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Factors associated with severe malnutrition among children under five-year old in Yogyakarta during the economic crisis

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ABSTRACT

Endy P. Prawirohartono, Atiek Werdiningsih - ***Factors associated with severe malnutrition among children under five-year old in Yogyakarta during the economic crisis***

Background: Malnutrition is a problem in under five-year old children. During the economic crisis, the nutritional status of this group has decreased. There are variety of risk factors related to severe malnutrition. Some risk factors are preventable. Recognition of preventable risk factors is important in the management of severely malnourished children in the community.
Objective: To determine factors associated with severe malnutrition among under five-year old children in Yogyakarta during the economic crisis.
Methods: A case control study conducted in Sleman and Bantul Districts. Thirty four severely malnourished children and 68 controls of well nourished children were enrolled in this study. There were 6 group of variables consisted of 21 factors analyzed in this study. A logistic regression analysis was done to calculate OR and 95%CI.
Results: Univariate analysis showed that low educated mother, mother who works outside home, bad water disposal, non-breastfed children, and tuberculosis were associated with severe malnutrition where their OR and 95%CI were 2.96 (1.26 - 6.94), 2.79 (1.15 - 6.77), 12.33 (3.44 - 44.24), 4.13 (1.70 - 10.02) and 9.03 (2.29 - 35.62) respectively. Using multivariate analysis only non-breastfed children, tuberculosis and bad water disposal related to severe malnutrition with OR and 95%CI 7.01 (1.35 - 36.48), 11.52 (1.43 - 92.64) and 32.64 (5.44 - 195.90) respectively.
Conclusions: Breastfeeding plays important role to support nutrients and other benefits to nutritional status of the children during the economic crisis. Tuberculosis is still a main factor related to severe malnutrition compared to acute diseases.

Keywords: malnutrition - under five - risk factors - breastfeeding - tuberculosis

ABSTRAK

Endy P. Prawirohartono, Atiek Werdiningsih - ***Faktor-faktor yang berhubungan dengan malnutrisi berat pada balita selama masa krisis ekonomi di Yogyakarta***

Latar Belakang: Malnutrisi merupakan masalah pada balita. Selama masa krisis ekonomi terjadi penurunan status gizi pada kelompok ini. Banyak faktor risiko malnutrisi berat pada anak. Beberapa factor risiko ini dapat dicegah. Mengenal faktor-faktor risiko yang dapat dicegah ini akan bermanfaat untuk mengelola balita dengan malnutrisi berat di masyarakat.
Tujuan: Menentukan faktor-faktor yang ada hubungannya dengan malnutrisi berat pada balita selama masa krisis ekonomi di Yogyakarta.
Bahan dan cara: Rancangan kasus-kontrol dilaksanakan di Kabupaten Sleman dan Bantul. Ada 34 kasus, yaitu balita dengan malnutrisi berat, dan 68 kontrol, balita dengan gizi baik. Dianalisis 6 kelompok faktor risiko yang terdiri dari 21 variabel dengan analisis regresi logistik, dan dihitung Odds Ratio dan 95% *confidence interval*nya.

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Hasil: Analisis univariat menunjukkan bahwa tingkat pendidikan ibu yang rendah, ibu bekerja di luar rumah, pembuangan air limbah yang buruk, balita yang tidak disusui, dan tuberculosis merupakan faktor risiko terjadinya malnutrisi berat pada balita dengan OR dan 95% CI masing-masing 2,96 (1,26 - 6,94); 2,79 (1,15 - 6,77); 12,33 (3,44 - 44,24); 4,13 (1,70 - 10,02); dan 9,03 (2,29 - 35,62). Pada analisis multivariat hanya balita yang tidak disusui, tuberkulosis, dan pembuangan air limbah yang buruk merupakan faktor risiko malnutrisi berat pada balita, masing-masing dengan OR dan 95%CI 7,01 (1,35 - 36,48); 11,52 (1,43 - 92,64); dan 32,64 (5,44 - 195,90).

Simpulan: Menyusui mempunyai peran penting untuk menunjang asupan nutrien dan faktor lain yang bermanfaat untuk balita selama masa krisis ekonomi. Tuberkulosis masih merupakan faktor penting bagi malnutrisi berat pada balita dibandingkan dengan penyakit akut.

