Predictors of Malnutrition in Children Aged Less than 5 Years in Surabaya, Indonesi

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Research Article
Predictors of Malnutrition in Children Aged Less than 5 Years in Surabaya, Indonesia

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Abstract
Background and Objective: Malnutrition in children in the community is still a problem in Indonesia, especially in Surabaya. This study aimed to analyze the predictors of malnutrition in Surabaya, Indonesia. **Methodology:** The study used a cross-sectional design with 114 families with malnutrition, selected by proportionate stratified random sampling. The data were collected with questionnaires and interviews that identified underlying factors, while specifics about malnutrition were collected using weight-for-age measurements that were then assessed by Z score. **Results:** Factors of maternal education, maternal knowledge, family income and history of disease simultaneously affected 93.3% (adjusted R 0.933) of malnutrition variables in children. The strongest predictors of child malnutrition were family income (b = 0.265), followed by maternal education (b = 0.245), history of Infectious Diseases (b = 0.191) and maternal knowledge (b = 0.115). **Conclusion:** Malnutrition in children in Surabaya, Indonesia, could be overcome by improving family income, increasing the knowledge and education of mothers and preventing the existence of infectious diseases.

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

In Indonesia, nutrition problems, especially malnutrition and lack of nutrition, are still a major concern that needs increased serious attention[1]. The problem of poor nutrition is also experienced in East Java Province, based on 2016 data from the Ministry of Health of the Republic of Indonesia, the percentage of malnutrition and food insufficiency in children aged 0-23 months is 6 and 11.0%, respectively[2]. Malnutrition is also experienced by children who live in Surabaya, East Java[2]. Based on the results of research in one of the districts of Darmokali in Surabaya, it was found that 34.1% of children were lacking in nutrition and 2.3% of children were malnourished[3]. The high incidence of malnutrition may be caused by various factors, such as age, type of food consumption, attendance at the public health center, frequency of illness and duration of illness[4].

Similarly, the study of Kusumayanti *et al.*[5] described inadequate energy intake and the particular form of food obtained by patients as factors that affect the incidence of malnutrition in the hospital. The study of Nayak *et al.*[6] noted that approximately 65.44% of mothers have some knowledge about malnutrition, 31.58% of mothers have poor knowledge and only 1.0% have good knowledge.

Some of the factors that cause malnutrition in children under five years of age in Indonesia are generally economic problems, lack of knowledge, poverty, inability of the parents to provide nutritious food for their children, natural factors, low nutrient intake in pregnant and lactating women, a lack of understanding about food safety, infectious diseases, cultural differences between rural and urban areas, access to health care, education, employment, smoking behavior, marrying young and others. However, not all of these factors cause malnutrition to occur in urban areas, especially in the city of Surabaya, Indonesia[7-10].

Indonesia needs to overcome the problem of malnutrition because there is a correlation between malnutrition and human resources. The study of Ruia *et al.*[11] states that malnutrition can affect human resources by leading to a loss of labor productivity and delaying national development. The study of Bhardwaj *et al.*[12] also notes efforts to overcome malnutrition through a program of learning that leads to improved nutritional status.

Based on the problem above, family income, the mother's education and knowledge and the child's history of infection are the factors that can influence nutritional status. This concern relates to the needs of families regarding the availability and production of food for children under five years. The efforts to overcome the problem involve finding possible causes of malnutrition, such as mother's occupation, mother's education, mother's knowledge, family income, age of child, sex, history of infectious diseases, priority of family food and prohibition of family meals. The purpose of this study was to find the predictors of malnutrition in children living in Surabaya, Indonesia.

MATERIALS AND METHODS

Ethical approval: This study was conducted with the approval of the Research and Ethics Committee of the Research Institute of Muhammadiyah University of Surabaya (Reference Number: LPPM/415/2017). The study approval letter was also obtained from the Surabaya City Health Office. Prior to doing this study, discussion was conducted among the nurses at the community health centers and respondents to explain the study procedures. In this study, there is no other interest than the development of science in the field of health.

Subject and study location: A cross-sectional study was conducted in Surabaya, a city of Indonesia, from April to May, 2017. A total of 114 malnourished children aged 0-5 years were the subjects of this study. The sampling technique of proportionate stratified random sampling was used to recruit respondents. Research respondents were parents of children who met the following inclusion criteria: (1) Parents who have children aged 0-5 years with a current medical diagnosis of malnutrition and (2) Parents who are willing to participate in this study.

Predictors of malnutrition: The predictor variables of malnutrition consisted of mother's occupation, mother's education, mother's knowledge, family income, age of child, sex, history of infectious diseases, priority of family food and prohibition of family meals, all measured using a questionnaire with 20 questions. The reliability of the questionnaire was tested with Cronbach's alpha (0.82). In the questionnaire, assessment of mother's occupation was categorized as 1 = Not working, 2 = Working; mother's education was categorized as 1 = Primary school, 2 = Junior high school, 3 = High school and 4 = College/university; mother's knowledge was categorized as 1= Low knowledge, 2 = Sufficient knowledge and 3 = Good knowledge; family income was categorized as 1 = <Rupiah 750.000, 2 = Rupiah 750.000-<1.150.000, 3 = > Rupiah 1.150.000; priority of family food was categorized as 1 = Priority 2 = No priority and prohibition of family meals was categorized as 1 = Abstinence, 2 = No abstinence.

