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Original Research

Food Security is A Determinant of Anemia in Children Aged 6 – 23 Months at UPTD Puskesmas DTP Pedes

Ketahanan Pangan Merupakan Faktor Determinan Terhadap Anemia Pada Usia 6 – 23 Bulan Di UPTD Puskesmas DTP Pedes

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Abstract: *In 2019, WHO data showed that the prevalence of anemia in children aged 6-59 months in Indonesia was 38.4%. The impact of anemia in children under two years old causes permanent cognitive damage and increases the risk of death. Objective: This study aims to determine the factors associated with anemia in children aged 6-23 months. Methods: This type of research is an analytic observational study with a cross-sectional design. The accidental sampling method was used to obtain 100 respondents who fit the inclusion and exclusion criteria. The study was conducted with a questionnaire instrument and Hb examination using the Easytouch GcHb tool. Data analysis included univariate, bivariate, and multivariate. Results: variables associated with anemia in under two are maternal education (p = 0.003), maternal age (p = 0.042), maternal knowledge (p = 0.004), maternal parenting (p = 0.003), and food security (p = 0.003). After multivariate test, it was found that food security was the dominant factor of anemia in children with OR 10.052. Conclusion: Food security is the dominant factor in children's anemia status with a 10.052 times higher potential for anemia. Food insecurity is related to changes in food quality that can affect the availability of nutrient-dense foods, including foods with high iron bioavailability. This can lead to anemia through inadequate micronutrient intake. The government should conduct early detection of anemia in children so as to prevent anemia as early as possible and provide non-cash food assistance to communities experiencing food insecurity.*

Key word: Anemia, Food Security, Maternal Characteristics, Under-two

1. INTRODUCTION

Anemia is a condition where the number of red blood cells or hemoglobin (Hb) is insufficient for the physiological needs of the body(1). Anemia has been recognized as a worldwide health problem which is very vulnerable in children aged 6 - 23 months. In children between 6 to 59 months the normal threshold for Hb levels is 11.0 g/dL(3). Based on Riskesdas data in 2018, the prevalence of anemia in children aged 6 - 59 months in Indonesia was 38.5%(4) this data has increased from 28.1% in 2013.5 In 2019 WHO data showed the prevalence of anemia in children aged 6-59 months in Indonesia was 38.4%(6).

During the age of infants, there is an increase in iron demand because they experience a rapid growth phase, resulting in infants being one of the groups that have a greater vulnerability to anemia(2). At the age of 6-23 months, it is a critical growth period and growth disorders occur(1). Research by Gebrehaweria et al., (2020) states that the impact of severe anemia in children under 2 years of age causes permanent cognitive damage and increases the risk of mortality(2).

Maternal characteristics are risk factors for anemia in under-two children. Maternal age, maternal education, maternal occupation and maternal knowledge about anemia(3). Several studies have shown that maternal education influences the occurrence of anemia in infants, and it was found that the prevalence of anemia was higher in children of mothers who did not attend school(4). Anemic infants were mostly found in mothers who did not work(5). Anemia in infants was also found to be greater in mothers aged 15-24 years(12).

During infancy, children are still fully dependent on their parents for essential activities, such as eating, bathing and toileting. The food intake of infants is almost completely dependent on parents. Nutritional problems can arise due to poor parenting in the family. This affects the incidence of anemia. One of the causes of anemia is due to the inhibition of iron absorption in the body due to the inaccurate parenting given to children(24). Food security is one aspect in assessing a person's benchmark in the ability to access consumption of food and the adequacy of consumption(6). In the study of Katsaras, et al., (2016) stated that low food security has a significant influence on the incidence of anemia(6). From the above background, this study aims to determine the factors associated with anemia in 6 - 23 months old.

2. METHODS

This study was conducted in the UPTD Puskesmas (Primary Health Care) DTP Pedes area in January - May 2023 with a cross-sectional research design. The population of this study were children aged 6 - 23 months. After calculation, this study has a minimum sample of 88 samples. The sampling method was carried out by accidental sampling. Inclusion criteria in this study are, children aged 6 - 23 months, mothers can communicate well, children do not have allergies to food (protein and iron sources) and children do not have chronic diseases that affect Hb levels and nutritional status (cancer, chronic kidney disease and leukemia).

