

Kronologis Proses Pemasukan (Submission) Artikel hingga Terbit (Published)

Judul artikel	: Adequate Vitamin A Levels with Stunting Adolescents of Minangkabau Ethnicity in Indonesia: A Case-Control Study
Link artikel	: https://oamjms.eu/index.php/mjms/article/view/8487
Jurnal	: Open Access Macedonian Journal of Medical Sciences
SJR	: 0,29 (Quartil Q3 sejak 2017 bidang medicine hingga sekarang) https://www.scimagojr.com/journalsearch.php?q=21100824403&tip=sj&d&clean=0
Submitted	: 03 Januari 2022
Review report	: 21 Januari 2022
Revise version	: 28 Januari 2022
Accepted	: 11 Februari 2022
Article in press	: 14 Maret 2022
Published	: 15 Maret 2022
Similarity index	: 18% (link hasil pemeriksaan turnitin) https://drive.google.com/file/d/1kSBZOBQEU1LmqR0ZDpY_D_ydE_TxG08b/view?usp=sharing

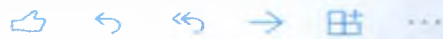
Kronologis sebagai berikut:

1. Manuskrip di submit pada tanggal 03 Januari 2022 dan mendapatkan email pemberitahuan dari editor Open Access Macedonia Journal of Medical Sciences bahwa artikel sudah dikirim (submitted) (*Gambar 1*). Original paper terlampir (*Lampiran A*)

[OAMJMS] Submission Acknowledgement



Prof. Dr Mirko Spiroski via SFS - Journals (Scientific Foundation SPIROSKI - Journals), Skopje, Republic of Macedonia
<noreply@publicknowledgeproject.org>



Mon 1/3/2022 6:05 PM

To: Elly Usman

Elly Usman:

Thank you for submitting the manuscript, "Adequate Vitamin A Levels with Stunting Adolescents of Minangkabau Ethnicity in Indonesia: A Case-Control Study" to Open Access Macedonian Journal of Medical Sciences. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Submission URL:

<https://oamjms.eu/index.php/mjms/authorDashboard/submission/8487>

Activate Windows

Gambar 1. Pemberitahuan editor bahwa manuskrip submitted

2. Email pemberitahuan oleh editor terkait hasil review dari 2 orang reviewer pada tanggal 21 Januari 2022

[OAMJMS] Editor Decision

2022-01-20 09:40 AM

Elly Usman (Author):

We have reached a decision regarding your submission to Open Access Macedonian Journal of Medical Sciences, "Adequate Vitamin A Levels with Stunting Adolescents of Minangkabau Ethnicity in Indonesia: A Case-Control Study", Manuscript ID = OJ58487.

Our decision is: Revisions Required

Sincerely,
Prof. Dr Mirko Splroski,
Editor-in-Chief, OAMJMS

Sasho Stoleski

Reviewer E:
Recommendation: Revisions Required

Comments to the Author

it is an important article, but it should be improved.
Here are my comments: 1. The language should be improved.

2. Abstract:

"Vitamin A measurement used SQ-FFQ"

Please write full first then the acronym (SQ-FFQ). SQ-FFQ is not a tool to assess the level of vitamin A but a tool for assessing food intake.

"Mean difference of vitamin A levels in stunting adolescents was 243.83 ± 63.32 mcg, and not stunting adolescents was 495.46 ± 26.31 mcg.

There was a mean difference in vitamin A levels among stunting adolescents of Minangkabau ethnicity ($p < 0.05$). Stunting adolescent of Minangkabau ethnicity in Indonesia had significantly adequate vitamin A levels ($p < 0.05$)"

It is not the right sentence.

The vitamin A levels in stunting adolescents were 243.83 ± 63.32 mcg, and in non-stunting adolescents was 495.46 ± 26.31 mcg, the mean difference was, + SD, 95% CI $p < 0,05$

Please use the consistent words: Stunting adolescent, stunted adolescent?

3. Introduction;

Why assess the Vit A not for example zinc, or Vit D? you should give strong reasons, for example, the prevalence of Vit A deficiency is high in the setting study and other reasons

4. Methods"

A case-control study was used in this research The age and sex of the cases and controls were matched. There were 42 cases and 42 controls in the research. Proportional random sampling was used as the sample technique.

