SOCIOECONOMIC DETERMINANTS OF MALNUTRITION AMONG CHILDREN UNDER THE AGE OF FIVE IN EASTERN INDONESIA

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Abstract

Malnutrition among children under the age of five is a major public health problem in Indonesia, especially in eastern Indonesia. Based on a report by Indonesia Basic Health Research (RISKESDAS) released by Ministry of Health Republic of Indonesia in 2013, the highest prevalence of malnutrition among children in Indonesia was dominated by provinces in Eastern Indonesia including East Nusa Tenggara, West Papua, Maluku and West Sulawesi. High prevalence of child malnutrition in eastern Indonesia could be impacted by low socioeconomic backgrounds. Indonesia Central Bureau of Statistics (BPS) data 2015 showed, the high poverty rate in Indonesia was still dominated by provinces in eastern Indonesia including West Papua, East Nusa Tenggara, Maluku and Gorontalo. The objective of this paper is to assess the impact of socioeconomic factors to malnutrition among children age group 0-59 month old in eastern Indonesia. This study used cross-section data obtained from Indonesian Family Life Survey (IFLS) East 2012. The number of samples was 1.095 children and child nutritional status was categorized into two groups-malnourished and adequate according to WHO Child Growth Standards 2006. Ordinary Least Square (OLS) and probit models were used to determine socioeconomic determinants of malnutrition. Both of OLS and probit regressions showed that probability of malnutrition was higher among children in age group 12 to 47 months old. Malnutrition was also associated to children who were born in forth of his/her birth order or live in bigger household size. On the other hand, household expenditure for food, parent with university education and skilled birth attendant were factors which statistically significant to reduce child malnutrition probability.

Keywords: Malnutrition, Children Under-five, Socioeconomic, Eastern Indonesia.

INTRODUCTION

In 2006 the National Commission on Macroeconomics and Health, World Health Organization (WHO) released a report about macroeconomic and health conditions in Indonesia. The report mentioned that the economic crisis in 1997 increased the poverty rates and declined the level of public health in Indonesia. The economic crisis caused percapita income decreased from US$ 1,120 to US$ 600 and the poverty rates increased to 18% of the population placing Indonesia on 112th among 175 countries in the UNDP Human Development Index. The economic crisis also caused a decline in the health of Indonesian society, which was marked by increasing cases of maternal and infant mortality, HIV/AIDS, malaria and tuberculosis. One of the main priorities of the National Commission on Macroeconomics and Health in the health sector in Indonesia was malnutrition because malnutrition has become one of the main causes of increased child

mortality under the age of five in Indonesia. In 2004, 38 of 1000 children under five in Indonesia died caused by malnutrition and infectious diseases (WHO, 2006).

Malnutrition among children under the age of five is major health problem in Indonesia, especially in eastern Indonesia. Based on a report by Indonesia Basic Health Research (RISKESDAS) 2013 released by Ministry of Health Republic of Indonesia, the highest prevalence of malnutrition among children under five years old in Indonesia was dominated by provinces in Eastern Indonesia including East Nusa Tenggara (33.0%), West Papua (30.9%), Maluku (28.3%) and West Sulawesi (29.1%) (Kementrian Kesehatan Republik Indonesia, 2014). High prevalence of child malnutrition in eastern Indonesia could be impacted by low socioeconomic backgrounds. According to a report of Central Bureau of Statistics (BPS) Republic of Indonesia, until 2015 the highest percentage of poverty rates in Indonesia was dominated by provinces in eastern Indonesia. Papua was the province with the highest poverty rate which was about 28,40%, followed by West Papua 25,73%, East Nusa Tenggara 22,58%, Maluku 19,36% and Gorontalo 18,16% (Badan Pusat Statistik Republik Indonesia, 2016).

