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**Frequency, amount, and supplementation of vitamin A food sources to enhance vitamin A sufficiency status among toddlers aged 12-59 months**

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## **Abstract**

Vitamin A plays a crucial role as a micronutrient, particularly in relation to vision and growth. However, excessive intake of Vitamin A can lead to impaired vision and growth in toddlers. This study aimed to examine the impact of the frequency and amount of Vitamin A from food sources, as well as the intake of Vitamin A supplements, on the sufficiency status of Vitamin A in toddlers aged 12-59 months. The research design employed a quantitative approach using an analytical cross-sectional survey with a sample of mothers and toddlers aged 12-59 months, totaling 100 respondents. The relationship between the independent variables and the dependent variable was analyzed using the Chi-Square ( $\alpha=0.05$ ) statistical test with a 95% confidence interval. Quantitative results indicated a Vitamin A sufficiency status (71%), frequency of intake (56%), amount of intake (64%), and intake of Vitamin A supplements (60%).

in the 'more' category. The results of the chi-square test showed the effect of Vitamin A food source intake on Vitamin A sufficiency status with a p-value of 0.002. Optimizing Vitamin A sufficiency among toddlers aged 12-59 months requires a multifaceted approach, focusing on frequency, amount, and appropriate food sources.

## **Introduction**

Vitamin A is the most essential nutrient for health restoration and survival. Vitamin A deficiency will increase morbidity and mortality, susceptibility to infectious diseases such as diarrhea, pneumonia, and ultimately death. The most serious consequence of Vitamin A deficiency is night blindness, another form of xerophthalmia that includes corneal damage and blindness.<sup>1,2</sup> Research conducted by the World Health Organization (WHO) showed that half of the 20 million toddlers in Indonesia suffer from Vitamin A deficiency. According to data from WHO, Indonesia is one of the countries where Vitamin A fulfillment is relatively low.<sup>3</sup>

The problem of sub-clinical Vitamin A deficiency in some provinces is still quite a concern, as 50% of children under five still have low Vitamin A status. Lack of Vitamin A will result in decreased body resistance to disease, which affects the survival of the child. Tackling the problem of Vitamin A deficiency is currently not only to prevent blindness but is also associated with efforts to spur growth and child health to support the reduction of infant and toddler mortality rates, which potentially increases the labor productivity of adults.<sup>3-5</sup>

The main functions of Vitamin A are related to vision, differentiation of epithelial cells, growth, and reproduction. Vitamin A deficiency is globally recognized by the public from year to year, but in general, the general public is more aware of the effects of insufficient intake of various types of vitamins, and conversely, knowledge of the consequences of excess vitamin intake is

very low, even though medically the impact is very dangerous. Excess Vitamin A can occur at all ages, especially during growth, due to its effect on protein synthesis, which can affect cell growth.<sup>6-8</sup>

Factors that can influence growth in children under five in Indonesia, based on the results of a survey by the Ministry of Health, are that there are several areas of good quality complementary foods so that micronutrients such as Vitamin A are fulfilled.<sup>9,10</sup> Vitamin A is very useful, especially for children under five. The benefits that can be obtained from Vitamin A sources include maintaining the health of the sense of vision, helping bone growth, protecting the body from infection, and helping the growth of body cells and tissues, especially in hair, nails, and skin.<sup>11</sup>

Eating habits in children are derived from experiences gained during infancy. The frequency and portion of vegetable and fruit intake were collected by counting the number of days of consumption in a week and the average number of servings in a day. A person is said to be adequate in vegetable and/or fruit intake if they eat at least 5 servings of vegetables and/or fruits per day for 7 days a week.<sup>9,12</sup> The aim of the study was to analyze the effect of frequency, amount of Vitamin A food source intake, and Vitamin A supplement intake on Vitamin A sufficiency status and explore the intake of Vitamin A food sources in toddlers aged 12-59 months.

## **Materials and Methods**

### ***Research design***

The research used in this study used a quantitative approach, and the research design was an analytical cross-sectional survey. The quantitative approach examined the frequency of intake of Vitamin A sources, the amount of intake of Vitamin A sources, and the provision of Vitamin A supplement intake in toddlers 12-59 months.

