

Adequate Levels of Vitamin A, Folic Acid, C, and D in Stunting Under-Five Children in Tanah Bumbu Regency, South Kalimantan

Triawanti¹^a, Muhammad Irwan Setiawan¹^b, Agung Waskito²^c, Muhammad Abdan Shadiqi¹^d,
Tyas Ningrum Rahmadayanti¹, Lulu Septiannisa¹, Ira Maharani¹, Mia Arpilawati¹,
Andi Anwar Sadat², Romatua S. Simanjuntak², Dyah Hartati Dewi², Rahmasari², Elvina Masrina²,
Hayatunnisa² and Sughi Mukti²

¹Faculty of Medicine, Lambung Mangkurat University, Banjarmasin, Indonesia

²Bappedalitbang Tanah Bumbu Regency, Tanah Bumbu, Indonesia

Keywords: Stunting, Vitamin A, Folic Acid, Vitamin C, Vitamin D.

Abstract: Background: Stunting is a chronic nutritional problem due to a lack of long-term nutrition, disrupting children's growth. WHO states that stunting is conditioned by the value of Z-score height by age (PB/ U or TB/U) less than -2 standard deviation (SD). Nutritional intake that affects stunting is not only macronutrients but also vitamins and minerals. Objective: The study aimed to determine the adequacy intake of vitamin A, folic acid, vitamin C, and vitamin D in stunting under-five children aged 4-59 months in Tanah Bumbu District. Methods: The type of research was cross-sectional quantitative analytic. This research was conducted from May to August 2023 in Tanah Bumbu Regency. The population of this study was stunting under-five children. The cluster random sampling method was used to obtain a sample of 314 stunting under-five aged 4-59 months. Stunting was analyzed by PB/U or TB/U index. Nutrient intake data was measured using the food recall 1 x 24 hours and analyzed using Nutrisurvey Software. Vitamin adequacy was calculated based on the total intake of vitamins compared to the RDA. Results: The 190 under-five children (60.5%) had insufficient vitamin A levels, and 124 under-five (39.5%) were sufficient. Folic acid adequacy was insufficient for 303 under-five children (96.5%) and classified as sufficient for 11 under-five children (3.5%). Vitamin C adequacy was insufficient for 244 under-five children (77.7%) and classified as sufficient for 70 under-five children (22.3%). Vitamin D adequacy was insufficient for 300 under-five children (95.5%) and classified as sufficient for 14 under-five children (4.5%). Conclusion: Based on the results of this study, it can be concluded that children stunting in Tanah Bumbu Regency obtained deficiency intake of vitamins A, folic acid, C, and D. For this reason, it is necessary to give multi-vitamin supplements to stunting under-five children and not just increased protein intake.

1 INTRODUCTION

Stunting is a chronic nutritional problem due to a lack of long-term nutrition, disrupting children's growth. WHO states that stunting is conditioned by the value of Z-score height by age (PB/ U or TB/U) less than -2 standard deviation (SD). Stunting is also one of the causes of stunted children's height, so it is lower than children their age. It is not uncommon for people to think that the condition of a short body is a genetic

factor and has nothing to do with health problems. In fact, genetic factors have little effect on a person's health compared to environmental factors and health services. Stunting usually begins to occur while the child is still in the womb and is seen when they enter the age of two.

The Indonesian nutritional status study (SSGI) in 2022 showed a national stunting prevalence of under-five children of 21.6%, and South Kalimantan recorded a stunting rate of 24.6%. The incidence of

^a <https://orcid.org/0000-0002-5753-3620>

^b <https://orcid.org/0000-0002-7231-6034>

^c <https://orcid.org/0000-0003-4161-786X>

^d <https://orcid.org/0000-0002-5478-6788>

stunting in South Kalimantan is spread across various districts. Tanah Bumbu Regency is one of the districts that has become the National stunting locus since 2019. Based on the SSGI in 2022, the prevalence of stunted under-five children in Tanah Bumbu Regency was 16.1%, and based on E-PPBGM data in 2022, the stunting rate in Tanah Bumbu Regency was 1,095 stunted children (Ministry of Health, 2022). This is still a challenge for Tanah Bumbu Regency to reduce stunting rates with a national target of 14% by 2024, as targeted by the government through Presidential Regulation No. 72 in 2021.