Another factor that could lead to the high prevalence of child malnutrition in eastern Indonesia is the lack of professional medical personnel. Based on data from the Ministry of Health of the Republic of Indonesia 2015, Nusa Tenggara-Maluku-Papua was the region with the lowest number of doctors and midwives in Indonesia. By 2015 there were about 38.53% of community health center (Puskesmas) in Indonesiahave excessof doctors, while 35.9% of community health centers have enough doctors and 25.57% of community health centers have lack of doctors. By region, the largest percentage of community health center with adequate and excess of doctors was Java-Bali (82.8%) and Sumatra (81.7%). Meanwhile, the Nusa Tenggara-Maluku-Papua was the region with the largest percentage of community health center with the shortage of doctors reaching 52.78%. Beside the shortage of doctors, Nusa Tenggara-Maluku-Papua was also the region with the largest percentage of community health center with the shortage of midwives reaching 68.85% (Kementerian Kesehatan Republik Indonesia, 2016).

METHODS

Data Source

This study used cross-sectional data obtained from Indonesian Family Life Survey (IFLS) East 2012. IFLS East 2012 is a large multi-topic data about individual, household and community located in eastern Indonesia. The survey was conducted on 10,000 individuals in 2,500 households living in 99 communities in seven provinces in eastern Indonesia including East Nusa Tenggara, East Kalimantan, Southeast Sulawesi, Maluku, North Maluku, West Papua and Papua. The IFLS East survey can be divided into two types: household survey and community survey. The questionnaire for household survey contains questions on individual and household level such as income, consumption, employment/pension status, education and health history, marital history, household asset, decision making in the household and etc. Meanwhile, the community survey was conducted to determine the characteristics of the village. The Community survey addressed to village leaders as well as parents. The questionnaire contains questions about history, economic infrastructure, and other physical infrastructure such as road conditions and electricity availability in village (IFLS-East User's Guide and Field Report, 2013).

Malnutrition

Children nutritional status was measured by the anthropometry measurements based on WHO Child Growth Standars 2006 which is a refinement of previous anthropometry measurements issued by the National Center for Health Statistics U.S.A and had been recommended by World Health Organization since 1995. An anthropometry indicator is a combination of body measurement (weight/height) and age. In general, malnutrition category based on anthropometry measurements is divided into three categories: height-for-age (stunting), weight-for-age (underweight) and weight-for-height (wasting). Children are categorized as stunting/underweight/wasting if the standard deviation on anthropometry measurement is less than minus two (WHO, 2006). In this study children nutritional status were categorized into two groups-malnourished and adequate. Children are categorized as malnutrition (stunting/underweight/wasting) if the standard deviation on anthropometry measurement is less than minus two (z-score < -2 SD) and Children are categorized as adequate if the standard deviation on anthropometry measurement is equal/more than minus two (z-score ≥ -2 SD).

Socioeconomic Variables

Historically, malnutrition prevalence has been related to household socioeconomic factors such food and

health care (Kandala, N.-B., Madungu, T. P., Emina, J. B., Nzita, K. P., & Cappuccio, F. P, 2011).In this study, socioeconomic variables are determined based on the child characteristics, parents characteristics, household characteristics, and pregnancy history. The child characteristics including Age, gender, and birth order variables. The parents' characteristics including household expenditure for food, and household size variables. Household characteristics including highest education level of parents variable, and pregnancy history including prenatal visit, postnatal care, and medical personnel variables.

Age variable is divided into five categories: 0-11 months old, 12-23 months old, 24-35 months old, 36-47 months old and 48-59 months old. Age variable is a dummy variable in which, the age of 48-59 months old is determined as base category. Gender variable is divided into two categories: male for male child and female for female child. Gender variable is dummy variable in which female variable is determined as base category. Child nutritional status could be affected by birth order. In this research, Birth order variable was divided into five categories: first order, second order, third order, fourth order, and fifth or higher order children. The birth order variable is a dummy variable in which fifth or higher order children is determined as base category.