### ***Study participants***

The population in this study consisted of mothers who had toddlers aged 12-59 months in West Bandung Regency, Indonesia, which consisted of 7 villages. The quantitative research sample used stratified random sampling by determining the population, allocating samples by separating based on sample characteristics, determining the number of samples for each sub-cluster, then randomizing each sub-cluster of 6699 children aged 12-59 months in 7 villages which meets the inclusion criteria of 100 mothers who have children aged 12-59 months.

### ***Variable, instrument, and data collection***

The variables in this study consisted of independent variables and dependent variables. The independent variable consisted of frequency of intake of Vitamin A sources, amount of intake of Vitamin A sources, and intake of Vitamin A supplements, while the dependent variable was Vitamin A sufficiency status. Confounding variables were education, occupation, and family income. The research instrument used for data collection in this study is quantitative research; the research instrument uses a semi-quantitative food frequency form.

The data collection tools used to measure changes in improving maternal nutrition behavior included questionnaires and checklist sheets for cognitive, affective, and psychomotor aspects. In this study, the nutritional status of toddlers was assessed using anthropometric indices, which included measuring the child's growth in length or height relative to their age and utilizing scales and body length gauges.

### ***Data analysis***

The researcher, assisted by two enumerators, began conducting research regarding the frequency of intake of Vitamin A food sources, the amount of intake of Vitamin A sources,

and Vitamin A supplementation. The household size used household tools such as spoons, plates, bowls, and glasses; besides that, the researcher also used photo aids of food ingredient sizes to make it easier for subjects to answer. The researcher fills in the form according to the subject's answer and then estimates the size of the portion eaten by the subject into weight (grams), converting all the frequency of the list of food ingredients for a day. For example, rice is eaten 3x per day, tofu is eaten 4x per week  $4/7$  per day  $=0.57$ , ice cream 5x per month  $5/30$  per day  $=0.17$ , and for seasonal fruits, the annual category is used, for example mango 10x, equivalent to  $10/365$  per day  $=0.03$  per day.

Multiplying the frequency per day by the serving size (grams) to get the weight consumed in grams/day. Counting the list of food ingredients consumed by the subject according to what was filled out in the form. After all food ingredients are known to be consumed in grams/day, then all item weights are summed to get the total nutrient intake of the subject.

After all the data was collected, the analysis was carried out using the Nutri-Survey, namely by entering the food ingredients to be analyzed in the food column in the Nutri-Survey Program, then entering the weight of the food ingredients that have been calculated in the average per day in the amount column, after that select extras, choose nutrient, select the nutrient you want to analyze, enter it into the order of selected nutrient column, then the results of the analysis of the nutrient to be studied come out, namely Vitamin A. The association between the independent variables and the dependent variable was evaluated using the Chi-Square and multivariate linear regression statistical test, with a significance level of  $\alpha=0.05$  and a confidence interval of 95%.

## **Results**

Table 1 indicates that the majority of children fall within the age range of 12-36 months (61.0%). Furthermore, it revealed that the predominant demographic among mothers of

toddlers was aged over 35 years (47%), with a primary level of education (73%). Additionally, 15% of mothers were identified as housewives, a percentage lower than that of fathers who are unemployed (44%). Moreover, the data shows that 85% of households have an income below the minimum wage of 1.531.000.

Table 2 revealed that the consumption of Vitamin A sources, measured by frequency of intake (56%), amount of intake (64%), and Vitamin A supplementation (60%), falls within the "more" category, exceeding 100% of the Nutritional Adequacy Rate on average. Food items significantly contribute to Vitamin A intake among children under five.

In Table 3, out of 100 children under five, 71 (71.0%) were categorized as having adequate levels of Vitamin A consumption, while the remaining 17 (17.0%) were categorized as having inadequate levels.