Malnutrition: Malnutrition data were measured by anthropometry, weight based on age using a z-score and the standard WHO-NCHS reference were used to classify subjects as having moderate malnutrition = -3SD to -2SD or severe malnutrition = <-3SD.

Statistical analysis: All data were analyzed using SPSS software version 20.0 (SPSS Inc, Chicago, IL, USA). Descriptive analysis such as frequency, average, standard deviation and percentage were used to describe the measurement of respondent's characteristics. Multiple logistic regression analysis was used to test the predictors of child malnutrition in Surabaya, Indonesia. The level of significance was set at p<0.05.

RESULTS

Sample characteristics: Dominant characteristics of the respondents included maternal age, with most mothers being 28-31 years old (36.8%), not working (68.4%), junior high school education (47.4%) and less knowledge of malnutrition (52.7%). Most of the children were aged between 12 and 21 months and were male (57.9%). Characteristics of respondents are presented in Table 1.

Family income variables, food taboos, family food priorities and history of infectious disease.

Table 2 shows the characteristics of family income, with most respondents having a low income (<Rp 750.000/month). Further, 78.9% had no food taboos in the family, 73.7% of respondents had a history of infectious diseases and most respondents (78.9%) did not have a culture of family food as a priority.

Malnutrition: Table 3 shows the degree of malnutrition measured using the Z score. Most of the respondents had light malnutrition (85.1%).

Relationship between independent variables and malnutrition: Table 4 displays the correlation between malnutrition and other variables such as mother's work, mother's education, mother's knowledge of nutrition, family income, child age, sex, history of infectious diseases, family food priorities and family food taboos.

The results of Pearson's correlation test on variables related to malnutrition in children in Surabaya, Indonesia, were significant. Maternal work, maternal education, mother's knowledge, family income, history of infectious diseases and other variables such as child age, sex, family food priority and abstinence were associated with malnutrition.

Table 1: Frequency and percentage of respondent characteristics (n = 114)

Characteristic of respondent	Frequency	Percentage
Mother's Job		
Works	36	31.6
Does not work	44	68.4
Mother's education		
Primary school	24	21.1
Junior high school	54	47.4
Senior high school	36	31.6
University	0	00.0
Mother's knowledge		
Good	12	10.5
Enough	42	36.9
Less	60	52.7
Sex of child		
Boy	66	57.9
Girl	48	42.1
	SD	Mean
Age of mother (years)	4.059	29.6
Age of child (months)	13.767	30.7

Table 2: Frequency and percentage of family income (n = 114)

Variables	Frequency	Percentage
Monthly income (Rupiah)		
<750.000	66	57.9
750.000-1.115.000	18	15.8
>1.115.000	30	26.3
Prohibition in family meals		
There is	24	21.1
There is no	90	78.9
History of infectious diseases		
There is	84	73.7
There is no	30	26.3
Priority of family food		
There is	24	21.1
There is no	90	78.9

Table 3: Frequency and percentage of degree of child malnutrition (n = 114)

Malnutrition	Frequency	Percentage
Light	97	85.1
Weight	17	14.9

Table 4: Matrix of correlation between independent variables and malnutrition (n = 114)

Independent variables	R	p-value
Mother's occupation	0.222	0.018
Mother's education	0.877	0.000
Mother's knowledge	0.683	0.000
Family income	0.831	0.000
Age of child	0.015	0.871
Sex	0.009	0.922
History of infectious diseases	0.781	0.000
Priority of family food	0.169	0.073
Prohibition of family meals	0.169	0.073

Factors predicting malnutrition: Multiple linear regression analysis was performed to test the variables that significantly predicted malnutrition in children. After examining multiple linear regression assumptions and independent variables such as maternal employment, maternal education, maternal

Table 5: Factors predicting malnutrition (n = 114)

Predictors	B	SE	Beta	t	p-value
Mother's occupation	0.032	0.019	0.050	1.653	0.101
Mother's education	0.245	0.024	0.526	10.125	0.000
Mother's knowledge	0.115	0.020	0.582	5.889	0.000
Family income	0.265	0.022	0.582	12.123	0.000
History of infectious diseases	0.191	0.031	0.230	6.122	0.000

R: 0.968, Adjusted R^2: 0.933

knowledge, family income, child age, child sex, history of infectious diseases, family food priorities and family food restrictions, there were only four significant variables that were predictors of malnutrition in children living in Surabaya, Indonesia.

Table 5 shows that maternal education, maternal knowledge, family income and history of disease together affect 93.3% (adjusted R 0.933) of malnutrition variables in children. The strongest predictors of child malnutrition were family income (B = 0.265), followed by maternal education (B = 0.245), history of infusion (B = 0.191) and maternal knowledge (B = 0.115).

