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Intake of Vitamin A, Calcium, and Zink Between Stunted and Non-Stunted Children in Cirebon

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Abstract: The food consumed by children greatly affects how they will live in the future. The amount of nutrition that enters a child's body affects their health and intelligence. Vitamin A and minerals Ca, Zn are vital components in the body for the process of growth and development, endurance, and other important functions. The purpose of this study was to see the intake of vitamins A, Ca, and Zn between stunted and non-stunted children. The research method is observational with a cross sectional design. The population is toddlers who live in Tegalwangi, Cirebon Regency. Sample with age 24-60 month that parents are willing to fill out the consent form as research subjects. The time for the study began in January-May 2023. Data was collected using the 3x24 hour nutritional recall questionnaire method, followed by converting nutritional intake through the Nutrisurvey software. The results of the study for the stunting group obtained an average intake of vitamin A 285.3RE ± 242.34RE, Ca 233.12mg±180.7mg and Zn 2.95mg ± 0.97mg. Meanwhile, for the non-stunted group, the average intake of vitamin A was 591.0RE±735.5RE, Ca 604.5mg±906.7mg and Zn 5.3mg±3.8mg. Analysis of the difference between the intake of the two groups resulted in a P -value of 0.009 for vitamin A intake, a P -value of 0.007 for Ca, a p-value of 0.000 for Zn. There is a significant difference between stunted and non-stunted children.

Keywords: Calsium; Stunting; Not stunting; Vitamin A; Zinc

Introduction

Nutrition or nutrients are food substances that the body needs for growth and development. A diet that must be given correctly by fulfilling balanced nutrition and various kinds of food and fulfilling the nutritional standards that children need (Yuliani, 2018).

Adequate nutrition in children can make children more active in their activities. Physical activity is body movement produced by muscles that requires energy. (Soraya et al., 2017). Problems regarding child nutrition are still a problem in developing countries including Indonesia. Nutritional problems tend to get worse with the occurrence of multiple problems because malnutrition has not been resolved, but the problem of excess nutrition is increasing (Luh & Purnama, 2015). One of the causes of nutritional disorders in children is insufficient nutrition. Several factors can cause nutritional problems in children, such as direct or indirect causes, root causes, and main problems. Nutritional problems can come from deficiencies of certain nutrients, inadequate diet, or inappropriate composition of the proportions of food consumed. Therefore, children who are malnourished can experience nutritional disorders such as stunting or shortness (Sulistianingsih & Yanti, 2015).

Vitamin A is an important nutrient that is needed by the body for growth and resistance to disease. Vitamin A has provitamin namely carotene. In vegetables, vitamin A is found as a provitamin in the form of the yellow pigment ß carotene, which consists of two retinal molecules linked at the aldehyde end of the carbon chain (Sanif & Nurwany, 2017). Vitamin A is useful for reducing morbidity and mortality, because

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vitamin A can increase the body's resistance to infectious diseases such as measles, diarrhea, and ARI (Acute Respiratory Infection). Deficiency or deficiency of vitamin A is caused by the malfunction of various cellular mechanisms in which retinoid compounds play a role.

Calsium is an important mineral most needed by the human body. As a nutrient is very important for the body. There are two main functions of Ca in the body: helping the formation of dental bones and regulating biological processes (Beto, 2015). Ca requirements increase during growth, but after reaching adulthood, Ca requirements continue to increase. In the process of bone formation, old bone is destroyed along with new bone formation.

There are two types of Ca sources: animal and vegetable. Examples of animals such as fish, shrimp, milk, egg yolks, and beef. Green leaf vegetables such as mustard greens, spinach, broccoli, papaya leaves, cassava leaves, and pumpkin leaves are sources of plant foods that contain Ca. In addition, grains (walnuts, sesame, almonds), nuts, and processed products (soybeans, red beans, polo beans, tempeh, tofu) (Yusmiati & Erni, 2017). Adequate Ca intake can help bone growth in children and adolescents. That some Ca will be lost through excretion (urine and feces), sweat, and the lungs when breathing. Consuming enough Ca every day can help restore it.

Zn is a very important micronutrient for child growth because it has a structure and a role in several enzyme systems that are responsible for physical growth, immunology, and reproductive function (Pecora et al., 2020). If a child experiences Zn deficiency, it can have an impact on children's physical growth, including a decrease in the sharpness of the sense of taste, slow wound healing, growth disorders, decreased sexual maturity, impaired IgG formation, and homeostatic disorders. Therefore, adequate nutritional intake is a basic requirement that is needed by children in their life cycle for the development and maintenance of bodily functions (Sulistianingtias Laila E, 2017).