Please explain the sample size calculation, and elaborate more regarding the proportional random sampling technique.

Please describe in the methods section the definition of "food type", Vitamin A intake (good, sufficient, insufficient).

5. Results

Table 2: please add the mean differences between stunting and non-stunting.

6. Discussions

Please elaborate more on the discussion using the recent related publications.


Add also the strength and the limitation of the study.

7. References:

Use more recent (update references), at least 10 years, except for the concept. reference no 3 MoH, Basic health survey 2010.

Gambar 2. Pemberitahuan editor terkait hasil review dari 2 orang reviewer

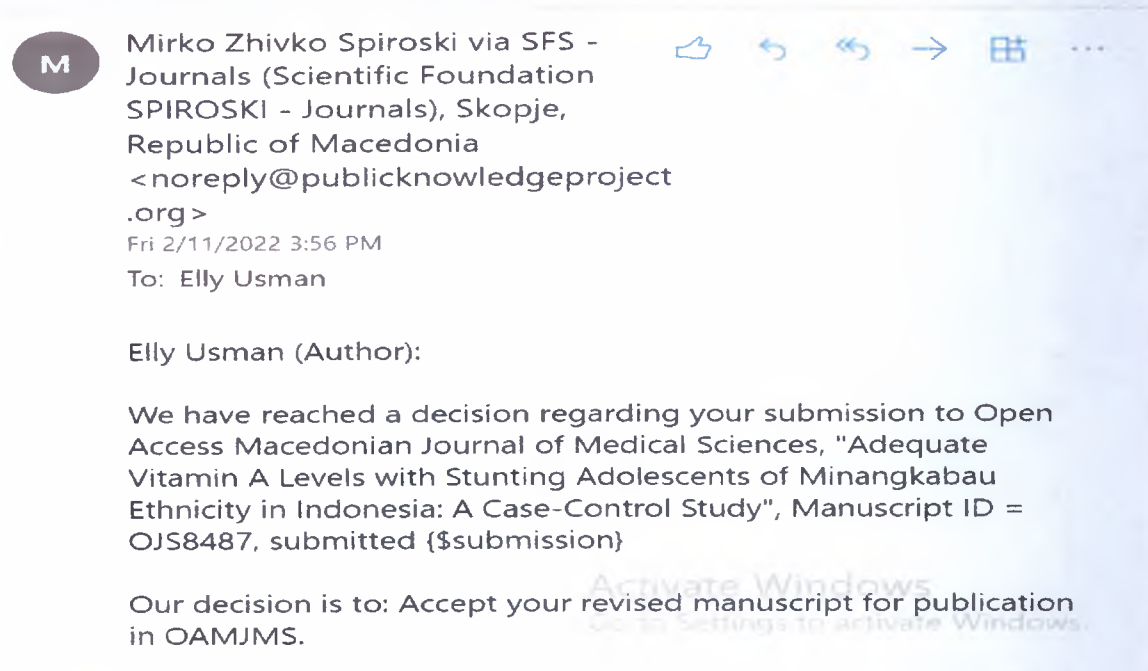
3. **Author mengirimkan perbaikan manuskrip berdasarkan hasil review dari reviewer dan melakukan resubmission ke jurnal system pada tanggal 28 Januari 2022. Perubahan dan penambahan pada manuskrip penelitian berdasarkan hasil review ditandai dengan tulisan berwarna highlight kuning (*Lampiran B*).**

Revisions		Q Search	Upload File
▶  70239	Revision_Manuscript Main File_Dr Eily Usman_Vit A.doc	January 28, 2022	Revised Manuscript

Gambar 3. Penulis mengirimkan hasil revisi berdasarkan review oleh reviewer

4. Pemberitahuan editor bahwa manuskrip diterima setelah dilakukan revisi pada tanggal 11 Feburari 2022

[OAMJMS] Editor Decision



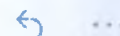
Gambar 4. Pemberitahuan editor bahwa manuskrip diterima setelah dilakukan revisi

5. Pemberitahuan editor Proofreading Request pada tanggal 8 Maret 2022

[OAMJMS] Proofreading Request (Author)



Teodora Fildishevska via SFS - Journals (Scientific Foundation SPIROSKI - Journals), Skopje, Republic of Macedonia <noreply@publicknowledgeproject.org>



Tue 3/8/2022 3:56 PM

To: Elly Usman

Dear Elly Usman:

Your submission "Adequate Vitamin A Levels with Stunting Adolescents of Minangkabau Ethnicity in Indonesia: A Case-Control Study" to Open Access Macedonian Journal of Medical Sciences now needs to be proofread by following these steps.

