



Stunting prevention with determining BMI, UAC, haemoglobin (Hb) levels as early detection in adolescent students Muhammadiyah Senior High School Ponorogo West Java

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ABSTRAK

Latar Belakang : Salah satu masalah yang dihadapi remaja putri (23%) adalah kekurangan zat besi (anemia defisiensi besi) dan lebih tinggi daripada remaja laki-laki. Anemia pada remaja putri mempengaruhi aktivitas fisik, konsentrasi belajar yang akan mempengaruhi prestasi remaja putri.

Tujuan : Penelitian ini bertujuan untuk mengukur Indeks Masa Tubuh (IMT), Lingkar Lengan Atas (UAC), dan Kadar Hemoglobin (Hb) Pra Integrasi Suplementasi Tablet Fero Sulfat (Fe) serta mengetahui hubungan antara BMI dan UAC dengan kadar Hb untuk pencegahan Stunting pada siswa di SMA Muhammadiyah Ponorogo

Metode : Desain penelitian yang dilakukan adalah penelitian eksperimen dengan pendekatan studi eksplorasi, desain studi pra-eksperimental, penelitian berlangsung pada bulan Januari hingga April 2023 di SMA Muhammadiyah Ponorogo. Sampel adalah 54 orang. Peneliti menganalisis kadar Hb, IMT, dan UAC dari semua sampel penelitian dan menghubungkan dengan setiap variable.

Hasil : Hasil penelitian menunjukkan bahwa BMI 48% (26 orang) undernutrition, kondisi UAC 65% (35 orang) underweight dan kadar Hb menunjukkan 87% (47 orang) normal. Uji analisis statistik menunjukkan bahwa uji *p-value* = 0,089 yang berarti tidak ada hubungan antara kadar BMI dan Hb pada remaja putri. Demikian pula, kadar Hb dengan UAC tidak menunjukkan hubungan dengan nilai *p* 0,707.

Kesimpulan : Kesimpulan dari penelitian ini, masih banyak remaja putri yang mengalami status gizi buruk, meskipun masih ditemukan beberapa sampel tersebut yang mengalami anemia. Sehingga penting penelitian selanjutnya yang mengkaji standar asupan gizi seimbang dan suplementasi tablet Fe untuk pencegahan stunting pada masa remaja.

KATA KUNCI : pencegahan stunting; imt, uac; kadar hb; dan remaja putri

ABSTRACT

Background : One of the problems facing adolescent girls (23%) is iron deficiency (iron deficiency anemia) and it is higher than adolescent boys. Anemia in adolescent girls affect physical activity, learning concentration which will affect adolescent girls achievement.

Objectives: This study aims to determine Body Mass Image (BMI), Upper Arm Circumference (UAC), and Haemoglobin (Hb) Levels Pre Integration of Fero Sulfate (Fe) Tablets Supplements and to know relationship between BMI and UAC with Hb levels for Stunting prevention in students at Muhammadiyah Ponorogo High School.

Methods: The research design carried out was experimental research with an exploratory study approach, pre-experimental study design, the research takes on January to April 2023 in Muhammadiyah High School Ponorogo. The samples was 54 people. Researchers analyze Hb, BMI, and UAC levels from all study samples and correlate all variables.

Results: The results show that BMI 48% (26 people) undernutrition, UAC 65% (35 people) underweight condition and Hb levels showed 87% (47 people) normal. The statistical analysis test shows that p -value test = 0.089 which means that there is no relationship between BMI and Hb levels in adolescent girls. Similarly, Hb levels with UAC show no relationship with p value 0.707.

Conclusions: The conclusion of this study, there are still many adolescent girls who experience malnutrition status, although found a few of these samples are anemic. So it is important that future studies on balanced nutritional intake and standardized Fe supplementation for stunting prevention in adolescence are important.

