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Risk Factors of Anemia in Preschool Children (3-5 Years Old) in Kedungkandang District, Malang

Rakhmalia Imeldawati*, Irwanto, Annis Catur Adi
Universitas Airlangga Surabaya, Indonesia
** Correspondent Author: rakhmaimelda@gmail.com*

ABSTRACT
Anemia is a condition where the mass of red blood cell (RBC) decrease from its normal value. Anemia was caused by some factors such as mother's education, mother's age, family income, and cigarette smoke exposure. The purpose of this study is to analyze factors associated with anemia in preschool children. The design of this study was cross-sectional. A cluster sampling was used to select the sample of 281 children. The data obtained from questionnaires and examined hemoglobin levels using hemoglobinometer digital. The data analyze using chi-square test and logistic regression test. The result of the study showed that 32% of preschool children were anemic. The significant factors associated with anemia were mother's education, mother's age, family income, and cigarette smoke exposure ($p<0.05$). We can conclude that need further socialization in the community about food, health and nutrition behaviors, and health and environmental service to prevent anemia in preschool children.

Keywords: Anemia, Preschool children, Mother's education and age, Family income, Cigarette smoke exposure

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BACKGROUND

Anemia is a global public health problem in which children and pregnant women are a vulnerable group. It is estimated that 40% of pregnant women and 42% of children under 5 years are anemic (WHO, 2018). Meanwhile in Indonesia, according to Riskesdas (2018) children under 5 years who experienced anemia were 38.5%. Globally almost 600 million preschool children and school-age children were anemic, 50% case of anemia caused by iron deficiency (Akhtar et. al, 2013).

Anemia is a condition where the mass of red blood cell (RBC) decrease from its normal value, it can't carry oxygen throughout the body normally. Anemia has a negative impact on preschool children. It will cause the decrease in learning ability and concentration, inhibit physical growth and development, and increased the risk of infections caused by inadequate function of the immune system (Widyastuti, 2014). The impact of anemia is very broad, it is necessary to make efforts to prevent this problem.

Decreased production of RBCs, increased destruction of RBCs (hemolysis), and blood loss are the primary causes of anemia. Besides that, some factors contribute to anemia development, they are the mother's education, mother's age, family income, and cigarette smoke exposure (Simamora, 2018). The mother who has primary education 1.122 times more at risk have children with anemia than mothers with higher education. The mother who has secondary education 1.032 times more at risk have children with anemia than mother with tertiary education (Afroja et. al, 2019). Children with low family income increase the risk of anemia 5.2 times greater (Gebreweld et. al, 2019). Parents who smoke are significantly associated with anemia in preschool children (Sirdah, 2014).

Based on the description of the background, it illustrated that anemia in preschool children caused by various factors. This study aims to analyze factors associated with anemia in preschool children. Especially mother's education, mother's age, family income, and cigarette smoke exposure.

METHODS

This research was an observational analytic study with cross-sectional design. A cluster sampling was used to select the sample of 281 children 3-5 years in Kedungkandang district of Malang city. This research was conducted in November-December 2020. The data of hemoglobin was obtained by examining with *easy touch* hemoglobinometer digital. The data of mother's education, mother's age, family income, and cigarette smoke exposure were obtained from a structured interviews with questionnaires and observation. Data analysis was carried out using non-parametric test named chi-square for bivariate analysis and logistic regression for multivariate analysis with 95% of confidence interval and significance level $p<0.05$. Data analysis was carried out using SPSS 25. This research has passed the examination of Ethical Commission of Health Research, number: 483/HRECC.FODM/X/2020, Faculty of Dental Medicine, Universitas Airlangga, Surabaya.

RESULT

Table 1 showed that 32% of respondents were anemic. Most mother's of children (51.2%) had secondary education (senior high school). Most mothers age of children (58.7%) was normal (between 20-35 years). Most of them had moderate-income (43.1%). Meanwhile, 50.1% of children had not exposed to cigarette smoke.

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Table 1. Characteristic of Respondents

Variable	Total (n=281)	
	Frequency	Percentage (%)
Anemia in Preschool Children		
Not anemia	191	68
Anemia	90	32
Mother's Education		
Primary Education	52	18.5
Secondary Education	144	51.2
Tertiary Education	85	30.2
Mother's Age		
Too young	3	1.1
Normal	165	58.7
Too old	113	40.2
Family Income		
Low income	57	20.3
Moderate income	121	43.1
High income	61	21.7
Very high income	42	14.9
Cigarette Smoke Exposure		
Yes	138	49.1
No	143	50.9

Table 2 shows that mothers with primary education has the highest percentage of children with anemia (67.3%). All children whose mothers were too young had anemia. Most anemia in children occurs in low-income families (73.7%). Preschool children who were anemic 53.6% exposed to cigarette smoke. The result of statistical analysis using chi-square test showed that maternal education, maternal age, family income, and cigarette smoke exposure were significantly associated with anemia in preschool children based on the calculation of p-value < 0.05.