Zn plays a role in increasing the body's resistance, the formation and activation of T-lymphocytes. Supplementation, helps increase the number of T-lymphocyte cells in the blood and increases the ability to fight infection. Another role is maintaining bone health. Zn sources can be obtained from foods with high, medium and low Zn content. The foods that contain high Zn of around 25-50 mg/kg are lean red meat, whole grain cereals, nuts and legumes. Foods with a moderate Zn content of around 10-25 mg/kg such as chicken, meat with a high fat content, for foods with a low Zn content <10 mg/kg such as fish, tubers, vegetables and fruits (Hidayati et al, 2019).

There has been no previous research that has identified the intake of vitamin A, calcium and zinc in stunted and non-stunting children in the stunting locus area. Seeing the importance of this intake because there is a lot of literature that identifies it as a trigger for stunting, the aim of this research is to look at the difference between intake of vitamin A, calcium and zinc between stunted and non-stunting children in Tegalwangi village, Cirebon Regency

Method

The following is the flow of the research carried out:

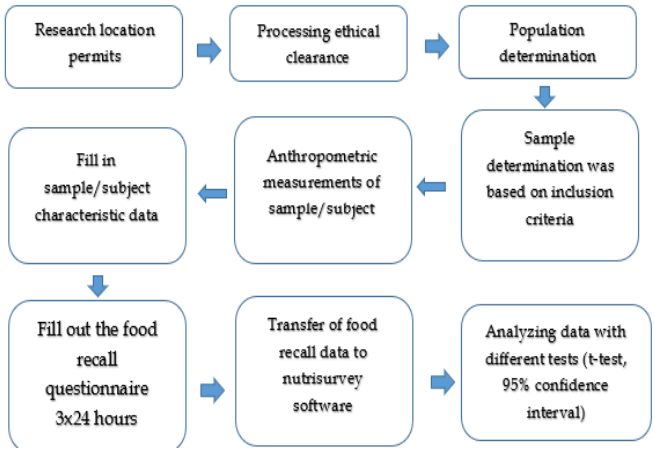


Figure 1. Research Flowchart

The instruments used included a questionnaire or a questionnaire. 3x24 hour nutrition recall, menu display book from the Department of Health, informed concent, nutrisurvey software, and gifts for children and their mothers.

This study used an analytic observational method with a cross - sectional design. The research was conducted in the stunting locus area in Cirebon District from January to May 2023. Permits were obtained from National Unity and Politics, the Cirebon District Office, Weru District Office, Tegalwangi Village Office to conduct the research. Research ethics permit was obtained from the Health Ethics Commission of the Faculty of Pharmacy, University of YPIB Majalengka with license number 003/KEPK/EC/III/2023.

Recruitment of the subject of children 24-60 months who are on the list of high-risk groups and not at risk of stunting from the Karangsari Health Center, because Tegalwangi village is included in the working area of the Public Health Center, parents/guardians expressed their willingness to be the subject of their child and were interviewed regarding the nutrition recall questionnaire. The instruments used included a questionnaire or a questionnaire. 3x24 hour nutrition recall, menu display

book from the Department of Health and for Parents who stated that they agreed to have their son/daughter as a subject and then asked to sign an informed consent. Children who were willing to be subjects were then measured for height and weight, while parents/guardians were interviewed to fill out a 3x24 hour nutrition recall questionnaire. Nutrition recall questionnaire results converted to software N utrisurvey to obtain intake data and comparative data on intake of vitamins A, Ca, and Zn for stunted and non-stunted children.

Result and Discussion

Parents who filled out *the informed consent*, consisting of 50 children whose children were stunted and 50 whose children were not stunted. The 100 children were measured for height and weight. The results of these measurements are included in the formula for determining z scores Height for Age and Weight for Age. The following are the results of research related to subject characteristics:

