

Hubungan Indeks Massa Tubuh (Imt) dengan Anemia Pada Remaja Putri di Indonesia (Analisis Data Indonesia Family Life Survey 5)

Relationship between Body Mass Index (BMI) and Anemia Among Adolescent Indonesian Girls (Analysis of The Indonesia Family Life Survey 5th Data)

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ABSTRAK

Latar Belakang: Anemia merupakan suatu keadaan yang ditandai dengan rendahnya kadar hemoglobin (Hb) dari batas normal yang seharusnya. Anemia masih menjadi salah satu permasalahan kesehatan masyarakat. Data menyebutkan prevalensi Anemia di negara Indonesia pada tahun 2013 adalah 21,7% dengan jumlah penderita diketahui lebih tinggi pada perempuan dibandingkan laki-laki. Prevalensi Anemia pada rentang usia 15 hingga 24 tahun adalah 18,4%. Status gizi menampilkan keseimbangan nutrisi akibat konsumsi, penyerapan, serta penggunaan zat gizi yang berasal dari makanan di dalam tubuh. Status gizi seseorang dapat dikatakan kurang apabila tubuh kekurangan asupan dari satu atau lebih zat gizi esensial bagi tubuh. Salah satu indikator untuk menilai status gizi seseorang adalah melalui Indeks Massa Tubuh (IMT). Status gizi yang kurang akan berpengaruh pada status gizi besi dalam tubuh seseorang sehingga dapat diartikan bahwa status gizi menjadi salah satu faktor dari Anemia. Mengonsumsi makanan dengan nilai gizi baik, terutama makanan yang mengandung zat besi tinggi akan turut mempengaruhi status gizi remaja tersebut sehingga risiko menderita Anemia akan menurun.

Tujuan: Studi ini bertujuan untuk menganalisis hubungan Indeks Massa Tubuh dengan Anemia pada remaja putri di Indonesia. **Metode:** Penelitian ini merupakan jenis penelitian cross-sectional. Data yang digunakan adalah data sekunder yang berasal dari Indonesia Family Life Survey (IFLS) 5. Populasi dari penelitian ini yaitu semua penduduk Indonesia yang mengikuti IFLS 5. Sampel yang digunakan berjumlah 3.525 responden. Kriteria inklusi penelitian ini meliputi, berjenis kelamin perempuan, berusia 10-18 tahun, belum menikah, memiliki data lengkap terkait berat badan, tinggi badan dan hasil pengukuran hemoglobin. Apabila data terkait hasil pengukuran hemoglobin, berat badan, tinggi badan tidak lengkap maka akan dieksklusikan. Uji statistik yang digunakan adalah chi-square.

Hasil: Terdapatnya hubungan antara Indeks Massa Tubuh (IMT) dengan Anemia pada remaja putri di Indonesia ($p = 0,034 < 0,05$). Berdasarkan analisis odd ratio dengan menggunakan kelompok Indeks Massa Tubuh (IMT) normal sebagai pembandingan, diketahui remaja putri dengan kategori IMT kurus memiliki risiko 1,198 kali lebih besar untuk mengalami Anemia dibandingkan dengan remaja putri dengan kategori IMT normal.

Kesimpulan: Ada hubungan antara IMT dengan Anemia pada remaja putri. Penting bagi remaja putri untuk selalu memperhatikan asupan zat besi disetiap harinya dengan mengonsumsi jenis makanan yang kaya akan kandungan zat besi atau dengan mengonsumsi obat tablet tambah darah (TTD) agar terhindar dari Anemia.

Kata Kunci: Indeks Massa Tubuh, Anemia, IFLS 5

ABSTRACT

Background: Anemia is a condition characterized by low levels of hemoglobin (Hb) concentration. Anemia is still a public health problem. Data states that the prevalence of anemia in Indonesia in 2013 was 21.7%, with the number of sufferers known to be higher among women than men. The prevalence of anemia in the age group of 15 to 24 years was 18.4%. Nutritional status of a person is derived from the balance of nutrients due to the consumption, absorption, and use of nutrients that derives from food consumed. A person's nutritional status is said to be deficient if the body lacks intake of one or more essential nutrients for the body. One of the indicators for assessing a person's nutritional status is the Body Mass Index (BMI). Inadequate nutritional status will affect the nutritional status of iron in a person's body so that it can be interpreted that nutritional status is one of the factors of anemia. Consuming foods with good nutritional value, especially foods that contain high iron content will also affect the nutritional status of these adolescents. In turn, the risk of suffering from anemia will decrease.