The dependent variable in this study is anemia status as seen from hemoglobin levels. The normal level of hemoglobin in 6 - 23 months old is 11-16 g/dl (WHO, 2011), the Hb examination uses the Easytouch GcHb tool. The independent variables in this study were mother's age, mother's education history, mother's employment status, mother's knowledge, parenting and food security. Data obtained by interview technique based on questions in the questionnaire. Maternal knowledge was measured through a questionnaire with a score of each good category (if the value is 8 - 10) less category (if the value is 5 - 7). Parenting is categorized into 2 categories based on the total score of answers to questions in the questionnaire, namely poor parenting (answer score <80%) and good parenting (answer score >80%).

Food security was measured using the Household Food Insecurity Access Scale (HFIAS) questionnaire with the categories of food security (if the total score is 0-1) and food insecurity (if the total score is 2-27). Data were analyzed by univariate test, bivariate test and multivariate test. This study has obtained ethical approval issued by the UPNVJ Health Research Ethics Committee with number: 218/V/2023/KEPK.

3. RESULTS

Based on the results of the study, 25% of the infants who experienced anemia (table 1). In terms of the level of anemia status, in this study all anemia samples experienced mild anemia with a range of Hb levels of 10 - 10.9 g/dL. Respondent characteristics include age and gender (table 2), the majority of respondents were aged 6 - 11 months (53%) and male (61%). The majority of mothers were in the age range of 26 - 35 years (63%). The majority of mothers had a history of primary education (52%). Most mothers did not work (81%). Most mothers had poor knowledge about anemia (62%). The majority of mothers had good parenting (59%) and respondents' food security data (table 2) showed that the majority of respondents were food secure (76%).

Table 1. Distribution of anemia status among under-two children

Anemia Status	Frequency	
	N	%
Yes	25	25,0
No	75	75,0
Total	100	100

Table 2. Distribution of maternal characteristics

Characteristics	Frequency	
	N	%
Age (month)		
6 - 11	53	53,0
12 - 24	47	47,0
Sex		
Boys	61	61,0
Girls	39	39,0
Age of mother		
18-25 years old	37	37,0
26-35 years old	63	63,0
Mother’s education		
Primary education	52	52,0
High education	48	48,0
Mother's employment status		
Employed	19	19,0
Unemployed	81	81,0
Knowledge about anemia		
Good	38	38,0
Poor	82	82,0
Parenting practice		
Optimal	41	41,0
Sub-optimal	59	59,0
Food Security		
Secure	76	76,0
Insecure	24	24,0
Total	100	100

Table 3 shows the results of the bivariate test analysis in this study. Variables associated with anemia in infants include maternal education (p = 0.003), maternal age (p = 0.042), maternal knowledge (p = 0.004), parenting (p = 0.003), food security (p = 0.003).

Table 3. Results of Bivariate Analysis of the Relationship between Maternal Characteristics and Food Security with Anemia in Under-Two

Maternal Characteristics	Anemia Status				*OR* (95% CI)	*p-value*
	Yes		No			
	N	%	N	%		
Age of mother						
18-25 years old	14	56	23	30,7	2,877 (1,823 – 15,852)	0,042*
26-35 years old	11	44	52	69,3		
Mother's education						
Primary education	20	80	32	42,7	5,375 (0,063 - 0,549)	0,003*
High education	5	20	43	57,3		
Mother's employment status						
Employed	7	28	12	16	2,042 (0,701 - 5,948)	0,239
Unemployed	18	72	63	84		
Knowledge about anemia						
Good	22	88	40	53,3	6,147 (1,769 – 23,281)	0,004*
Poor	3	12	35	46,7		
Parenting practice						
Optimal	17	68	24	32	4,516 (1,711 – 11,916)	0,003*
Sub-optimal	8	32	51	68		
Food Security						
Secure	12	48	12	16	4,846 (1,786 - 13,152)	0,003*
Insecure	13	52	63	84		

The results of the multivariate test which shows the most dominant variable and the greatest influence on anemia in under-two in the Pedes Health Center area is food security. The multivariate test results show that food security has a p-value of 0.003 with the highest *odds ratio* (OR) value of 10.052.