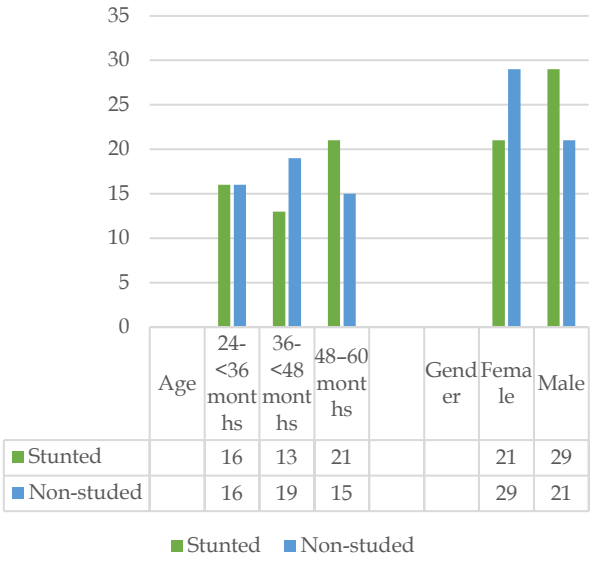


Figure 2. Characteristics by Age and Gender

The characteristics of stunted children show that most of the group is at the age of 48-60 months and the group of children who are not stunted is at the age of 36-<48 months. In this study, the male sex in stunted children was the most compared to non-stunted children. Boys tend to be more physically active so they expend more energy on activities and not on growth (Alfionita et al., 2023). In addition, in general, boys have faster growth after going through puberty, while girls generally experience faster growth than boys before and during puberty (Adani & Nindya, 2017).

According to the gender table, the frequency of boys and girls in both the stunted and non-stunting groups is coincidentally the same. The percentage of men is 42% and women is 58%. The results of data analysis showed that men had 1x greater risk than women, this value was not significant because the P value was> 0.5. In line with previous research, boys tend to be more physically active so they spend more energy on activities and not on growth. Apart from that, in general men have faster growth after going through puberty, while women generally experience faster growth than men before and during puberty (Hardinsyah et al., 2013a)

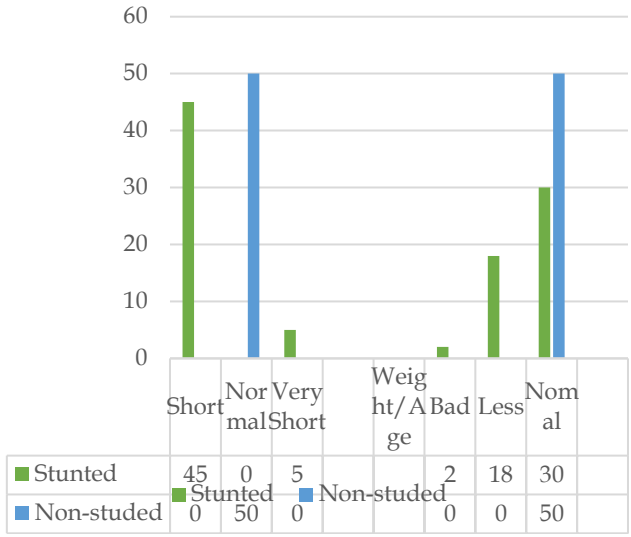
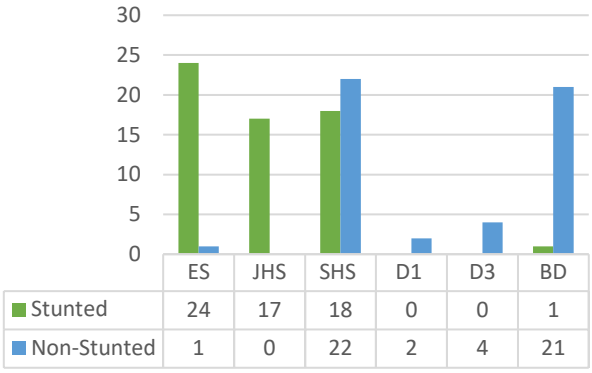


Figure 3. Characteristics by Height for Age and Weight for Age

The indicators used to identify Stunting toddlers are based on the Height for Age index according to WHO child growth standards with Stunting criteria if the Height for Age z score < -2 Standard Deviation (SD) (IAI, 2014).

Based on WHO standards, which proves that this parameter is useful as an indicator of growth and nutritional status (Atikah, Rahayu, 2018; Novikasari & Setiawati, 2021; Zeweil et al., 2020). Stunting not only impacts the physical growth of toddlers, but also other important body functions, such as brain development and the immune system (Khalil et al., 2015; Permatasari & Sumarmi, 2018). Stunting toddlers have the potential to have suboptimal levels of intelligence, are more susceptible to disease, and in the future could be at risk of decreasing levels of productivity, and will increase the burden on the country (Takele et al. al., 2019).



ES=Elementary School, JHS=Junior High School, SHS=Senior High School,D1=Diploma 1, D3=Diploma 3, CB=Bachelor Degree

Figure 4. Education for Stunted and Non-Stunted ChildrenIn Tegalwangi Village, Cirebon

The education and knowledge characteristics of the mothers of stunted children show that some of the mothers of stunted children with high school education status have a lower level of knowledge than the mothers of non-stunted children. The level of mother's knowledge is the key in managing the household, this will affect the attitude of the mother in choosing food ingredients that will be consumed by the family (Margawati & Astuti, 2018). Mothers with good nutritional knowledge will understand and understand the importance of good nutritional status for health and well-being (Adelina, 2018).