KEYWORD : preventive stunting, bmi, uac; hb levels; and adolescent girls

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INTRODUCTION

Stunting is still a global concern, the stunting rate estimated globally in 2025 is 127 million in children under 5 years old (1). The stunting prevalence rate in Indonesia decreased from 30.8% (2018) to 24.4% (2022) based on the Indonesia Indonesia Nutritional Status Survey (2). However, the target of the Government of the Republic of Indonesia is to reduce stunting rate by 14% by 2024 –(3). The involvement of all elements of society is needed to help accelerate the reduction of stunting rates and strengthen stunting prevention for the future (4). According to the Regulation of the Minister of Health of the Republic of Indonesia Number 25 of 2014, adolescents are residents in the age range of 10-18 years and according to the Population and Family Planning Agency (BKKBN) the age range of adolescents is 10-24 years and unmarried (5). Adolescents are one of the keys in preventing stunting, based on Riskesdas 2018 adolescents in the age range of 16-18 years have thin bodies and are very thin (6). Stunting cannot be separated from nutritional status, there are three main things that affect nutritional status including food safety (quantity and quality of food) which

is an important factor for stunting, inadequate care, and health (disease infection) (7). The key adolescents of the nation's next generation, breaking the chain of stunting can be started through education by involving adolescents about the need for proper nutrition in adolescence (8). Islam considers it important to maintain the continuity of human generations, maintaining the quality of life by balancing spiritual and physical needs (9). In addition to measuring nutritional status through height and weight, measuring upper arm circumference (UAC) is important for adolescents to determine body fat levels (10). There is a strong correlation between UAC and BMI in adolescent girls (Young Women) to the incidence of SEZ (Chronic Energy Deficiency)(5). SEZs in adolescents can affect hormonal and health status (5).

One of the problems facing adolescent girls (23%) is iron deficiency (iron deficiency anemia) and its incidence is higher than adolescent boys. Adolescent girls will undergo a phase of the life cycle and will later become a mother-to-be. Anemia in pregnancy can be a predictor of stunting events (11). Anemia in adolescent girls will also affect physical

activity, learning concentration which will affect adolescent girls achievement (6). Supplementation of Fero Sulfate Tablets (Fe) in adolescent girls and WUS is one of the government's efforts to meet iron intake. In addition to the problem of anemia, adolescents must also be aware of their height, BMI measurement is one alternative to assess nutritional status in adolescent girls (12).

The purpose of this research are determining BMI, UAC, and Haemoglobin (Hb) levels pre supplementation Fe tablet and knowing relationship between BMI and UAC with Hb levels in adolescent students at Muhammadiyah Ponorogo High School for stunting prevention.

MATERIALS AND METHODS

The research design carried out was experimental research. With an exploratory study approach, pre-experimental study design, the research location was carried out at Muhamamdiyah High School, Ponorogo Regency during the period October 2022 to February 2023. The population in this study is class XII female students who attend Muhammadiyah High School, Ponorogo Regency. There are 3 Muhammadiyah High

Schools in Ponorogo district, The sampling technique was taken by taking into account the inclusion and exclusion criteria. The number of samples was 54 people. Researchers measured Hb, BMI, and UAC levels from all study samples. Tools and materials prepared weight gauges, wtatue mater, and electric Hb examination tools. Then researchers linked the status of BMI and UAC with the Hb levels owned by adolescent girls. Descriptive and correlate analysis data were used to determine results test.

RESULTS AND DISCUSSION

RESULTS

The results of anthropometric measurements of BMI showed that 37% (20 people) of adolescent girls were underweight, 48% (26 people) were normal, and 9.2% (5 people) were obese and 5.5% (3 people) were overweight. While the measurement results of UAC adolescent girls show 65% (35 people) underweight condition, 33% (18 people) normal condition, 2% (1 person) overweight condition. Hb measurements showed 87% (47 people) had normal Hb levels while 12.9% (7 people) had mild anemia. The following is presented in the table below:

Table 1. Body mass image study eksplorative result

IMT							
Body weight << (n)	%	Normal (n)	%	Obesity (n)	%	Overweight (n)	%
13	24,1	11	20	2	4	1	2
4	7,4	4	7	1	2	0	0
3	5,5	11	20	2	4	2	4

Table 2. Upper arm circumference study eksplorative result

LILA					
Underweight (n)	%	Normal (n)	%	Overweight (n)	%
16	30	10	19	1	2
8	15	1	2	0	0
11	20	7	13	0	0

