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Incidence of Anemia among Urban and Rural High School Students in Bone Regency

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ABSTRACT

Background: Anemia is a level of hemoglobin (Hb) in the blood that is below normal. In the world there are 40-88% of adolescents (10-19 years) experiencing anemia with a frequency of 26.2% in Indonesia, consisting of 59% of men and 49.1% of women. This study aims to determine the description of the incidence of anemia in rural high school students and urban high school students in Bone Regency, South Sulawesi in 2022. **Methods**. The type of research used is quantitative observational with an analytic observational approach with a cross sectional design. The population in this study were all female students in urban and rural areas, namely SMA 1 Bone and SMA 21 Bone with a total sample of 83 people which is equivalent to the number of samples in rural areas. The sampling technique used is non-random sampling and total sampling. **Results**. The results of this study indicate that there is a difference between the incidence of anemia in rural high school students and urban high school students in Bone district with an Asymp value. Sig. (2-tailed) of 0.026 <0.05. Adolescents have the potential to experience anemia because their lifestyle and consumption patterns vary due to growth and development. **Conclusion**. Terdapat perbedaan kejadian anemia dan status gizi pada siswi di perkotaan dan pedesaan. Tidak terdapat perbedaan pola menstruasi dan pola konsumsi inhibitor zat besi pada siswi di perkotaan dan pedesaan.

Keywords: Anemia, Incidence of Anemia in rural and urban areas, Total sampling

ABSTRAK

Latar Belakang: Anemia merupakan Kadar hemoglobin (Hb) dalam darah yang berada di bawah normal. Didunia terdapat remaja (10-19 tahun) sebanyak 40-88% mengalami anemia dengan frekuensi 26,2% di Indonesia, terdiri dari 59% pria dan 49,1% wanita. Penelitian ini bertujuan untuk mengetahui Gambaran Kejadian Anemia Pada Siswi SMA Pedesaan Dengan Siswi SMA Perkotaan Kabupaten Bone Sulawesi Selatan Tahun 2022. **Metode**. Jenis penelitian yang digunakan adalah kuantitatif observasional dengan pendekatan analitik observasional dengan desain cross sectional. Populasi dalam penelitian ini adalah seluruh siswi di perkotaan maupun di pedesaan yaitu SMA 1 Bone dan SMA 21 Bone dengan jumlah sampel sebanyak 83 orang yang dimana disetarakan dengan jumlah sampel dipedesaan. Teknik sampling yang digunakan yaitu non-random sampling dan total sampling. **Hasil**. Hasil penelitian ini menunjukkan bahwa ada perbedaan antara kejadian anemia pada siswi SMA Pedesaan dengan siswi SMA Perkotaan dikabupaten bone dengan nilai Asymp. Sig. (2-tailed) sebesar 0,026 < 0,05. Remaja berpotensi mengalami anemia karena gaya hidup dan pola konsumsi remaja bervariasi karena pertumbuhan dan perkembangan. **Kesimpulan**. Terdapat perbedaan kejadian anemia dan status gizi pada siswi di perkotaan dan pedesaan. Tidak terdapat perbedaan pola menstruasi dan pola konsumsi inhibitor zat besi pada siswi di perkotaan dan pedesaan.

Kata Kunci : Anemia, Kejadian Anemia dipedesaan dan diperkotaan, Total sampling

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INTRODUCTION

Adolescence is defined by the WHO as the age between 10 and 19 years. BKKBN (2018) states that adolescence ranges from 10 to 24 years old. Adolescence is crucial for shaping their development during the first ten years of life. Rapid development and changes from childhood to young adulthood can be noticed during this time. Biological changes that occur during adolescent puberty include changes in body composition, height and weight gain, bone mass buildup, and sexual development. A person's attitude will change due to having good information, making it a daily habit. Someone who has knowledge about healthy eating likes nutritious food and rarely eats fast food.

Anemia is one of the categories of malnutrition and poor health problems. Hemoglobin (Hb) levels in the blood are below normal, which is a sign of anemia (MOH, 2018). According to WHO, malnutrition is the most common cause of anemia. (WHO, 2018). Adolescents are the next generation that is very strategic and easy to absorb rejuvenation because the quality of adolescents will determine the quality of adults in the future, but currently they do not receive enough attention from nutrition programs. Adolescent girls often want to stay small, therefore it is believed that by continuously tracking their weight and eating with different adolescent goals, this can be achieved. (Gallagher ML., 2008)

Girls in their teenage years still have significant rates of anemia. As stated by (World Health Organization, 2011), Anemia affects 40-88% of adolescents (10-19 years) worldwide, with a frequency of 26.2% in Indonesia, consisting of 59% males and 49.1% females. According to data (Basic Health Research, 2018), in Indonesia, 48.9% of the population suffer from anemia, which is more prevalent in the age group of 15-24 years and 25-34 years. The South Sulawesi Provincial Health Office contributes to the fulfillment of energy needs by protein by 27.4% in the form of snacks. Findings show that 78% of school children eat snacks while at school, both in the canteen and outside the canteen, making them more vulnerable to diseases, one of which is an increase of 33.7% (South Sulawesi Health Profile, 2015).