Table 4 illustrated that among toddlers with a lower frequency of intake of Vitamin A sources, the proportion of those with insufficient Vitamin A status was 41.2%, whereas, among those with a higher frequency of intake, 64.3% have sufficient status. Regarding the amount of intake, 29.4% of toddlers with lower intake have insufficient Vitamin A status, compared to 70.4% with higher intake, indicating sufficiency. The analysis revealed a significant influence of Vitamin A source intake frequency ( $p\text{-value}=0.000$ ) and intake amount ( $p\text{-value}=0.002$ ) on Vitamin A sufficiency status among toddlers aged 12-59 months. Moreover, 59.3% (42 individuals) of toddlers with Vitamin A supplementation exhibit sufficient status. The analysis suggests a significant correlation between Vitamin A supplementation and Vitamin A sufficiency status ( $p\text{-value}=0.004$ ) in this age group.

In Table 5, the results of multivariate linear regression analyses indicated that Total Source Vitamin A has a coefficient B value of 2.241. This suggests that the total source of Vitamin A has a twofold effect on the Vitamin A sufficiency status in toddlers aged 12-59 months in Batujajar District, West Bandung Regency ( $p\text{-value}=0.000$ ).



## Discussion

The result showed that the characteristics and sociodemographic factors of mothers may have an impact. Specifically, mothers with lower levels of education and those from low-income families appear to be at higher risk of their children having inadequate intake of Vitamin A-rich foods. One possible explanation is that more educated women possess better skills to access modern health services and are more likely to comprehend messages regarding dietary diversity and health.<sup>13,14</sup> Numerous studies have found that children of working mothers have a lower nutrition status than those whose mothers remain at home. Others, however, have found maternal employment outside the home to have a positive impact on children's nutrition status.<sup>15,16</sup> It is also believed that economically independent women are more likely to be able to use their knowledge to maintain good nutrition and health for their children than economically dependent women.<sup>17,18</sup>

The frequency of food intake is used to calculate the amount of nutrient intake that enters the body so that the needs that enter that day can be known.<sup>17</sup> The frequency of eating is required 3 times a day with an adequate amount of food intake according to the needs of the body.<sup>19</sup> The frequency of intake of Vitamin A sources is obtained from fruits and vegetables. The vegetables most consumed by children under five in this area are carrots and fruit, which are generally consumed frequently, namely bananas; this is because these types of vegetables and fruits are quite available in households to be consumed every day. The frequent intake of vegetables is due to the large number of vegetables consumed by children from their habit of liking vegetables. Parents get a variety of vegetables from their own farm income, and some buy them.<sup>20</sup> Sources of Vitamin A vegetables and fruit in the family are not something that is rarely found in the daily diet; in general, children do not like vegetables and fruit. The results of this study are inversely proportional because parenting patterns that often provide a rich intake of

Vitamin A from childhood, with a frequency of more than 3 times a day can result in excessive intake of Vitamin A sources obtained by the toddler.<sup>21</sup> The results of the study indicate the influence of the amount of intake of food sources of Vitamin A on the status of Vitamin A adequacy. In theory, micronutrient needs can be met through food intake if consumed in an amount that is in accordance with the daily nutritional requirement so that it can meet the nutritional adequacy rate for toddlers. This indicates that food intake has a direct effect on the nutritional status of children under five.<sup>22</sup>

The results of this study showed that respondents had a good Vitamin A adequacy status. Infancy is the most important period in the process of growth and development. Vitamins and minerals in infancy are needed in high amounts for physical growth, brain and intelligence development, and the body's resistance to disease. Vitamins and minerals are not enough only to be obtained from food intake, so people get used to taking supplements to meet the need for vitamins and minerals.<sup>21</sup> Activities to overcome Vitamin A deficiency are carried out by intervening in Vitamin A capsules for children under five through the distribution of Vitamin A capsules. Given the low intake of nutrients, including Vitamin A, it is necessary to provide additional Vitamin A through Vitamin A supplements that are consumed every day.<sup>4</sup>

Nutritional status is the result of a balance between food that enters the body (nutrition intake) and the body's needs (nutrition output) for certain nutrients. Toddlers whose food intake is not good enough will weaken their immune systems and will be susceptible to disease. For toddlers who are sick, their weight will decrease, which will affect the nutritional status of the child.<sup>20</sup>