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Objective: This study aims to analyze the relationship between body mass index (BMI) and anemia among adolescent Indonesian girls.

Methods: This study is a cross-sectional study. The data used are secondary data from the Indonesian Family Life Survey (IFLS) 5. The population of this study was all Indonesians who participated in IFLS 5. The sample used in this study amounted to 3,525 respondents. Inclusion criteria of this study included female, aged 10-18 years, unmarried, having complete data regarding body weight, height and hemoglobin measurement results. Incomplete data of hemoglobin, body weight, height were excluded. The statistical test used was a chi-square test.

Results: There was a relationship between Body Mass Index (BMI) and anemia among adolescent girls in Indonesia ($p = 0.034$, $p < 0.05$). Based on the odd ratio analysis using the normal Body Mass Index (BMI) as the reference group, it is shown that underweight adolescent girls with BMI categories, have a 1.198 greater risk of experiencing anemia than girls with normal BMI categories.

Conclusion: There is a relationship between BMI and anemia in adolescent girls. It is important for adolescent girls to pay attention to daily iron intake by eating foods that are rich in iron or by consuming blood-booster tablets (TTD) to avoid anemia.

Keywords: Body Mass Index, Anemia, IFLS 5

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INTRODUCTION

Anemia is a condition of public health importance and is a health problem for population in developed as well as developing countries. Anemia refers to a condition in which red blood cells or hemoglobin (Hb) concentration are insufficient to meet the physiological needs of the human body. This decreases the ability of the blood to carry oxygen to body tissues¹. Anemia is an indicator of malnutrition and a person's poor health condition².

In general, anemia occurs due to a lack of nutrients, especially iron. It is known that 50% of all anemia cases occur due to a lack of iron (Fe) in the body, although it is still necessary to pay attention to the local population and area. Anemia can also be caused by folic acid deficiency, vitamin A and B12 deficiency, hemoglobinopathies and some diseases such as malaria, HIV, tuberculosis and parasitic infections³. A person suffering from anemia will have several symptoms such as feeling tired, weak, dizzy, sleepy and short of breath. Anemia affects the health of adolescents and their concentration will interfere with daily activities. More troubling, anemia have an effect on decreasing school achievement and productivity².

In 2011 it is estimated that there are around 800 million children and women suffer from anemia. Data from the World Health Organization (2011b) states that the prevalence of anemia in reproductive women is 29.4% or 496.3 million people. The prevalence of anemia is known to be very high in low-income countries³. Anemia is a serious problem in children, adolescent, pregnant women and women of childbearing age.

In Indonesia, the prevalence of anemia in urban residents in is reported as 14.8%. The prevalence of

anemia in urban female residents is 14.7%, while the prevalence of anemia in urban male residents is lower by 13.1%. Based on age group, the prevalence of anemia in the age group 5 to 14 years is 9.4%, while the prevalence of anemia in the age group 15 to 24 years is 6.9%⁵. Data from Basic Health Research (Riskesdas) in 2013 showed that the overall prevalence of anemia in the population in Indonesia was 21.7%. Anemia sufferers are known to be more common in the female population than in the male population. The data states that the prevalence of anemia in women is 23.9% while the prevalence of anemia in men is only 18.4%. Anemia prevalence based on showing the prevalence in the group aged 5 to 14 years is 26.4% while in the group aged 15 to 24 years it is only 18.4%⁶. Based on these data, it can be seen that the prevalence of anemia in Indonesia tends to increase. The prevalence of anemia is always high in the female population group compared to the male population.

Adolescence is a period of growth where the body will need adequate nutritional intake. Calculating a person's nutritional status is a method that can be used to find out what the nutritional adequacy or balance of nutrients in a person's body looks like⁷. A person's nutritional status can be said to be lacking if the body lacks intake of one or more essential nutrients for the body. One indicator to assess a person's nutritional status is through Body Mass Index (BMI).

