

Intake Protein, Vitamin C, and Fe (Iron) As a Risk Factor of Anemia in Children Aged 2-5 Years

Silvia Wagustina, Junaidi

Department of Nutrition Health Polytechnic Ministry of Health Aceh, Indonesia

Abstract:- Anemia is caused by nutritional deficiencies of nutrients that play a role in the formation of hemoglobin, either because of lack of consumption or due to impaired absorption. Nutrients in mention are iron, protein, pyridoxine (vitamin B6), which acts as a catalyst in the synthesis of heme in the hemoglobin molecule, vitamin C may affect the absorption and release of iron from transferrin into the body tissues, and vitamin E that affects red blood cell membrane stability. This study aims to determine the intake of protein, vitamin C and Fe as a risk factor for Nutritional Anaemia in children aged 2-5 years in the District of Darul Imarah. The research is a descriptive analytic study using a case control study design, to find out and study the intake of protein, vitamin C, and iron and their effects on anemia in children aged 2-5 years in the district of Darul Imarah Aceh Besar, then performed statistical tests using the odds ratio. The average protein intake of children aged 2-5 years by 75% RDA, vitamin C intake by 61% RDA, and intakes of Fe (iron) by 62% RDA. Children with less protein intake had a 3.31 times greater risk than children with adequate protein intake ($p = 0.001$), children with less intake of vitamin C had 9.67 times greater risk than children with adequate intake of vitamin C ($p = 0.000$) and children with the intake of Fe (iron) has approximately 2.94 times greater risk than in children with the intake of Fe (iron) less ($p = 0.002$) in the District of Darul Imarah. Intake of protein, vitamin C and Fe (iron) is a risk factor for anemia in children aged 2-5 years in the district of Darul Imarah and the factors that most influence the intake of vitamin C. Nutritionists need to improve counseling about eating patterns of children aged 2-5 years who can meet the food sources of protein, vitamin C and Fe (iron) in preventing nutritional anemia in children.

Keywords:- Protein intake, vitamin C and Fe (iron), and Anemia, children aged 2-5 years.

I. INTRODUCTION

The nutritional problem in Indonesia today is not only a matter of macro nutrient deficiency, or what we often call lack of protein energy, but there is another hidden nutritional problem, namely micronutrient deficiencies. At present the main micronutrient deficiency problems found in Indonesia are vitamin A deficiency, Iodine Deficiency Disorders and iron deficiency called Iron Nutrition Anemia¹. The prevalence of children under five suffering from malnutrition in Aceh Province has increased by 26% compared to the results of Riskesdas in 2010 with a

prevalence of 23%. The high rate of malnutrition is often caused by a lack of adequate nutrition. Not infrequently children who experience malnutrition accompanied by anemia which will ultimately cause children to fail to grow and develop. In general, these malnourished children in addition to lack of energy and protein also lack other micronutrients such as iron and vitamin C^{2,3}.

An estimated 25-35% of Indonesia's population suffers from iron nutritional anemia, with the greatest prevalence in pregnant women and toddlers. Children aged 2-5 years are included in the vulnerable group because there is rapid growth so they need more nutrients. Therefore, if the lack of nutrients will cause nutritional disorders or health⁴. Based on Riskesdas 2013 data, the prevalence of iron deficiency anemia in children under five in Indonesia is 28.1%. The prevalence of anemia in children under five in four districts in Aceh is Aceh Besar at 68.5%, Banda Aceh at 62.8%, Aceh Jaya at 66.7% and Aceh Barat at 69.1% and the total number of the four districts is 67, 8% of 571 children⁵.

Nutritional or health problems in children under five are caused by incorrect eating patterns. Children under five have not been able to take care of themselves properly, especially in terms of food. In general, children who are still small (toddlers) get food rationed by their mothers and do not choose and take their own which they like and this results in lazy children eat, causing health problems, one of which is iron nutritional anemia^{6,7}.