Education is not always related to the level of knowledge. However, the results of this research are in line, insufficient education also provides a low level of knowledge. The mother's level of knowledge is key in household management, this will influence the mother's attitude in choosing food ingredients that will be consumed by the family. Mothers with good nutritional knowledge will understand and understand the importance of good nutritional status for health and well-being (Lailatul & Ni'mah, 2015)

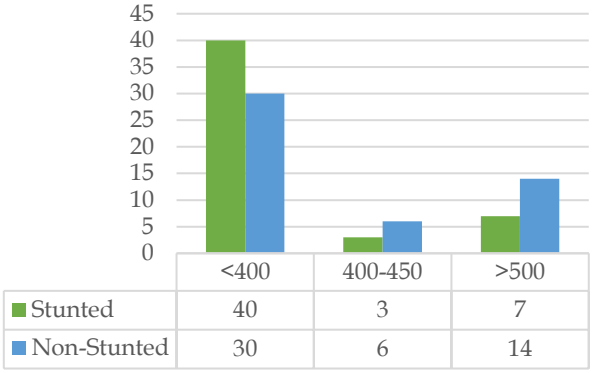


Figure 5. Frequency of Vitamin A Intake for Stunted and Non-Stunted Children In Tegalwangi Village, Cirebon

In this study, intake of vitamin A in stunted and non-stunted children had different average amounts. The average intake of vitamin A in children with stuns is 285.3RE. Meanwhile, the average intake of vitamin A in children who are not stunted is 591.0RE. The value of vitamin A intake in children aged 24-60 months is 400-450RE according to PMK Number 28 of 2019. The results of the analysis show that there is a significant difference in vitamin A intake between stunted and non-stunted children. Children who experience vitamin A deficiency will potentially experience 1,002 stunting events. Vitamin A is an important nutrient that the body really needs for growth and body resistance to disease (Ulfa et al., 2021) and reduces morbidity and mortality, because vitamin A can increase the body's resistance to infectious diseases such as measles, diarrhea, and ARI (Acute Respiratory Infection) (Aritonang et al., 2020). The solution is to increase the intake of vitamin A for 18 months in stunted children to increase growth and reduce the incidence of stunting.

A key factor in maintaining a healthy immune system is micronutrient homeostasis. Insufficient vitamin A intake has a 2.953x chance of stunting, and the P value is <0.005 so it is significant. Vitamin A is found in food and tissues mainly as an ester combined with long chain fatty acids such as palmitic acid. Food sources rich in Vitamin A are liver, fish and other animal sources (Song et al., 2022). The need for Vitamin A in toddlers 2-3 years is 400-450 micro g/day. Vitamin A with carotenoids functions for eye health. Another function is as an anti-oxidant which can ward off free radicals (Koprivica & Bjelanovic, 2021).

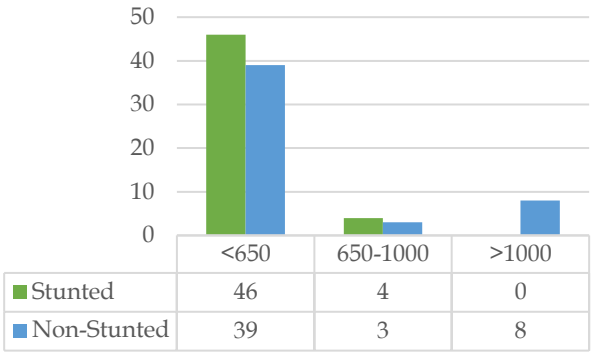


Figure 6. Frequency of Ca Intake in Stunted and Non-Stunted Children In Tegalwangi Village, Cirebon

The average Ca intake for stunted children was 233.12 mg, lower than the Ca intake for stunted children of 604.5 mg. These results are the same as previous studies where there was a very significant difference in Ca intake between stunted and non-stunted children aged 24-49 months in Pontianak (Sari, 2016). A intake of micronutrients, in this case Ca, greatly affects the growth

of children's bones (Sudiarmanto & Sumarmi, 2020). Low Ca intake can lead to low mineralization of the new bone deposit matrix which affects osteoblast work, if a child has a severe deficiency it can cause stunting (Martony et al., 2020). Low Ca intake can cause stunting events by 0.996 times when compared to the group with sufficient Ca intake (Wulan et al., 2022). However, it is very necessary to provide nutrition education to mothers who provide family meals so they can select food ingredients that contain high Ca, not necessarily from milk but can be obtained from fish and green vegetables, so that children's Ca intake can meet the recommended nutritional adequacy rate (Martony et al., 2020). Low calcium intake has a big impact on bone growth, where calcium is needed as a filling material for bone mass, so growth will be different when compared to children whose calcium intake meets standards (Wati, 2021).

