

Mineral and Enzyme Deficiency Diseases Associated with Nutritional Diseases in Society

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Abstract

Nutritional deficiency disease is a disease caused by nutritional deficiencies, including macronutrients and micronutrients. Macronutrient diseases are diseases caused by deficiency of protein, fat and carbohydrates. This deficiency will usually show clinical symptoms that directly affect nutritional status. This study aims to study and examine mineral intake, dietary patterns of research subjects, mineral and enzyme levels, and soil condition data. The number of research subjects to be taken was 180 subjects with 90 research subjects coming from mothers who had healthy children and 90 research subjects came from mothers who had stunted children or other nutritional disorders. The research stage will run after going through the inclusion of research subjects, namely mothers who have healthy children and mothers who have nutritionally deficient children, aged 20-40 years. The research stage consisted of two stages. The statistical analysis used is to use the ANOVA test, which will then compile a manuscript.

Keywords: nutritional deficiency, macronutrient, mineral, enzyme, stunting

Introduction

Indonesia still has a high number of deficiency disorders, including North Sumatra. Several districts include Medan, Deli Serdang, Langkat, Simalungun, Dairi, Pakpak Barat, Tapanuli Tengah, Mandailing Natal, Padang Lawas, Padang Lawas Utara, Nisa, South Nias, West Nias, North Nias, and Gunung Sitoli. This area is also still experiencing a number of diseases due to nutritional disorders such as stunting, hydrocephalus, and various other diseases. North Sumatra's stunting rate for 2019 is 30.11 percent, only down 2.3 percent from 2018. Of course this value creates a desire to know what causes it even though various programs have been implemented. Nutritional deficiency disease is a disease caused by nutritional deficiencies, including macronutrients and micronutrients. Macronutrient diseases are diseases caused by deficiency of protein, fat and carbohydrates. This deficiency will usually show clinical symptoms that directly affect nutritional status.

However, micronutrient deficiencies including minerals and vitamins are often not detected because they originate from subclinical symptoms, but will cause long-term defects. These defects are very fundamental, causing a disturbance in nutritional

status, especially in children, which will last until adulthood. The influential micronutrients are minerals, these minerals are metal and inorganic compounds whose cycle starts from the soil as the main source. The land around the area will provide a source of nutrition for plants and animals to the surrounding population. Plants that contain sufficient mineral nutrients will provide a good source for the surrounding community. In addition, humans cannot consume and digest food if there are no enzymes in the digestive tract. Humans really need these minerals and enzymes to be digested properly.

Literature review

Growth and development are important health parameters in children. The problem of growth disruption, one of which is stunting, occurs in many developing countries including Indonesia and is a major problem for the progress of a country because of its impact in the future. Stunting is a linear growth disorder caused by chronic nutritional deficiency and / or recurrent and chronic infectious diseases. Stunting and severely stunting is a condition of short and very short children, which is indicated by the size of the body length for age (PB / U) or height for age (TB / U) with a z-score value less than -2 standard deviation (SD) and -3 SD World Health Organization (WHO) Child Growth Standards 2006 (WHO, 2008; Keane, 2016; Asworths 2016; Ministry of Health RI, 2018).

In 2017, 22.2% or around 150.8 million children under five in the world were stunted. More than half of stunted children in the world come from Asia (55%), while more than one third (39%) are in Africa. Of the 83.6 million stunting children under five in Asia, the proportion in Southeast Asia is 14.9%. Compared to several neighboring countries, the prevalence of stunting in Indonesia in 2015 (36.4%) was the second highest after Laos (43.8%), Myanmar (35.1%), Vietnam (19.4%), Malaysia (17.2%).), Thailand (16.3%) and Singapore (4%) (WHO, 2018). According to data from the basic health research (Riskesdas) of the Ministry of Health of the Republic of Indonesia in 2018, reported that the national prevalence of short children under five in Indonesia is 30.8% consisting of 19.3% short and 11.5% very short, with an estimated number of 8.9 million children from 23,848,283 people under five. One in three children under five is stunted (Kemenkes RI, 2018). This figure decreased from the 2013 Riskesdas report (37.2%) (Ministry of Health RI, 2013). The prevalence of stunting in North Sumatra in 2018 is around 35%, including the high category (Kemenkes RI, 2018). Data from the North Sumatra Provincial Health Office in 2017 reported the highest number of children under five with stunting and severely stunting in five districts in North Sumatra, respectively West Nias 45.7% (25.5%; 20.2%), North Nias

41.6% (24.8%; 16.8%), Nias 41.6% (17.3%; 24.3%), Humbang Hasundutan 41.5% (23.6%; 17.9%) and Padang Lawas 40, 5% (24.7%; 15.8%) (Dinkesprovsu, 2018). According to WHO, the prevalence of stunting is a public health problem if the prevalence is 20% or more (UNICEF, 2018). The Sustainable Development Goals (SDGs) target to reduce 40% of the number of stunting under five in Indonesia by 2025 and end all types of malnutrition by 2030 (WHO, 2014; Indonesian Ministry of Health, 2018).