Nutritional needs can be met through food intake if consumed in an amount that follows the number of nutritional needs per day so that it can meet the nutritional adequacy rate for toddlers. Based on the results of research on the intake of natural sources of Vitamin A in children under five, it was found that the adequacy level of Vitamin A consumption was mostly low, caused by wrong eating habits, not eating vegetables and fruit, or because of poor purchasing power.

low, unable to buy animal foods rich in Vitamin A. Vitamin A derived from animals is generally consumed in small amounts because it is expensive.<sup>17</sup>

## **Conclusions**

Children between the ages of 12 and 59 months who consume Vitamin A regularly have a positive impact on their Vitamin A adequacy. The level of Vitamin A adequacy in toddlers aged 12-59 months was influenced by the Total source of Vitamin A sources they consume. Measuring the proportion of children who have received two doses of Vitamin A within the past year can be used to monitor coverage of interventions aimed at increasing child survival rates. Government programs are needed to control Vitamin A deficiency to increase children's chances of survival, reduce the severity of childhood illnesses, ease the strain on health systems and hospitals, and contribute to the well-being of children, their families, and communities.

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**Table 1.** Frequency distribution of respondents' characteristics.

Variable	Frequency	%
<b>Toddler age</b>		
12-36 months	61	61
37-59 months	39	39
<b>Mother's age</b>		
<20 years	22	22
20-35 years	31	31
>35 years	47	47
<b>Mother's education</b>		
Elementary Sschool	73	73
Senior high school	15	15
College	12	12
<b>Father's education</b>		
Elementary school	49	49
Senior high school	40	40
College	11	11
<b>Mother's job</b>		
Employed	73	73
Unemployed	15	15
<b>Father's job</b>		
Employed	56	56
Unemployed	44	44
<b>Parents' income</b>		
≤Regional Minimum Wage IDR 1.531.000	15	15
≥Regional Minimum Wage IDR 1.531.000	85	85
<b>Total</b>	100	100





**Table 2.** Frequency distribution of Vitamin A food source intake.

<b>Food source intake Vitamin A</b>	<b>Frequency</b>	<b>%</b>
<b>Frequency of intake</b>		
Less	25	25
Enough	19	19
More	56	56
<b>Total intake</b>		
Less (<80% RDA)	16	16
Sufficient (80-100% RDA)	20	20
More (>100% RDA)	64	64
<b>Vitamin A supplement</b>		
Less (<80% RDA)	1	1
Sufficient (80-100% RDA)	39	39
More (>100% RDA)	60	60
<b>Total</b>	100	100

RDA, Recommended Dietary Allowance

**Table 3.** Frequency distribution of Vitamin A sufficiency status.

<b>Adequacy status</b>	<b>Frequency</b>	<b>%</b>
Deficient (<80%)	17	17
Adequate (80-100%)	12	12
More (>100%)	71	71
<b>Total</b>	<b>100</b>	<b>100</b>

**Table 4.** Effect of frequency of intake of Vitamin A sources on Vitamin A sufficiency status.

Variable	Vitamin A sufficiency status					p-value
	Less		Enough		More	
	n	%	n	%	n (%)	
<b>Vitamin A source</b>						0.039
Less	7	41.2	4	33.3	14 (19.7)	
Enough	6	35.3	1	8.3	12 (19.9)	
More	4	23.5	7	58.3	45 (64.3)	
<b>Vitamin A intake</b>						0.002
Less	5	29.4	5	41.7	6 (8.5)	
Enough	4	23.5	1	50.0	15 (75.0)	
More	8	47.1	6	50.0	50 (70.4)	
<b>Vitamin A supplement</b>						0,004
Less	0	0	1	8.3	0 (0)	
Enough	8	47.1	2	16.7	29 (40.8)	
More	9	52.9	9	75.0	42 (59.2)	

**Table 5.** Influence of frequency, amount, and Vitamin A supplementation on Vitamin A adequacy status of toddlers aged 12-59 months.

Variable	Coefficient B	SE	p-value
Frequency source Vitamin A	1,892	0,911	0,002
Total source Vitamin A	2,241	0,694	0,000
Supplement Vitamin A	2,220	0,666	0,004

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