Adolescent girls are known to have a higher need for iron than boys. Adolescent girls will tend to lose blood due to menstruation thus they are said to be prone to anemia compared to boys. However, in reality, today's young women also tend to reduce their consumption of nutritious foods, especially foods rich in iron in order to lose weight. Though these actions will certainly affect the



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fulfillment of iron in the body(Wibowo, Notoatmojo and Rohmani, 2013).

Low body Mass Index (BMI) is reported to be one of several factors associated with anemia in the adolescent group. According to Martinis (2015)nutritional status is a factor associated with anemia in adolescent girls in Lampung. Research findings from Wibowo, Notoatmojo and Rohmani (2013) reported that adolescent girls in Semarang also showed similar results where nutritional status with anemia had a significant relationship. If the food consumed has good nutritional value, especially foods with high iron content, then the nutritional status of the teenager will be high so that the risk of suffering from anemia will decrease and vice versa. Therefore, it is very important for young women to consume foods that contain carbohydrates, protein, fat, fiber, water, vitamins and minerals in sufficient quantities according to their respective needs so that nutritional status becomes better and avoids anemia.⁹. However, several similar studies actually found different result where there was no relationship between Body Mass Index (BMI) and anemia. Research findings from Harahap et al. (2019)in Mataram showed that there was no relationship between BMI and the incidence of anemia. In line with the results of this study, researchby Harahap et al.(2019) in Pekanbaru also showed that there was no relationship between BMI and anemia in adolescent girls.

Based on these conflicting results, researchers are interested in assessing the relationship between Body Mass Index (BMI) and the occurrence of anemia, especially in adolescent girls in Indonesia, especially with in large-scale studies. This is rarely carried out. This study aims to analyze the relationship between Body Mass Index (BMI) and anemia in adolescent girls in Indonesia.

METHOD

The design of this study is cross-sectional in nature. The population of this study is the entire population in Indonesia who were selected as IFLS 5 respondents. A total of 3,525 young women who have met the inclusion criteria and was included in this analysis for this study. The inclusion criteria of this study were female, aged 10-18 years, unmarried, had complete data regarding weight, height and hemoglobin measurement results. Incomplete data related to the results of hemoglobin measurements, weight and height were excluded.

Primary data collection for IFLS 5 was done in September 2014 to April 2015. The data collection was carried out in 13 provinces in Indonesia which were selected as research samples in 1993, including North Sumatra, South Sumatra, West Sumatra, Lampung, West Java, DKI Jakarta, Central Java, East Java, Special Region of Yogyakarta, South Kalimantan, Bali, South Sulawesi and West Nusa Tenggara. Residents in 13 of the 26 provinces were considered to represent 83% of the population throughout Indonesia(Strauss et al., 2016). The retrieval and analysis of secondary data from this study was done in October 2020. The IFLS 5 secondary data collection was

obtained by researchers by accessing the official website, namely www.rand.org.

The independent variable of this research is Body Mass Index (BMI). The dependent variable of this study is anemia. Body Mass Index (BMI) is an assessment of a person's nutritional status which is obtained from the calculation of weight in kilograms divided by height in meters to the power of two. Respondents who have a BMI < 18.5 will be categorized in the thin group, 18.5-25.0 will be categorized in the normal group, and > 25.0 will be categorized in the overweight/obese group. Anemia is a condition where the respondent has a hemoglobin level below normal based on the results of an examination using a hemoglobin measurement tool. Respondents can be classified as anemic if they have a hemoglobin level of less than 11.5 for those aged 10-11 years and less than 12 g/dl for those aged 12 years and over.

Age is a variable that is also included in this study. The age variable is defined as age of the respondent from the year of birth to the last birthday before taking data.

This study uses a questionnaire measuring instrument in the US book. Measurements related to the independent variable, namely Body Mass Index, were obtained through the US book section US questions number US06 and US04. Measurements related to the dependent variable, namely anemia, were obtained through the US section of the US book, question number US13. The measurement of the age variable was obtained through the US book section US question number US03.

The data that has been obtained was then analyzed univariately and bivariately. The chi-square statistical test is a statistical test that was chosen to test the relationship between the independent and dependent variables in the study. The confidence interval (confident interval) of 95% and the error rate (α) of 0.05 was chosen.

The IFLS 1 survey was conducted ethically by the RAND Corporation in the United States. The IFLS 5 has conducted an ethical review by Survey Meter in Indonesia.