Iron deficiency in infants and children has very dangerous effects, including impaired growth and development, inhibited intelligence, decreased immune system so that it is susceptible to disease, even in a long time can decrease the quality of the human brain. The most dangerous complication is accelerating the occurrence of death. Micro nutrient deficiency is one of the nutritional problems that can cause disorders in health, growth, mental, cognitive function, immune system, reproduction and other disorders. Until now, the problem of micronutrients that is important for the body and has not been successful in overcoming them is iron^{8,9}.

One cause of anemia is due to low iron consumption. Consuming less variety of food provides a low source of iron. Besides anemia can also be caused by lower substances in food because they contain substances that can prevent iron. Some anemia occurs together with other micronutrient deficiencies such as vitamin C, vitamin B12 and folic acid. The existence of worm infestation will further aggravate the incidence of anemia in most children

in rural areas in addition to genetic factors and chronic diseases¹⁰.

To increase iron absorption in the body, it needs to be combined with other micronutrients, such as protein and vitamin C. Protein plays a role in the transportation and mobilization of iron reserves in the body and synthesis of hemoglobin. While vitamin C can help accelerate the absorption of iron in the body and play a role in transferring iron into the blood, mobilization of iron deposits, especially hemosiderin in spleen¹¹.

Nutrition problems that occur at certain times will cause development problems in the future. Delay in providing nutrition services will result in damage that is difficult and may not be helped. Therefore, efforts to improve nutrition are primarily aimed at infants, toddlers and pregnant women¹². Anemia that occurs at the age of under 5 years will cause low body resistance to disease, impaired growth and development of brain cells, decreased cognitive function, low physical ability, motor and coordination disorders, psychological and behavioral influences, and low intellectual ability which will have an impact the long term, namely the low quality of human resources¹³.

II. MATERIALS AND METHODS

The research is a descriptive analytic study using a case control study design, to find out and study the intake of protein, vitamin C, and iron and their effects on anemia in children aged 2-5 years in the district of Darul Imarah Aceh Besar. This research was conducted in February-April 2018. The research subjects in this study were children aged 2-5 years who were found in Darul Imarah District. The research subjects were 80 people as the case group and

80 people as the control group (1:1). Cases are children aged 2-5 years who are diagnosed with anemia.

The data collected included data on the characteristics of mothers of children aged 2-5 years as research respondents, and children's data consisting of name, date of birth, age, gender obtained through interviews with respondents (mothers of toddlers), hemoglobin levels of children aged 2-5 years collected using easy touch. Secondary data in the form of the number of children aged 2-5 years and research related data obtained from document search.

Data on protein, vitamin C and Fe intake were obtained through direct interviews with respondents (mothers of toddlers) using the Semi Quantitative Food Frequency Questioner (SQ-FFQ) form of food intake during the past 1 month which was converted into days. Next calculate the amount of these nutrients by using software that is nutri survey. Data collected for protein, vitamin C and Fe were then grouped into two groups, namely low intake if intake < 85% RDA and sufficient if intake ≥ 85% RDA. Children aged 2-5 years are said to suffer from anemia if Hb levels <11 mg/dl.

III. STATISTICAL ANALYSIS

Data were analyzed using Statistical Package for Social Sciences (20.0). Data were analyzed descriptively using frequency distribution. Bivariate analysis was performed using Chi-Square statistical tests at a confidence level of 95% (α <0.05). Furthermore, to determine the magnitude of the risk of intake of Vitamin C and Fe against anemia in children aged 2-5 years can be determined by determining the value of Odd Ratio (OR).