1. Click on the Submission URL below.
2. Log into the journal and view PROOFING INSTRUCTIONS
3. Click on VIEW PROOF in Layout and proof the galley in the one or more formats used.
4. Enter corrections (typographical and format) in Proofreading Corrections using "[Mark up text with edits](#)" or "[Use annotation and drawing markup tools to add comments in PDFs](#)".
5. Save corrected Galley Proof with the addition "Corrected" to the

Gambar 5. Pemberitahuan editor proofreading request

6. Author langsung mengirimkan proofreading ke journal system pada tanggal 8 Maret 2022

Teodora Fildishevskva (tfildishevskva)

Elly Usman (elly)

Messages

Note

Dear editor Open Access Macedonian Journal of Medical Sciences

Here I attached files of my corrected galley proof and copyright form for my manuscript. I hope this manuscript could be published very soon in your journal.

Thank you very much for your generosity and kind help.

Yours sincerely,

Dr. Elly Usman

 oamjms-10e-8487-20220307-corrected.pdf

 oamjms-copyright-signed.docx

From

elly

2022-03-08 01:16 AM

[Add Message](#)

Act
Go to

Gambar 6. Author mengirimkan proofreading ke journal system

7. Pemberitahuan editor bahwa artikel sudah diterbitkan pada jurnal Open Access Macedonian Journal of Medical Sciences. 2022 Mar 14; 10(E):337-340.

[OAMJMS] Your Article was Published

x

Participants

MSc, Eng Ivo Spiroski (ivos)

Elly Usman (elly)

Messages

Note

Dear Elly Usman,

Please note that your paper "Adequate Vitamin A Levels with Stunting Adolescents of Minangkabau Ethnicity in Indonesia: A Case-Control Study", was published in Open Access Maced J Med Sci (OAMJMS).

DOI: <https://doi.org/10.3889/oamjms.2022.8487>

Username: Elly Usman

Thank you for your fine contribution. On behalf of the Editors of the Open Access Macedonian Journal of Medical Sciences, we look forward to your continued contributions to the journal.

From

ivos

2022-03-14 05:44 AM

Act
Go to

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

Elly Usman

Department of Pharmacology, Faculty of Medicine, Universitas Andalas Padang, Indonesia

Masrul Masrul

Department of Nutrition, Faculty of Medicine, Universitas Andalas Padang, Indonesia



Published

2022-03-09

DOI: <https://doi.org/10.3889/oamjms.2022.8487>

How to Cite

Usman E, Masrul M. Adequate Vitamin A Levels with Stunting Adolescents of Minangkabau Ethnicity in Indonesia. *Oamjms* (Online). 2022;10(3):8487-8492.

Information

For Readers

For Authors

For Librarians

Open Journal Systems

[Make a Submission](#)

Browse

Activate Windows

Go to Settings to activate Windows.

Gambar 7. Pemberitahuan editor bahwa artikel sudah diterbitkan

LAMPIRAN A
PAPER DENGAN VERSI PERTAMA KALI DIKIRIM (*ORIGINAL VERSION*) DAN VERSI REVISI

1. PAPER DENGAN VERSI PERTAMA KALI DIKIRIM [*ORIGINAL VERSION*]

Research article

Manuscript Title:

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

Elly Usman¹, Masrul²

Affiliations:

- 1) Department of Pharmacology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia.
- 2) Department of Nutrition, Faculty of Medicine, Universitas Andalas, Padang, Indonesia.

Corresponding author

Elly Usman

Department of Pharmacology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia.

E-mail: ellyusman@med.unand.ac.id

Tel: + 62751 31746

Running title

Adequate Vitamin A Levels with Stunting Adolescents

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. This study was performed to determine adequate vitamin A 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 to 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. Vitamin A measurement used SQ-FFQ. 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-value < 0.05 . *GraphPad Prism 7.00* program was used to gather and analyze data.