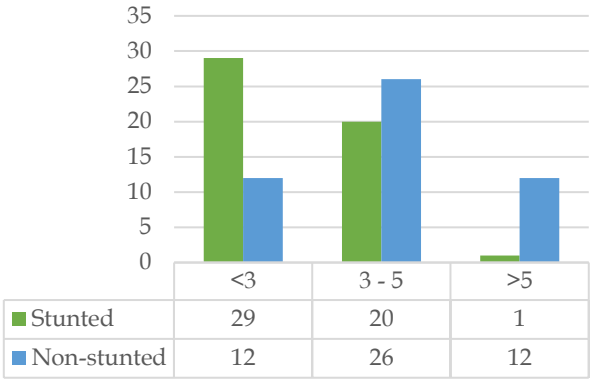


Figure 7. Frequency of Zn Intake in Stunted and Non-Stunted Children In Tegalwangi Village, Cirebon

Zn intake in stunted children obtained an average of 2.95 mg with a standard value lower than the RDA set by the government (PMK, 2019). Meanwhile, Zn intake in non- stunted children obtained an average of 5.3 mg. A similar study in Western Europe found that Zn intake of stunted children aged 1-3 years was very low, most of them were Zn deficient. Similar research in West Kenya in 60 villages, children aged 6-35 months, giving vitamin A and iron can alleviate the problem of malnutrition and stunting (Chaparro & Suchdev, 2019). The results of the study on stunted children concluded that the Zn intake of stunted children was lower than that of non-stunted children. More sufficiency level Zn is indeed not in accordance with the theory which states that stunted children experience Zn deficiency. Low intake of Zn can cause Zn levels in the body to be low and experience stunting 2,520 times because Zn plays a role in children's linear growth. Zn is also associated with important hormones involved in bone growth such as samatomedin - c, osteocalcin, testosterone, thyroid hormone and insulin. Zn plays an important role in growth and the immune system. Zn is known to play a role in more than 300 enzymes, both as part of their structure and their catalytic and regulatory actions (Anindita, 2018).

Zinc or Zinc is important for various functions including growth and development, reproductive function, sensory and immune function, antioxidants, and membrane stabilization (Wessels et al., 2017). The results of the study show that zinc deficiency has a high risk of stunting, this is in line with previous research that insufficient zinc intake will have a risk of stunting (Nugraheni et al., 2020b). The zinc intake obtained from the nutritional recall results was 4,093 mg ± 3,134. Low values of zinc intake also affect the growth and development process. The importance of zinc for various enzymatic processes in the body, including the enzymatic destruction of free radicals, the body requires zinc. Its deficiency can affect health development, which is related to cognitive development (Steinbrenner & Klotz, 2020)

Zinc is an important micronutrient involved in the regulation of innate and adaptive immune responses. The main cause of zinc deficiency is malnutrition. Zinc deficiency causes cellular immune dysfunction and other manifestations. Consequently, such dysfunction leads to poorer outcomes in response to bacterial infections and sepsis. Zinc is an important component of the pathogen elimination signal transduction pathway leading to the formation of neutrophil extracellular traps (NETs), as well as inducing cell-mediated immunity versus humoral immunity by regulating specific differentiation factors. The results of this study are in line with previous research that there is a link between zinc deficiency and stunting (Sharif et al., 2020). In addition, zinc deficiency plays a role in inflammation, especially increasing the inflammatory response and damage to host tissue. It is also involved in controlling oxidative stress and regulating inflammatory cytokines. Zinc plays complex functions during immune responses and its homeostasis is essential for maintaining good immune function (Gammoh & Rink, 2017)

Cases of stunting in children can be used as a predictor of the low quality of a country's human resources. Efforts have been made by the Government to provide information related to health and nutrition. Health and nutrition are one of the essential needs of early childhood that must be met, with this it is hoped that children can grow and develop optimally according to their age group (Nugroho et al., 2021). The nutritional status of children greatly influences the quality of human resources. Child intelligence related to nutrition. The intake of nutrients that children receive greatly influences the development of their intelligence (Dewi Indriawati, 2013). Nutritional status and children's

health are negatively correlated with decreased intake of nutrients received. Infants and children who are malnourished, especially those who are less than five years old, may experience decreased physical growth and intelligence. The growth of brain cells is very fast, and at the age of four to five years, it will stop or reach the perfect stage.