Table 2. Factors associated with anemia in preschool children

Characteristic	Anemia		Not Anemia		Total	p
	n	%	n	%	n (%)	
Mother's Education						
Primary Education	35	67.3	17	32.7	52 (100)	0.000
Secondary Education	44	30.6	100	69.4	144 (100)	
Tertiary Education	11	12.9	74	87.1	85 (100)	
Mother's Age						
Too young	3	100	0	0	3 (100)	0.000
Normal	34	20.6	131	79.4	165 (100)	
Too old	53	46.9	60	53.1	113 (100)	
Family Income						
Low Income	42	73.7	15	26.3	57 (100)	
Moderate Income	29	24	92	76	121 (100)	0.000
High Income	5	8.2	56	91.8	61 (100)	
Very High Income	14	33.3	28	66.7	42 (100)	
Cigarette Smoke Exposure						
Yes	74	53.6	64	46.4	138 (100)	0.000
No	16	11.2	127	88.8	143 (100)	

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Table 3 shows the result of multivariate analysis using logistic regression. It showed that mother who has secondary education 0.262 times more at risk have children with anemia than mother with tertiary education (p=0.020). The family who has moderate-income 0.123 times more at risk have children with anemia than a family with very high income (p=0.001). The family who has low income 0.208 times more at risk have children with anemia than a family with very high income (p=0.000). Children who are exposed to cigarette smoke increase the risk of anemia 5.060 times greater (p=0.000).

Table 3. Summary of Logistic Regression

Characteristic	B	p	Exp (B)	95% of CI
Mother's Education (Secondary)	-1.340	0.020	0.262	0.085-0.807
Mother's Education (Tertiary)	-0.449	0.314	0.638	1.266-1.529
Mother's Age (Normal)	-20.807	0.999	0.000	0.000
Mother's Age (Too Old)	-21.720	0.999	0.000	0.000
Family Income (High)	-0.032	0.956	0.969	0.312-3.010
Family Income (Moderate)	-2.095	0.001	0.123	0.036-0.418
Family Income (Low)	-1.573	0.000	0.208	0.090-0.479
Cigarette Smoke Exposure	1.621	0.000	5.060	2.417-10.593

DISCUSSION

The study showed that mother's education was significantly associated with anemia in preschool children. It similars with a study conducted by Bharati (2013), his study showed that there is a significant relationship between mother's education and anemia in preschool children. This study also showed that children who have a mother with secondary education were 0.262 times more at risk of anemic than children who have tertiary education. This study is in accordance with other research results before. The mother who has primary education 1.122 times more at risk have children with anemia than mothers with higher education. The mother who has secondary education 1.032 times more at risk have children with anemia than mother with tertiary education (Afroja et. al, 2019).

Education is one of the factors that influence the process of decision-making and practice of mother care for children. Low-educated mothers will affect the abilities of the mother to understand information about healthy life, such as information about nutrition. Highly educated mothers generally have a better understanding of childcare and nutrition than low-educated mothers. Highly educated mothers have more opportunities to be exposed to information about childcare and nutrition education because of their ability to read and understand health media information than low-educated mothers (WHO, 2017).

This study also showed that mother's age was significantly associated with anemia in preschool children. The highest percentage of anemia was found in mothers who are too young. This study is in accordance with another study conducted by Habte (2013), his study showed that a mother's age significantly associated with anemia in preschool children. Anemia in children mostly occurs in mothers aged 15-19 years. Mother's age is related to the quality of childcare. Older mother will have a better quality of childcare because they usually have more than 1 children and become more experienced (Al-Qoud et. al, 2015).

Family income is also associated with anemia in preschool children. The family who has moderate and low income were more at risk have children with anemia than a family with higher income. The result of this study is consistent with other study showing that family income associated with anemia in preschool children (< 5 years) and anemia mostly occur in low-income family (Bharati et. al, 2013). Family income describes the socioeconomic status and relate to poverty. Poverty is a major risk factor for health, such as

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anemia. Family income is associated with anemia in preschool children through their ability to purchase various foods that contain lots of vitamins and mineral (Konstantyner et. al, 2012). Besides that, high-income family will have greater access to food (including access to fortified food and animal source food), health and nutrition behaviors (including smoking and feeding practice which can affect hemoglobin concentration), and health and environmental service (including access to anemia prevention and treatment, such as iron supplements) than low-income family (Kounnavong et. al, 2011; WHO, 2017).

Cigarette smoke exposure is significantly associated with anemia in preschool children. This study also showed that children who were exposed to cigarette smoke were more at risk of anemic than children who didn't exposed by cigarette smoke. The result of this study is consistent with another study in Palestine showing that cigarette smoke exposure is significantly associated with anemia in preschool children. Children who are exposed to cigarette smoke 0.580 times more at risk of anemic than children who didn't expose to cigarette smoke (Sirdah et. al, 2013).

The main component of cigarettes is tar, nicotine, carbon-monoxide (CO), free radicals, and lead (Pb). Long exposure to tar will cause bone marrow damage which will interfere the process of erythropoiesis. Continuous exposure to carbon-monoxide will cause carbon-monoxide to bind with hemoglobin to become carboxy-hemoglobin (HbCO). It causes hemoglobin desaturation which causes a decrease in oxygen circulation. Exposure to free radicals has an impact erythropoiesis process (Leifert, 2008). Lead (Pb) will affect the hematopoietic process by inhibiting the enzyme that play role in this process. Exposure to cigarette smoke can cause a decrease number of erythrocytes and hemoglobin levels (Wulandari et. al, 2013). An effort to prevent cigarette smoke exposure will reduce the risk of anemia in preschool children.

CONSLUSION

Mother's education, mother's age, family income, and cigarette smoke exposure associated with anemia in preschool children. However, the mother's education, family income, and cigarette smoke exposure affect anemia in preschool children. Based on these conclusions, it is suggested Community Health Center improve the socialization of smoking in the community, such as the dangers of smoking and quitting smoking, to prevent cigarette smoke exposure to children. It also needs socialization in the community about food, health and nutrition behaviors, and health and environmental service to improve mother's knowledge. Although we cannot improve mother's education through formal education, we can improve their knowledge by giving them access to understand health information.

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CONFLICT OF INTEREST

The author state that there is no conflict of interest in this study.

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