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Adequate Vitamin A Levels with Stunting Adolescents of Minangkabau Ethnicity in Indonesia: A Case-Control Study

Elly Usman[1]*, Masrul Masrul[2]

[1]Department of Pharmacology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia; [2]Department of Nutrition, Faculty of Medicine, Universitas Andalas, Padang, Indonesia

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***Correspondence:** Elly Usman, Department of Pharmacology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia. E-mail: ellyusman@med.unand.ac.id
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Abstract

BACKGROUND: Stunting is a type of linear growth condition. The release of growth hormone in long bones can be hampered by a lack of micronutrients such as Vitamin A.

AIM: This study was performed to determine adequate vitamin levels with stunting adolescents of Minangkabau ethnicity in Indonesia.

METHODS: A case-control study was used in this study. This study was undertaken at several senior high schools in Padang, Indonesia. Stunting adolescents aged 16–18 years of Minangkabau ethnicity were included in the study. Adolescents with stunting were in the case group, whereas those who did not have stunting were in the control group. The age and sex of the cases and controls were matched. There were 42 cases and 42 controls in the research. Food intake measurement used *Semi-Quantitative Food Frequency* Questionnaire. The independent sample T test and the Chi-square test were used to analyze the data. Statistical significance was defined as a two-tailed $p < 0.05$. *GraphPad Prism 7.00* program was used to gather and analyze data.

RESULTS: The Vitamin A levels in stunting adolescents were 243.83 ± 63.32 mcg and in non- stunting adolescents were 495.46 ± 26.31 mcg, the mean difference was 251.63 ± 37.01 mcg ($p < 0.05$).

CONCLUSION: Our research found that stunting adolescents of the Minangkabau ethnic group in Indonesia have low Vitamin A levels.

Introduction

Reduce child stunting, which is a key indicator in the second Sustainable Development Goal of Zero Hunger, is the first of six Global Nutrition Targets for 2025 [1]. In Indonesia, the frequency of child stunting has remained high over the past decade, with an estimated 37% of children stunted at the national level. Subnationally, there are significant differences, ranging from 26% to 52%. West Sumatera is an Indonesian province where 32% of children are stunted [2], [3].

Stunting is caused by a lack of nutrients in the diet. Micronutrient insufficiency has an impact on linear growth as well [4]. The prevalence of Vitamin A the previous studies revealed a significant deficiency as a cause of stunting [5], [6]. Stunting can be influenced by a lack of Vitamin A in the diet [5]. Then, Vitamin A is involved in a variety of physiological activities in the body, including eyesight, cell differentiation, acquaintance, growth and development, reproduction, cancer and heart disease prevention, and hunger suppression [7].

A previous study discovered a relationship between Vitamin A consumption and stunting. Over and beyond any associations between Vitamin A supplementation and stunting, the positive correlation between getting Vitamin A supplements and stunting reported in this study shows that [8]. This study was performed to determine adequate vitamin levels with stunting adolescents of Minangkabau ethnicity in Indonesia. This information will be used to design a better-targeted approach for identifying and treating stunted adolescents in Indonesia, so that they can return to being normal and healthy adolescents.

Methods

Study design and research sample

A case-control study was used in this research. This study was undertaken at several senior high schools in Padang, Indonesia. Stunting adolescents aged 16–18 years of Minangkabau ethnicity were included in the study. Adolescents with stunting were in the case group, whereas those who did not have stunting were in the control group. The age and sex of the cases and controls were matched. The sample size calculation used comparing two proportions. There were 42 cases and 42 controls in the research. The sample technique used was proportional random sampling, which gathered

samples based on high schools in Padang City, then a number of research samples were obtained from each selected school depending on the proportion of cases reported. For stunted adolescents, a Z-score of −2 standard deviation was used as an inclusion criterion. Exclusion criteria: (a) not present during data collection, (b) chronic disease, (c) physical disability, and (e) not taking a comparable multivitamin-mineral supplement. The independent variable in this study was Vitamin A levels (mcg), while the dependent variable was stunting adolescent of Minangkabau ethnicity.

Data collection technique

An informed consent form was created for this study to protect respondents and researchers while doing research. The Ethics Commission of the Faculty of Medicine, Universitas Andalas, Indonesia, gave its approval to this study (No: 101/KEP/FK/2018). For the 1st time, data collection began with a screening to identify cases in a selected senior high school, followed by a control group. Food intake measurement used *Semi-Quantitative Food Frequency* Questionnaire. When the mean quantity consumed is compared to the nutrition adequacy rate, adequate amounts of Vitamin A are attained. The Vitamin A Recommended Dietary Allowance for men and women aged 16–18 years were 900 and 700 mcg retinol activity equivalents/day, respectively [9].

Following the interview, blood samples were taken. Each individual had 2 ml of venous blood taken. To preserve Vitamin A from light deterioration, the blood sample was put in a glass centrifuge tube and immediately wrapped in foil. Serum samples were separated after centrifugation and stored frozen at −20° C until further investigation. Anthropometry was performed by measuring height with a microtoise with an accuracy of 0.1 cm and weight with a digital scale with an accuracy of 0.01 kg.

Data analysis

Means, standard deviations, and percentages were used to record the quantitative data. The Independent sample T test and the Chi-square test were used to analyze the data. Statistical significance was defined as a two-tailed $p < 0.05$. GraphPad Prism 7.00 was used to gather and analyze data.

Results

Table 1 shows that in both the cases (73.8%) and control groups, more than half of the respondents were female (59.5%). In the cases group, major food and side dishes (50.0%) accounted for half of the respondent intake, whereas in the control group, main food and side dishes accounted for half of the respondent consumption (47.6%).