Stunting describes chronic nutritional problems, which are influenced by the condition of the mother / expectant mother, fetal period, infancy and toddlerhood. Growth and development is very rapid and determines the quality of life starting from the beginning of conception through to the age of 2 years. Stunting is a condition that occurs due to chronic nutritional deficiencies, especially in the first 1000 days of life (HPK). The period of 1000 HPK is calculated from the time the child is in the womb (270 days) and after birth (730 days). Malnutrition that occurs in 1000 HPK has an impact on growth and development problems, increased morbidity and mortality, and in the long term can interfere with intellectual abilities and proficiency in academic capacity (WHO, 2010; Ministry of Health RI, 2016). In developing countries, malnutrition in pre-pregnancy and pregnant women has an impact on the birth of children with intrauterine growth restriction (IUGR). Almost half of the IUGR conditions are related to the nutritional status of the mother, both macronutrients and micronutrients (Unterscheider et al., 2014; Divon et al., 2017).

Ethical approval

This research was conducted following the ethics committee protocol, and was approved by the ethics committee of the Universitas Sumatera Utara (number 423/KEP/USU/2020).

Methods

This research is a case control study, with primary data collection, is a laboratory clinical trial study on the subject of mothers who have children aged 2-3 years, aged 20-40 years. This research will be conducted in 4 locations, namely cities and regencies with high stunting rates, namely Medan, Deli Serdang, Langkat, Simalungun. This study aims to study and examine mineral intake, dietary patterns of research subjects, mineral and enzyme levels, and soil condition data. The number of research subjects to be taken was 180 subjects with 90 research subjects coming from mothers who had healthy children and 90 research subjects came from mothers who had stunted children or other nutritional disorders. The affordable population

is women aged 20-40 years who are in stunting areas including 15 districts in North Sumatra during September 2020.

The research stage consisted of two stages, the first stage was the initial screening of the primary data of the research subjects, namely by analyzing food intake including mineral intake data, the diet of the research subjects, mineral and enzyme levels, and data on soil conditions in the area. The second stage was to analyze the relationship between the existing variables so that the most significant relationship was seen between the differences in diet, mineral content, enzyme levels, and soil content between the two groups. The statistical analysis used was to use the ANOVA test.

Reference

1. Gupta AP, Bhandari B, Gupta A, et al. Mineral content of breast milk from north Indian mothers giving birth preterm and at term--implication for mineral nutrition of preterm infants. *J Trop Pediatr* 1984; 30: 286-288. 1984/10/01. DOI: 10.1093/tropej/30.5.286.
2. Sarwar M, Saleem MF, Ullah N, et al. Role of mineral nutrition in alleviation of heat stress in cotton plants grown in glasshouse and field conditions. *Sci Rep* 2019; 9: 13022. 2019/09/12. DOI: 10.1038/s41598-09-49404-6.
3. Cheng WW, Zhu Q and Zhang HY. Mineral Nutrition and the Risk of Chronic Diseases: A Mendelian Randomization Study. *Nutrients* 2019; 11 2019/02/15. DOI: 10.3390/nu11020378.
4. Yoo KO, Kim MJ and Ly SY. Association between vitamin D intake and bone mineral density in Koreans aged ≥ 50 years: analysis of the 2009 Korea National Health and Nutrition Examination Survey using a newly established vitamin D database. *Nutr Res Pract* 2019; 13: 115-125. 2019/04/16. DOI: 10.4162/nrp.2019.13.2.115.
5. Bouain N, Krouk G, Lacombe B, et al. Getting to the Root of Plant Mineral Nutrition: Combinatorial Nutrient Stresses Reveal Emergent Properties. *Trends Plant Sci* 2019; 24: 542-552. 2019/04/23. DOI: 10.1016/j.tplants.2019.03.008.
6. [Dinkesprovsum] Dinas Kesehatan Provinsi Sumatera Utara, Bidang Kesehatan Masyarakat. 2018. Gambaran status gizi masyarakat, balita kurang energi protein berdasarkan pemantauan status gizi. Diakses tanggal 2 Desember 2018. Tersedia di: <http://dinkes.sumutprov.go.id/v2/berita-309-gambaran-status-gizimasyarakat-balita-kurang-energi-protein-berdasarkan-pemantauan-status-gizi.html>
7. [Kemenkes RI] Kementerian Kesehatan Republik Indonesia. 2008. *Riset kesehatan dasar (Riskesdas) 2008*. Badan Penelitian dan Pengembangan Kesehatan Republik Indonesia, Jakarta.

