International Conference on Health and Biological Science
ICHBS, Page 315-323, December 2024

Correlation of Age, Body Mass Index, and Age of Menarche with Hemoglobin Levels in Adolescents in Singaraja

Made Anggita Abdi Jayanti[1*], *Nyoman* Gita Laksmi Maharani[1], *Desak* Radha Nityanandeshwari[2], *Putu* Duta Mahardhika[2], *Made* Amanda Cipta Dewi[3], *Ni* Nyoman Ayu Desy Sekarini[1], *Putu* Irma Pratiwi[1], *Luh* Nik Armini[1]

[1]Department of Midwifery, Faculty of Medicine, Universitas Pendidikan Ganesha
[2]Department of Medicine, Faculty of Medicine, Universitas Pendidikan Ganesha
[3]Department of Nursing, Faculty of Medicine, Universitas Pendidikan Ganesha

Abstract. According to the World Health Organization (WHO), 24.8% of the global population is affected, and it is estimated that around 50-80% of anemia cases are caused by iron deficiency. Anemia occurs when hemoglobin levels are below normal (<12 g/dL). Factors contributing to the high incidence of anemia in adolescents include low iron intake and inadequate consumption of other nutrients. Anemia frequently occurs during menstruation and can be prevented by consuming iron supplements. A preliminary survey of 50 students showed that most were unaware of the importance of taking iron supplements when they reach adolescence and 16 had hemoglobin levels below 12 g/dL. This study aims to analyze the correlation between age, body mass index, and age of menarche with hemoglobin levels in adolescents in Singaraja. The research employs a quantitative analytical method with a cross-sectional design. Data were obtained through interviews and direct measurements of height and weight. The findings indicate a correlation between age, body mass index, and age of menarche with hemoglobin levels in adolescents. Futher research with a larger, move diverse sample is recommended, incorporating variables like diet and physical activity. A longitudinal approach and advanced statistical methods would also improve the study's depth and validity. This would offer deeper insights into the factors affecting hemoglobin levels and their implications for adolescent health.

1 Introduction

Anemia is a prevalent health issue in both developed and developing countries. Although micronutrient malnutrition, particularly iron deficiency, is the primary cause of anemia, it remains a significant global problem, with a prevalence rate of 40%. Anemia is more common among women and girls than among men, and unfortunately,

* Corresponding author: anggita.abdi@student.undiksha.ac.id

many who suffer from it are unaware of it. Adolescent girls with hemoglobin (Hb) levels below 12 g/dL are considered anemic (1). Generally, the normal hemoglobin level in adolescent girls is 12 gr/dL. If it is below that, then teenagers are categorized as anemic. Hemoglobin itself is a protein substance in red blood cells (erythrocytes) that contains iron and functions to transport oxygen and as an exchange of oxygen (O_2) and (CO_2). The low level of hemoglobin is what causes the supply of oxygen to be obstructed so that a person experiences anemia.

Adolescence is a transitional phase from childhood to adulthood, marked by the development of secondary and primary sexual characteristics as well as reproductive maturity. This period also included physiological, emotional, and psychological changes. Throughout a woman's reproductive years, blood loss due to menstruation results in the loss of approximately 12.5-15 mg of iron per month, equivalent to about 0.4-0.5 mg per day. This loss contributes to a decline in hemoglobin levels and causes anemia (2). There are many factors that influence the incidence of anemia in adolescent girls, including age, body mass index, and age of menarche. This is related to the pattern of habits in consuming foods that contain iron or blood supplement tablets. Adolescent age has a high risk of iron deficiency anemia. This is due to the rapid growth and hormonal changes that occur before adulthood. Adolescents need nutrients, especially iron, to transport oxygen through hemoglobin(3). In addition, the nutritional status of adolescents is one of the factors that affect hemoglobin levels. If the intake of nutrients, especially iron, is not fulfilled, it will inhibit the process of hemoglobin formation in red blood cells(4). However, a previous preliminary study stated that there was no significant relationship between hemoglobin levels and menarche. In that study, it was not explained why the age of menarche did not affect adolescent hemoglobin levels (5).

The World Health Organization (WHO) estimates that approximately 1.62 billion people, or 24.8% of the global population, suffer from anemia. The WHO Health Organization classifies anemia as a severe public health problem if its prevalence exceeds 40% (1). In India, 55.8% of adolescents aged 15-19 years have anemia. A study in Baghdad reported that 17.6% of adolescent girls had anemia, and a 2009 study in Nepal revealed a prevalence rate of 78.3% among adolescent girls. In developing countries, including Indonesia, the prevalence of adolescent anemia is higher at 27% compared to only 6% in developed nations. Anemia is also prevalent among children and women of reproductive age, particularly pregnant women, with rates ranging from 80% to 90% among preschool-aged children (2).