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INTRODUCTION

WHO Database on Child Growth (1983) stimulates the awareness of magnitude of childhood malnutrition in the world, particularly in under privileged population.[1] There are many concepts those explain the correlation between childhood malnutrition and its risk factors. Waterlow (1992) describes a hierarchical model of the risk factors of malnutrition in 5 levels. Malnutrition, the 5th level, is directly influenced by anorexia (4th level) due to infection, neglected child, and lack of food (3rd level).[2] Kavishe (1996) describes the three kinds of risk factors, namely immediate, underlying and basic risk factors. Immediate risk factors are inadequate dietary intake and diseases such as diarrhea, acute respiratory tract infection, measles, malaria, worms and AIDS. Underlying risk factors are lack of enough foods, inadequate care of women and children, and poor health services and sanitation. Whereas basic risk factors consist of political, economic and cultural situations, which affect the under lying risk factors.[3] Pelletier (1994) describes a more complex relationship consisting of effect modification and confounding of biobehavioral determinants of child anthropometry and survival. This model explains that child's age, sex, socio-economic status, and season may all affect child's nutritional status and survival one or more following pathways: energy or nutrient availability as affected by intake and body reserves, disease exposure, immune status, and treatment of illness.[4] These models can explain the increase of malnutrition incidence among children during economic crisis that began in the middle of 1997 in Indonesia. During the economic crisis, food availability at the household levels often in short supply. The poor in rural areas, especially the landless, and the urban poor are more likely to be the first group to become malnourished.[5] Beside the economic sectors, the crisis also influences the health status, and worsens the nutritional status of the children. According to the data from the National Social and Economic Survey (SUSENAS) nutritional deficiencies among under five year old children (less than - 2 SD of weight for age using WHO-NCHS standard) dropped from 37.5% in 1989 to 29.5% in 1998, to 26.4% in 1999 to 17.13% in 2000. However, in the age group of 6 to 23 months old the prevalence of poor nutrition and malnutrition (less than - 3 SD of weight for age using WHO-NCHS standard) rose prior to and during the crises. Children living in the rural areas suffered more than those in urban areas, where the prevalence of moderate and severe malnutrition among under five-year children were higher in the rural areas than urban areas. Toward the end of 1999 approximately 25,000 children from all over Indonesia were reported to experience marasmus, kwashiorkor, and marasmic-kwashiorkor.[6] A wide variety of risk factors may exist among areas. Some of the risk factors are preventable. Understanding of significant risk factors of severe malnutrition may become beneficial input for preventive action. Preventable risk factors have more significant importance to increase child nutritional status than non-preventable risk factors. The aim of this study is to know the potential risk factors of severe malnutrition, namely the family, parental, housing, feeding, disease and health facilities.

METHODS

A case control study was carried out in Sleman and Bantul districts during the period of August

through November 2000. These districts were purposively chosen based on the practical considerations. Based on a preliminary data, there were 52 severely malnourished under five year old children recorded in the two districts. Out of the children there were 34 who were eliqible for this study. Two children were misdiagnosed as severe malnutrition by the health professionals, 1 child was excluded because of lacking of parental informed consent, 2 children were excluded because of technical difficulties, and 13 children had incomplete data which produced problems in data analysis. Sixty-eight wellnourished children from the same villages were chosen as controls. Twenty one risk factors of 6 groups were analyzed in this study. Demographic and nutritional status, housing, feeding, disease, and health facilities variables were collected in the beginning of the study. Interview was done to collect data about variables of demographic, feeding, common diseases such as fever, diarrhea, upper respiratory tract infection that occurred in the last week, and health facilities. The history of tuberculosis was confirmed with data from the health centers.

Dichotomous variables were analyzed using X^2 test or Fisher exact test to differentiate the proportion of two variables. Univariate and multivariate logistic regressions tested the Odd Ratios and 95% confidence intervals of 21 risk factors of getting severe malnutrition. Variables with p value of < 0.25 calculated in univariate analysis were included in the multivariate logistic regression analysis.[7]

RESULTS

There were 34 severely malnourished children (cases) and 68 wellnourished children (controls) were enrolled in this study.

Family characteristics

Most of children were the first or second children in the family, with more than 3 persons, and aged < 2 years in the control group, but > 2 years in case group, but there was no statistical difference (p>0.5) (TABLE 1). TABLE 2 indicates that there was no significant risk factor of these family variables.

Parental characteristics

Most of severely malnourished children came from families with low educated mother (61.8%) compared to wellnourished children (35.3%), and this difference was statistically significant (p = 0.01). A significant difference was also found in the occupation of mother, where most of the mothers of wellnourished children (77.9%) were housewives compared to severely malnourished children (55.9%) with a p value of 0.02 (TABLE 3). However, in multivariate analysis education level of mother was not a significant risk factor (TABLE 4).