In household level, household expenditure for food and Household size are variables which could affect child malnutrition in eastern Indonesia. Household expenditure for food variable is total household expenditure for food per month in Indonesia rupiah. House hold expenditure for food variable is converted to log variable to make the data more normally distributed. Another variable is household size. Household size variable is the number of individuals who live a household.

Highest level of education is related to the level of knowledge that can affect the decision-making process. In this study, highest education level of parents' variable was chosen because every decision in household level is decided by both of husband and wife. Highest education level of parents variable was divided into five categories: parent education unschooled for parents who have never received education, parent education elementary school for parents with the highest level of education in primary education or equivalent, parent education junior high school for parents with the highest level of education in secondary education or equivalent, parent education senior high school for parents with the highest level of education in senior High School or equivalent, and parent education university for parents with highest level of education in college. Highest education level of parents' variable is dummy variable in which parent education unschooled is determined as base category.

Prenatal and postnatal cares are the potential determinants of childhood malnutrition (Hamel, C., et al. 2015).Prenatal care are represented by prenatal visit variable. Prenatal visit variable is related to maternal and child health checkups during pregnancy.During prenatal visit, mother gets prenatal care including nutritional advice (Forero Ramirez, N., Gamboa, L. G., Bedi, A., & Sparrow, R. 2014). Based on the Mother and Child Health Guidebook (KIA) of the Ministry of Health of the Republic of Indonesia the pregnancy checkups should be done at least four times during pregnancy (Kementrian Kesehatan Republik Indonesia, 2015). Therefore in this study, prenatal visit variable was divided into three categories including prenatal visit1, if the number of pregnancy checkups is Less than four times, prenatal visit2 if the number of pregnancy checkups is four times to nine times (assuming mother does pregnancy checkups every month) and prenatal visit3 if the number of pregnancy checkups is more than nine times.Prenatal visit variable is a dummy variable in which prenatal visit2 was determinded as as base category. Meanwhile, postnatal care is represented by forty days care variable. Forty days care variable is divided into two categories: forty days care1 if mother gets 40 days assistance after gave birth, and forty days care2 if mother doesn't get 40 days assistance after gave birth. Forty days care variable is dummy variable in which forty days care2 was determined as base category. Another potential determinant of childhood malnutrition is birth attendant. According to a report from WHO, using a skilled birth attendant at birth can contribute to good health through the life cycle (WHO, 2006). Birth attendant variable is divided into two categories: skilled birth attendant including doctor, private midwife, village midwife, and nurse and unskilled birth attendant including not assisted, traditional midwives, family and others. Birth attendant variable is a dummy variable in which unskilled birth attendant is determined as base category.

Statistical Analysis

Ordinary Least Square (OLS) and Probit regression analysis were used to calculate the impact socioeconomic variables on malnutrition among children under five in eastern Indonesia. Malnutrition as dependent variable is a binary variable (malnourised and adequate). The value of malnutrition is one if child is malnourished and zero if child is adequate.Unlike OLS model that the coefficients of independent variables direcly can predict the effect on the dependent variable. In the probit model, the effect of independent

variables on the dependent variable is predicted based on the marginal effect. All statistical analyses were carried out using STATA/SE version 12 (STATA Corp.,College Station, USA) for statistical analysis. The result of standard error has been adjusted so there is no heterokedasticity.

RESULTS

Tabel 4.1 contains descriptive statistics of socioeconomic variables of malnutrition among children under the age of five. Socieconomic variables as the independent variables are categorized based on child's characteristics,household's characteristics, parent's characteristics and pregnancy history.