Stunting has an impact that is not only short but is accompanied by a decrease in intelligence. Stunted under-five children have imperfect growth potential, low motor skills and productivity, and a higher risk of suffering from degenerative diseases (Widiant, 2016). The risk of psychosocial dysfunction in stunted children is higher than in normal conditions. Children can tend to have anxiety, prone to depression, and low self-confidence when they are in their adolescents. Stunting can also affect the quality of human resources at a productive age (Rafika, 2019).

Stunted under-five children need immediate treatment. Handling stunting can be started by providing optimal nutritional intake. Nutrient intake that affects stunting is not only macronutrients but also vitamins and minerals. Vitamin deficiency can occur due to low intake of food sources of vitamins. Stunting children still can get higher if their nutritional intake is met. Lack of nutritional intake in under-five children, if not immediately corrected, can cause a decrease in physical quality (Amelia, 2019). Based on this, it is necessary to know the level of adequacy of nutritional intake, especially vitamin intake. Vitamin A, folic acid, vitamin C, and vitamin D have an indirect role in the process of bone growth (Pontang, 2020), (Salvatore et al., 2023, Bening et al., 2017, Taylor, 2020).

2 METHOD

This type of research was an observational study with a cross-sectional design. The study was conducted from May to August 2023 in Tanah Bumbu Regency. This study has received ethical clearance from the Faculty of Medicine, University of Lambung Mangkurat No.172/KEPK-FKULM/EC/VII/2023. The population of this study was all stunting under-five children in Tanah Bumbu Regency. We used the cluster random sampling method to obtain 314 stunting toddlers aged 4-59 months. Stunting Data

were analyzed with the PB/U or TB/U index based on Permenkes RI Number 2 of 2020. Nutrient intake was measured using the 1 × 24-hour food recall method and analyzed using Nutrisurvey software. Vitamin adequacy levels were calculated based on total vitamin intake compared to the RDA based on Permenkes RI Number 28 of 2019. The level of vitamin adequacy was considered insufficient if it was >77% and sufficient if it was ≤77%.

3 RESULT AND DISCUSSION

3.1 Result

The characteristics of under-five children in this study are as follows

Table 1: Characteristics of under-five children.

Characteristic	n	%
Gender		
Male	176	56
Female	138	44
Age		
≤ 2 years	112	36
> 2 years	202	64

Stunting under-five children in this study were primarily male (56%). The age of many under-five children in this study were > 2 years old (64%).

Table 2: Nutrients intake of stunting under-five children.

Nutrients intake	n	%	Average
Vitamin A			
Sufficient	124	39.5	± 314 mcg
Insufficient	190	60.5	
Folic acid			
Sufficient	11	3.5	± 53 mcg
Insufficient	303	96.5	
Vitamin C			
Sufficient	70	22.3	± 18 mcg
Insufficient	224	77.7	
Vitamin D			
Sufficient	14	4.5	± 3 mcg
Insufficient	300	95.5	

Table 2 shows the level of vitamin A insufficient in stunting under-five children, as many as 190 children (60.5%) and stunting under-five children with sufficient vitamin A, as many as 124 children (39.5%). The level of insufficient folic acid in stunting under-five children were 303 children (96.5%) and stunting under-five children with

sufficient intake of folic acid were 11 children (3.5%). The level of vitamin C insufficient in stunting under-five children were 224 children (77.7%) and stunting under-five children with sufficient intake of vitamin C intake were 70 children (22.3%). The level of vitamin D insufficient in stunting under-five children were 300 children (95.5%), and stunting under-five children with sufficient intake of vitamin D were 14 children (4.5%).