Results: Mean difference of vitamin A levels in stunting adolescent was 243.83 ± 63.32 mcg and not stunting adolescent was 495.46 ± 26.31 mcg. There was a mean difference in vitamin A levels among stunting adolescent of Minangkabau ethnicity ($p < 0.05$). Stunting adolescent of Minangkabau ethnicity in Indonesia had significantly adequate vitamin A levels ($p < 0.05$).

Conclusion: Our research found that stunted adolescent of the Minangkabau ethnic group in Indonesia have low vitamin A levels.

Keywords: Vitamin A, Stunting, Minangkabau ethnicity, Adolescents

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 last 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]. Stunting can be influenced by a lack of vitamin A in the diet [5]. 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 [6].

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 [7]. This study was performed to determine adequate vitamin a 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.

Materials and 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 to 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. Proportional random sampling was used as the sample technique. 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 first time, data collection began with a screening to identify cases in a selected senior high school, followed by a control group. Vitamin A measurement used Semi Quantitative Food Frequency Questionnaire (SQ-FFQ). When the mean quantity consumed is compared to the nutrition adequacy rate, adequate amounts of vitamin A are attained. Following the interview, blood samples were taken. Each individual had two millilitres 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 microtoice 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-value of < 0.05. GraphPad Prism 7.00 was used to gather and analyze data.

Results

Respondent characteristics (Table 1).

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 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 respondent intake, whereas in the control group, main food and side dishes accounted for half of respondent consumption (47.6%).

The mean difference in vitamin A levels among stunting adolescent of Minangkabau ethnicity (Table 2).

Table 2. The mean difference in vitamin A levels among stunting adolescent of Minangkabau ethnicity

Intake	Cases (n=42)	Control (n=42)	p-value
Vitamin A levels (mcg)	243.83±63.32	495.46±26.31	<0.001*

*p<0.05, defined as a significant

Mean difference of vitamin A levels in stunting adolescent was 243.83±63.32 mcg and not stunting adolescent was 495.46±26.31 mcg. There was a mean difference in vitamin A levels among stunting adolescent of Minangkabau ethnicity (p<0.05).

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

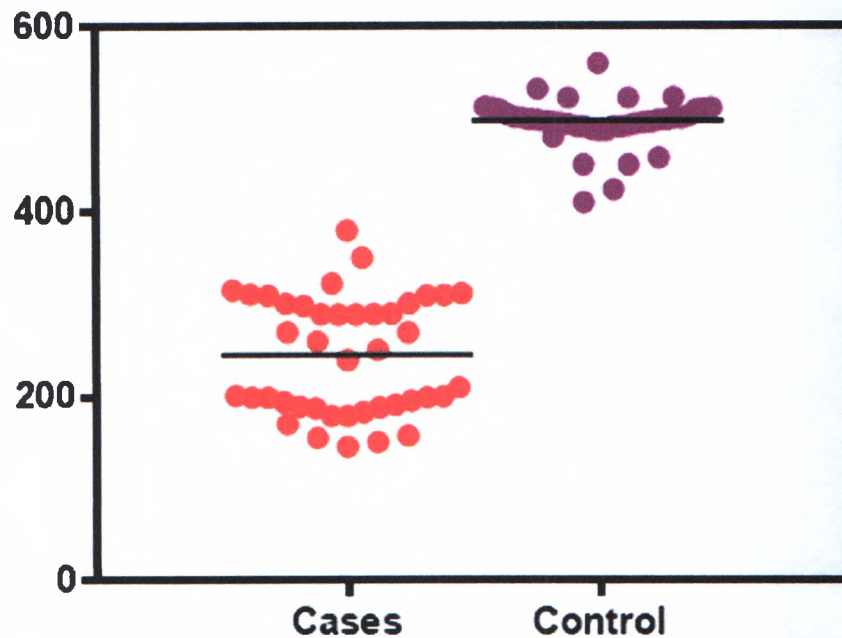


Figure 1. Scatter plots mean difference of vitamin A levels with stunting adolescent of Minangkabau ethnicity

Figure 1 known mean difference of vitamin A levels in stunting adolescent lower than and not stunting adolescent.