4. DISCUSSION

In a study in the UPTD Puskesmas Pedes area, the proportion of anemia was 25%. In Indonesia, in 2019 the prevalence of anemia in infants reached 38.4%(7). In terms of the level of anemia status, in this study all anemia samples experienced mild anemia with a range of Hb levels of 10 - 10.9 g/dL. Anemia is a decrease in hemoglobin levels below normal due to impaired iron metabolism, which consists of absorption, transport, storage, use, and excretion(8). Several factors that contribute to the occurrence of anemia such as age, gender, place of residence, maternal education, disease are significantly associated with anemia(9). Low tissue oxygenation due to anemia can cause abnormalities in immune function, impaired growth, and impaired motor and cognitive development, which affect work performance and productivity in the future(10). Based on the results of the study, it was found that there was a significant relationship between maternal age and anemia in children aged 6 - 23 months. The results of this study are in accordance with the research of Zuffo et al., (2016), which states that maternal age is associated with anemia(13). Age affects a

person's attention span and mindset, the older the age, the more developed the attention span and mindset, so that the knowledge obtained is getting better(11). This is related to the knowledge and experience gained during life.[12] On the other hand, between maternal age and children's anemia status has a maternal relationship(12). Where physical growth still takes place in teenage mothers, so that there is competition between the mother and the fetus in obtaining nutrients. This results in the mother being at risk of carrying an *Intrauterine Growth Restriction* fetus and giving birth to a child who has anemia status(14). In addition, mothers who are young are psychologically immature in terms of mindset, so that the mindset in child nutrition care in teenage mothers is not as good as older mothers. Older mothers will have more experience and information about family health and nutrition(12).

This study shows that there is a significant relationship between maternal education history and anemia in under-two. This study is in line with several studies that have been conducted, which show a significant relationship between maternal education history and anemia in children(15-19). The level of education affects awareness of the importance of individual health and the environment, which can affect or encourage the need for health services, as well as how a person acts and looks for causes and solutions in his life(20). Maternal education is related to knowledge about nutrition, and the mother's role in child care, including feeding practices. The higher the mother's education, the higher her knowledge about health and nutrition and the quality of child feeding(21). There is a 1.5 times greater risk of anemia in mothers with low or no school education compared to mothers who have a high level of education (22).

Maternal employment status affects maternal behavior in providing nutrition to toddlers. Non-working mothers have more time to spend with their children. As a non-working mother, she has more opportunities to manage children's diets, so that children always eat healthy and nutritious foods compared to working mothers(23). The results of the bivariate test showed no significant relationship between the mother's employment status and the incidence of anemia in under two. The results of this study are in accordance with the research of Sunardi et al. (2021), which states that maternal employment status is not associated with iron deficiency anemia in toddlers ($p>0.05$)(24). Parents' work is related to family income, so it can be said that the type of work can determine a person in meeting family nutritional needs(25). In this study, working mothers tended to have children who were not anemic. This may occur because there are other factors that support working mothers to have children with good nutrition, namely additional family income(12). Working mothers can increase family income so that it can increase family purchasing power in fulfilling child nutrition. This is in line with the results of research by Bayoumi et al. (2020) which states that limited family income affects anemia in toddlers(26).

In this study, most mothers had insufficient knowledge about anemia at 62%. Knowledge about anemia is the result of a person's knowledge about anemia through his five senses, especially the senses of sight and hearing(11). Knowledge about anemia includes a description of the mother's understanding of anemia, risk factors for anemia, the process of anemia, signs and symptoms of anemia, and prevention and treatment of anemia. This knowledge can be considered as a form of anemia prevention(27).

