Risk Factor of Iron Deficiency

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RISK FACTORS FOR IRON DEFICIENCY ANEMIA IN INFANTS AGED 6 MONTHS IN TEGAL REJO PUBLIC HEALTH CENTER, YOGYAKARTA, INDONESIA

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ABSTRACT

Background: *Anemia is a global public health problem affecting both developing and developed countries with major consequences on human health as well as social and economic development. Anemia resulting from iron deficiency that may adversely affects the infants' cognitive and motor development. The objective of this research was to find out the risk factors of iron deficiency anemia (IDA) in 6 months old infants.*

Methods: *This was an observational research with case-control design. Population was all 6 months old infants having been examined for their hemoglobin levels in Tegalrejo public health center in Yogyakarta from 2017 to 2018. 164 samples were taken with random sampling contained of 82 infants with anemia diagnosis in case group and 82 infants with normal hemoglobin levels for control group. Dependent variable was iron deficiency anemia (IDA) assessed based on hemoglobin level less than 11 gr% and independent variables were IDA risk factors (birth weight, sex, maternal education, maternal occupation, and maternal age) obtained from medical records and direct interviews. Data were analyzed by using logistic regression.*

Results: *the risk factor influencing IDA was exclusive breastfeeding (p<0.05). Infants who did not receive exclusive breastfeeding had 2.16 folds higher risk of having IDA than those who received exclusive breastfeeding. Other risk factors such as birth weight, sex, maternal education, maternal occupation, and maternal age did not correlate significantly to iron deficiency anemia (IDA).*

Conclusion: *Exclusive breastfeeding was the significant risk factor toward iron deficiency anemia in 6 months old infants after controlling other risk factors. Therefore, these finding can be implemented by maternal and child health practitioners to make iron deficiency anemia prevention program by eliminating or minimizing its risk factor.*

Keywords: *Iron deficiency, Anemia, Exclusive breastfeeding, 6-month-old infants.*

INTRODUCTION

Anemia is a global public health problem that influences both developing and developed countries with a main consequence to human health and social and economy developments. Anemia is defined as reduced red blood cell or reduced hemoglobin concentration in blood circulation that influences oxygen transportation capacity. About 50% anemia cases are caused by iron deficiency. The highest anemia prevalence in the world at 6-59 months ages was 42.6%, while in Indonesia was 32% in 2011 and 28.1% in 2013.[1,2] The anemia prevalence at 5 – 7 months children was very high. Based on previous research data, it was 65.3% up to 80%.[3]

Iron deficiency anemia (IDA) influences cognitive and motoric developments, causes fatigue and lower productivity.[4,5] Anemia effects when it occurs at 0-9 years old ages include motoric and coordination disorders, growth disorder, learning ability, psychology and behavioral disorders. Anemia can influence cognitive development, school achievement, physical growth, and immunity to diseases. A study result to children 6-18 months old shows that iron deficiency anemia (IDA) at infancy period is one of permanent brain function disorder causes. Child iron deficiency must be a serious attention because it influences child's intelligence and development. Anemia is also the cause of mortality and morbidity in developing countries where resources to detect the mortality and morbidity causes are low.[6] Anemia prevalence is an indicator of health and it can provide information about severity level of iron deficiency.[7]

Some risk factors contribute iron deficiency anemia at infants include birth weight, exclusive breastfeeding, sex, and social and economy levels such as maternal education, occupation, and age. Birth weight can influence anemia at infants. Lower birth weighted infants (less than 2500 grams) have faster growth rate compared to those infants with normal birth weights, so that iron deposit will be depleted faster for metabolism process.[8] Male infants are found to have higher anemia risk compared to female ones, so that iron would be absorbed faster for growth process.[9, 10, 11] Formula milk administration correlates to anemia cases. Infants fed with formula milk have bigger anemia risk that exclusively breastfed infants. Iron content in breast milk is more effective and easier to absorb then the same iron in formula milk.[7] Lower maternal education would influence nutrition status of her children, because less maternal awareness about nutrition and unhealthy diet habits.[12] a mother with higher education would have anemia protection effect for her infants. This is because of good diet regime and good infant care practices by the mother with higher education.[9] Some other researches also show that children under five anemia prevalence is mostly found at unschooled mothers.[10, 13] Research result of Habte Research (2013) found that children under five anemia cases were found at higher rate with working mothers.[9] Maternal occupation has negative effect on the nutrition and health statuses of children. Working load can influence maternal nutrition and health, and this causes lowering capacity for doing other activities including caring children and fulfilling children nutrition needs.[14]