Adequate vitamin A levels with stunting adolescent of Minangkabau ethnicity (Table 3).

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
Good	5 (11.9)	8 (19.0)	13 (15.5)	0.025
Sufficient	15 (35.7)	18 (42.8)	33 (39.3)	
Insufficient	22 (52.4)	16 (38.2)	38 (45.2)	
Total	42 (100.0)	42 (100.0)	84 (100.0)	

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

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, 9].

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 [10], and also exhibiting biological validity is the role of vitamin A in cell development and function [11]. According to a research published in the Southeast Asian Nutrition Survey (SEANUTS), children who drink milk can help ensure that they get enough vitamin A from their daily diet, which is vital for growth [12].

Vitamin A is an important vitamin for children's development and growth, as well as their resistance against 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 [13]. Controlling growth hormone in skeletal tissue growth can alter the growth process. Retinoic acid will affect the rate of cyclic AMP (adenosine monophosphate) release and growth hormone secretion [14].

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 have low vitamin A levels.

Acknowledgements

The authors would like to express their gratitude to Universitas Andalas, Padang, Indonesia for a grant for expedited research, as well as all participants in this study.

Conflict of interest statement

There were no potential conflicts of interest stated by the authors.

References

1. Wirth JP, Petry N, Tanumihardjo SA, Rogers LM, McLean E, Greig A, et al. Vitamin A Supplementation Programs and Country-Level Evidence of Vitamin A Deficiency. *Nutrients*. 2017;9(3):190.
2. Lipoeto NI, Masrul, Nindrea RD. Nutritional contributors to maternal anemia in Indonesia: Chronic energy deficiency and micronutrients. *Asia Pac J Clin Nutr*. 2020;29(Suppl 1):S9-S17.
3. Ministry of Health Republic of Indonesia. Basic Health Research. Ministry of Health Republic of Indonesia. Jakarta. 2010.

4. Abdel Wahed WY, Hassan SK, Eldessouki R. Malnutrition and Its Associated Factors among Rural School Children in Fayoum Governorate, Egypt. *J Environ Public Health*. 2017;2017:4783791.
5. Galler JR, Ramsey F. A follow-up study of the influence of early malnutrition on development: behavior at home and at school. *J Am Acad Child Adolesc Psychiatry*. 1989;28(2):254-61.
6. Gardner JM, Grantham-McGregor SM, Himes J, Chang S. Behaviour and development of stunted and nonstunted Jamaican children. *J Child Psychol Psychiatry*. 1999;40:819-27.
7. Ernawati F, Syauqy A, Arifin AY, Soekatri MYE, Sandjaja S. Micronutrient Deficiencies and Stunting Were Associated with Socioeconomic Status in Indonesian Children Aged 6-59 Months. *Nutrients*. 2021;13(6):1802.
8. Hadi H, Stoltzfus RJ, Dibley MJ, Moulton LH, West KP Jr, Kjolhede CL, Sadjimin T. Vitamin A supplementation selectively improves the linear growth of Indonesian preschool children: results from a randomized controlled trial. *Am J Clin Nutr*. 2000;71(2):507-13.
9. Sedgh G, Herrera MG, Nestel P, el Amin A, Fawzi WW. Dietary vitamin A intake and nondietary factors are associated with reversal of stunting in children. *J Nutr*. 2000;130(10):2520-6.
10. Underwood BA, Arthur P. The contribution of vitamin A to public health. *FASEB J*. 1996 Jul;10(9):1040-8.
11. De Luca LM. Retinoids and their receptors in differentiation, embryogenesis, and neoplasia. *FASEB J*. 1991;5(14):2924-33.

12. Nguyen Bao KL, Sandjaja S, Poh BK, Rojroongwasinkul N, Huu CN, Sumedi E, et al. The Consumption of Dairy and Its Association with Nutritional Status in the South East Asian Nutrition Surveys (SEANUTS). *Nutrients*. 2018;10(6):759.
13. De Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*. 2007;85:660–667.
14. Imdad A, Mayo-Wilson E, Herzer K, Bhutta ZA. Vitamin A supplementation for preventing morbidity and mortality in children from six months to five years of age. *Cochrane Database Syst Rev*. 2017;3(3):CD008524.