The results of the bivariate test showed a significant relationship between knowledge and anemia in infants. Research similar to the research conducted by Souganidis et al., (2012) with the results of the study there is a statistically significant relationship between maternal knowledge and anemia in infants(28). Insufficient knowledge about

anemia has an influence on health behavior, resulting in less than optimal health behavior in preventing anemia and having an impact on the lack of consumption of foods containing iron. Conversely, someone who has good knowledge about anemia will avoid anemia because they will tend to fulfill their food consumption to meet nutritional needs (27).

In this study, most mothers had good parenting patterns at 59%. Research conducted by Dewi el al., (2022) showed the same results, namely the majority of mothers had good parenting(29). Parenting is a person's action in feeding with a variety of menus and good presentation and clean processing that will affect the metabolic process of various substances in the body and will affect the adequacy of children's nutritional needs. If the feeding of children is appropriate, the nutritional needs of children will be fulfilled which will affect the decrease in the incidence of illness in children so that it affects the incidence of anemia(30). The results of the bivariate test showed a significant relationship between parenting patterns and anemia in under-five children. Research conducted by Anggraini et al., (2017) showed the same results, namely that there was a relationship between parenting patterns and anemia in under-fives (p = <0.001)(31). Parenting patterns indirectly cause anemia, if parenting is not good in serving and processing food, it can cause infection, it will affect the absorption of nutrients and affect a person's Hb levels(30).

In this study, the majority of samples had a food security status that was food resistant as much as 76%. Bayoumi et al.'s research (2020) also showed the same results with the majority of samples being food secure(26). Food security is a situation in which all people at all times have physical, economic and social access to sufficient, safe and nutritious food that meets their nutritional needs and enables them to lead productive and healthy lives(32). Good food security will lead to nutritional security. Nutritional security is a reflection of adequate nutrient intakes and nutritional status. Conversely, food insecurity can lead to inadequate micronutrient intake, which can impact the incidence of anemia(33). Inadequate micronutrient intake in food-insecure households can be caused by under-consumption of food, or over-consumption of energy-dense but nutrient-poor foods(34).

The results of the bivariate test showed a significant relationship ($p < 0.05$) between food security and anemia in under-fives. Research conducted by Metallinos et al., (2016) and Engidaye et al., (2019) also stated that there was a relationship between food security and anemia in under-fives(35,36). In addition, the results of the multivariate test showed that food security had a p-value of 0.003 with the highest odds ratio (OR) value of 10.052, so it can be concluded that baduta who have food insecurity have a 10 times greater risk of experiencing anemia compared to baduta who have good food security.

Toddlers with low food security have a 1.9 times greater risk of anemia compared to those with good food security. Food insecurity is associated with changes in food quality that can affect the availability of nutrient-dense foods, including foods with high bioavailability of iron and can lead to anemia through inadequate micronutrient intake(31). Inadequate micronutrient intake in food-insecure households can be caused by under-consumption of food, or over-consumption of energy-dense but nutrient-poor foods(34).

A study in the US also found that iron intake was lower in children with food insecurity compared to children with good food security(35). Furthermore, children with food

insecurity will limit their consumption of heme iron foods compared to children with good food security. As a result, food insecure children are unable to obtain the iron they need for growth and development(36). Iron is an essential nutrient in children's growth and development. In addition to red blood cell formation, iron plays a role in nerve cell development, namely for myeliniai, neurogenesis, and brain cell differentiation, children with iron deficiency and anemia are found to have poor memory, less social interaction, delayed attention and lower achievement(37).

5. CONCLUSION

It is necessary to increase the knowledge of mothers through counseling on the risk factors and dangers of anemia and provide information facilities for mothers such as posters or leaflets about anemia. In addition, it is necessary to increase the consumption of sources of heme iron, non-heme iron, and iron enhancers at affordable prices suggested to samples related to the condition of low household food security such as eggs, fruits, green vegetables and freshwater fish. To the government, it is necessary to conduct early detection of anemia in children so that they can prevent anemia as early as possible and provide food assistance in the form of non-cash to people who experience food insecurity.

CONFLICT OF INTEREST

The authors declare that there were no conflicts of interest in this study.

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