Table 3. Haemoglobin study eksplorative hb

LILA					
Normal (n)	%	Mild Anemia (n)	%	Seevre Anemia (n)	%
22	41	5	9	0	0
8	15	1	2	0	0
17	31	1	2	0	0
35	87	7	12,96	0	0

DISCUSSION

The data showed that the nutritional status of most adolescent girls was still in the underweight category in BMI and UAC. While the Hb levels of the samples are in the normal category. Anemia is still a problem among adolescent girls. Adolescent girls who experience anemia can result in decreased concentration power and decreased learning achievement (5). In addition to the problem of decreasing learning achievement, anemia also has a long-term impact on the quality of the nation's next generation, as young women are prospective mothers who will later experience the pregnancy phase and produce the nation's next generation (13) (14). If adolescent girls is not aware of the dangers of anemia, anemia will be considered normal and not treated early (6). From the theoretical studies that have been conducted, the impact of anemia on pregnancy is lower birth weight (LBW), abortion, premature, and ASD/Austic Spectrum Disorder (15). In addition, anemia in

pregnancy will affect newborn anthropometry, namely the length of the baby, there is a relationship between anemia and the length of the newborn(6)(7). Previous studies have examined Hb levels and BMI index in stunted toddlers with insignificant results but have not been carried out in adolescents(11)(16). Study shows that positive relationship between junk food and anemia that was higher the consumption of junk food higher the chances of anemia occurrence, lesser the consumption of junk food lower the chances to be anemic (17). Appart from fast food, junk food, exposure to pesticides can also cause stunting in studies using zebrafish as experimental animals(3)(18).

The statistical analysis test shows that the data is not normally distributed, so the spearman rank test is used to measure the relationship between BMI and UAC with Hb levels. The results of the p-value test = 0.089 which means that there is no relationship between BMI and Hb levels in adolescent girls.

Similarly, Hb levels with UAC show no relationship with a p-value of 0.707. Stunting is the failure to achieve linear growth due to suboptimal health conditions and lack of nutrition, characterized by low-height-for-age (HAZ) less than -2 standard deviations (-2 SD) based on WHO growth standards that can be detrimental throughout the life cycle(19). Stunting is one form of chronic malnutrition which is the biggest nutritional problem, defined by measuring length or height based on age (height/age) less than -2 SD (6). Adolescents need to be prepared from an early age to be able to produce a quality next generation of the nation(15)(20). Prevention of stunting in adolescents needs to be done, one of which is by checking hemoglobin levels regularly and giving blood tablets(19)(21).

CONCLUSION AND RECOMMENDATION

The conclusion of this study, there are still many adolescent girls who experience malnutrition status, although found a few of these samples are anemic. So that further research needs to be carried out on balanced nutritional intake and standardized TTD supplementation for stunting prevention in adolescence.

