugar was not limited to rich households and also occured in poor households.[29] In line with a study conducted by Donelly et al which used household data from a national representative from Brazil asking the parent-child associations regarding dietary behavior, it is shown that the dietary behavior of mothers and fathers was related to the dietary behavior of their children. Parents played an important role in shaping their children's diet through these social and environmental pathways.[30] Besides affecting nutritional status, Setiawati et al found that sugary diet in high frequency increase the incidence of dental caries among children aged 6-24 months in Indonesia.[31] It can be concluded that dental health and nutritional problems in children shared the similar risk factors which could not be neglected.

The limitation of this study due to cross-sectional study design is that it could not describe causal relationship between independent variables to dependent variables because the nutritional and oral health problems were chronic diseases that need longitudinal or cohort studies for further relationship to obtain. Recall bias may be present due to parents' recognition and awareness of their children's oral health condition during the survey. This study also needs to include clinical examination of oral health as the comparison to get more valid and reliable results.

Conclusions

The findings of this study were expected to be used as prior knowledge regarding the association between self-reported oral health problems and malnutrition in children. The use of self-reported oral health problems requires further studies prior to its use in the analysis of risk factors, but it is valid for population-based health surveys with the aim of planning and monitoring oral health interventions.

Acknowledgments

This study was supported by Universitas Indonesia.

Declaration of Interest

The authors report no conflict of interest.

Variables	N	(%)
Nutritional status		
Underweight	2,130	(7.88)
Normal	20,343	(75.28)
Overweight	1,999	(7.4)
Obese	2,550	(9.44)
Self reported oral health problems		
No	16,169	(59.84)
Yes	10,826	(40.06)
Age		
36-48 months	12,536	(46.39)
49-60 months	10,804	(39.98)
61-72 months	3,682	(13.63)
Gender		
Man	13,670	(50.59)
Woman	13,352	(49.41)
Mother's educational level		
No school	3,848	(14.24)
Did not finish SD/MI	11,669	(43.18)
Graduated SD/MI	4,761	(17.62)
Graduated Middle School/MTS	3,214	(11.89)
Graduated high school / MA	2,733	(10.11)
Graduated College	797	(2.95)
Father's employment status		
Does not work	4,316	(15.97)
Still in school	9,332	(34.53)

PNS/TNI/POLRI/BUMN/BUMD	179	(0.66)
Private employees	711	(2.63)
Entrepreneur	605	(2.24)
Farmer/Labourer	718	(2.66)
Fisherman	68	(0.25)
Labor/Driver/Housekeeper	481	(1.78)
Other	10,612	(39.27)
Family economic status		
Extremely poor	8,495	(31.44)
Poor	6,340	(23.46)
Enough	4,989	(18.46)
Rich	4,106	(15.2)
Very rich	3,092	(11.44)
Children's dietary practice		
Eat healthy food		
No Consumption	23,615	(87.39)
1-2 servings	3,112	(11.52)
3-4 servings	243	(0.9)
> 5 servings	52	(0.19)
Consumption of risky foods		
> 1 x a day	14,577	(53.94)
1 x a day	5,139	(19.02)
3-6 times a week	3,615	(13.38)
1-2 times a week	2,901	(10.74)
< 3 x per month	600	(2.22)
Do not know	190	(0.7)
Mother's dietary practice		
Eat healthy food		
1-2 servings	23,350	(86.41)
3-4 servings	3,068	(11.35)
> 5 servings	586	(2.17)
Consumption of risky foods		
> 1 x a day	14,356	(53.13)
1 x a day	4,360	(16.14)
3-6 times a week	3,940	(14.58)
1-2 times a week	3,408	(12.61)
< 3 x per month	760	(2.81)
Do not know	198	(0.73)
Access to healthcare facilities		
Easy	19,657	(72.74)
Difficult	4,003	(14.81)
Very difficult	3,362	(12.44)

Diarrhea		
Yes < last 2 weeks	1,313	(4.86)
Yes > last 2 weeks	1,023	(3.79)
No	24,662	(91.27)
Do not know	24	(0.09)
Total	27,022	(100)

Table 1. Characteristics of children aged 36-72 months.