IV. RESULTS

Characteristic of Mother	Anemia		Non Anemia	
	n	%	n	%
1. Age (in Year)				
- < 25	25	31,4	17	21,3
- 25-35	33	41,1	36	45,0
- > 35	22	27,5	27	33,7
2. Profession				
- Housewife	63	78,8	49	61,3
- Civil Servant	17	21,2	31	37,7
3. Education				
- Secondary School	48	60,0	34	42,5
- High School	21	26,3	33	41,3
- Bachelor	11	13,7	13	16,2
Total	80	100	80	100

Table 1:-Characteristics of Mother Children 2-5 Years Old in Darul Imarah District, Aceh Besar District

Based on maternal age of children aged 2-5 years, in the case group and control group the dominant maternal age is 25-35 years of age respectively 41.1% and 45.0%. The occupation of mothers in both groups was generally housewives, namely 78.8% in the case group and 61.3% in the control group. Mothers who stay more at home are expected to pay more attention to their children's food intake so that they can meet the daily nutritional needs of children. Mother's education in the case group is mostly primary education (60%) and in the control group of primary and secondary education is almost the same proportion. The low level of maternal education has an impact on the low knowledge and behavior of feeding children so that the nutritional needs of children are insufficient.

Characteristic of Research Subject	Anemia		Non Anemia	
	n	%	n	%
Gender				
- Male	52	65,5	33	41,3
- Female	26	32,5	47	58,7
Age (in Year)				
- 2 – 3	33	41,3	46	57,5
- >3 – 5	47	58,7	34	42,5
Total	80	100	80	100

Table 2:- Characteristic of Research Subject

Based on the characteristics of the research subjects, it can be seen that in the case group most of the sex of the child is male (65.5%) and in the control group the majority of children are female (58.7%). The age of children in the most cases is age above 3-5 years and in the control group most of them are 2-3 years old. The high number of children aged over 3 years who suffer from anemia can be caused by giving food that does not meet the needs of children after stopping breastfeeding. Breast milk still contributes to the energy and nutritional needs of children up to the age of 2 years.

Nutrient Intake	Anemia		Non Anemia	
	n	%	n	%
Protein				
Less	61	76.3	35	43.7
Enough	19	23.7	45	56,3
Vitamin C				
Less	63	78.7	21	26.3
Enough	17	21.3	59	73,7
Iron				
Less	56	70	37	46
Enough	24	30	43	54
Total	80	100	80	100

Table 3:- Intake of Protein, Vitamin C and Iron in Children 2-5 Years Old in the District of Darul Imarah Aceh Besar District

Based on Table 3. shows that in the case group more children who lack protein intake than in the control group that is equal to 76.3%. Furthermore, in the case group more experienced by children with less vitamin C intake (78.7) compared to children with adequate vitamin C intake (21.3%). Whereas the dominant control group was found in children with sufficient vitamin C intake compared with children with less vitamin C intake (26.3%). Anemia generally occurs in children with less Fe intake (70%) compared to children with sufficient Fe intake (30%). Meanwhile, in children aged 2-5 years who are not anemic, most of the intake of Fe is sufficient (54%) compared to Fe intake of children who lack (46%).

Nutrients Intake	Anemia		Non anemia		Total		p	OR (95% CI)
	n	%	n	%	n	%		
Protein								
Less	61	76.3	35	43.7	96	100	0,000	4.13 (2.09-8.13)
Enough	19	23.7	45	56.3	64	100		
Vitamin C								
Less	63	78.7	21	26.3	84	100	00,000	10.41 (5.01-21.64)
Enough	17	21.3	59	73,7	76	100		
Iron								
Less	56	70	37	46	96	100	0,004	2.71 (1.42-5.19)
Enough	24	30	43	54	64	100		
Total	80	100	80	100	160	100		

Table 4:- Intake of Protein, Vitamin C dan zat Besi of Anemia in Children aged 2-5 Years Old in the District of Darul Imarah Aceh Besar District Besar

Based on the results of interviews using the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) protein intake obtained children aged 2-5 years are children with less protein intake of 76.3% (61 children) in cases while in controls of 43.7% (35 children). Research Found that the average protein intake for children aged 2-5 years by 75% RDA, meaning that the protein intake of the children is insufficient. Thus children with less protein intake have a greater chance of anemia than children with sufficient protein intake because the proportion to experience anemia is higher in children with less protein intake categories.

