Biopsychosocial Factors Associated with Child Growth at Ngembal Kulon Community Health Center, Kudus

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ABSTRACT

Background: The first five years of life is widely acknowledged as a sensitive period for child growth. Any interruption exposing during this period may cause problems in child growth. Various internal and external factors can affect child growth. This study aimed to analyze the effects of biopsychosocial factors associated with child growth with life course perspective.
Subjects and Method: This was an observational analytic study with cross-sectional design. It was conducted at Ngembal Kulon community health center, Kudus, Central Java, from December 2016 to February 2017. A total sample of 160 children aged 1 to 5 years old and their mothers were selected for this study by purposive sampling. The dependent variable was child growth as measured by weight for age (WAZ) and height for age (HAZ). The independent variables were birth weight, body length at birth, maternal height, number of children, and family income. The data was collected by a set of questionnaire. Child and maternal heights were measured by microtoise. Data on birthweight and body length at birth were obtained from maternal and child health book. Multiple linear regression was used for data analysis on Stata 13.
Results: Child growth (WAZ) was associated with family income (b= 0.36; 95% CI= 0.22 to 0.49; p<0.001), birthweight (b= 0.42; 95% CI= 0.25 to 0.58; p<0.001), and number of children (b= -0.25; 95% CI= -0.42 to -0.08; p=0.004). Child growth (HAZ) was associated with family income (b= 0.26; 95% CI= 0.12 to 0.39; p<0.001), body length at birth (b=0.21; 95% CI= 0.12 to 0.30; p<0.001), and maternal height (b= 0.43; 95% CI= 0.27 to 0.58; p<0.001).
Conclusion: Child growth (WAZ) is associated with family income, birthweight, and number of children. Child growth (HAZ) is associated with family income, body length at birth, and maternal height. Life course influences were demonstrated in this study.

Keywords: child growth, WAZ, HAZ, birthweight, body length at birth, number of children, maternal height, family income

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BACKGROUND

Based on demographic data, children aged 0-4 years contributed 9.4% of Indonesia's population of 252,124,458 people in 2014 and increased in 2015 (Ministry of Health RI, 2015; Ministry of Health RI, 2016). The number of children aged 0-4 years in Kudus contributed 10% of the total population of 797,003 people (Kudus District Health Office, 2014; Kudus District Health Office, 2015).

Toddlers are a critical period for children's growth. Health problems often occur at this time such as the increasing prevalence of malnutrition, high stunting problems and high incidence of over nutrition.

Basic Health Research in 2013 noted the prevalence of malnutrition among children under five (BB/U<-2SD) and it gave a fluctuating picture of 18.4% in 2007 decreased to 17.9% in 2010 then increased again

to 19.6% in 2013 (Ministry of Health RI, 2013).

The prevalence of malnutrition is increasing in 2015 which is 48.9% (Ministry of Health RI, 2016). In addition, the number of children with over nutrition in 2013 identified from the age of a toddler showed a fairly large number of 11.9% (Ministry of Health RI., 2013). In addition, the prevalence of very thin in 2013 was still quite high at 5.3% despite showing a decrease compared to 2010 of 6.0% and in 2007 of 6.2%. Likewise, the prevalence of obese children experienced a national decline in 2013 in Indonesia was 11.9% from 14% in 2010. Based on data on obese children in Central Java Province included in the 12 major provinces, Central java included to the province with a high prevalence of obesity (Ministry of Health RI, 2013).

In the Ngembal Kulon Health Center which is one of the health centers in Kudus Regency and has the most underweight children in 2014, there were 102 children and children under five years old amounting to 129 children (Kudus District Health Office, 2015). Based on interviews with the Midwife Coordinator at the Ngembal Kulon Health Center, it shows that the community awareness for growth monitoring is still lacking. One of the influencing factors is that most parents work so that most of the children under five are entrusted, cared for by a maid, or their grandmother.

The government's efforts to improve the quality of future generations by providing early detection facilities for growth and development and posyandu services are not necessarily well responded by the community. Based on the results of basic health research in 2013, the percentage of children aged 6-59 months who had never been weighed in the last six months tended to increase from 2017 at 25.5%, in 2010 amounted to 23.8% and in 2013 amounted to 34.3%.

The Ministry of Health Republic of Indonesia survey (2015) states that data on health services for children under five in Indonesia is 75.82%. This figure is not really different from the coverage of under-five health services based on the Central Java Provincial Health Office (2014), the coverage of children under five health services in Central Java Province is 86.9%, while the health service coverage in Kudus Regency is 81.6% (Kudus District Health Office, 2015). The coverage of health services for children under five in Kudus Regency was not achieved because the public awareness of the importance of early detection of child growth and development deviations carried out in Posyandu was still very low. The Ngembal Kulon Health Center is one of the puskesmas that has a targeted participation in the Posyandu, which is 82.2% (Kudus District Health Office, 2015). This figure still cannot reach the national target stated in the Decree of the Minister of Health of the Republic of Indonesia No: 828/MENKES/SK/IX/2008 which is 90%.