3.2 Discussion

Gender determines the amount of nutritional needs, so there is a relationship between nutritional status and gender. The amount of nutritional needs is influenced by differences in body composition between men and women. So, the intake that must be consumed is even more (Febriana et al., 2018).

Children aged > 2 years can already choose food or eat certain foods only, and the child's habit of snacking carelessly. Research by (Azzahrah et al., 2023) in Luwu Regency showed that as many as 84.6% of children aged > 2 years experienced picky eating. Children with picky eating behaviour tend to have nutritional status problems due to consuming foods that do not vary, so intake tends to be inadequate (Sagihira, 2021). Children who can already choose their food will consume fewer vegetables and fruits as a nutritious food source.

3.2.1 Adequate Levels of Vitamin A

The average intake of vitamin A was ± 314 mcg while the adequacy of vitamin A in stunting children, according to Permenkes RI number 28 of 2019, is 450 mcg. Research (Pontang, 2020) states that there was a meaningful relationship between vitamin A and the incidence of stunting. Vitamin A regulates osteoblasts (bone cell formation) and osteoclasts (bone cell resorption). Vitamin A deficiency can cause gastrointestinal mucosal disorders resulting in reduced absorption of nutrients that cause growth failure and susceptibility to infectious diseases such as diarrheal diseases (Ssentongo et al., 2021). Vitamin A also plays an essential role in the development and normal functioning of the brain and the development of the central nervous system. Insufficient nutritional intake, such as vitamin A, can lead to brain dysfunction and changes in the immune system (Sanyoto DD et al., 2021).

3.2.2 Adequate Levels of Folic Acid

The average intake of folic acid was ± 53 mcg while the adequacy of folic acid in stunting children,

according to Permenkes RI number 28 of 2019, is 200 mcg. Folic acid is essential for the growth and development of children under five. Folic acid is an essential nutrient that plays a role in many biological processes, including DNA and protein synthesis, cell growth, and differentiation. Folic acid deficiency can affect child growth (Salvate et al., 2023). Folic acid influences the brain's formation and the nervous system's development. Folic acid also plays an essential role in neurotransmitter synthesis, proliferation, and growth of glial and nerve cells and prevents neural tube defects (Valera et al., 2014).

3.2.3 Adequate Levels of Vitamin C

The average intake of vitamin C was ± 18 mcg, while the adequacy of vitamin C in stunting children, according to Permenkes RI number 28 of 2019, is 50 mcg. Vitamin C is an organic bone component responsible for cell changes and the formation of a new bone matrix (Amalia et al., 2018). Research (Bening et al., 2017) states that low levels of vitamin C adequacy were a risk factor for stunting in children. Under-five children with vitamin C deficiency will experience barriers to forming structural proteins and collagen, thus inhibiting growth. Vitamin C deficiency results in impaired bone health due to increased osteoclast formation and decreased bone formation (Chin & Ima, 2018). Vitamin C also has antioxidant properties to protect against free radicals in the brain. Insufficient vitamin C intake can lead to neurodevelopmental and cognitive disorders (Tveden & Lykkesfeldt, 2009).

3.2.4 Adequate Levels of Vitamin D

The average intake of vitamin D in stunting under-five children was ± 3 mcg while the adequacy of vitamin D in stunting children, according to Permenkes RI number 28 of 2019 is 15 mcg. The primary function of vitamin D is to maintain calcium homeostasis and bone health. Vitamin D deficiency affects linear growth, ranging from infants, toddlers, and children to adolescents (Taylor, (2020). Research (Nurhayati et al., 2020) states that toddlers with adequate vitamin D were more or less likely to experience stunting indirectly; vitamin D plays a role in calcium metabolism, which is also essential in bone growth. Vitamin D also plays a role in brain development and function. Vitamin D and protein are involved in learning, memory, motor control, and social activities such as adaptability. Vitamin D deficiency can increase the risk of depression, schizophrenia and seasonal affective disorder (Weydert, 2014).