The variable "family income" affected child malnutrition, with B = 0.265 (p<0.01). This variable showed that predicted malnutrition in children would be 0.265 times greater if the family income was low. This pattern can also be seen in the assessment of the maternal education variable, [B = 0.245 (p<0.01)] which showed that the predicted malnutrition in children would be 0.245 times more if the education level of the mother was low. The mother's knowledge (B = 0.115, p<0.01) indicated that the child would experience malnutrition if the knowledge of the mother was low and a variable history of infection, with B = 0.191 (p<0.01), indicates a prediction that children would be malnourished if they had a history of infectious diseases.

DISCUSSION

The factors that predicted malnutrition in Surabaya, Indonesia, were family income, maternal education level, history of infectious diseases in children and mother's knowledge about malnutrition treatment. This is in accordance with the study of Kusumayanti et al.[5], who stated that the incidence of malnutrition can be caused by a history of infectious diseases and insufficient energy intake. Kuntari et al.[13] reported that the presence of maternal and chronic disease factors are also contribute to the risk of the high incidence of malnutrition in the Bantul district in Yogyakarta, Indonesia. Nuzula et al.[14] also stated the influence of infectious diseases, nurturing patterns, food intake and knowledge of mothers on the incidence of malnutrition in the Banyuwangi district of East Java, Indonesia. Similar findings

are reported from other countries in the world. According to the study of Asim and Nawaz[15], the incidence of malnutrition in Pakistan could be influenced by various factors such as low income, lack of exclusive breastfeeding, etc. The study of Birdi et al.[16] explained that the causes of malnutrition in India included incorrect family-care practices in addition to minimal consumption of nutrients such as vegetables and cereal and nuts, which could cause micronutrient deficiency.

The findings of this study also have similarities and differences with those of previous studies, including the research of Nnyepi et al.[17], who reported the following findings: the incidence of malnutrition will increase in children raised by single parents, the incidence of malnutrition decreased when family income increased and when the level of the parents' education is high, malnutrition in children decreases, thus, feeding can decrease the incidence of malnutrition. Regarding these different predictive factors, in our study, having children raised by single parents would not lead to a significant difference in the malnutrition rate because Indonesian culture always involves family participation in childcare, including in decision-making; likewise, breastfeeding status is not studied in this research because among these children, there is a history of successful breastfeeding.

Although there are differences in the above studies, they are in-line with the concept of health and illness, which explains that complex health problems result from various environmental problems, both natural and artificial, that are socio-cultural and behavioral in nature, involving populations and genetics. The aspect of public health referred to as psychosocial somatic health well-being was the result of four factors that include environment, behavior, heredity and health services. Environmental imbalances and behaviors could cause health problems, as descendants were strongly influenced by population distribution. Based on this, the environment is the determinant of a healthy condition of illness[18].

The results of the study show that factors causing problems with malnutrition were closely related. For example, a low average family income could lead to the purchase of types of food that are also low in nutrition, thus, the resulting consumption of nutritious food would also be low. A low education level of the mother could be related to a low level of knowledge regarding the care of children at home and could trigger the occurrence of malnutrition in her children. A history of infectious diseases is also a risk factor for malnutrition if grouped together with other factors and could ultimately be the cause of malnutrition. Thus, the prediction of malnutrition in a child would increase by 0.2 times greater

if family income is low and there would be an increase of 0.2 times greater if the mother's education is at a low level, an increase of 0.1 time greater if the mother's knowledge was low and an increase of 0.19 time greater if the child had a history of infectious diseases.

This study has implications regarding the application of problem-solving practices to health issues, especially the incidence of malnutrition in children, as well as whether the policy can be determined in an urban nutrition program in urban areas. Therefore, it is necessary to recommend to the municipality that a priority program be developed to overcome malnutrition problems. Limitations in this study lie in the use of questionnaires in search of malnutrition predictors, as sometimes the respondents' answers do not show the real situation.

CONCLUSION

This study determined the factors that predicted the incidence of malnutrition in children in Surabaya, Indonesia, which is the second largest city in Indonesia. These factors were education, family income, knowledge and history of infectious diseases. This study showed that family income, education, knowledge and history of infection affected malnutrition in Surabaya. However, the strongest predictor of child malnutrition was family income, followed by maternal education, history of infection and mother's knowledge. Suggestions can be given to improve family income and education, to create awareness and to promote the prevention of malnutrition in Surabaya.

SIGNIFICANCE STATEMENT

This study discovers that the main predictors of the occurrence of malnutrition in children are family income, maternal education, history of infectious diseases and knowledge of the mother. This study will help researchers find solutions to overcome malnutrition problems in developing urban areas such as Surabaya in Indonesia by improving family income, education, knowledge about nutrition and prevention of infectious disease. Thus, a new theory has arrived which showed that family income, education, knowledge and history of infectious agents may cause malnutrition.

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