According to statistics from the Bone Regency Health Office, the prevalence of anemia in adolescents was 29.76% in 2018 and 22.70% in 2019 (Bone Regency Health Office, 2019). There are currently quite a lot of cases of anemia in adolescents, which is 21.7%. The incidence rate of cases involving adolescents is 18.4%. Anemia cases were 20.6% in urban areas and 22.8% in rural areas (Riskesdas, 2013).

Adolescent girls with anemia are 1.87 times more likely than girls without anemia to have less educational success. This is because anemia in adolescent girls can affect the ability to concentrate while learning, in addition to adversely affecting growth, susceptibility to disease, and levels of freshness and fitness (Alexander, 2020).

Anemia will affect students' ability to concentrate in class, their level of fitness, and their ability to grow normally in terms of height and weight. Anemia is also a very serious micronutrient intake problem due to the occurrence of various problems in mothers and newborns (Herwandar & Soviyati, 2020). According to the theory (Chaparro & Suchdev, 2019), anemia is influenced by socio-demographics and behavior, as well as physiologically vulnerable women (gestational age, parity, menstruation, birth spacing), enriched food sources, access to health services, knowledge and education about nutrition, clean water and sanitation, inadequate nutrient intake and absorption and micronutrient deficiencies, infectious diseases and genetic hemoglobin abnormalities. All these are some of the factors that cause anemia.

Based on information obtained from a review of journal literature, many studies have addressed macronutrient intake, infectious diseases, parenting, and sociodemographics. Previous studies suggested focusing on the influence of micronutrient intake on the incidence of anemia. In addition, there is a lack of studies addressing the influence of iron inhibitors and the prevalence of anemia among adolescents. The intake of macronutrients (carbohydrates and protein) and micronutrients (other nutrients) will be categorized in this study (Vitamin C and Fe) as a description of the incidence of anemia in adolescents. This is what distinguishes it from previous researchers. Therefore, the researcher is interested in conducting a study entitled Overview of the Incidence of Anemia in Urban High School Students and Rural High School Students in Bone Regency, South Sulawesi in 2022.

METHODS

This type of research is quantitative research with an observational analytic approach with a cross sectional study design. This research was conducted in rural high schools and urban high schools. The population in this study were all female students in urban and rural areas, namely SMA 1 Bone and SMA 21 Bone with a sample size of 83 people which was equal to the number of samples in rural areas. The sampling technique used is non-random sampling and total sampling.

Data collection methods were carried out in two ways, namely primary data and secondary data. Primary data was obtained using a menstrual pattern questionnaire, iron inhibitor consumption intake questionnaire, 2x24 hour recall and to determine nutritional status by measuring height and weight and upper arm circumference using microtoise, weight scales and LILA tape. Meanwhile, secondary data were obtained from the puskeSMAs, health department, education department, and schools. In addition, secondary data were obtained from the 2018 Riskesdas data and other reading sources or references.

Data processing was carried out using a computerized program, namely SPSS (Social Science Package System) to test the results of this research questionnaire and use calculations to add up the BMI of each student.

RESULTS

Table 1
Mann Whitney Test of Anemia Incidence

Test Statistic	Incidence of Anemia
Mann- Whitney U	2756
Wilcoxon W	6242
Z	-2.227
Asymp. Sig. (2-tailed)	0.026

Table 1 shows that the Asymp. Sig. (2-Tailed) value of 0.026 <0.05. So it can be concluded that the hypothesis is accepted". Thus it can be said that there is a difference between the incidence of anemia of female students in rural high schools and the incidence of anemia of female students in urban high schools.

Table 2
Mann Whitney Test Nutritional Status

Test Statistic	BMI	CED
Mann- Whitney U	0	2756
Wilcoxon W	3486	6242
Z	-11.127	-2.227
Asymp. Sig. (2- tailed)	0	0.026

Table 2 shows that the Asymp. Sig. (2-Tailed) is 0.000 < 0.05 and 0.026 < 0.05. So it can be concluded that the hypothesis is accepted. Thus it can be said that there is a difference between the nutritional status of female students in rural high schools and the nutritional status of female students in urban high schools.