RESULTS AND DISCUSSION

Based on Table 1, it is shown that there were 3,525 adolescent girls in Indonesia who have met the inclusion criteria. These adolescent girls were on average 13.59 or 14 years old. The minimum and maximum ages of the respondents were 10 years and 18 years.

The results of the Body Mass Index (BMI) measurements were categorized into three groups, namely thin, normal and overweight/obese. Table 2 shows this results, where there were 1,746 (50%) adolescent girls in the thin group, 1,549 (44%) adolescent girls in the normal group and 230 (6%) adolescent girls in the overweight/obese group. Most of the adolescent girls in Indonesia in this study were in the thin group.

Most of the adolescent girls in this study were not suffering from anemia. Table 3 shows that there were



only 985 (27.9%) adolescent girls experiencing anemia with an average hemoglobin of

Table 1. Characteristics of Young Women in Indonesia by Age

Age	Amount	Percentage (%)
10	446	12.7
11	487	13.8
12	436	12.4
13	395	11.2
14	445	12.6
15	400	11.3
16	344	9.8
17	294	8.3
18	278	7.9
Total	3.525	100
mean		13.59
Min-Max		10 - 18

Table 2. BMI Characteristics of Adolescent Girls in Indonesia

BMI	Amount	Percentage (%)
Thin	1,746	50
Normal	1,549	44
Overweight/obese	230	6

Table 3. Frequency Distribution of Anemia in Adolescent Girls in Indonesia

Anemia	Amount	Percentage (%)
Yes	985	27.9
No	2,540	72.1

Table 4. The Relationship between Body Mass Index and Anemia in Young Women in Indonesia

Body mass index	Anemia				OR (95% CI)	p value
	Yes		No			
	n	%	N	%		
Normal	459	29.6	1.090	70.4	1.0	
Thin	454	26.0	1,292	74.0	1.198 (1,209-1,396)	0.034
Overweight/obese	72	31.3	158	72.1	0.924 (0.685-1.246)	

10.99 g/dl. A total of 2,540 other adolescent girls were known not to suffer from anemia with an average hemoglobin of 13.13 g/dl.

The largest proportion of anemia was found in the group with a body mass index (BMI) overweight/obese, which was 31.3%. The lowest proportion of anemia was in the group with a thin Body Mass Index (BMI), which was 26.0%. The group with normal Body Mass Index (BMI) had anemia proportion of 29.6%. These results showed that adolescent girls with overweight/obese BMI tend to suffer more from anemia.

Based on the results of the correlation test using chi-square, it was found that there was a relationship between Body Mass Index (BMI) and anemia in adolescent girls in Indonesia with $p = 0.034$ ($p < 0.05$).

Odd ratio analysis used a group with a normal Body Mass Index (BMI) as a reference group. Adolescent girls with a thin BMI category have a 1.198 times greater risk of developing anemia compared to girls with a normal BMI category. These results show significant results because there is no value of 1.00 in the estimated interval. Adolescent girls in the overweight/obese BMI category have 0.924 times greater odds of developing anemia compared to girls in the normal BMI category. These results do not show significant results because there is a value of 1.00 in the estimated interval.

Anemia is a condition in which the hemoglobin (Hb) level in the body is less than the normal Hb level ¹. Hemoglobin is one of several components contained in erythrocytes or red blood cells as a carrier of oxygen and



circulates it to cells throughout the body so that cells in the body can carry out their functions properly.¹². It is known that the normal limit for Hb levels for children aged 5 to 11 years is 11.5 g/dl, 12 to 14 years old is 12.0 g/dl, and female adults were 12.0 g/dl.¹.

Iron is an important element in the formation of hemoglobin in the body. Some examples of foods that have high iron content include beef, eggs, liver from chicken, tuna, green beans, soybeans, spinach, shellfish and many more.^{7,12}. Therefore, it is important for every individual, especially the group of young women to always eat foods that have a high iron content as an effort to prevent anemia. A person's nutritional adequacy can be evaluated through the measurement of Body Mass Index (BMI).