Research indicates that poor nutritional intake, especially of folic acid and iron, among adolescents significantly affects their growth, resistance to infectious diseases, and productivity (6). The consequences of anemia in adolescent girls are commonly associated with decreased academic performance and motivation due to iron deficiency, manifesting as symptoms such as pallor, fatigue, decreased appetite, and impaired growth (2).

According to the Department of Nutrition at the Faculty of Public Health, Universitas Indonesia (FKM UI), awareness of proper nutrition plays a critical role in addressing nutritional problems among adolescents. Nutritional knowledge influences food choices and the use of iron supplements during menstruation, which can have a positive impact on anemia prevention (7). Regular consumption of iron supplements has been shown to increase hemoglobin levels to 10.2 g/dL in pregnant women and 8.6 g/dL in non-pregnant women. Iron supplementation can reduce anemia in women by approximately 50% (8).

Adolescent girls often neglect healthy eating habits and frequently consume fried foods and fast foods. They may also follow unsupervised diets, which can interfere with iron absorption and affect hemoglobin levels. Drinking tea or coffee within an hour of eating can further impair nutritional status (9). Prolonged menstrual periods in adolescent girls can result in greater blood loss and reduced iron availability, leading to a decrease in hemoglobin levels. According to Manuaba's theory, women require more iron than men because of monthly menstrual blood loss, which amounts to 50-80 mL per month, accompanied by a loss of 30-40 mg of iron, causing anemia (10).

Efforts to prevent anemia include the promotion of a balanced and nutritious diet. Consuming a variety of foods from different groups (staples, proteins, vegetables, and fruits) is essential for maintaining a diverse and balanced diet (11). Animal-based foods are an important source of iron that is essential for oxygen transport and cellular respiration. Iron is involved in the formation of hemoglobin and myoglobin. The highest iron requirements occur during the productive years (13-49 years), with a daily requirement of 15-18 mg, increasing by 9 mg/day for pregnant women in their second and third trimesters (12). In cases where traditional diets do not meet micronutrient requirement, supplementation is a viable alternative. In addition to iron tablets, regular hemoglobin testing is essential for monitoring blood levels, especially for individuals identified as anemic (13).

Common signs of anemia include pale skin, mood changes, fatigue, dizziness, rapid heart rate, and changes in skin and eye color. Anemia can result from inadequate iron intake, red blood cell destruction, or slow red blood cell production and can be treated with dietary changes, blood transfusions, or iron supplements [11].

So far, there has been no research that discusses the relationship between age, body mass index, and menarche age in adolescent girls in Singaraja. Given the high prevalence of anemia and the discrepancies in previous research findings, this study aimed to examine the correlation between age, body mass index, age of menarche, and hemoglobin levels in adolescent girls. Additionally, the study sought to identify early signs and symptoms of anemia in adolescent girls in Singaraja (15).

3.1 Method

This study employed a quantitative analytical approach, with a cross-sectional design. The study was conducted at the Semara Ratih Singaraja Youth Health Center in July 2024 with 50 adolescent girls as respondents. The variables examined in this study were age, height, weight, age at menarche, and hemoglobin levels. Data collection involved direct interviews to determine the age of menarche. The study population included all adolescent girls at the center who agreed to participate as research respondents Nutritional status was assessed by measuring height, weight so that the results of the Body Mass Index (BMI) and hemoglobin levels were obtained through peripheral blood samples with finger pricks using a digital GCHb device (16). The collected data were analyzed using univariate and bivariate analyses. Bivariate analysis was employed to explore the correlation between age, BMI, and age at menarche and hemoglobin levels in adolescent girls in Singaraja (17).

3. Result and Discussion

The analysis was conducted in two stages: univariate and bivariate analyses, with the aim of identifying the correlation between age, BMI, and age at menarche and hemoglobin levels in adolescents in Singaraja.