Table 1: Respondent characteristics

Variables	Cases (f/%) (n = 42)	Control (f/%) (n = 42)
Sex		
Male	11 (26.2)	17 (40.5)
Female	31 (73.8)	25 (59.5)
Food type		
Main food and side dishes	21 (50.0)	20 (47.6)
Main food, vegetables, and side dishes	15 (35.7)	18 (42.9)
Main food, vegetables, side dishes, and fruits	6 (14.3)	4 (9.5)

Table 2 found that the Vitamin A levels in stunting adolescents were 243.83 ± 63.32 mcg and in non-stunting adolescents were 495.46 ± 26.31 mcg, the mean difference was 251.63 ± 37.01 mcg ($p < 0.05$) ($p < 0.05$).

Table 2: The mean difference in Vitamin A levels among stunting adolescent of Minangkabau ethnicity

Variable	Cases (n = 42)	Control (n = 42)	Mean difference	p-value
Vitamin A levels (mcg)	243.83 ± 63.32	495.46 ± 26.31	251.63 ± 37.01	<0.001*

*$p < 0.05$, defined as a significant.

The mean difference in Vitamin A levels in stunting adolescent of Minangkabau ethnicity is presented as a scatter plot (Figure 1).

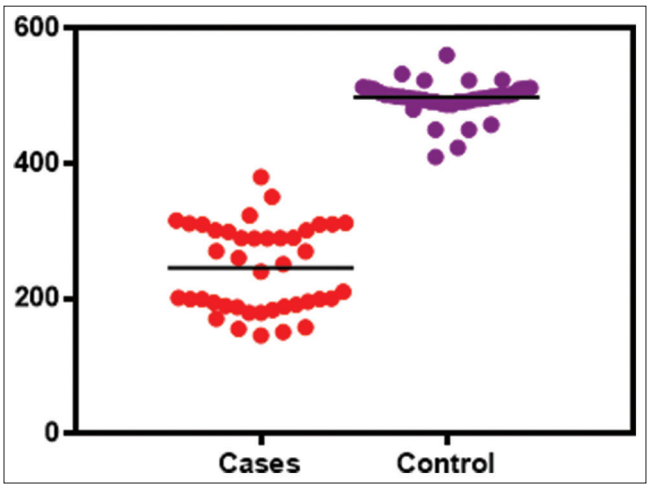

Figure 1: Scatter plots mean difference of Vitamin A levels with stunting adolescent of Minangkabau ethnicity

Figure 1 known mean difference of Vitamin A levels in stunting adolescent lower than and non-stunting adolescent.

Table 3 showed that there was significant adequate Vitamin A levels with stunting adolescents of Minangkabau ethnicity ($p < 0.05$).

Table 3: Adequate Vitamin A levels with stunting adolescent of Minangkabau ethnicity

Vitamin A intake	Cases (f/%) (n = 42)	Control (f/%) (n = 42)	Total (f/%)	p-value
Sufficient	20 (47.6)	26 (61.8)	46 (54.8)	0.025
Insufficient	22 (52.4)	16 (38.2)	38 (45.2)	
Total	42 (100.0)	42 (100.0)	84 (100.0)	

Discussion

There was a mean difference in Vitamin A levels among stunting adolescent of Minangkabau ethnicity, according to this finding. While in West Sumatera Province, Indonesia, there was a significant correlation between adequate Vitamin A levels and stunting adolescent of Minangkabau ethnicity.

A previous study found that taking Vitamin A supplements is related to a considerable increase in adolescent development [7]. Vitamin A supplementation, according to this study, may help to avoid stunting. In observational studies, the relationship between Vitamin A and child growth has been shown [8], [10].

This relation has been attributed to a number of mechanisms, including an inverse relationship between Vitamin A consumption and the incidence and severity of childhood infections, which could lead to stunting due to decreased nutritional consumption, nutrient malabsorption, and increased nutrient expenditure during illness [11], and also exhibiting biological validity is the role of Vitamin A in cell development and function [12]. According to a research published in the Southeast Asian Nutrition Survey, children who drink milk can help ensure that they get enough Vitamin A from their daily diet, which is vital for growth [13].

Vitamin A is an important vitamin for children's development and growth, as well as their resistance to illness. Vitamin A deficiency has been related to stunted development. Vitamin A deficiency has an effect on protein synthesis, which can affect cell development. One of the Vitamin A variations is the presence of retinoic acid in epithelial cells [14]. Controlling growth hormone in skeletal tissue growth can alter the growth process. Retinoic acid will affect the rate of cyclic adenosine monophosphate release and growth hormone secretion [15].

Previous studies have found a high incidence of stunting in children with Vitamin A deficiency [16], [17]. This happens because parenting patterns and consumption of children are known to be inadequate according to the recommended Vitamin A needs. Vitamin A is known to play an important role in the growth and development of children [18], [19].

Our study's strength was that it was performed in West Sumatera, Indonesia, in a region with a high prevalence of stunting. As a result, this is a good setting for investigating potential relationships between stunting and nutrient consumption. A limitation of this study in that nutritional intake was examined when the subjects were already 16–18 years old, although most stunting is thought to develop between the ages of 6 and 24 months. We don't have any data on food consumption at this time.

These findings suggest that the Vitamin A consumption described here is directly associated to growth retardation. To avoid stunting, enough Vitamin A intake must be increased by the consumption of a diversified and balanced diet. As a result, children with low Vitamin A levels may be at a higher risk of stunting.

Conclusion

This research found that stunted adolescent of the Minangkabau ethnic group in Indonesia has low Vitamin A levels.

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