Housing characteristics

TABLE 5 showed that the family of the children with severe malnutrition had bad water disposal (91.2%) compared to those who were

TABLE 1. - Characteristics of family variables

Variables	Wellnourished group	Severely malnourished group	p#
Number of children		22 (64.7%)	0.16
Number 1and 2	53 (77.9%)	12 (35.3%)	
Number > 2	15 (22.1%)		
Family size	10 (14.7%)	8 (23.5%)	0.27
3 persons	58 (85.3%)	26 (76.5%)	
> 3 persons			
Child Age	36 (52.9%)	12 (35.3%)\	0.09
< 2 years	32 (47.1%)	22 (64.7%)	
≥ 2 years			

#χ^2 test

TABLE 2. - Univariate and multivariate OR and 95% confidence intervals of family variables

Variables	p	Univariate		Multivariate	
		OR	95%CI	OR	95%CI
Number of children					
Number 1and 2		1		1	
Number > 2	0.16	1.93	0.78-4.77	1.30	0.31-5.41
Family size					
3 persons		1			
> 3 persons	0.27	0.56	0.20-1.58	-	
Child Age					
< 2 years		1		1	
≥ 2 years	0.09	2.06	0.88-4.82	0.58	0.11-3.04

TABLE 3. - Characteristics of parental variables

Variables	Wellnourished group	Severely malnourished group	p#
Education of father			
High[p]	49 (72.0%)	19 (55.9%)	0.10
Low[q]	19 (28.0%)	15 (44.1%)	
Education of mother			
High	44 (64.7%)	13 (38.2%)	0.01*
Low	24 (35.3%)	21 (61.8%)	
Occupation of father			
Others	38 (55.9%)	14 (41.2%)	0.16
Labor and farmer	30 (44.1%)	20 (58.8%)	
Occupation of mother			
Housewife	53 (77.9%)	19 (55.9%)	0.02*
Others	15 (22.1%)	15 (44.1%)	

[p]High school or higher
[q]Elementary school
*significant
#χ^2 test

TABLE 4. - Univariate and multivariate OR and 95% confidence intervals of parental variables

Variables	p	Univariate		Multivariate	
		OR	95%CI	OR	95%CI
Education of father					
High[p]		1		1	
Low[q]	0.10	2.04	0.86-4.81	1.91	0.36-10.00
Education of mother					
High		1		1	
Low	0.01	2.96	1.26-6.94*	1.34	0.33-5.49
Occupation of father					
Others		1		1	
Labor and farmer	0.16	1.81	0.79-4.17	0.83	0.21-3.36
Occupation of mother					
Housewife		1		1	
Others	0.02	2.79	1.15-6.77*	2.83	0.76-10.53

[p]High school or higher
[q]Elementary school
*significant

TABLE 5. - Characteristics of housing variables

Variables	Wellnourished group	Severely malnourished group	p#
Water			
Tap water	7 (10.3%)	3 (8.8%)	0.81
Non tap water	61 (89.7%)	31 (91.2%)	
Latrine			
Good	44 (64.7%)	16 (47.1%)	0.09
Bad	24 (35.3%)	18 (52.9%)	
Lighting			
Good	52 (76.5%)	28 (82.3%)	1.00
Bad	16 (23.5%)	6 (17.7%)	
Ventilation			
Good	45 (66.2%)	17 (50.0%)	0.11
Bad	23 (33.8%)	17 (50.0%)	
Water disposal			
Good	37 (54.4%)	3 (8.8%)	0.001*
Bad	31 (45.6%)	31 (91.2%)	

*significant
#χ^2 test

TABLE 6. - Univariate and multivariate OR and 95% confidence intervals of housing variables

Variables	p	Univariate		Multivariate	
		OR	95%CI	OR	95%CI
Water					
Tap water		1		1	
Non tap water	0.81	1.18	0.29 – 4.90	1.52	0.18-12.60
Toilet					
Good		1		1	
Bad	0.09	2.06	0.89 – 4.76	1.95	0.49-7.79
Lighting					
Good		1			
Bad	1.00	1.00	0.38 – 2.64	-	
Ventilation					
Good		1		1	
Bad	0.12	1.96	0.84 – 4.53	0.24	0.06-1.05
Water disposal					
Good		1		1	
Bad	0.00	12.33	3.44 – 44.24*	32.64	5.44 – 195.90*

*Significant

wellnourished (45.6%) and this difference was statistically significant (p = 0.001). Multivariate analysis demonstrated that family with bad water disposal had a 32 times greater risk of getting severe malnutrition, OR 32.64 (95% CI 5.44 - 195.90) (TABLE 6).