3.1 Crosstab the result

Table 1. Age vs hemoglobin levels

Age	Low	Normal	High
10-12	0	0	5
13-14	4	3	4
15-16	3	6	19

Table 2. BMI vs hemoglobin levels

BMI	Low	Normal	High
Underweight	5	6	12
Normal	4	4	17

Tabel 3. Menarche vs hemoglobin levels

Menarche	Low	Normal	High
10	3	3	3
11	3	3	11
12	2	3	8
13	1	1	7

3.2 Characteristics of the Study Variables

This study involved 50 respondents, including adolescents who were willing to participate and met the research criteria. The respondents' characteristics are listed in the following table:

Table 4. Respondent Characteristics

No	Variable	**Frequency (n = 50)**	**Percentage (%)**
1	**Age**		
	Early	20	40%
	Mid	30	60%
	Late	0	0%
2	**Age of Menarche**		
	< 12 years	28	56%
	12 – 13 years	22	44%
	>14 years	0	0%
3	**BMI**		
	Underweight (17-18,4 kg/m^2)	24	48%
	Normal (18,5-25 kg/m^2)	26	52%
	Overweight (25-28,9 kg/m^2)	0	0%
4	**Hemoglobin Levels**		
	Normal (≥ 12 gr/dL)	36	72%
	Mild Anemia (11-11,9 gr/dL)	6	12%
	Moderate Anemia (8-10,9 gr/dL)	8	16%
	Severe Anemia (≤ 8 gr/dL)	0	0%

Of the 50 participants, the majority (60%) were in the mid-adolescence age group. The majority (56%) had an age of menarche of ≤12 years, 52% had a normal BMI, and 72% had hemoglobin levels below 12 g/dL.

Explain these age categories on the table

- Early age: 10-13 years old, adolescence in the early stages of puberty
- Middle age: 14-16 years old, the age of adolescents who are in the middle of puberty
- Late: >16 years, the age of adolescence towards adulthood

3.3 Correlation Between Age and Hemoglobin Levels

Analysis of the relationship between age and hemoglobin levels was conducted using the Spearman rank non-parametric test, as the data were not normally distributed. The statistical results showed a significant correlation between the age of adolescents and their hemoglobin levels in Singaraja, with a p-value of 0.018 ($p<0.05$) [Table 2] (18).

Table 5. Spearman Rank Correlation Results

No	Variable		Hemoglobin Levels
1.	Age	Correlation Coefficient	.334
		Sig. (2-tailed)	.018
2.	Age of Menarche	Correlation Coefficient	.342
		Sig. (2-tailed)	0.15
3.	BMI	Correlation Coefficient	.366
		Sig. (2-tailed)	.009

Normality tests were conducted using Kolmogorov-Smirnov and Shapiro-Wilk for the variables of age, BMI, age at menarche, and hemoglobin levels. The test results showed p values <0.05 for all variables, so the data were not normally distributed. Therefore, the analysis was continued using non-parametric methods, namely the Spearman Rank test.

The results indicated a significant relationship between age and hemoglobin levels ($p = 0.018$). These findings are consistent with those of Rizkiawati (2012), who also found a correlation between age and hemoglobin levels in rickshaw drivers in Pasar Mranggen, Demak. The study concluded that as individuals age, hemoglobin levels tend to decrease (18).

This study also demonstrated a relationship between adolescent age and the occurrence of anemia. This finding aligns with a study by Novi Susanti (2024), who demonstrated an increased risk of anemia among pregnant women based on their age (19).

Anemia is a condition in which the body lacks sufficient red blood cells or hemoglobin to transport oxygen throughout the body. Age is one of the factors that can influence the occurrence of anemia (20). In older age groups, the risk of anemia increases owing to a decline in physiological functions, including reduced bone marrow capacity to produce red blood cells, altered iron metabolism, and the presence of chronic diseases that can trigger anemia (21). In younger individuals, particularly children and adolescents, anemia often occurs due to the increased demand for iron as the body grows. During puberty, especially in adolescent girls, the risk of anemia increases due to menstrual blood loss (22). Inadequate iron intake to support growth and replace lost blood can lead to anemia during adolescence.

3.4 Correlation Between Body Mass Index (BMI) and Hemoglobin Levels

Statistical analysis revealed a significant correlation between BMI and hemoglobin levels among adolescents in Singaraja, with a p-value of 0.009 ($p<0.05$) [Table 2]. This study found a positive correlation between BMI and anemia prevalence among adolescent girls in Singaraja, indicating that dietary iron intake is significantly associated with Hb levels (18).

These findings align with those of Rumiyati and Ahmad Muhlisin, where the Pearson correlation test indicated a significant relationship between BMI and hemoglobin levels, with a correlation coefficient of 0.396, showing a low but positive correlation ($p < 0.05$). However, this result contrasts with the findings of Dwi Eni and Arum Margi, who found no significant correlation between BMI and hemoglobin levels in their study using Spearman correlation analysis, as their data did not exhibit a normal distribution ($p = 0.942$) (23).