A study conducted by Muqni et al. (2012), states that toddlers who were born with LBW or normal weight had the same opportunities to be fat or thin. Other factors that can also influence children's growth are parenting, eating patterns and infectious diseases suffered by children. These three factors contribute positively to improving malnutrition (Isnaini, 2016). Therefore, it can be concluded that the things that can influence the growth of children, namely the adequacy of food and parenting, are influenced by family food security related to family income, maternal work, maternal education, and maternal knowledge about nutrition and health (Soetjiningsih, 2014).

This study aims to determine the effect of family income, number of children, birth weight, body length, and maternal height on the child's growth.

SUBJECTS AND METHOD

1. Study Design

This was an analytic observational study with a cross sectional design. The study was conducted at the Ngembal Kulon Health Center, Kudus, Central Java, from December 2016 to February 2017.

2. Population and Samples

The population in the study was children aged 1-5 years in Ngembal Kulon Health Center, Kudus, with a total of 1,346 children. A total sample of 160 children aged 1-5 years old and their mothers were selected for this study by purposive sampling.

3. Study Variables

The independent variables were family income, number of children in the family, birth weight, birth length, and maternal height. The dependent variable was the child growth weight for age (WAZ) and height for age (HAZ).

4. Operational Definition of Variables

The growth of children under five according to WAZ was a change in the body size of a child that can be measured by weight (in kilograms). Growth of children under five according to HAZ was a change in the body size of a child that can be measured by height (in centimeters).

Family income was the amount of fixed and side income from the head of the family, mother and other family members in 1 month in million rupiah. The number of children was the number of children born to a mother in a family life.

Birth weight was a measure of the baby's body weight at birth in kilograms. Birth length was the size of the baby's body length at birth in cm.

Maternal height was a measure of maternal height that can be seen through maternal and child health in cm.

5. Study Intruments

The data collection technique on family income, number of children and birth weight of children, date of birth of children were conducted by using questionnaires, while for collection of BB children was done by weighing childbirth, child TB and maternal TB was done by measuring using a TB meter at the posyandu or home visits using scales with brand *one met*. Then the weighting results of BB according to age were converted into standard devision using the WHO antro application.

6. Data Analysis

The data were analyzed by univariate, bivariate, and multivariate analysis. Multivariate analysis was conducted by a multiple linear regression.

7. Research Ethics

In this study, the ethical protection of research subjects was conducted before conducting the study. This study already got the approval from the Ethical Health Research Ethics Commission's of Dr. Moewardi hospital, Surakarta/ Universitas Sebelas Maret Faculty of Medicine with number 983/ XI/ HREC/ 2016 issued on November 21, 2016.

RESULTS

1. Characteristic of Study Subjects

The characteristics of the study can be seen in table 1 which shows that the characteristics of mothers and children under five in Ngembal Kulon Community Health Center area were 124 subjects (77.5%), most of the mothers were under in an reproductive age. Most of the mothers were housewives (47.5%). The majority of mothers whose children were the subject of the study were the first child of 59 samples (36.9%), with

children aged around 24 -35 months at 57 samples (35.6%) and male (59.4%).

2. Bivariate Analysis

The bivariate analysis was carried out by Pearson correlation test between each independent variable on one dependent variable. The results of the correlation test between family income and child growth (body weight/age). Family income (r= 0.46; p <0.001), there was a positive correlation birth weight and child growth (body weight/age) (r= 0.46; p= 0.001), and number of children (r= 0.31; p<0.001) increased child growth (body weight/age).

Table 3 described the results of the Pearson correlation test between family income, birth length, and maternal height on the child growth (body height/age). Table 3 showed that family income (r= 0.35; p<0.001), birth length (r= 0.43; p<0.001), and maternal height (r= 0.43; p<0.001) increased child growth (body height/age).

Table 1. The Characteristics of the Study Subjects

Characteristics	Frequency	Percentage (%)
Maternal age (year)		
< 20 years	0	0%
20 – 35 years	124	77.5%
≥35 years	36	22.5%
Maternal Occupation		
Private Employee	19	11%
Housewife	76	47.5%
Company worker	34	21.3%
Enterpreneur	28	18.5%
Civil Servant	3	1.9%
Number of children		
<2 children	59	36.9%
≥ 2 children	101	63.3%
Toddlers (month)		
12-14 months	5	3.1%
15-17 months	7	6.9%
18-23 months	26	16.3%
24-35 months	57	35.6%
36-47 months	31	19.4%
48-60 months	30	18.8%
Gender		
Male	95	59.4%
Female	65	40.6%
Family		
<minimum wage	73	45.6%
≥minimum wage	87	54.4%
Z score (WAZ)		
Severe malnutrition (<-3)	3	1.9%
Malnutrition (-3 to <-2)	28	17.5%
Good nutrition (-2 to 2)	125	78.1%
More nutrition (≥ 2)	4	2.5%
Z score (WHZ)		
Very short (<-3)	4	2.5%
Short (-3 to <-2)	31	19.4%
Normal (-2 to 2)	122	76.3%
High (≥2)	3	1.9%