Infant anemia early detection program currently does not yet emphasize the program at primary level of health care facilities that become front line of public health service. Public health centers in Yogyakarta have implemented infant anemia earlier detection, including Tegalrejo public health center. This program was launched at August 2016 with a title "Si Embul program" (examination for 6 months old baby). This program includes health and growth examinations of the baby, breastfeeding evaluation, education and consultation about feeding infants and children and to prepare giving complementary feeding besides breastfeeding, and hemoglobin examination. A preliminary study conducted by the researchers in the

Tegalrejo public health center showed that from 187 examined infants, there were 108 infants (57.7%) suffered anemia (Hb < 11 gr/dl). Based on this background, the researchers considered the importance of infant anemia prevention by recognizing the infant anemia risk factors. The objective of this research was to find out the anemia risk factors at 6 months infants.

METHODS

This was an observational research by using case-control design. Population was all 6 months infants had been examined for hemoglobin levels in Tegalrejo public health center in Yogyakarta, Indonesia, from 2017 to 2018. 164 samples were taken by using random sampling and containing of 82 infants with anemia diagnosis (hemoglobin level less than 11 gr/dl) for case group and 82 infants with normal hemoglobin levels for control group. The inclusion criteria for samples were at term delivery (pregnancy more than 37 weeks) and having complete medical record. The exclusion criteria for samples were infants with congenital major or multiple disorders, gamelli pregnancy, samples could not be found or died. The dependent variable was iron deficiency anemia (IDA) that was assessed based on hemoglobin level examination result recorded in medical record. Independent variables were IDA risk factors (birth weight, sex, maternal occupation, maternal education, and maternal age) obtained from medical records and direct interviews. Samples were estimated by using Lemeshow formula with power 80, and 82 minimum samples were obtained for each group. Data were analyzed by using bivariate analysis with chi square test and multivariate analysis with logistic regression. P-value of chi square probability ratio was used as a guidance for fit model. All two tailed p-values and statistical significant level was determined to be less than 0.05. the ethical consideration proposal had been approved by Ethics Committee of Health polytechnics in Yogyakarta (reference number: No.LB 01.01 / KE.01 / XX / 316/2018).

RESULTS

This research found 240 infants examined for hemoglobin level in Tegalrejo public health center in Yogyakarta. 236 infants satisfied inclusion and exclusion criteria and then were randomized for taking samples, and 82 samples were obtained for case group and 82 samples for control group.

Table 1 shows that most male infants (56.1%) suffered anemia. There was no correlation between sex and anemia case. Most infants with normal birth weight (96.3%) did not suffer anemia. There was no correlation between birth weight and anemia case. Most infants with exclusive breastfeeding (96.3%) did not suffer anemia. There was no correlation between exclusive breastfeeding and anemia case. There was no correlation between maternal age and anemia case. Most infants with unemployed mothers (65.9%) did not suffer anemia. There was no correlation between maternal occupation and anemia case. Most of infants with higher education mothers (93.3%) did not suffer anemia. There was no correlation between maternal education and anemia case.

The correlations of exclusive breastfeeding, sex, birth weight, maternal age, maternal occupation and maternal education were analyzed with logistic regression analysis. The logistic regression analysis steps were as follows. First, bivariate selection was done with chi square test. Any variable with p-value < 0.05 would be entered into multi-variables selection. Bivariate analysis result showed that birth weight, maternal age, and maternal occupation had p-value > 0.25o, so that they were excluded from multi-variables selection. The final result of logistic regression analysis is presented in Table 2.

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Table 1. Relationship between sex, birth weight, status of exclusive breastfeeding, age of motherhood, mother's education and mother's job with the incidence of anemia.