REFERENCES

1. Primaditya V, Cory'ah FAN, Ariati LIP, Zakiah, Wardani DWKK, Yuningsih, et al. Effect of centella asiatica to the glucose transporter 4 and osteocalcin on the rotenone-induced zebrafish larvae (Danio rerio) stunting model. AIP Conf Proc. 2020;2231.
2. Kuala US. Stunting in Indonesian Children and Its Contributing Factors : Study through Bibliometric Analysis. 2022;16(2).
3. Waterlow JC. Introduction. Causes and mechanisms of linear growth retardation (stunting). Eur. J Clin Nutr. 48(1):1–4.
4. Hanifah RN, Djais JTB, Fatimah SN. Prevalensi Underweight, Stunting, dan Wasting pada Anak Usia 12-18 Bulan di Kecamatan Jatinangor. Jsk. 2019;5(3):3–7.
5. Siswati T, Kasdjono HS, Olfah Y. How Adolescents Perceive Stunting and Anemia : A Qualitative Study in Yogyakarta ' s Stunting Locus Area , Indonesia Persepsi Remaja tentang Stunting dan Anemia : Studi Kualitatif di Daerah Locus Stunting di Yogyakarta , Indonesia. 2022;13(2):169–86. Available from: <https://jurnal.dpr.go.id/index.php/aspirasi/article/view/3097>.
6. Nguyen PH, Walia M, Pant A, Menon P, Scott S. Changes in anemia and anthropometry during adolescence predict learning outcomes: Findings from a 3-year longitudinal study in India. Am J Clin Nutr. 2022;115(6):1549–58.
7. Rahmadhita K. Jurnal Ilmiah Kesehatan Sandi Husada Permasalahan Stunting dan Pencegahannya Pendahuluan. J Ilm Kesehatan Sandi Husada . 2020;11(1):225–9.
8. Ridlayanti A, Lusiani E. EMPOWERMENT PARENTS BY COMPREHENSIVE EDUCATION AS PREVENTIVE STUNTING GROWTH IN CHILDREN 0-5 YEARS. :1–5.
9. Heydari A, Khorashadizadeh F, Nabavi FH, Mazlom SR, Ebrahimi M. Spiritual health in nursing from the viewpoint of Islam. Iran Red Crescent Med J. 2016;18(6).
10. North American Society for Pediatric and Adolescent Gynecology. Journal Pediatr

- Adolesc Gynecol. 2010;23(5):322.
11. Agustina R, Wirawan F, Sadariskar AA, Setianingsing AA, Nadiya K, Prafiantini E, et al. Associations of Knowledge, Attitude, and Practices toward Anemia with Anemia Prevalence and Height-for-Age Z-Score among Indonesian Adolescent Girls. *Food Nutr Bull*. 2021;42(1_suppl):S92–108.
 12. Qorbanalipour K, Ghaderi F, Jafarabadi MA. Comparison of the effects of acupressure and electroacupuncture in primary dysmenorrhea: A randomized controlled trial. *Int J Women's Heal Reprod Sci [Internet]*. 2018;6(4):471–6. Available from: <https://doi.org/10.15296/ijwhr.2018.78>
 13. Kolsteren P. The determinant of stunting : can we regard the linear growth performance as a continuum of fetal development ?. *Asia pasific J Clin Nutr*. 1996) 5. p. 59–69.
 14. Biopharmaceutical and pharmacokinetic characterization of asiatic acid in *Centella asiatica* as determined by a sensitive and robust HPLC – MS method. *J Ethnopharmacol [Internet]*. 163:31–38. Available from: <http://doi.org/10.1016/j.jep.2015.01.006>
 15. Indriastuti Kurniawan YA, Muslimatun S, Achadi EL, Sastroamidjojo S. Anaemia and iron deficiency anaemia among young adolescent girls from peri urban coastal area of Indonesia. *Asia Pac J Clin Nutr*. 2006;15(3):350–6.
 16. Nizaruddin N, Ilham MI. The Effect of Sanitation on Stunting Prevalence in Indonesia. *Populasi*. 2022;30(2):34.
 17. The stunting syndrome in developing countries. *Paediatr Int Child Health*. 34(4):250–65.
 18. Wijayanti AR, Ridlayanti A, Muljohadi Ali HK. Protection of Pegagan (*Centella asiatica*) Extract through Hsp60 and Bax Expression on Stunting Model Zebrafish Larvae (*Danio rerio*) by Rotenone Inducted. *J Phys Conf Ser*. 2021;1764(1).
 19. Indah Budiastutik, Muhammad Zen Rahfiludin. Faktor Risiko Stunting pada anak di Negara Berkembang . *Amerta Nutr*. 2019;3(3):122–9.
 20. Omer A, Hailu D. Child-Owned Poultry Intervention Effects on Hemoglobin , Anemia , Concurrent Anemia and Stunting , and Morbidity Status of Young Children in Southern Ethiopia : A Cluster Randomized Controlled Community Trial. 2023;
 21. Abudayya A, Thoresen M, Abed Y, Holmboe-Ottesen G. Overweight, stunting, and anemia are public health problems among low socioeconomic groups in school adolescents (12-15 years) in the North Gaza Strip. *Nutr Res*. 2007;27(12):762–71.