Tabel 4.1 Descriptive Statistics of Socioeconomic Variables of Malnutrition among Children under the Age of Five in Eastern Indonesia

Variables	Mean	Std. Dev.	Min	Max
Malnutrition (z-score < -2)	0,5017921	0,500221	0	1
Child Characteristics				
	0,5197133	0,4998352	0	1
Age1 (0-11 months)	0,2267025	0,4188863	0	1
Age2 (12-23 months)	0,1989247	0,3993703	0	1
Age3 (24-35 months)	0,2016129	0,4013845	0	1
Age4 (36-47 months)	0,1917563	0,3938589	0	1
2nd birth order	0,2275986	0,4194701	0	1
3rd birth order	0,187276	0,3903078	0	1
4th birth order	0,1146953	0,3187968	0	1
5th birth order	0,2159498	0,4116641	0	1
Household Characteristics				
HHfood expend. (in IDR/month)	2.250.546	1.759.527	199.333	14.200.000
LogHH food expend (per month)	14,37101	0,7207409	12,203	16,469
Household size	5,572581	2,105112	2	16
Parent's Characteristics				
(Parent's Highest Education)				
Parent Edu. Elementary school	0,2473118	0,431643	0	1
Parent Edu. Junior high school	0,1899642	0,3924484	0	1
Parent Edu. Senior high school	0,3655914	0,4818115	0	1

Parent Edu. University	0,1774194	0,3821945	0	1
Pregnancy History				
Prenatal visit1 (< 4 times)	0,1415771	0,3487721	0	1
Prenatal visit3 (> 9 times)	0,1729391	0,3783641	0	1
40days care (Yes/ No)	0,4605735	0,4986666	0	1
Skilled birth attendant (Yes/No)	0,5250896	0,499594	0	1
Total Samples	**1.095**			

Source: IFLS east 2012, processed.

Based on data obtained from the Indonesian Family Life Survey (IFLS) East 2012, We found that 551 children (50.32%) of 1.095 children are malnourished. Furthermore, 330 children (30.14%) are moderately malnourished nutrition, and 221 children (20,18%) are severely malnourished.

The estimation of OLS and Probit models showed the similarity of coefficient value of OLS model and marginal effect value of probit model. This is caused by the marginal probability value of the OLS model and the marginal effect of the probit model are in the same range (zero to one). Table 4.2 shows the age of child, birth order, log household expenditure for food, household size, parents' highest education, and skilled birth attendant are the factors that statistically significant influence the probability of malnutrition among children under the age of in eastern Indonesia.

Table 2. Ordinary Least Square (OLS) and Probit Models Estimation

Variable	**OLS**	**Probit**	
	Coeficient	Coeficient	*Marginal effect*
Male	0.004	0.007	0.003
	(0.029)	(0.078)	(0.10)
Age1 (0-11 months)	-0.017	-0.026	-0.010
	(0.047)	(0.123)	(0.22)
Age2 (12-23 months)	**0.094****	**0.250****	**0.094****
	(0.07)	**(0.123)**	**(2.04)**
Age3 (24-35 months)	**0.088***	**0.233***	**0.088***
	(0.045)	**(0.119)**	**(1.97)**
Age4 (36-47 months)	**0.097****	**0.256****	**0.096****
	(0.047)	**(0.124)**	**(2.07)**
2nd birth order	-0.042	-0.108	-0.041

	(0.043)	(0.113)	(0.97)
3rd birth order	0.022	0.061	0.023
	(0.046)	(0.119)	(0.51)
4th birth order	**0.094***	**0.252***	**0.095***
	(0.052)	**(0.140)**	**(1.81)**
5th birth order	-0.039	-0.103	-0.039
	(0.045)	(0.118)	(0.87)
LogHH food expend	**-0.091*****	**-0.238*****	**-0.090*****
(per month)	**(0.022)**	**(0.06)**	**(4.07)**
Household size	**0.013***	**0.035***	**0.013***
	(0.007)	**(0.019)**	**(1.78)**
Parent Highest Education	-0.109	-0.311	-0.117
Elementary school	(0.099)	(0.298)	(1.05)
Parent Highest Education	-0.152	-0.424	-0.160
Junior high school	(0.101)	(0.302)	(1.41)
Parent Highest Education	-0.123	-0.349	-0.132
Senior high school	(0.099)	(0.299)	(1.17)
Parent Highest Education	**-0.188***	**-0.519***	**-0.196***
University	**(0.104)**	**(0.310)**	**(1.68)**
Prenatal visit1	0.014	0.037	0.014
(< 4 times)	(0.047)	(0.125)	(0.29)
Prenatal visit3	0.012	0.032	0.012
(> 9 times)	(0.036)	(0.095)	(0.034)
40days care	0.029	0.077	0.029
(Yes/ No)	(0.030)	(0.078)	(0.98)
Skilled birth attendant	**-0.126*****	**-0.325*****	**-0.123*****
(Yes/ No)	**(0.039)**	**(0.087)**	**(3.81)**