From table 4. it can be seen that based on the results of the chi-square test at a 95% confidence level with $p = 0,000$. This shows that there is a statistically significant relationship between protein intake and nutritional anemia in children aged 2-5 years. Analysis of the closeness of the relationship between the two variables obtained OR = 4.13 (95% CI: 2.09 - 8.13) means that children with less protein intake have a risk of developing nutritional anemia 4.13 times compared to children with adequate protein intake.

Anemia tends to occur in children whose vitamin C intake is less (78.7%) compared to children whose vitamin C intake is sufficient (21.3%). Furthermore children aged 2-5 years who were not anemic were more in the group of children with adequate vitamin C intake (73.7%). Average

vitamin C intake for children aged 2-5 years by 61% RDA, meaning that the vitamin C intake of the children is insufficient. Based on the results of the chi-square test at 95% confidence level with $p < 0.005$ shows that there is a statistically significant relationship between vitamin C intake and anemia in children aged 2-5 years. Analysis of the closeness of the relationship between the two variables obtained OR = 10.41 (95% CI: 5.01 - 21.64) means that children with vitamin C intake have less risk of anemia 10.41 times compared to children with adequate vitamin C intake.

Furthermore, anemia affects more children with less Fe intake (70%) than children with sufficient Fe intake (30%). On the other hand, non-anemia was more in the group of children with sufficient Fe intake (54%) compared to children with less Fe intake (46%). Average Fe intake for children aged 2-5 years by 62% RDA, meaning that the Fe intake of the children is insufficient. Statistical analysis using the chi-square test at 95% confidence level with $p < 0.05$ showed that there was a statistically significant relationship between Fe intake and anemia in children aged 2-5 years. Analysis of the closeness of the relationship between the two variables obtained OR = 2.71 (95% CI: 1.42 - 5.19), meaning that children with less Fe intake have a risk of anemia 2.71 times compared to children with adequate Fe intake.

Variables	B	OR (95% CI)	P
Constant	0.467		0,001
Protein Intakes	0.186	4,13 (2.09 – 8.13)	0,010
Vitamin C Intakes	0.451	10.41 (5.01 – 21.64)	0.000
Iron Intakes	0.75	2.71 (1.42 – 5.19)	0.289

Table 5:- Effects of Protein, Vitamin C, and Iron On Iron Status in Children Aged 2-5 years

The results of multiple linear regression analysis showed that between the intake of protein, vitamin c and Fe (iron). The proportion of anemia incidence is higher in children aged 2-5 years, namely the intake of vitamin c is less than the intake of protein and less Fe. Where the tilapia odds ratio is seen that the risk of children aged 2-5 years who lack vitamin C intake is 10.41 times greater than in children with protein intake and less Fe to experience nutritional anemia.

Children's intake that must be considered, the function of vitamin C in absorbing and metabolizing Fe is that vitamin C reduces ferric iron into ferrous in the small intestine so that it is easily absorbed. Vitamin C inhibits the formation of hemosiderin which is difficult to mobilize to free iron when needed. Absorption of iron in the form of nonhem increases fourfold when there is vitamin C. Vitamin C plays a role in transferring iron from transferrin in plasma to liver ferritin so that it can maintain normal levels of hemoglobin in the blood

V. DISCUSSION

Anemia is caused by a lack of nutrients that play a role in the formation of hemoglobin, either due to lack of consumption or due to absorption disorders. Nutrients concerned are iron, protein, pyridoxine (vitamin B6) which act as catalysts in hem synthesis in the hemoglobin molecule, vitamin c can affect absorption and release of iron from transferrin into body tissues, and vitamin E which affects the stability of red blood cell membranes¹⁴.