Feeding characteristics

TABLE 7 showed that most of severely malnourished children (70.6%) were not breastfed, whereas only 36.8% of wellnourished children were not breastfed (p = 0.001). Children who were not

breastfed having a 7 times risk of getting severe malnutrition compared to those who were breastfed, OR 7.01 (95%CI 1.35 - 36.48) (TABLE 8).

Disease characteristics: Tuberculosis was clearly a risk of severe malnutrition, since 70.6% of children with severe malnutrition had suffered from tuberculosis compared to 29.4% of wellnourished children (p = 0.001). Children with tuberculosis had a 11 times risk of getting severe malnutrition compared to those who were not, OR 11.52 95% (CI 1.43 - 92.64) (TABLE 9 and 10).

TABLE 10. Univariate and multivariate OR and 95% confidence intervals of disease variables

Health facilities characteristics. There was no difference of health facilities accessed in the two groups. Either families of children with severe malnutrition or wellnourished stated that they were difficult to access health facilities because of their

TABLE 7. - Characteristics of feeding variables

Variables	Wellnourished group	Severely malnourished group	p#
Breastfeeding			
Yes	43 (63.2%)	10 (29.4%)	0.001*#
No	25 (36.8%)	24 (70.6%)	
Exclusively breastfed			
Yes	33 (48.5%)	19 (55.9%)	0.48#
No	35 (51.5%)	15 (44.1%)	
Feeding pattern			
Good	62 (91.2%)	32 (94.1%)	0.46@
Bad	6 (8.8%)	2 (5.9%)	
Preparing food			
By mother herself	60 (88.2%)	32 (94.1%)	0.29@
Other	8 (11.8%)	2 (5.9%)	
Caring			
By mother herself	64 (94.1%)	33 (97.1%)	0.46@
Other	4 (5.9%)	1 (2.9%)	

@Fisher exact test
#$\chi 2$ test
*significant

TABLE 8. - Univariate and multivariate OR and 95% confidence intervals of feeding variables

Variables	p	Univariate		Multivariate	
		OR	95%CI	OR	95%CI
Breastfeeding					
Yes		1		1	
No	0.00	4.13	1.70 – 10.02*	7.01	1.35 – 36.48*
Exclusively breastfed					
Yes		1			
No	0.48	0.74	0.32 – 1.70	–	
Feeding pattern					
Good		1			
Bad	0.60	0.64	0.12 – 3.38	–	
Preparing food					
By mother herself		1			
Other	0.36	0.47	0.09 – 2.34	–	
Caring					
By mother herself		1			
Other	0.52	0.48	0.05 – 4.51	–	

*Significant

TABLE 9. - Characteristics of disease variables

Variables	Wellnourished group	Severely malnourished group	p#
Tuberculosis			
No	65 (95.6%)	24 (70.6%)	0.001*#
Yes	3 (4.4%)	10 (29.4%)	
Fever			
No	48 (70.6%)	25 (73.5%)	0.76#
Yes	20 (29.4%)	9 (26.5%)	
Diarrhea			
No	65 (95.6%)	32 (94.1%)	0.54@
Yes	3 (4.4%)	2 (5.9%)	
ARI			
No	35 (51.5%)	20 (58.8%)	0.48#
Yes	33 (48.5%)	14 (41.2%)	

*significant
@Fisher exact test
#$\chi 2$ test

TABLE 10. - Univariate and multivariate OR and 95% confidence intervals of disease variables

Variables	p	Univariate		Multivariate	
		OR	95%CI	OR	95%CI
Tuberculosis					
No		1		1	1.43 – 92.64*
Yes	0.00	9.03	2.29 – 35.62*	11.52	
Fever					
No		1			
Yes	0.76	0.86	0.34 – 2.17		
Diarrhea					
No		1			
Yes	0.74	1.35	0.21 – 8.51		
ARI					
No		1			
Yes	0.48	0.74	0.32 – 1.70		

*Significant

TABLE 11. - Characteristics of health facilities variables

Variables	Wellnourished group	Severely malnourished group	p#
Access to health service			
Easy	3 (4.4%)	3 (8.8%)	0.32
Difficult	65 (95.6%)	31 (91.2%)	
Immunization status			
Complete	65 (95.6%)	32 (94.1%)	0.41
Incomplete	3 (4.4%)	2 (5.9%)	

TABLE 12. - Univariate and multivariate OR and 95% confidence intervals of health facilities variables

Variables	p	Univariate		Multivariate	
		OR	95%CI	OR	95%CI
Access to health service					
Easy		1		-	
Difficult	0.38	0.48	0.09-2.50		
Immunization status					
Complete		1		-	
Incomplete	0.49	2.03	0.27-15.09		

limitation. However, most of children of the two groups were completely vaccinated (TABLE 11 and 12).