Table 3
Mann Whitney Test of Menstrual Pattern

Test Statistic	Menstrual Pattern
Mann-Whitney U	3258.5
Wilcoxon W	6744.5
Z	-0.613
Asymp. Sig. (2-tailed)	0.54

Table 3 shows that the value of Asymp. Sig. (2-Tailed) value of 0.540> 0.05. So it can be concluded that "Hypothesis Rejected". Thus it can be said that there is no difference between menstrual patterns of female students in rural high schools and menstrual patterns of female students in urban high schools.

Table 4
Mann Whitney test of iron inhibitor consumption pattern

Test Statistic	Iron Inhibitor Consumption Pattern
Mann-Whitney U	3024
Wilcoxon W	6510
Z	-1.409
Asymp. Sig. (2-tailed)	0.159

Table 4 Test shows that the value of Asymp. Sig. (2-Tailed) of 0.159 > 0.05. So it can be concluded that "Hypothesis Rejected". thus it can be said that there is no difference between the consumption pattern of iron inhibitors of female students in rural high schools and the consumption pattern of iron inhibitors of female students in urban high schools.

Table 5
Mann Whitney Test of Food Intake

Test Statistic	Carbohydrate Intake	Protein Intake	Iron Intake	Vitamin C Intake
Mann- Whitney U	3141	3395.5	3442	2413
Wilcoxon W	6627	6881.5	6928	5899
Z	-0.98	-0.158	-0.008	-3.332
Asymp. Sig. (2-tailed)	0.327	0.874	0.994	0.001

Table 5 shows that the value of Asymp. Sig. (2-Tailed) value is 0.327 > 0.05. So it can be concluded that "Hypothesis Rejected". Thus it can be said that there is no difference between the pattern of carbohydrate intake of female students in rural high schools and the pattern of carbohydrate intake of female students in urban high schools. Based on the "Test Statistic" Output, it is known that the value of Asymp. Sig. (2-Tailed) of 0.874> 0.05. So it can be concluded that "Hypothesis Rejected". Thus it can be said that there is no difference between the pattern of protein intake of female students in rural high schools and the pattern of carbohydrate intake of female students in urban high schools. Based on the "Test Statistic" Output, it is known that the Asymp. Sig. (2-Tailed) of 0.994 > 0.05. So it can be concluded that "Hypothesis Rejected". Thus it can be said that there is no difference between the pattern of iron intake of female students in rural high schools and the pattern of iron intake of female students in urban high schools. Based on the "Test Statistic" Output, it is known that the asymp. sig. (2-tailed) of 0.001 <0.05. it can be concluded that the "Hypothesis Accepted". thus it can be said that there is no difference between the pattern of vitamin c intake of female students in rural high schools and the pattern of vitamin c intake of female students in urban high schools.

DISCUSSION

Relationship between the Incidence of Anemia in Rural High School Students and Urban High School Students

Hemoglobin plays an important job in both transporting carbon dioxide back to the lungs for exhalation out of the body and carrying oxygen to all parts of the body for consumption. These mechanisms can be disrupted if hemoglobin levels are too low, leaving the body with low oxygen levels (hypoxia). Anemia often has a very good prognosis and is often treatable. The severity of the anemia, the underlying etiology, and the general condition of the patient all affect the prognosis. Heart attacks can occur due to severe anemia because it can cause insufficient oxygen levels in the heart and other important organs (Proverawati, 2011).

According to Adriani and Wirjatmadi (2012), iron is an important component in the formation of hemoglobin (Hb). In the body, iron, which can be found in the form of hemoglobin, myoglobin, or cytochrome, performs tasks related to the transportation, storage, and use of oxygen. Most of the iron released during the breakdown of red blood cells will be reused to meet the demand for hemoglobin production before the deficiency needs to be addressed and replenished through eating.

The amount of iron consumed through food, the amount absorbed through the digestive system, the amount of iron stored in excretory tissues, and the body's needs all have a significant impact on a person's level of iron nutrition. (Adriani, M, Wijatmadi, B, 2012). The body obtains iron from three different sources:

the digestive system, iron is taken from storage in the body, and iron is obtained through the breakdown of red blood cells (hemolysis).

In a typical individual, hemolysis accounts for about 20-25 mg of the iron they need each day, while about 1 mg comes from other sources in small amounts. Adults are thought to absorb and excrete only a small amount of iron each day, between 0.5 to 2.2 mg. There is some absorption in the duodenum, but little in the ileum and jejunum (Adriani, M, Wijatmadi, B, 2012).