Table 2. The results of Pearson correlation test on child growth (WAZ)

Independent Variables	r	p
Family income	0.46	<0.001
Birth weight	0.46	<0.001
Number of children	-0.31	<0.001

Table 3. The results of Pearson correlation test on child growth (WHZ)

Independent Variables	r	P
Family income	0.46	<0.001
Body length at birth	0.42	<0.001
Maternal height	0.43	<0.001

Table 4. The results of a multiple linear regression of family income, birth weight, and number of children, on child growth (WAZ)

Independent Variable	b	95% CI		p
		Upper Limit	Lower Limit	
Constants	-0.10	0.38	-0.57	<0.696
Family income (x Rp 1,000,000)	0.36	0.49	0.22	<0.001
Birth weight	0.42	0.58	0.25	<0.001
Number of children	-0.25	-0.08	-0.42	<0.004
N observation= 160				
Adjusted R^2= 0.356				
p<0.001				

3. Multivariate Analysis

The analysis used was a multiple linear regression to examine the associations of family income, birth weight, and the number of children, on child growth (WAZ).

Table 4 showed that there was a positive relationship between family income, birth weight, and number of children on and child growth (WAZ).

Table 4 showed that family income (b= 0.36; 95% CI= 0.22 to 0.49; p<0.001) and birth weight (b= 0.42; 95% CI= 0.25 to 0.58; p<0.001) increased child growth (WAZ).

Table 4 showed that number of children decreased child growth (WAZ) (b= -0.25; 95% CI= -0.42 to -0.08; p= 0.004).

Table 5 explained that there was a positive relationship between family income, birth length, and maternal height with child growth (WHZ). Table 5 showed that family income (b= 0.26; 95% CI= 0.12 to 0.39; p <0.001), birth length (b= 0.21; 95% CI= 0.12 to 0.30; p<0.001), and maternal height (b=0.43; 95% CI= 0.27 to 0.58; p<0.001) increased child growth (WHZ).

Table 5. The results of a multiple linear regression of family income, birth weight, and number of children, on child growth (WHZ)

Independent Variable	b	95% CI		p
		Upper Limit	Lower Limit	
Constants	-0.40	-0.08	-0.70	<0.013
Family Income (x Rp 1,000,000)	0.26	0.39	0.12	<0.001
Body Length at Birth (cm)	0.21	0.30	0.12	<0.001
Maternal Height (cm)	0.43	0.58	0.27	<0.001
N observation = 160				
Adjusted R^2 = 35.8%				
p<0.001				

DISCUSSION

1. The effects of family income, birth weight, and number of children, on child growth (WAZ)

Based on the results of analysis by using multiple linear regression, it showed that only 36.8% that explained variations in child growth according to age were affected by family income, birth weight, and the number of children. While the rest 63.2% was explained by the reasons beyond these factors.

This was in accordance with the theory of growth according to Ministry of Health RI (2012) and Daelmans (2015) which stated that the factors that can affect the growth were not only family income, birth weight, and the number of children in the family. However, factors that can affect the child growth were internal factors in toddlers, such as race/ ethnicity or nation, family, age, gender, genetic and chromosomal abnormalities, and external factors namely prenatal factors (nutrition, mechanics, toxins/ chemicals, endocrine, radiation, infection, immunological disorders, embryo anoxia, and maternal psychology), labor factors, and postpartum factors (nutrition, chronic diseases/ congenital abnormalities, physical and chemical, psychological, endocrine, socio-economic, environment, stimulation, and drugs).

This study only revealed by 36.8% that income factor, birth weight, and the number of children in the family affected child growth (WAZ).

If each independent variable showed that family income has a positive and significant relationship to the child growth (WAZ). The result of this study was supported by Lu et al. (2016), which stated that high family income would reduce the incidence of malnutrition. Similar thing also stated by Onis et al., some studies conducted in several Asian and African countries that took a large sample of about 171 million children aged 0 to 60 months old revealed that high family income would reduce the incidence of underweight.

The result of analysis showed that there was a negative and significant relationship between the number of children in a family and child growth (WAZ). The result of this study was in accordance with Prasetyo et al. (2008) which stated that the number of children ≥ 4 in a family would increase the problem of poor nutritional status than the first child by 1.3 points. This was because parents' attention has been shared with all their children and they tend to pay attention to the youngest child. Different statement stated by Karundeng et al. (2016) in his study which used 246 samples, it was found that the number of children did not affect the toddler's nutritional status. This phenolmenon was interpreted that a lot of children would make the mothers to be more experienced in nurturing their children.