3.2.5 Insufficiency of Vitamin A, Folic Acid, C, and D Intake in Stunting Under-Five Children

Insufficient adequate levels of vitamins can occur due to the low intake of food sources of micronutrients in the daily consumption of stunting under-five children. The age of children who can choose their food and low mother nutrition education can also worsen the selection of foods with low nutritional value, increasing the risk of malnutrition in children. Mother nutrition knowledge is important in managing household consumption, and it will affect the mother's attitude in the selection and processing of food ingredients that the family will consume. Mothers with good nutritional knowledge will understand the importance of good nutritional status for their family's health and well-being (Adelia et al, 2018).

Most mothers stated that their children did not like eating nutritious foods such as vegetables and fruits. Their children preferred eating snacks and drinking flavored and sweetened condensed milk rather than formula or growth milk. Flavored milk and sweetened condensed milk contain more sugar than nutrients, so it cannot be used to fulfill nutritional intake. If children consume non-nutritious foods or drinks regularly, it will impact their health in the future (Hidayat et al, 2022).

Achieving adequate vitamin consumption should be done by eating various foods such as vegetables and fruits. Fulfilling nutritional intake is not easy if it is not accompanied by the mother's role in good consumption patterns for the family. Nutritious food consumption can be started by processing local food ingredients. Nutritional needs that are well met can improve and increase the nutritional status of children (Sari & Montessori, 2021).

4 CONCLUSIONS

Based on the results of this study, it can be concluded that children stunting in Tanah Bumbu Regency obtained deficiency intake of vitamins A, folic acid, C, and D. For this reason, it is necessary to give multi-vitamin supplements to stunting under-five children and not just increased protein intake and also give nutrition education for mothers of stunting under-five children.

ACKNOWLEDGEMENTS

We want to appreciate and thanks Bappedalitbang Tanah bumbu Regency for supporting our research.

REFERENCES

- Adelia, F. A., Widajanti, L., & Nugraheni, S. A. 2018. Hubungan Pengetahuan Gizi Ibu, Tingkat Konsumsi Gizi, Status Ketahanan Pangan Keluarga Dengan Balita Stunting (Studi Pada Balita Usia 24-59 Bulan Di Wilayah Kerja Puskesmas Duren Kabupaten Semarang). *Jurnal Kesehatan Masyarakat (Undip)*, 6(5), 361-369.
- Amalia, Z., Tarigan, N., Manggabarani, S., & Nababan, A. S. V. 2018. Hubungan Asupan Protein, Vitamin C dan Asupan Vitamin D dengan Densitas Mineral Tulang (DMT) Pada Wanita Dewasa Muda di Kota Lubuk Pakam. *Jurnal Dunia Gizi*, 1(1), 36-44.
- Amelia, R. R. 2019. Prevalensi dan Zat Gizi Mikro dalam Penanganan Stunting. *Jurnal Ilmu Kedokteran Dan Kesehatan*, 6(2), 138-145.
- Azzahrah, I., Nurlinda, A., & Yusuf, R. A. 2023. Hubungan Perilaku Makan Orang Tua Dengan Perilaku Picky Eating Pada Balita Di Posyandu. *Window of Public Health Journal*, 411-416.
- Bening, S., Margawati, A., & Rosidi, A. 2017. Zinc deficiency as risk factor for stunting among children aged 2-5 years. *Universa Medicina*, 36(1), 11-18.
- Chin, K. Y., & Ima-Nirwana, S. 2018. Vitamin C and bone health: evidence from cell, animal and human studies. *Current drug targets*, 19(5), 439-450.
- Febriani, C. A., Perdana, A. A., & Humairoh, H. 2018. Faktor kejadian stunting balita berusia 6-23 bulan di Provinsi Lampung. *Jurnal Dunia Kesmas*, 7(3), 127-134.
- Hidayat, A., Yudistira, S., Chairunnisa, C., & Soefihara, E. Y. 2022. Pengetahuan dan Kebiasaan Pemberian Konsumsi Susu Kental Manis (SKM) & Krimer Kental Manis (KKM) pada Balita di DKI Jakarta, Jawa Barat, Jawa Timur, Maluku, dan NTT Tahun 2020. *Jurnal Pendidikan dan Konseling (JPDK)*, 4(4), 4411-4421.
- Kementrian Kesehatan RI. 2019. *Peraturan Menteri Kesehatan Nomor 28 Tahun 2019 tentang Angka Kecukupan Gizi yang Dianjurkan untuk Masyarakat Indonesia*. Jakarta, Kemenkes RI.
- Kementrian Kesehatan RI. 2022. *Buku Saku Hasil Studi Status Gizi Indonesia (SSGI) Tingkat Nasional, Provinsi, Dan Kabupaten/Kota Tahun 2022*. Jakarta, Kemenkes RI.
- Nurhayati, E., Paramashanti, B. A., Astiti, D., & Aji, A. S. 2020. Dietary diversity, vitamin D intake and childhood stunting: a case-control study in Bantul, Indonesia. *Malaysian Journal of Nutrition*, 26(2).
- Pontang, G. S. 2020. Hubungan Antara Asupan Protein, Vitamin A, Zink, dan Riwayat ISPA dengan Kejadian Stunting pada Balita Usia 2-5 Tahun di Desa Wonorejo