Constant	**1.867*** **	**3.603*** **	
	(0.327)	**(0.880)**	

Robust (Standard errors)

*** p<0.01, ** p<0.05, * p<0.1

Based on the probit model, table 2. shows that children aged 12-47 months old are more likely to be malnourished. The probability of children aged 12-23 months and 36-47 months to be malnourished increases by about 9.4 percentage points and about 9.6 percentage points respectively, compared to children aged 48-59 months (p<0.05). While the probability of children aged 24-35 months to be malnourished increases by about 8.8 percentage points compared with children aged 48-59 months (p<0.1). The probability of children who were born in forth of his/her birth order to be malnourished increases by about 9.5 percentage points compared to children who were born in first of his/her birth order (p<0.1). It could be caused by better facilities that the first child gets than the older children in the family (Chaudhuri, A., 2004).

In the household level, log household expenditure for food is a variable which negatively significant influence malnutrition among children under five years. An increase in household expenditure for food by 1% descreases the probability of being malnourished by about 9 percentage points (p<0.01). This founding support the previous studies which also found that food consumption was a strong proximate determinant for malnutrition. Children are more likely to be malnourished due to low intake of food and less access to food (De Onis M, Blössner M, Borghi E., 2012). On the other hand, household size variable is a variable which positively significant influence child malnutrition. An increase in household member by one person increases the probability of being malnourished by about 1.3 percentage points (p<0.1). Previous research found that a bigger household size could make fewer availability of resources in household (Filmer, D., Friedman, J., & Schady, N. 2009) and fewer food resources in household make children more likely to be malnutrition (Demissie, S. 2013).

Parent highest education variables, from elementary to university level, have a negative relationship in influencing children malnutrition. However, the regression result shows only the parent highest education in university level variable which statistically significant influence children malnutrition. The probability of children to be malnourished decreases by about 19.6 percentage points in parent who has the highest level of education in university level than parents who do not have education (p<0.01). This founding support previous studies that said that parental education is an important determinant of child malnutrition. A previous study In indonesia by Mayang Sari also found that child malnutrition was significantly associated to lower parents' education (Sari M. et. al, 2009). Skilled birth attendant variable has a negative and significant relationship in influencing children malnutrition. It is because Skilled birth attendance has a big role, to give adequate care during prenatal, delivery and post-natal process (WHO, 2004). The regression result shows that the probability of children be malnourished decreases about 12.3 percentage points in children whose birth were assisted by skilled birth attendant compared with children whose birth were not assisted by skilled birth attendant (p<0.1).

CONCLUSION

The results of this study found that socioeconomic determinants have an influence on malnutrition among children under the age of five years in eastern Indonesia. Log household expenditure for food and skilled birth attendant variables are the most significant factors affecting children malnutrition. Other variables that significantly influence malnutrition among children under five years in eastern Indonesia are household size, birth order of children, and parent highest education. Both of OLS and probit regressions show that probability of malnutrition is higher among children in age group 12 to 47 months old. The Wide range of the age group indicated that nutritional condition of children under-five in eastern Indonesia is very critical.

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