The findings of this study highlight the role of BMI in the hemoglobin status of adolescent girls. A lower BMI, indicating poor nutritional status, is often associated with lower hemoglobin levels due to insufficient intake of iron and other nutrients essential for red blood cell production (24). This result is supported by research conducted by Arisani in 2024, which found a significant correlation between menstrual duration, BMI, upper arm circumference (LILA), and knowledge level and hemoglobin levels in adolescent girls at the Palangka Raya Health Polytechnic (25). In addition, Resmiani's 2024 study supports these findings, showing a significant relationship between BMI and hemoglobin levels among adolescent girls at the Darun Najah Orphanage in Depok, Yogyakarta. Of the 22 adolescents studied, 63.6% had a normal BMI, while 36.4% had an abnormal BMI (26). Conversely, Sofwan's 2024 study on anemia risk factors among pregnant women found no significant relationship between BMI and hemoglobin levels, suggesting that the effect of BMI on anemia may differ between adolescents and pregnant women (27). However, iron deficiency, a key component of hemoglobin formation, remains the primary cause of reduced hemoglobin production. The current study supports previous research by Fadillah in 2024, who found that lower BMI is associated with lower hemoglobin levels in students at the Dayah Madinatuddiniyah Jabal Nur Islamic Boarding School (28).

BMI serves as an important indicator of nutritional status, and various factors such as dietary intake, education, knowledge, environment, eating habits, physical activity, lifestyle, socioeconomic status, and chronic disease exposure can affect BMI (29). Individuals with low BMI may be more prone to anemia due to insufficient intake of key nutrients, such as iron, folate, and vitamin B12, which are essential for red blood cell production. However, individuals with a high BMI (overweight or obese) may also be susceptible to anemia due to chronic inflammation that interferes with iron absorption, leading to inflammatory anemia (30). Obesity-related liver fat accumulation can trigger lipid peroxide formation, affecting iron metabolism and hampering hemoglobin synthesis (31).

3.5 Correlation Between Age of Menarche and Hemoglobin Levels

Statistical analysis also indicated a significant correlation between age at menarche and Hb levels in adolescent girls in Singaraja, with a p-value of 0.015 ($p<0.05$) [Table 5]. This study found that early menarche was significantly associated with lower hemoglobin levels (18). These findings are consistent with research conducted on female students at Mulawarman University's Faculty of Medicine, which also reported a significant relationship between age at menarche and Hb levels (p = 0.016) (12). Table 2 shows that most participants with menarche before the age of 12 years had the lowest hemoglobin levels (32). This result supports the theory that early menarche increases the risk of hemoglobin deficiency, as adolescent girls may not yet have the necessary nutritional knowledge to prevent anemia (33).

Menarche, the onset of menstruation, is a critical event in a girl's life and can affect the anemia status (34). Early menarche is often linked to a higher risk of anemia because the body requires more iron to compensate for blood loss during menstruation. Without sufficient iron intake, the risk of anemia increases. Early menarche may also indicate hormonal or nutritional imbalances that affect blood production and iron absorption (35).

4. Conclusion

This study found that 16% of adolescents at the Samara Ratih Health Center in Singaraja had low hemoglobin levels, despite having normal nutritional status and early menarche (<12 years). Significant correlations were observed between age, BMI, and age at menarche with hemoglobin levels. To better understand these relationships, further research with a larger, more diverse sample is recommended, incorporating variables like diet and physical activity. A longitudinal approach and advanced statistical methods would also improve the study's depth and validity. This would offer deeper insights into the factors affecting hemoglobin levels and their implications for adolescent health.

5. Acknowledgments

We express our gratitude to all parties who contributed to this research, both directly and indirectly. Special thanks to Universitas Pendidikan Ganesha and Faculty of Medicine for their full support and funding of this study.