Research article

Manuscript Title:

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

Elly Usman¹, Masrul²

Affiliations:

- 1) Department of Pharmacology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia.
- 2) Department of Nutrition, Faculty of Medicine, Universitas Andalas, Padang, Indonesia.

Corresponding author

Elly Usman

Department of Pharmacology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia.

E-mail: ellyusman@med.unand.ac.id

Tel: + 62751 31746

Running title

Adequate Vitamin A Levels with Stunting Adolescents

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. This study was performed to determine adequate vitamin A 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 to 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 (SQ-FFQ).

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-value < 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.

Keywords: Vitamin A, Stunting, Minangkabau ethnicity, Adolescents

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 last 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 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 a 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.

Materials and 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 to 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 first 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 (SQ-FFQ). 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 (RDA) for men and women aged 16-18 years were 900 and 700 mcg retinol activity equivalents (RAE)/day, respectively [9].

Following the interview, blood samples were taken. Each individual had two millilitres 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 microtoice 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-value of < 0.05. GraphPad Prism 7.00 was used to gather and analyze data.

Results

Respondent characteristics (Table 1).

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 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 respondent intake, whereas in the control group, main food and side dishes accounted for half of respondent consumption (47.6%).

The mean difference in vitamin A levels among stunting adolescent of Minangkabau ethnicity (Table 2).

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

Table 2 found 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).

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

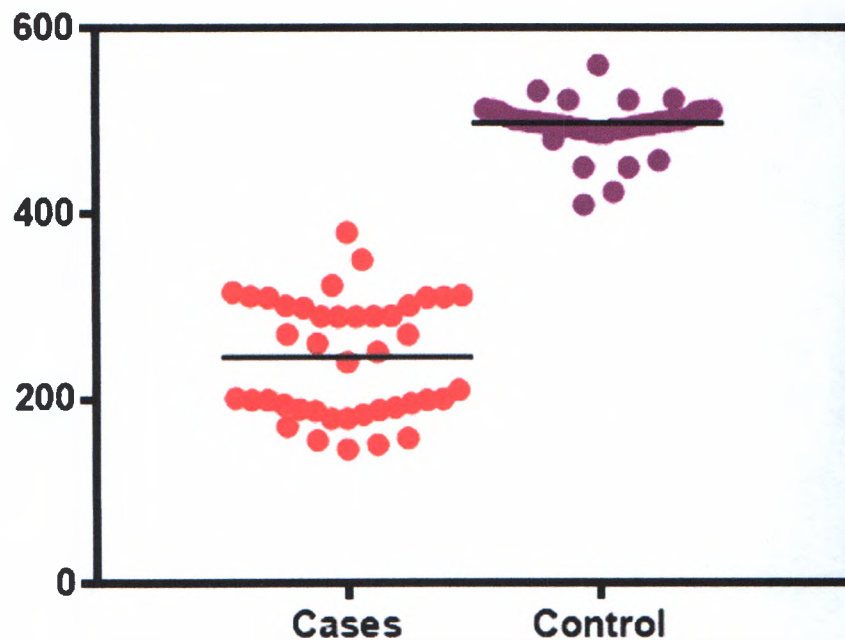


Figure 1. Scatter plots mean difference of vitamin A levels with stunting adolescent of Minangkabau ethnicity

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

Adequate vitamin A levels with stunting adolescent of Minangkabau ethnicity (Table 3).

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)	

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

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 (SEANUTS), 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 against 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 AMP (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 is 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 have low vitamin A levels.

Acknowledgements

The authors would like to express their gratitude to Universitas Andalas, Padang, Indonesia for a grant for expedited research, as well as all participants in this study.

Conflict of interest statement

There were no potential conflicts of interest stated by the authors.