Relationship between Nutritional Status in Rural High School Students and Urban High School Students

The digestive system, iron taken from body reserves, and iron obtained from the destruction of red blood cells are the three main sources of iron (hemolysis). About 20-25 mg of the daily iron requirement for the average person comes through hemolysis, while only about 1 mg comes from other sources in small amounts. Adults only ingest and excrete between 0.5 and 2.2 milligrams of iron daily, according to estimates. In the ileum and jejunum, absorption is very little compared to the duodenum. This study is in line with previous research (Ratna, R.D., Dyah, U.P., and Kusnandar, 2015) showing that grade V children at SDN 1 Purwojati and SD Santo Yosep have different nutritional status from children in urban and rural areas. Food consumption habits differ between rural and urban locations. This can be seen from the socioeconomic circumstances of a more educated and affluent population, the accessibility of adequate health and educational resources, the availability of health professionals, and the business sector where most city dwellers work as employees and business owners. The low socioeconomic conditions, lack of educational opportunities, and dependence of the population on agriculture and manual labor, on the other hand, suggest that the diet of the rural population falls short of nutritional requirements.

This study is in line with research (Handayani, M.S., Cesilia, M.D., and Hadi, R, 2013) showing that there was no significant difference in the BMI/U of samples in urban and rural junior high schools in terms of nutritional quality. In urban junior high schools, 76% of the sample fell into the normal group, while the remaining 24% fell into the overweight category. 92% of SMPs in rural areas fell into the normal group, compared to 6% for underweight students and 2% for overweight students. Most of the sample had an acceptable nutritional status, which will cause adolescents to grow properly as healthy body development requires proper nutrition.

Relationship between Menstrual Patterns in Rural High School Students and Urban High School Students

The average menstrual cycle lasts between 21 and 35 days, periods last between 2 and 8 days, and between 20 and 80 ml of blood is shed daily. When the monthly cycle, length, and blood volume are abnormal, this condition is referred to as a menstrual disorder. The menstrual cycle usually lasts for 28 days. A typical cycle lasts 21 to 35 days. Every woman's menstrual cycle is different; more than 90% of women have periods that last 25 to 35 days, while about 10% to 15% have cycles that last more than 28 days. However, some women have irregular cycles. The start day is used to determine the length of the menstrual cycle, which is then calculated until the end day, which is one day before the next month's menstruation begins (Saryono, 2009).

Relationship between Iron Inhibitor Consumption Patterns in Rural High School Students and Urban High School Students

This study is not in line with research (AOLIA FEBRIANI ATMA W, 2019) This results in a p value of 0.003 which indicates that there is a significant difference between anemic and non-anemic adolescent girls at SDN Totosari and SDN Tunggulsari I, II Surakarta in the use of iron inhibitors.

Relationship between Food Intake in Rural High School Girls and Urban High School Girls

A high-affinity glucose transporter is present in the HR membrane, which is why it relies heavily on glucose as an energy source. The ATP route involves glycolysis, which produces lactate. Since the HR lacks mitochondria, there is no oxidative phosphorylation to generate ATP. Ion and water balance is maintained through a number of transporters in the HR. To control the oxygen-carrying capacity of HB, a process directly connected to glycolysis results in the synthesis of 2,3-bis phosphoglycerate (Robert K. Murray, Daryl K. Granner, Victor W. Rodwell).

Hemolytic anemia is often caused by a lack of glucose 6-phosphate dehydrogenase activity. Hemolytic anemia is caused by the metabolism of about 5-10% of the total glucose flow by the pentose phosphate

pathway, which works in red blood cells. One of the roles of reduced glutathione (GSH), which is essential for HR metabolism, is to counteract the potentially harmful effects of peroxides. To convert oxidized glutathione (G-S-S-G) back to its reduced state, HR can produce GSH and requires NADPH (Robert K. Murray, Daryl K. Granner, Victor W. Rodwell).

Iron in hemoglobin must be stored in ferrous form, and cytochrome b3 reductase and cytochrome b5 work together as part of the NADPH-dependent methemoglobin reductase system to convert ferrous iron to ferric iron. Glycogen, fatty acids, proteins, and nucleic acids are not synthesized in red blood cells (RBCs), however certain membrane lipids, such as cholesterol, can be exchanged for the same lipid plaSMA (Robert K. Murray, Daryl K. Granner, Victor W. Rodwell).