Conclusion

The results of the analysis show that there are significant differences in intake vitamins A, Ca, Zn between stunted and non-stunted children. The results of the average intake of vitamins A, Ca, Zn in stunted children were lower than the average intake of vitamins A, Ca, Zn in non-stunted children. Deficiency of vitamins A, Ca, Zn can cause stunting in Tegalwangi Village, Cirebon Regency. If children are not treated quickly, malnutrition can have an impact on the next generation.

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Conflicts of Interest
This article has not been published before, and it is not under consideration for publication in any other journal. I have obtained written permission for the use of text, tables, and/or illustrations from any copyrighted source, and I no conflict of interest.

References

Adani, F. Y., & Nindya, T. S. (2017). Differences in Energy, Protein, Zinc Intake, and Development in Stunting and Non-Stunting Toddlers. Amerta Nutrition, 1(2), 46. https://doi.org/10.20473/amnt.v1i2.6225

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, 6*(5), 361 - 369. https://doi.org/10.14710/jkm.v6i5.22059

Alfionita, N., Sulistyorini, L., & Septiyono, E. (2023). Hubungan Sedentary Lifestyle dengan Status Gizi Remaja pada Masa Pandemi Covid-19 di SMPN 14 Jember. *Pustaka Kesehatan, 11*(2), 92-101. https://doi.org/10.19184/pk.v11i2.37128

Anindita, P. (2018). Hubungan Tingkat Pendidikan Ibu, Pendapatan Keluarga, Kecukupan Protein & Zinc Dengan Stunting (Pendek) Pada Balita Usia 6-35 Bulan Di Kecamatan Tembalang Kota Semarang. *Jurnal Kesehatan Masyarakat, 1* (2), 617–626. Retrieved from http://ejournal-s1.undip.ac.id/index.php/jkm/article/view/1342

Aritonang, EA, Margawati, A., & Dieny, FF (2020). Analisis Pengeluaran Pangan, Ketahanan Pangan Dan Asupan Zat Gizi Anak Bawah Dua Tahun (Baduta) Sebagai Faktor Risiko Stunting. *Journal of Nutrition College, 9* (1), 71–80. https://doi.org/10.14710/jnc.v9i1.26584

Atikah, Rahayu, et al. (2018). Stunting dan Upaya Pencegahannya Dalam buku Stunting dan Upaya Pencegahannya

Beto, JA (2015). The Role of Calcium in Human Aging. *Clinical Nutrition Research, 4* (1), 1. https://doi.org/10.7762%2Fcnr.2015.4.1.1

Chaparro, C. M., & Suchdev, P. S. (2019). Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. *Annals of the New York Academy of Sciences,* 1450(1), 15–31. https://doi.org/10.1111/nyas.14092

Dewi, EK, & Nindya, TS (2017). Hubungan Tingkat Kecukupan Zat Besi Dan Seng Dengan Kejadian Stunting Pada Balita 6-23 Bulan. *Amerta Nutrition, 1* (4), 361. https://doi.org/10.20473/amnt.v1i4.2017.361-368

Dewi Indriawati. (2013). Hubungan Antara Status Gizi Dan Kecerdasan Emosi Terhadap Kesulitan Belajar Anak Usia Dini. *Jurnal Pendidikan Usia Dini,* 7, 133–154. Retrieved from https://pps.unj.ac.id/journal/jpud/article/view/36

Gammoh, N. Z., & Rink, L. (2017). Zinc in Infection and *Inflammation*. Nutrients, 9(6). https://doi.org/10.3390/nu9060624

Hidayati, MN, Perdani, RRW, & Karima, N. (2019). Peran Zink terhadap Pertumbuhan Anak. *Majority, 8,* 168–171.

IAI, P. (2014). Pedoman Pelaksanaan GKSO.