Variable	Anemia				p-value	OR	CI 95%	
	Yes		No				Lower	Upper
	n	%	n	%				
Gender								
Male	46	56.1	38	46.3	0.211	1.480	0.800	2.737
Female	36	43.9	44	53.7				
Birth weight								
Low BW	3	3.7	6	7.3	0.304	0.481	0.116	1.992
Normal BW	79	96.3	76	92.7				
Exclucive Breasfeeding								
No	35	42.7	21	25.6	0.021	2.163	1.116	4.191
Yes	47	57.3	61	74.4				
Mother's age								
Risk	13	15.9	11	13.4	0.659	1.216	0.510	2.899
No Risk	69	84.1	71	86.6				
Mother's job								
Yes	31	37.8	25	30.5	0.323	1.386	0.725	2.650
No	51	62.2	57	69.5				
Mother's Education								
Basic	8	9.8	3	3.7	0.119	2.847	0.728	11.139
High	74	90.2	79	96.3				

Table 2: Relation of exclusive breastfeeding factors to the incidence of anemia in infants

Variable	B	Sig.	Exp (B)	95 % CI for EXP (B)	
				Lower	Upper
Exclusive Breastfeeding					
No	0.772	0.022	2.163	1.116	4.191
Yes					

Table 2 shows that the risk factor related to anemia is only exclusive breastfeeding with p-value 0.022<0.05. Infants without exclusive breastfeeding have 2.16 folds risk (95%; CI 1.116-4.191) of having anemia at 6 months age compared to those infants receiving exclusive breastfeeding.

DISCUSSION

The research results show that the factor related to anemia case at 6 months infants is exclusive breastfeeding status. Other risk factors such as sex, birth weight, maternal education, maternal occupation, and maternal age do not correlate to anemia case. Infants those not receiving exclusive breastfeeding have 2.16 folds of risk of having anemia compared to those infants receiving exclusive breastfeeding. The association strength is strong enough by OR 2.16. This research finding supports the previous research, such as a research by Pinelli (2005), that there is a significant correlation between exclusive breastfeeding and anemia case at infants of 6-12 months old. The infants not receiving exclusive breastfeeding would have 1.28 folds of risk compared to infants receiving exclusive breastfeeding.[15] This research result is also in line with the research by Malkanthi (2010) showing that exclusive breastfeeding is related to anemia case in children under 5 years old.[16] The biological mechanism to explain this correlation is that in case the infants breastfed by their mothers, even though iron in breast milk may be less than the iron contained in formula milk, but the iron contained in breast milk is absorbed more effective and easier by the infants compared to the iron in formula milk.[7] The iron deficiency anemia (IDA) most commonly occur at infants consuming cow milk formula in large amount. That cow milk formula does not contain enough iron, so that it would not sufficient for infants at their first 5 months life.[17] Indonesian Pediatric Society (IDAI) currently recommends iron supplement administration for children of 1-2 years old. This is because in these ages, iron level from maternal breast milk is not sufficient anymore to fulfil their needs of iron, because toddlers start to do many activities, such as crawling and rolling over.

This research has both superiority and limitation. The superiority of this research is that data concerning iron deficiency anemia risk factors were measured by using primary and secondary data. This was done to ensure data validity and to prevent bias. The limitation of this research was that there were some external variables that were not examined such as infant's disease history, and data of hemoglobin levels were taken from medical records. This may cause non-differential bias classification error that is able to influence accuracy of anemia variables. To prevent this bias, the researchers avoided taking anemia data from one health center only and examinations that were done by the same laboratory workers.

This research shows that the exclusive breastfeeding is the main risk factor of iron deficiency anemia (IDA) case at 6 months infants. This finding proves that exclusive breastfeeding administration is program that should be promoted to all expectants so that they would breastfeed their infants exclusively. This is also an important information for health promotion to all maternal and child health practitioners that exclusive breastfeeding can prevent infant anemia case. Therefore, this research finding is expected to be implemented by maternal and child health practitioners to make iron deficiency anemia prevention by eliminating or minimizing its risk factor.

CONCLUSION

One of iron deficiency anemia (IDA) risk factors is exclusive breastfeeding. The infants those not receiving exclusive breastfeeding have 2.16 folds of risk of having IDA compared to those infants receiving exclusive breastfeeding. Other risk factors such as birth weight, sex, maternal education, maternal occupation, and maternal age do not have significant correlation with IDA. This research result can be implemented by maternal and child health practitioners to make iron deficiency anemia prevention by eliminating or minimizing its risk factor.

COMPETING INTERESTS

We declare we have no competing interests.

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FINAL GRADE

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GENERAL COMMENTS

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