Based on the results of the analysis of the relationship above, it can be seen that many adolescent girls with a thin Body Mass Index (BMI) do not suffer from anemia. A total of 26% of adolescent girls who have a thin BMI and suffer from anemia may occur due to insufficient intake of essential nutrients such as iron in the body. It is known that iron is an important element in forming hemoglobin in the body. Insufficient consumption of iron will affect the components of the preparation of red blood cells in the body so that it can make red blood cells in the body experience a decrease in function in supplying oxygen in the body which can cause anemia. These results do not contradict with the research conducted by Arifin, Mayulu and Rottie (2013) in elementary school students where there is a relationship between the consumption of foods containing iron with the occurrence of anemia. Seventy-four percent of other adolescent girls were known to have a low BMI and do not suffer from anemia. This is possible because even though their nutritional status is classified as lacking, both in terms of the type and amount of food that has been consumed by the teenager can be said to have contained iron and has met the body's needs.

The results of the analysis of the relationship between the two variables above can also be seen that most of the adolescent girls with a normal Body Mass Index (BMI) were not in anemia state. Seventy point four percent of respondents who have a normal BMI and do not suffer from anemia were possible because the adolescent girls have consumed foods rich in iron content so that the iron needed in the body can be met. Twenty-nine point six percent of other adolescent girls who have a normal BMI but still suffer from anemia may occur because the iron content in the food that has been consumed is still not able to meet the iron needed. Lack of iron in the body can interfere with the formation of hemoglobin in the body so that the oxygen supply will become less in the blood and cause anemia in adolescents. According to research conducted by Sukarno, Marunduh and Pangemanan (2016) adolescent who consume a large amount of fast food compared to nutritious food can reduce their iron absorption and disrupt the formation of hemoglobin.

The results of this study revealed that the majority of adolescent girls with overweight/obese Body Mass Index (BMI) were not suffering from anemia. Thirty-one point three percent of adolescent girls who were obese but still have anemia may occur due to the presence of fat deposits in body fat. Accumulation of fat cells in the body can interfere with the absorption of iron in the body (Sukarno, Marunduh and Pangemanan, 2016). Eftekhari, Mozaffari-Khosravi and Shidfar, (2009) also showed similar results where the prevalence of iron deficiency anemia was high in adolescent girls who were overweight. Seventy-two percent of young women who have a high BMI but do not suffer from anemia may occur because the iron content in the adolescent's diet is sufficient to meet the needs of the adolescent.

The results of this study found a relationship between BMI and anemia in adolescent girls in Indonesia. These results were in line with the results of several previous studies in Indonesia. A study by Martinis (2015) at one high school in East Lampung showed results where knowledge, one's nutritional status and mother's education were some of the factors known to be associated with anemia in adolescent girls. The magnitude of the risk of adolescent girls with lean body mass index is 3.059 times greater for experiencing anemia compared to normal BMI girls. Nutritional status is also known to have a relationship with the occurrence of anemia in high school girls in Yogyakarta¹⁶.

The problem of anemia among adolescents today is known to occur because the nutritional needs of adolescents were not met, and one example is the need for iron. In addition, anemia can also occur due to loss of blood during menstruation. According to the Indonesian Ministry of Health (2019) anemia that occurs in adolescent girls most often occurs due to lack of iron intake. It is important for young women to always ensure the adequacy of their daily iron intake, one of which is through the consumption of food that have a high iron content. A person's nutritional adequacy can be evaluated through the measurement of Body Mass Index (BMI). When an individual consumes foods with high nutritional value, the individual's nutritional status will certainly get better, and vice versa (Hapzah and Yulita, 2012). Adolescents with good nutritional status will reduce the occurrence of anemia and adolescents with poor nutritional status will increase the risk of anemia. Adolescents with good nutritional status consume food according to their needs or balanced according to the needs of the body, while adolescents with poor nutritional status consume food that is not balanced with the body's needs.⁹.

CONCLUSION

There is a relationship between BMI and the occurrence of anemia in adolescent girls in Indonesia. Although the majority of adolescent girls with thin, normal and overweight/obese BMI do not suffer from anemia than those who suffer from anemia, it is important for all adolescents, especially young women, to



always meet their daily iron intake needs by consuming foods high in iron content such as dark green leafy vegetables, beef, eggs, chicken liver, tuna and nuts as well as the consumption of blood-added tablets (TTD) to avoid anemia. Preventing the onset of anemia can further improve fitness and ability to concentrate in various activities especially in school.

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