Khalil, M. I., Tanvir, E. M., Afroz, R., Sulaiman, S. A., & Gan, S. H. (2015). Cardioprotective Effects of Tualang Honey: Amelioration of Cholesterol and Cardiac Enzymes Levels. BioMed Research International, 2015, 286051. https://doi.org/10.1155/2015/286051

Koprivica, M., & Bjelanovic, J. (2021). the Importance of Vitamin a in the Nutrition. Medicinski Casopis, 55(3), 99–103. https://doi.org/10.5937/mckg55-31633

Lailatul, M., & Ni'mah., C. (2015). Hubungan Tingkat Pendidikan, Tingkat Pengetahuan dan Pola Asuh Ibu dengan Wasting dan Stunting pada Balita di Keluarga Miskin. Media Gizi, 10(2015), 84–90.

https://doi.org/Vol. 10, no. 1 January–June 2015: p. 84–90 comp

Luh, N., & Purnama, A. (2015). Perilaku orang tua dalam pemberian makan dan status gizi anak usia 2-5 tahun. *Jurnal Gizi Klinik Indonesia, 11* (03), 97–104. https://doi.org/10.22146/ijcn.19281

Margawati, A., & Astuti, AM (2018). Pengetahuan ibu, pola makan dan status gizi pada anak stunting usia 1-5 tahun di Kelurahan Bangetayu, Kecamatan Genuk, Semarang. *Jurnal Gizi Indonesia, 6* (2), 82–89. https://doi.org/10.14710/jgi.6.2.82-89

Martony, O., Lestrina, D., & Amri, Z. (2020). Pemberdayaan Ibu untuk Perbaikan Pola Konsumsi Ikan terhadap Peningkatan Asupan Protein, Kalsium, Zink dan Z-Score Tinggi Badan Menurut Umur pada Anak Stunting. *Jurnal Keperawatan Silampari*, *3* (2), 672–686. https://doi.org/10.31539/jks.v3i2.1188

Novikasari, L., & Setiawati, S. (2021). Hubungan Riwayat Penyakit Infeksi Dengan Kejadian Stunting Pada Anak Usia 12-59 Bulan Jurnal Kebidanan Malahayati 15(2), 197–202. https://doi.org/10.33024/hjk.v15i2.1666Nugraheni, A. N. S.,

Nugraheni, S. A., & Lisnawati, N. (2020a). Hubungan Asupan Zat Gizi Makro dan Mineral dengan Kejadian Balita Stunting di Indonesia: Kajian Pustaka. Media Kesehatan Masyarakat Indonesia, 19(5),322–330. https://doi.org/10.14710/mkmi.19.5.322-330

Nugroho, MR, Sasongko, RN, & Kristiawan, M. (2021). Faktor-faktor yang Mempengaruhi Kejadian Stunting pada Anak Usia Dini di Indonesia.*Jurnal Obsesi:jurnal Pendidikan Anak Usia Dini*, *5* (2). Retrieved from https://obsesi.or.id/index.php/obsesi/article/view/1169

Pecora, F., Persico, F., Argentiero, A., Neglia, C., & Esposito, S. (2020). The role of micronutrients in support of the immune response against viral infections. *Nutrients, 12* (10), 1–45. https://doi.org/10.3390%2Fnu12103198

PMK. (2019). Angka Kecukupan Gizi. *Peraturan Menteri Kesehatan RI,* 156–157.

Pramono, A., Panunggal, B., Anggraeni, N., & Rahfiludin, MZ (2016). Asupan Seng, Kadar serum Seng, dan Stunting pada Anak Sekolah di Pesisir Semarang. JurnalGizi Pangan, *11* (1), 19–26. https://doi.org/10.25182/jgp.2016.11.1.%25p

Permatasari, D. F., & Sumarmi, S. (2018). Differences of Born Body Length, History of Infectious Diseases, and Development between Stunting and Non-Stunting Toddlers. Jurnal Berkala Epidemiologi, 6(2),182. https://doi.org/10.20473/jbe.v6i22018.182-191

Rahayu, A., Yulidasari, F., Putri, AO, & Anggraini, L. (2018). Stunting dan Upaya Pencegahannya

Sanif, R., & Nurwany, R. (2017). V Vitamin A dan perannya dalam siklus sel Rizal Sanif, Raissa Nurwany. *urnal kesehatan keluargak, 4* (2), 83–88. Retrieved from https://ejournal.unsri.ac.id/index.php/jkk/article/view/6100

Sari, EM, Juffrie, M., Nurani, N., & Sitaresmi, (2022). Nutrient and Food Intake of Indonesian Children Under 5 Years of Age: A Systematic Review. *Asia-Pacific journal of public health*, *34*(1), 25–35. https://doi.org/10.1177/10105395211041001.