References

1. Wirth JP, Petry N, Tanumihardjo SA, Rogers LM, McLean E, Greig A, et al. Vitamin A Supplementation Programs and Country-Level Evidence of Vitamin A Deficiency. *Nutrients*. 2017;9(3):190.
2. Lipoeto NI, Masrul, Nindrea RD. Nutritional contributors to maternal anemia in Indonesia: Chronic energy deficiency and micronutrients. *Asia Pac J Clin Nutr*. 2020;29(Suppl 1):S9-S17.
3. Ministry of Health Republic of Indonesia. Basic Health Research. Ministry of Health Republic of Indonesia. Jakarta. 2010.
4. Abdel Wahed WY, Hassan SK, Eldessouki R. Malnutrition and Its Associated Factors among Rural School Children in Fayoum Governorate, Egypt. *J Environ Public Health*. 2017;2017:4783791.
5. Onoja US, Iloeje IC, Onoja NC, Uzor PF. Nutritional status of adolescent schoolchildren in South East Nigeria. *Pak J Nutr*. 2019; 18: 845-851.
6. Gowele VF, Kinabo J, Jumbe T, Rybak C, Stuetz W. High prevalence of stunting and anaemia is associated with multiple micronutrient deficiencies in school children of small-scale farmers from Chamwino and Kilosa Districts, Tanzania. *Nutrients*. 2021;13(5):1576.

7. Ernawati F, Syaury A, Arifin AY, Soekatri MYE, Sandjaja S. Micronutrient Deficiencies and Stunting Were Associated with Socioeconomic Status in Indonesian Children Aged 6-59 Months. *Nutrients*. 2021;13(6):1802.
8. Hadi H, Stoltzfus RJ, Dibley MJ, Moulton LH, West KP Jr, Kjolhede CL, Sadjimin T. Vitamin A supplementation selectively improves the linear growth of Indonesian preschool children: results from a randomized controlled trial. *Am J Clin Nutr*. 2000;71(2):507-13.
9. Institute of Medicine (US) Panel on Micronutrients. Dietary reference intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc. Washington (DC): National Academies Press (US); 2001.
10. Sedgh G, Herrera MG, Nestel P, el Amin A, Fawzi WW. Dietary vitamin A intake and nondietary factors are associated with reversal of stunting in children. *J Nutr*. 2000;130(10):2520-6.
11. Stuetz W, Gowele V, Kinabo J, Bundala N, Mbwana H, Rybak C, et al. Consumption of dark green leafy vegetables predicts vitamin A and iron intake and status among female small-scale farmers in Tanzania. *Nutrients*. 2019;11(5):1025.
12. van Stuijvenberg ME, Nel J, Schoeman SE, Lombard CJ, du Plessis LM, Dhany MA. Low intake of calcium and vitamin D, but not zinc, iron or vitamin A, is associated with stunting in 2- to 5-year-old children. *Nutrition*. 2015;31(6):841-6.
13. Nguyen Bao KL, Sandjaja S, Poh BK, Rojroongwasinkul N, Huu CN, Sumedi E, et al. The Consumption of Dairy and Its Association with Nutritional Status in the South East Asian Nutrition Surveys (SEANUTS). *Nutrients*. 2018;10(6):759.

14. De Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*. 2007;85:660–667.
15. Masrul, Usman E, Yanis A, Nindrea RD. Scoring system in prediction of stunting risk among children in West Sumatera Province, Indonesia. *Sys Rev Pharm*. 2020; 11(9): 636-41.
16. Imdad A, Mayo-Wilson E, Herzer K, Bhutta ZA. Vitamin A supplementation for preventing morbidity and mortality in children from six months to five years of age. *Cochrane Database Syst Rev*. 2017;3(3):CD008524.
17. Masrul M, Izwardy D, Sudji IR, Purnakarya I, Syahrial S, Nindrea RD. Microbiota profile with stunting children in West Sumatera Province, Indonesia. *Open Access Maced J Med Sci*. 2020;8(E):334-40.
18. Hendriyani H, Sudargo T, Lusmilasari L, Helmyati S, Susetyowati S, Nindrea RD. Complementary feeding self-efficacy: a concept analysis. *Open Access Maced J Med Sci*. 2020;8(F):11-22.
19. Masrul, Lipoeto NI, Yanis A, Purnakarya I, Sudji IR, Nindrea RD. Psychosocial Stress, cortisol and growth hormone levels among stunting adolescent of Minangkabau ethnicity in West Sumatera Province, Indonesia: a school-based study. *Sys Rev Pharm*. 2021;12(1): 1561-5.