- Kecamatan Pringapus Kabupaten Semarang. *Jurnal Gizi Dan Kesehatan*, 12(1), 36-44.
- Rafika, M., & Gz, S. 2019. Dampak stunting pada kondisi psikologis anak. *Buletin Jagaddhita*, 1(1).
- Sagihira, Y. 2021. Hubungan Perilaku Picky Eater Dengan Status Gizi Pada Anak Prasekolah di Wilayah Kerja Puskesmas Sukaraya Baturaja. (Skripsi Sarjana, Universitas Sriwijaya).
- Salvate, K., Farias, D. R., Normando, P., Berti, T. L., de Castro, I. R. R., & Kac, G. 2023. High Serum Folate Concentration, Vitamin B12 Deficiency, and Anthropometric Nutritional Status in Brazilian Children Aged 6–59 Months: Data from the Brazilian National Survey of Child Nutrition. *The Journal of Nutrition*.
- Sanyoto, D. D., Triawanti, Noor, M. S., Hidayah, N., Ramadhani, R., Fatimah, H., & Airlangga, D. I. 2021. *Neuronutrisi*. Banjarmasin, CV Sari Mulia Indah.
- Sari, R. P. P., & Montessori, M. 2021. Upaya Pemerintah dan Masyarakat dalam Mengatasi Masalah Stunting pada Anak Balita. *Journal of Civic Education*, 4(2), 129-136.
- Ssentongo, P., Ba, D. M., Ssentongo, A. E., Fronterre, C., Whalen, A., Yang, Y., ... & Chinchilli, V. M. 2020. Association of vitamin A deficiency with early childhood stunting in Uganda: A population-based cross-sectional study. *PLoS One*, 15(5), e0233615.
- Taylor, S. N. 2020. Vitamin D in toddlers, preschool children, and adolescents. *Annals of Nutrition and Metabolism*, 76(Suppl. 2), 30-41.
- Tveden-Nyborg, P., & Lykkesfeldt, J. 2009. Does vitamin C deficiency result in impaired brain development in infants?. *Redox Report*, 14(1), 2-6.
- Valera-Gran, D., de la Hera, M. G., Navarrete-Muñoz, E. M., Fernandez-Somoano, A., Tardón, A., Julvez, J., ... & Vioque, J. 2014. Folic acid supplements during pregnancy and child psychomotor development after the first year of life. *JAMA pediatrics*, 168(11), e142611-e142611.
- Weydert, J. A. 2014. Vitamin D in children's health. *Children*, 1(2), 208-226.
- Widanti, Y. A. 2016. Prevalensi, faktor risiko, dan dampak stunting pada anak usia sekolah. *JITIPARI (Jurnal Ilmiah Teknologi Dan Industri Pangan UNISRI)*, 1(1).