8. [Kemenkes RI] Kementerian Kesehatan Republik Indonesia. 2010. *Riset kesehatan dasar (Riskesdas) 2010*. Badan Penelitian dan Pengembangan Kesehatan Republik Indonesia, Jakarta.
9. [Kemenkes RI] Kementerian Kesehatan Republik Indonesia. 2010. Buku Saku Pelayanan Kesehatan Neonatal Esensial. Pedoman Teknis Pelayanan Kesehatan Dasar. Badan Penelitian dan Pengembangan Kesehatan Republik Indonesia, Jakarta.
10. [Kemenkes RI] Kementerian Kesehatan Republik Indonesia. 2013. *Riset kesehatan dasar (Riskesdas) 2013*. Badan Penelitian dan Pengembangan Kesehatan Republik Indonesia, Jakarta.
11. [Kemenkes RI] Kementerian Kesehatan RI. 2014. Pedoman gizi seimbang. Jakarta.
12. [Kemenkes RI] Kementerian Kesehatan Republik Indonesia. 2016. *Pedoman pelaksanaan stimulasi, deteksi dan intervensi dini tumbuh kembang anak*. Kemenkes RI, Jakarta.
13. [Kemenkes RI] Kementerian Kesehatan Republik Indonesia. 2018. *Riset kesehatan dasar (Riskesdas) 2018*. Badan Penelitian dan Pengembangan Kesehatan Republik Indonesia, Jakarta.
14. [Kemenkes RI] Kementerian Kesehatan Republik Indonesia. 2018. Situasi balita pendek (stunting) di Indonesia. Dalam: *Buletin Jendela Data dan Informasi Kesehatan*, Semester I. Pusat Data dan Informasi (Pusdatin) Kementerian Kesehatan RI, Jakarta.
15. [WHO] World Health Organization. 2008. *WHO Child Growth Standards*. Geneva: WHO.
16. [WHO] World Health Organization. 2010. *Interpretation Guide Nutrition Landscape Information System (NLIS)*. Geneva: WHO.
17. [WHO] World Health Organization. 2014. *Comprehensive implementation plan on maternal, infant, and young child nutrition*. Geneva: WHO.
18. [WHO] World Health Organization. 2016. Recommendations on Antenatal Care for a Positive Pregnancy Experience. Geneva: WHO.
19. [WHO] World Health Organization. 2018. *Reducing stunting in children: equity considerations for achieving the global nutrition targets 2025*. Geneva: WHO.
20. Unterscheider, J., O'Donoghue, K. and Daly, S. 2014. Fetal growth restriction and the risk of perinatal mortality—case studies from the multicentre PORTO study. *BMC Pregnancy Childbirth*. 14(1): 63.
21. Ashworth, A. 2016. Nutrition, food security and health. In: *Nelson textbook of pediatrics*, Edition 20 ed. Kliegman, R.M., Stanton, B.F., St. Geme-III, J.W., Schor, N.F. and Behrman, R.E. Elsevier, Philadelphia, pp. 295-306.
22. Divon, M.Y., Levine, D. and Barss, V.A. 2017. Fetal growth restriction: Diagnosis. UpToDate.
23. Zerfu, T.A. and Ayelel, H.T. 2013. Micronutrients and pregnancy: effect of supplementation on pregnancy and pregnancy outcomes: a systematic review. *Nutrition Journal* 12: 20.

24. Lee, S.E., Talegwkwar, S.A., Merialdi, M. and Caulfield, L.E. 2012. Dietary intakes of women during pregnancy in low- and middle-income countries. *Public health nutrition* 16(8): 1340-1353.

Approval Sheet After Explanation (Informed Consent)

My Informed Consent Sheet signed below,

Name :

Age :

Gender :

Has been clearly explained by the researcher about the study “Mineral and Enzyme Deficiency Diseases Associated with Nutritional Diseases in Society”, so I hereby voluntarily and without coercion stated :

☐ Willing to be included in the study.

Such is this statement to be used as necessary.

Sincerely,