Based on table 6 it can be seen that children aged 2-5 years with less protein intake have a risk of nutritional anemia 4.13 times greater than children with adequate protein intake. Protein as a means of transport and storage of hemoglobin is carrying oxygen in erythrocytes while myoglobin carries oxygen in the muscles. Iron ions are transported in blood plasma by transferrin and stored in the liver as complexes with ferritin. Animal protein, though not all, can also promote the absorption of nonhem iron. Cellular protein derived from beef, goat, lamb, liver and chicken supports the absorption of nonhem iron. However protein derived from cow's milk, cheese and eggs cannot increase the absorption of nonhemelc iron¹⁵.

Some research shows that toddlers who lack protein intake tend to suffer from anemia. Andarina and Sumarni (2006)¹⁶ results in children aged 13-36 months in Sidoarjo showed a significant relationship between levels of consumption of animal protein with hemoglobin levels in children under five. In children with a protein consumption level of less than 70% the recommended dietary allowance will experience anemia. The results of the study also explained that children under five consume animal protein less than 14.4% of the standard Food Pattern Hope are likely to suffer from anemia. Research by Syatriani and Aryani (2010)¹⁷ states that adolescents who lack protein have a risk of 3.48 times greater anemia than those with adequate protein intake.

Adequate protein intake can increase iron absorption and increase bioavailability. The availability of food iron also depends on the source, with foods that are low in protein also have a negative effect on iron absorption. As a means of transporting proteins can act specifically, for example retinol binding proteins that only carry vitamin A and also iron as transferrin, thus protein as a means of transport and storage of hemoglobin is carrying oxygen in erythrocytes.

The study of Zulaekah et. al (2013)¹⁸ shows that children who are malnourished due to energy and protein deficiencies are at risk for other micronutrient deficiencies. This micronutrient deficiency will cause anemia which will eventually cause the child to fail to grow and have lower psychomotor abilities than children who are not anemic.

Vitamin C is a white crystal that dissolves easily. In a dry state, vitamin C is quite stable, but in its soluble state vitamin C is easily damaged. Vitamin C is easily absorbed actively and diffusely in the upper part of the small intestine and then enters the blood circulation through the Poorta vein. The average absorption is 90% for consumption between 20-120 mg a day. Vitamin C has many functions in the body. Ascorbic acid is a material that has a strong reduction ability and acts as an antioxidant in hydroxylation reactions. Many metabolic processes are affected by ascorbic acid between absorption and iron metabolism. Where, vitamin C reduces ferrous iron into ferrous in the small intestine so that it is easily absorbed. Vitamin C inhibits the formation of hemosiderin which is difficult to mobilize to free iron when needed by the body. Absorption of iron in the non-hem form quadruples when there is vitamin C. Vitamins play a role in transferring iron from transferrin in plasma to liver ferritin¹⁹.

The results of this study indicate that most of the vitamin C intake of children under five is less than the recommended adequacy rate. Daily nutrient adequacy rate for vitamin C sources for Indonesia according to the 2014 recommended nutrition adequacy list is 40-45 mg / day for children aged 2-5 years. Increased need for vitamin C is needed in a state of psychological or physical stress, such as injuries, high heat. Food sources of vitamin C include vegetables and fruits, especially acids such as oranges, pineapple, papaya and tomatoes. Thus, this lack of

micronutrients will increase the incidence of anemia in children aged 2-5 years²⁰.

Nutritional or health problems in children under five years are caused by incorrect eating patterns. Children under five years have not been able to take care of themselves properly, especially in terms of food. In general, children who are still young get food in rations by their mothers and do not choose and take their own which they like and this causes children to be lazy to eat and cause health problems, one of which is iron nutrient anemia. Because the mother needs to know about the composition of the food given to her toddlers. Mother's education influences knowledge about proper feeding for her child.

From the results of this study note that most maternal education is basic education. This certainly will affect the pattern of parenting, especially parenting nutrition or food. Low education will cause the mother's ignorance of good food given to her child increasingly high. Mother very rarely provides food sources of vitamin C which come from vegetables and fruits. Even if providing this source of vitamin C is not enough to meet the needs of children. Children find it difficult to accept vegetables because they are not accustomed to consuming vegetables that are rarely given by mothers.