References

1. Suandana IA, Satya MCN, Lisus Setyowati, Sari DK, Renamastika SN. Literature Review: Analisis Faktor-faktor yang Berhubungan dengan Kejadian Anemia Pada Remaja Putri. ARTERI : Jurnal Ilmu Kesehatan. 2023 Jan;4(1):44–53.
2. Pengetahuan Remaja Putri Tentang Konsumsi Tablet FE Pada Saat Menstruasi Pengan Anemia. Jurnal Endurance. 2022 Aug;4(2):343–9.
3. Dewi KIT, Bekti HS, Krisna LAW, Dewi NNA. Gambaran Kadar Hemoglobin pada Remaja Putri (Studi Kasus di SMA Negeri 2 Denpasar). Jurnal Skala Husada : The Journal Of Health. 2023 Dec;20(2):8–14.
4. Nafisa AN, Budi Rahayu. The Relationship between Body Mass Index and Hemoglobin Levels in Young Girls at SMA Muhammadiyah 7 Yogyakarta. JURNAL KEBIDANAN KESTRA (JKK). 2023 Oct;6(1):20–7.
5. Karimah N, Pratiwi DKS, Puriastuti EA. The Relationship of Hemoglobin Levels with Menstrual Patterns in Adolescent Girls at Surakarta. Jurnal Ilmiah Kebidanan (The Journal Of Midwifery). 2024 May;12(1):56–62.
6. Nadiyah N, Sitoayu L, Dewanti LP. Remaja Putri Pedesaan Di Indonesia Berisiko Anemia Dua Kali Lebih Tinggi. Gizi Indonesia. 2022 Apr;45(1):35–46.
7. Refi Lindawati. Analisis Faktor Yang Berhubungan Dengan Kepatuhan Konsumsi

Tablet Fe Pada Remaja Putri Di Sma Negeri 3 Kota Serang Provinsi Banten Tahun 2022. Detector: Jurnal Inovasi Riset Ilmu Kesehatan. 2023 Jan;1(1):239–55.

8. Nurhayati L, Marhamah E, Fuady A, Berliana N, Olivia P. Pengetahuan Anemia Dan Tablet Fe Terhadap Kepatuhan Minum Tablet Fe. Jurnal Keperawatan Karya Bhakti. 2024;10(1):45–53.
9. Nasruddin H, Faisal Syamsu R, Permatasari D. Angka Kejadian Anemia Pada Remaja di Indonesia. Cerdika: Jurnal Ilmiah Indonesia. 2021 Apr;1(4):357–64.
10. Astuti ER. Literature Review: Faktor-Faktor Penyebab Anemia Pada Remaja Putri. Jambura Journal of Health Sciences and Research. 2023 Mar;5(2):550–61.
11. Sari P, Herawati DMD, Dhamayanti M, Hilmanto D. Anemia among Adolescent Girls in West Java, Indonesia: Related Factors and Consequences on the Quality of Life. Nutrients. 2022 Sep;14(18):3777.
12. Nuraini S, Sa'diah YS, Fitriany E. Hubungan Usia Menarche, Status Gizi, Stres dan Kadar Hemoglobin Terhadap Kejadian Dismenorea Primer pada Mahasiswi Fakultas Kedokteran, Universitas Mulawarman. Jurnal Sains dan Kesehatan. 2021 Jun;3(3):443–50.
13. Kemenkes RI. Buku Saku Pencegahan Anemia Pada Ibu Hamil Dan Remaja Putri. Vol. 5, IEEE Sensors Journal. Jakarta: Kementerian Kesehatan RI; 2023. 7–9 p.
14. Marselina D. Studi Literatur: Penyebab Terjadinya Anemia pada Remaja Putri. Prosiding Seminar Nasional dan CFP Kebidanan Universitas Ngudi Waluyo. 2022;1(2):544–56.
15. Zhu Z, Sudfeld CR, Cheng Y, Qi Q, Li S, Elhoumed M, et al. Anemia and associated factors among adolescent girls and boys at 10–14 years in rural western China. BMC Public Health. 2021 Dec;21(1):218.
16. Hidayat N, Sunarti S. Validitas Pemeriksaan Kadar Hemoglobin Menggunakan Metode Hb Meter Pada Remaja Putri Di Man Wonosari. Jurnal Kesehatan Masyarakat (Journal of Public Health). 2015 May;9(1).
17. Cholifah N, Rusnoto R, Himawan R, Trisnawati T. Hubungan Siklus Menstruasi Dan Indek Massa Tubuh (Imt) Dengan Kejadian Anemia Pada Remaja Di Smk Islam Jepara. Jurnal Ilmu Keperawatan dan Kebidanan. 2020 Sep;11(2):302.
18. Kusudaryati DP, Praningrum R. HUBUNGAN USIA, ASUPAN VITAMIN C DAN BESI DENGAN KADAR HEMOGLOBIN PADA REMAJA PUTRI ANEMIA. Proceeding of The 8Th University Research Colloquium. 2019;250–5.
19. N. Susanti, S. Ramadhanu, D. Brando, P. Tarigan and MNF. Hubungan Antara Umur, Usia Kehamilan Dan Kadar Hb Dengan Kejadian Anemia Pada Ibu Hamil Di Puskesmas Medan Deli. 2024;5(2).
20. Sari SA, Fitri NL, Dewi NR. HUBUNGAN USIA DENGAN KEJADIAN ANEMIA PADA IBU HAMIL DI KOTA METRO. JURNAL WACANA KESEHATAN. 2021 Jul;6(1):23.
21. Firdaus R. Hubungan Usia, Jenis Kelamin dan Status Anemia dengan Fungsi Kognitif pada Lanjut Usia. Faletehan Health Journal. 2020 Mar;7(1):12–7.
22. Cia A, Annisa HN, Lion HF. Asupan Zat Besi dan Prevalensi Anemia pada Remaja Usia 16-18 Tahun. Window of Health : Jurnal Kesehatan. 2022 Apr;4(2):144–50.
23. Danarsih DE, Kusumawardani AM. Hubugan Antara Indeks Massa Tubuh dan Kadar Hemoglobin pada Remaja Putri. Healthy Indonesia Journal. 2023;2(2):53–8.
24. Noviyanti NI, Johan RB, Padlilah R, Ruqaiyah R. Analisis Pengaruh Status Gizi Terhadap Kejadian Anemia pada Remaja Putri di SMA Hangtuah Kota Tarakan. Journal Of Issues In Midwifery. 2024 May;8(1):11–8.
25. Arisani G, Noordiati N, Herlinadiyaningsih H. Korelasi Lama Menstruasi, Indeks Massa Tubuh (IMT), Lingkar Lengan Atas (LILA) dan Pengetahuan dengan Kadar