Sedgh, G., Herrera, MG, Nestel, P., El Amin, A., & Fawzi, WW (2000). Dietary vitamin A intake and non-dietary factors are associated with reversal of stunting in children. *The Journal of Nutrition, 130* (10), 2520–2526. https://doi.org/10.1093/jn/130.10.2520

Sharif, Y., Sadeghi, O., Dorosty, A., Siassi, F., Jalali, M., Djazayery, A., Shokri, A., Mohammad, K., Parsaeian, M., Abdollahi, Z., Heshmat, R., Yarparvar, A., Pouraram, H., & Esmaillzadeh, A. (2020). Association of vitamin D, retinol and zinc deficiencies with stunting in toddlers: findings from a national study in Iran. Public Health, 181, 1–7. https://doi.org/10.1016/j.puhe.2019.10.029.

Song, A., Mousa, H. M., Soifer, M., & Perez, V. L. (2022). Recognizing vitamin A deficiency: special considerations in low-prevalence areas. Current Opinion in Pediatrics, 34(2), 241–247. https://doi.org/10.1097/MOP.0000000000001110

Soraya, D., Sukandar, D., & Sinaga, T. (2017). The relationship between nutritional knowledge, nutritional adequacy level, and physical activity with the nutritional status of junior high school teachers. *The Indonesian Journal of Nutrition, 6* (1), 29–36.

Steinbrenner, H., & Klotz, L.-O. (2020). [Selenium and zinc: "antioxidants" for healthy aging?]. Zeitschrift fur Gerontologie und Geriatrie, 53(4), 295–302. https://doi.org/10.1007/s00391-020-01735-0

Sudiarmanto, AR, & Sumarmi, S. (2020). Hubungan Asupan Kalsium dan Zink dengan Kejadian Stunting Pada Siswi SMP Unggulan Bina Insani Surabaya. *Media Gizi dan Kesehatan Masyarakat*, *9* (1), 1.

Sulistianingsih, A., & Yanti, DAM (2015). Kurangnya Asupan Makan Sebagai Penyebab Kejadian Balita Pendek (Stunting. Jurnal Dunia Kesehatan, *5* (1), 72–75.

Sulistianingtias Laila E. (2017). *Hubungan Antara Asupan Zink Dengan Kejadian Stunting Pada Remaja di*

Sukoharjo Jawa Tengah. 1–10.

Takele, K., Zewotir, T., & Ndanguza, D. (2019). Understanding correlates of child stunting in Ethiopia using generalized linear mixed models. BMC Public Health, 19(1), 626. https://doi.org/10.1186/s12889-019-6984-x

Ulfa, NL, Dewi, MUK, & Istiana, S. (2021). Literatur Review: Faktor-faktor yang Berhubungan dengan Pemberian Vitamin A Pada Balita. *Prosiding Seminar UNIMUS*, *4*, 1525–1535.

Wati, R. W. (2021). Hubungan Riwayat Bblr, Asupan Protein, Kalsium, Dan Seng Dengan Kejadian Stunting Pada Balita. Nutrition Research And DevelopmentJournal,1(2),1–12. https://doi.org/10.15294/nutrizione.v1i2.50071Wessels, I., Maywald, M., & Rink, L. (2017). Zinc as a gatekeeper of immune function. Nutrients, 9(12), 9–12. https://doi.org/10.3390/nu9121286

Wessels, I., Maywald, M., & Rink, L. (2017). Zinc as a gatekeeper of immune function. Nutrients, 9(12), 9–12. https://doi.org/10.3390/nu9121286

Wibowo, HKA, & Dasuk, MS (2020). Hubungan Asupan Kalsium dan Pendidikan Ibu dengan Kejadian Stunting *Fakultas Kedokteran Universitas Muhammadiyah Surakarta*, 146–154.

Wulan, DN, Sari, NP, Dewi, PIY, Hantana, PKD, Khazanah, SN, & Sarudji, D. (2022). Hubungan Asupan Gizi Anak Terhadap Stunting Pada Balita 3-5 Tahun. *CoMPHI Journal: Community Medicine and Public Health of Indonesia Journal, 2* (3), 95–100.

Yusmiati, SNH, & Erni, E. (2017). EPemeriksaan Kadar Kalsium Pada Vegetarian. *Journal of ScienceHealth, 1* (1), 43.

Zeweil, M. M., Sadek, K. M., Elsadek, M. F., Mahmoud, S. F., Ahmed, B. M., & Khafaga, A. F. (2020). Sidr honey abrogates the oxidative stress and downregulates the hyaluronic acid concentration and gene expression of TGF-β1 and COL1a1 in rat model of thioacetamide-induced hepatic fibrosis. Animal Science Journal = Nihon Chikusan Gakkaiho, 91(1), e13434. https://doi.org/10.1111/asj.13434