2. The effects of family income, birth length, and maternal height, on child growth child growth (WHZ)

The effect of family income, body length, and maternal height, on child growth (WHZ) only provide 37% of contribution, this mean that there were many other factors which involved and might have greater effect. This was in accordance with Ibrahin and Faramita (2015) which stated that maternal education could give a significant effect on the incidence of stunting.

Similar thing also stated by Ni'mah and Nadliroh (2015), a study conducted on children aged 12-59 months old by using chi square test revealed that there was a relationship between toddler's birth length, history of exclusive breastfeeding, family income, maternal education, and maternal nutritional knowledge on the incidence of stunting in toddlers. In addition, Nadiyah

(2014) also explained that there were other factors that affect child growth (WHZ), which was more emphasized in the incidence of stunting. The results of chi-square test showed that there was a positive and significant relationship between low birth weight, poor sanitation, father's smoking habit at home, low maternal education, low father's education, low income, and maternal height <150 cm with the incidence of stunting among children aged 0-23 months old. In addition, based on the results of logistic regression tests, it showed that low birth weight, maternal height <150 cm, poor sanitation, and prelacteal feeding were the risk factors for stunting.

Genetic factors possessed by parents, especially mothers, have a contribution to child birth length (Ministry of Health RI, 2012; Rieger and Trommlerová, 2016; Amin and Hadi, 2015). Babies born with normal or long body length which have the possibility of an enhancement on their height were 3 times more likely to experience stunting (Amaliah, 2016).

Child growth pattern according to Santrock (2011) stated that the height of the eldest child of urban middle socio-economic status was higher than non-eldest children from rural low socio-economics status. The result of this study showed that the majority of children were 59 (36.9%) and it was found that children who had a short classification (-3 to -2) were 31 research subjects (19.4%), normal (-2 to 2) were 122 research subjects (76.3%) and high (>2) were 3 samples (1.9%). Although the data showed that most of the samples were the eldest children, the impact could not be seen directly because the research tests were not conducted. This study was in line with Rieger and Trommlerová (2016) who stated that children's height was affected by their body length at birth that would always increase as they grow up.

There was a positive and significant effect of family income on the child growth (WHZ). The result of this study was supported by Lu et al., (2016), which stated that high family income would reduce the incidence of stunting. Similar thing was also stated by Onis et al., (2011) that some studies conducted in several Asian and African countries that took a large sample of about 171 million children aged 0 to 60 months old showed that families with high income would reduce the incidence of stunting.

There was a positive and significant relationship between body length at birth and child growth (WHZ). Similar thing also stated by Nugroho (2016), 16 of 84 research subjects including stunting toddlers and the result of statistical tests of p= 0.042, which mean that there was a significant relationship between the child's body length at birth and the incidence of stunting/ short child. This height factor supported an increase in the height of toddlers due to internal factors such as genetic which greatly contributed to other internal factors such as race/ ethnicity, family, and gender (Ministry of Health RI, 2012).

Children who have short body length at birth were 3 times more likely to experience stunting (Amaliah, 2016). Maternal height has a positive and significant effect on child growth (WHZ) and it was statistically significant. Every enhancement of 1 cm of maternal height increased child growth (WHZ).

The results of this study were on the contrary to the study by Hanum et al. (2014), which stated that from Pearson correlation test results, there was no significant relationship (r= 0.562; p>0.05) between maternal height and children nutritional status (WHZ). This difference was because the study method used was different and the number of research sub-

jects was smaller. The result of this study was in line with Rieger and Trommlerova (2016) which stated that maternal height has a great role in the enhancement of child growth, especially child's height.

This was strengthened by Amin and Hadi (2015) in a study conducted on 252 research subjects with logistic regression of statistical tests, it showed that maternal height variables contributed significantly to the incidence of stunting/ short children among 6-23 months old toddlers. This study also illustrated that genetic factors, especially the height of parents that have an impact on the incidence of stunting/ short children was the maternal height only, while the height of the father did not have any significant impact. Nugroho (2016) showed different results, he stated that maternal height did not have any effect on the incidence of stunting/short children.

Based on the descriptions above, it can be concluded that there was a positive and significant relationship between family income and birth weight with child growth. There was also a negative relationship between the number of children and child growth (WAZ). The enhancement of family income and birth weight would increase child growth (WHZ), otherwise, every enhancement of the number of children in a family would reduce the child growth (WHZ). In addition, there was a positive and significant relationship between family income, body length at birth, and maternal height with child growth (WHZ). The enhancement of family income, body length at birth, and maternal height would increase child growth (WHZ).

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