From the results of the study also showed that more children in the case group were aged > 3-5 years. This relates to the characteristics of children under five as active consumers. This means that children have started to be able to choose foods based on their preferences, but of course they do not understand good food for them. The mother gives freedom to her child in terms of choosing food so they tend to consume less vegetables and fruits. The impact in the long run is that children will be deficient in vitamin C.

Iron absorption is strongly influenced by vitamin C. The function of vitamin C in iron metabolism (accelerating absorption) in the intestine and its transfer into the blood. Vitamin C can be involved in mobilizing iron deposits, especially hemosiderin in the spleen. Vitamin C has a very important role in the absorption of iron, especially from non-hemic iron which is found in many plant foods. Vitamin C also inhibits the formation of hemosiderin which is difficult to mobilize to free iron when needed. Foodstuffs containing iron hem can be absorbed as much as 37% while non-hem iron foodstuffs only 5% can be absorbed by the body. Absorption of non-hem iron can be increased by the presence of absorption-promoting substances such as vitamin C and other driving factors such as meat, chicken, fish. Vitamin C acts as a powerful enhancer in reducing ferries to ferrous materials, making it easily absorbed in pH over 3 as found in the duodenum and small intestine. The effect of vitamin C or ascorbic acid is dose related and significant on all types of food. This indirect relationship provides the main effect on the first administration of 25-50 mg of ascorbic acid in food, for the addition of ascorbic acid will be relatively less effective^{21,22}.

Several studies explain the same thing. Research conducted by Tadete, et al (2013)²³ in elementary school children in the Bunaken District of Manado City shows that there is a significant relationship between vitamin C intake and anemia. This means that lack of intake of vitamin C in food will cause children to experience anemia. A similar study by Hartati, et al (2012)²⁴ in primary school children with anemia in Sako Kenten sub-district showed that there was a significant relationship between vitamin C consumption and healing anemia. The study explained that the addition of vitamin C intake in the composition of Fe plus folic acid was better in healing anemia compared to administration of Fe added with folic acid without the addition of vitamin C.

Another study by Kirana (2011)²⁵ in young women in the city of Semarang stated that there was a link between vitamin C intake and the incidence of anemia. The higher the intake of vitamin C in adolescent girls, the higher the levels of hemoglobin, which means that the incidence of anemia is lower. This shows that vitamin C can increase the absorption of iron in the body.

To increase the effectiveness of iron absorption, the presence of vitamin C is needed. Lack of vitamin C intake can be overcome by giving vitamin C in supplement form in limited dosages and periods. Provision of iron tablets with the addition of vitamin C to changes in Hb and serum ferritin levels proved that administration of iron and vitamin C tablets by 150 mg, can increase the highest levels of hemoglobin compared to other groups. Provision of vitamin C in the form of tablets or in the form of food ingredients (papaya fruit) can increase the absorption of iron in pregnant women. Provision of 100 mg vitamin C tablets increases the absorption of iron 37.5% - 46% in pregnant women with staples of rice, corn and tiwul. Meanwhile, the provision of vitamin C in the form of food ingredients (250 grams of papaya) increases the absorption of 42-54.2%. This indirect relationship provides the main influence on the first administration of 25-50 mg of ascorbic acid in food, the addition of ascorbic acid is relatively less effective²⁶.

The research of Ahmad et. al shows that anemia is more common in children with iron deficiency, children with iron deficiency are 5.8 times more likely to suffer from anemia than children without iron deficiency. For this reason it is necessary to provide food sources of iron when preparing children's food²⁷.

Based on research conducted by Cordoso et al (2012)²⁸ in children in the Amazonian, explaining that one of the causes of anemia is caused by lack of iron intake in daily food. Furthermore Wijaya's research (2011)²⁹ in children aged 6-23 months in Aceh Besar District concluded that children under five who lack iron intake would be at risk of 1.22 times suffering from anemia compared to children whose iron intake was sufficient.