DISCUSSION

This study showed that there were 3 kinds of variables namely breastfeeding, sanitation condition (bad water disposal), and chronic disease (tuberculosis) which affect the nutritional status of under five year old children in the two districts studied. These findings are in line with risk factors presented by Waterlow (1992), Kavishe (1996) and Pelletier (1994).[2-4] All of these authors stated that food intake and diseases were the direct factors affected the nutritional status of children. Children with poor intake have a higher risk of getting malnutrition. Unfortunately we were not able to demonstrate this important factor, since analysis of food intake of all children could not be performed in this study because of technical limitation. However, in the other study food intake of severely malnourished children were calculated exclusively. Data showed that during the economic crisis, food intake of this group of children were lower than *Recommended Daily Allowances* (RDA) except for vitamin A.[8] One explanation is that the poor families could not supply enough food for their family members. Martin-Prével *et al.* (2000) reported an effect of devaluation of CFA franc on nutritional status of young children and their mothers in Brazzaville, Congo. The researchers showed the decline of quality of complementary feeding received by infants and young children due to the devaluation. The predominant factor in the decreased quality of complementary feeding would appear to be economic, as evidenced by the less frequent use of highest-cost foodstuffs, in particular in the poorest households.[9] Other report from Iraq concluded that under the long economic blockade, poor nutrition and under nutrition had become most common among infants and young children.[10]

It is interesting that breastfeeding is an important factor in this study, because most of severely malnourished under five year old children were not breastfed compared to who were wellnourished. The beneficial effect of breast milk as source of nutrients and its economic values are generally accepted. The WHO Global Database on Child Growth showed that Asia had higher rates of malnutrition than did Africa or Latin America. The possible explanations were in Asian countries there were poor practices relates to breastfeeding and the timing of introduction of complementary foods compared to those in Africa or Latin America.[11] A study done in Uganda showed that the risk of stunting was low for children who were breastfed for 18 months compared to those who were breastfed only in early infancy. Continuation of breastfeeding more than 18 months up to 24 months decreased the risk of stunting almost sevenfold.[12] The study from Cameroon explains that children age 6-12 months became malnourished may result from cessation of breastfeeding and greater contact with infectious agents in the environment. Thus this was only partly explained by weaning.[13] Islam et al. (1996) reported that lack of breastfeeding was associated with approximately fourfold increased risk of severe malnutrition.[14] Sanitation played important role in this study, since families with bad water disposal had risk factor of severe malnutrition in children. The WHO Global Database on Child Growth also emphasized the role

of all-round poor hygiene as a factor of malnutrition beside other factors such as poor care afforded to girls and women by husbands and elders and feeding practices.[11] It is likely that in our study this bad sanitation variable operated through other variables, such as the level of knowledge of the parents or economic status. Unfortunately we do not have any data needed to explain this condition. We had limitations in collecting data regarding the economic status of the family, since in this community it was not easy to collect valid data of family income. Based on general observation, families enrolled in this study were poor. A study performed in Jamaica showed that poor housing related to poor nutritional status of the children.[15] Furthermore, study in Bangladesh also confirmed that hygiene and sanitation were associated with severe malnutrition in children.[14] The nutritional status of the children is affected by diseases condition. Tuberculosis is an infectious disease, which is commonly associated with malnutrition, although the causal relationship of the two conditions is not clearly understood.[16] One explanation that children with tuberculosis have poor intakes because of anorexia. However, there is a bi-directional impact between malnutrition and tuberculosis. A study done in India found that most of children with severe tuberculosis had poorer nutritional status compared to children with localized tuberculosis or control group. This study demonstrated the role played by malnutrition in contributing to the clinical profile of the disease through its effect on the immune function.[16] Saiman *et al.* (2001) identified several risk factors for latent tuberculosis, and they found that contact with adult suffering from active tuberculosis, foreign birth, foreign travel, and a relative with positive tuberculin skin test were predictive of case status.[17] These risk factors identified in this study are preventable. Families with such risk factors have to be identified by health professionals. Attention must be paid on these families. The promotion of breastfeeding is still a significant preventive action to decrease the prevalence of severe malnutrition in poor community. Children with severe malnutrition should be checked for tuberculosis, and otherwise, children with tuberculosis should get proper nutrition to prevent severe malnutrition.

CONCLUSION

We concluded in this study that breastfeeding status, hygiene status, and tuberculosis are the potential risk factors of severe malnutrition among under five year old children.

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