Some forms of hemolytic anemia are caused by a deficiency of certain nucleotide metabolism enzymes found in red blood cells, such as adenosine deaminase, pyrimidine nucleotidase, and adenylyl kinase. When red blood cells reach the end of their useful life, globin is broken down into amino acids, which can then be reused by the body. Iron is also liberated from the heme and reused, while the heme component tetrapirole is converted into bilirubin, which is mainly eliminated by bile in the colon (Robert K. Murray, Daryl K. Granner, Victor W. Rodwell).

In the iron-containing hydroxylase connected to -ketoglutarate, ascorbic acid plays a specific function. In vitro, it also makes a number of other enzymes more active, however this is a non-specific lowering activity. In addition, this acid has a number of non-enzymatic actions as a result of its role as a reducing agent and oxygen radical “quencher” (Robert K. Murray, Daryl K. Granner, Victor W. Rodwell)

Carboxy-terminal amides generated from terminal glycine residues are present in various peptide hormones. The copper-containing enzyme peptidyl glycine hydroxylase hydroxylates this glycine at the -carbon and again requires ascorbate to degrade Cu2+. However, according to some, the presence of vitamin C in the gut is what causes it to increase iron absorption (Robert K. Muray, Daryl K. Granner, Victor W. Rodwell).

CONCLUSION

Based on research on the description of the incidence of anemia in rural high school students and urban high school students in Bone Regency, South Sulawesi in 2022, it can be concluded that the incidence of anemia in urban students and rural students has a difference between the two. Nutritional status in urban schoolgirls and rural schoolgirls has a difference between the two. Menstrual patterns in urban schoolgirls and rural schoolgirls have no difference between the two. There is no difference between the consumption patterns of iron inhibitors in urban schoolgirls and rural schoolgirls.

REFERENCE

Adriani, M , Wijatmadi, B. (2012). Pengantar Gizi Masyarakat. Jakarta: Kencana

Alexander, M. (2020). Faktor-Faktor Yang Berhubungan Dengan Kejadian Anemia Pada Remaja Putri Di Sekolah Smpn 09 Pontianak Tahun 2019.

Jurnal_Kebidanan, 9(2), 394–403. https://doi.org/10.33486/jurnal_kebidan an.v9i2.84

Aolia Febriani Atma W. (2019). Perbedaan Kebiasaan Konsumsi Susu Dan Asupan Kalsium (Ca) Antara Remaja Anemia Dan Non Anemia Di Sdn Totosari Dan Sdn Tunggulsari I, Ii Di Surkarta. SURAKARTA: fAKULTAS ILMU KESEHATAN UNIVERSITAS MUHAMMADIYAH SURAKARTA.

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 Gallagher ML. . (2008). The Nutrients and

TheirMetabolism. In: Mahan LK, EscottStump.S. Krause’s Food, Nutrition, and Diet Therapy. 12th edition. Philadelphia: Saunders.

Handayani, M.S., Cesilia, M.D., dan Hadi, R. (2013). Hubungan Komposisi Tubuh dan Status Gizi dengan Perkembangan Seksual Pada Remaja Putri di Perkotaan Dan Pedesaan. Jurnal Gizi dan Pangan, 8(6).

Herwandar, F. R., & Soviyati, E. (2020). Perbandingan Kadar Hemoglobin Pada Remaja Premenarche Dan Postmenarche Di Desa Ragawacana Kecamatan Kramatmulya Kabupaten Kuningan Tahun 2018. Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal, 11(1), 71–82. https://doi.org/10.34305/jikbh.v11i1.15 4

Kemenkes Republik Indonesia. (2019). Profil kesehatan Indonesia tahun 2019. Kementerian Kesehatan. (2017). Status Gizi. Kementrian Kesehatan. (2018). Penanggulangan Anemia. Profil Kesehatan Sulawesi Selatan. (2015).

No Title. Proverawati, A. (2011). Anemia Dan Anemia Kehamilan. Nuha Medika.

Ratna, R.D., Dyah, U.P., dan Kusnandar. (2015). Perbedaan Status Gizi Dan Tingkat Kesegaran JaSMAni Pada Anak Sekolah Dasar Perdesaan Dan Perkotaan. Jurnal KeSMAsindo, 7(3): 237-243 .

Robert K. Muray , Daryl K. Granner , Victor W. Rodwell. (n.d.). Biokimia Harper. penerbit buku kedokteran EGC.

Saryono. (2009). Sindrom Premenstruasi. Yogyakarta: Nuha Medika.

World Health Organization. (2011). Prevalensi Anemia di Dunia.

World Health Organization. (2013). Worldwide Prefalance of Anemia : WHO Global Database on Anemia. WHO Press.