Microminerals are found in very small amounts in the body, but have an essential role for life and health, one of which is iron (Fe). Iron is a micro mineral that is most abundant in the body. Iron functions as a means of transporting oxygen from the lungs to body tissues, as a means of transporting electrons in cells, and as an integrated part of various enzyme reactions in body tissues. Iron is needed by the body to form blood hemoglobin. The excess iron will be stored in the form of ferritin and hemosiderin proteins in the liver and spinal cord, and the rest is stored in the lymph and muscles. Iron deficiency will cause reduced ferritin levels. If this situation continues it will cause anemia. Factors that influence iron absorption are the form of iron in food that affects its absorption, organic acids help the absorption of Fe, phytic acid, tannins inhibit iron absorption. The iron adequacy rate for children aged 2-5 years is as much as 8-9 mg/day³⁰.

Iron source foods are animal foods such as meat, chicken and fish. As a result of iron deficiency usually attacks vulnerable groups such as children, adolescents, pregnant women, and nursing mothers. Clinically iron deficiency is associated with nutritional anemia. Lack of iron generally causes pale, weak, tired, lethargic and lack of appetite. Iron deficiency in infants and children has a very dangerous impact. Impacts that can be included growth and development of intelligence can be hampered, a decrease in the body's immune system so that it is susceptible to disease, even in a long time can decrease the quality of the human brain. In fact, anemia can cause death in children under five. Iron in the body consists of two parts, namely reserve and functional. Iron in the form of reserves has no physiological function other than as a buffer, namely providing iron if needed to play a role in physiological functions. While functional iron is in the form of hemoglobin and a small portion in the form of myoglobin. If the body lacks iron input, the body activates iron reserves to meet the amount of functional iron, so the longer the amount of spare and functional iron will decrease. Eventually a state of iron deficiency called anemia³¹.

Therefore the provision of food sources of iron in the diet of toddlers need to be considered. Food arrangements with balanced and diverse menu patterns can provide an adequate source of iron. Besides that, it should be noted that there are several substances contained in food that can inhibit the absorption of iron in the body. These substances include phytic acid, oxalic acid, tannin in high fiber tea in the daily diet.

Oleh karenanya pemberian bahan makanan sumber zat besi dalam menu makanan anak balita perlu diperhatikan. Susunan makanan dengan pola menu seimbang dan beraneka ragam dapat menyediakan sumber zat besi yang cukup. Disamping itu perlu diperhatikan adanya beberapa zat yang terkandung dalam makanan yang dapat menghambat penyerapan zat besi dalam tubuh. Zat tersebut antara lain adalah asam fitat, asam oksalat, tannin pada teh serai yang tinggi dalam menu makanan sehari-hari.

To increase the mother's knowledge about feeding to children under 5 years the role of nutritionist is needed. Generally, mothers do not know how much their children need to eat every day so that the nutritional needs of children can be fulfilled. Besides that, mothers also do not understand the nutrients that are important to support the growth and development of their children. Nutritionists also need to explain how to process food ingredients so that nutrients are not lost during the processing.

VI. CONCLUSION

Children aged 2-5 years with less protein intake have a risk of developing anemia 4.13 times compared to children with adequate protein intake. Children aged 2-5 years with less Vitamin C intake have a 9.7 times greater risk of developing nutritional anemia compared to children whose intake of Vitamin C is sufficient. Children aged 2-5 years with less iron (iron) intake have a 2.9 times greater risk of developing nutritional anemia than toddlers with sufficient iron (iron) intake.

VII. RECOMMENDATION

Nutritionists need to improve counseling about eating patterns of children aged 2-5 years who can meet the food sources of protein, vitamin C and Fe (iron) in preventing nutritional anemia in children. To overcome iron deficiency anemia in children, iron supplementation should not be confused with doses for the prevention and treatment of anemic children, because with low hemoglobin levels the need for iron increases so that iron needs are high enough so various supplements need to be given between heavy, moderate and mild to get optimal hemoglobin levels.

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