	Child Nutritional Status (BMI/AGE)								*p-value*
	Underweight (%)		Normal (%)		Overweight (%)		Obese (%)		
Self-reported oral health problems									**0.001**
No	1,294	(7.99)	12,041	(74.35)	1,247	(7.7)	1,614	(9.97)	
Yes	836	(7.72)	8,302	(76.69)	752	(6.95)	936	(8.65)	
Age									**0.001**
36-48 months	990	(7.9)	9,267	(73.92)	1,026	(8.18)	1,253	(10)	
49-60 months	820	(7.59)	8,215	(76.04)	754	(6.98)	1,015	(9.39)	
61-72 months	320	(8.69)	2,861	(77.7)	219	(5.95)	282	(7.66)	
Gender									**0.142**
Man	1,103	(8.07)	10,214	(74.72)	1,048	(7.67)	1,305	(9.55)	
Woman	1,027	(7.69)	10,129	(75.86)	951	(7.12)	1,245	(9.32)	
Mother's education level									**0.001**
High	333	(9.57)	2,817	(80.93)	207	(5.95)	124	(3.56)	
Middle	197	(7.21)	2,058	(75.3)	207	(7.57)	271	(9.92)	
Low	1,880	(9.03)	15,056	(72.36)	1,717	(8.25)	2,155	(10.36)	
Father’s employment status									**0.001**
Formal	1,079	(8.07)	9,994	(74.73)	1,030	(7.7)	1,271	(9.5)	
Informal	1,051	(7.7)	10,349	(75.83)	969	(7.1)	1,279	(9.37)	
Family economic status									**0.001**
Rich	480	(6.67)	5,262	(73.1)	600	(8.34)	856	(11.89)	
Middle	385	(7.72)	3,736	(74.88)	381	(7.64)	487	(9.76)	
Poor	1,265	(15.16)	4,852	(58.16)	1,018	(12.2)	1,207	(14.47)	
Children's dietary practice									
Eat healthy food									**0.001**
Yes	1,819	(8.19)	17,667	(79.56)	1,699	(7.65)	1,021	(4.6)	
No	311	(8.43)	2,676	(72.5)	300	(8.13)	404	(10.95)	
Consumption of risky foods									**0.001**
No	1,095	(7.51)	11,213	(76.92)	1,019	(6.99)	1,250	(8.58)	
Yes	1,429	(11.48)	9,848	(79.13)	495	(3.98)	673	(5.41)	

Mother's dietary practice									**0.006**
Eat healthy food									
Yes	1,300	(17.16)	4,004	(52.87)	1,110	(14.66)	1,160	(15.32)	
No	2,600	(13.37)	12,408	(63.8)	1,970	(10.13)	2,470	(12.7)	
Consumption of risky foods									**0.001**
No	388	(8.89)	3,216	(73.66)	338	(7.74)	424	(9.71)	
Yes	1,742	(7.69)	17,127	(75.6)	1,661	(7.33)	2,126	(9.38)	
Access to healthcare facilities									**0.002**
Easy	1,532	(7.79)	14,782	(75.2)	1,497	(7.62)	1,846	(9.39)	
Difficult	1,098	(13.96)	5,561	(70.71)	502	(6.38)	704	(8.95)	
Diarrhea									**0.043**
No	4,937	(20)	7,560	(30.62)	3,827	(15.5)	8,362	(33.87)	
Yes	190	(8.13)	1,794	(76.8)	170	(7.28)	182	(7.79)	

Table 2. The correlation between children's nutritional status and self-reported oral health problems, sociodemographic factors, behavioral factors and diarrhea diseases.
* Chi-Square test (significant if p-value < 0.05), n = 27,022

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