Hemoglobin pada Remaja Putri. Jurnal Surya Medika. 2024 Apr;10(1):162–70.
26. Resmiaini R, Sulistyo A. Korelasi Indeks Massa Tubuh Berbasis Aplikasi Appsheet dan Kadar Hemoglobin Remaja Putri di Panti Asuhan Darun Najah Yogyakarta. Jurnal Penelitian Inovatif. 2024 Jun;4(3):979–86.
27. Mutoharoh AVN, Indarjo S. Faktor Risiko Kejadian Anemia pada Ibu Hamil. HIGEIA (Journal of Public Health Research and Development). 2024 Jun;8(1):22–30.
28. Wahyuni W, Zulaikha F. Hubungan Antara Anemia Dan Indeks Masa Tubuh Ibu Hamil Terhadap Kejadian Stunting Pada Anak: Literature Review. Caring : Jurnal Keperawatan. 2024 Aug;13(1):15–23.
29. Pasalina PE, Jurnalis YD, Ariadi A. Hubungan Indeks Massa Tubuh Dengan Kejadian Anemia Pada Wanita Usia Subur Pranikah. Jurnal Ilmu Keperawatan dan Kebidanan. 2019 Jan;10(1):12.
30. Zainiyah Z, Susanti E, Sari DP, Madura NH. Hubungan Indeks Massa Tubuh dengan kejadian anemia pada remaja. Jurnal Ilmiah Obsgin. 2023;18(2):567–73.
31. Paramudita PU, Dwi Mahayati NM, Somoyani NK. Hubungan Indeks Massa Tubuh Dengan Status Anemia Pada Remaja Putri. Jurnal Ilmiah Kebidanan (The Journal Of Midwifery). 2021 Jul;9(1):98–102.
32. Sulistyaningdiah E, Astuti RP. Hubungan Pengetahuan, Menarche Dan Kadar Hemoglobin Dengan Kejadian Disminore Pada Siswi Sma Negeri 1 Way Bungur Kecamatan Way Bungur Kabupaten Lampung Timur Tahun 2023. SIMFISIS: Jurnal Kebidanan Indonesia. 2023 Nov;3(2):623–9.
33. Beddu S, Mukarramah S, Lestahulu V. Hubungan Status Gizi dan Usia Menarche Dengan Dismenore Primer pada Remaja Putri. SEAJOM: The Southeast Asia Journal of Midwifery. 2015 Oct;1(1):16–21.
34. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. World Health Organization (WHO). 2011;
35. Putra KA, Munir Z, Siam WN. Hubungan Kepatuhan Minum Tablet Fe dengan Kejadian Anemia (Hb) pada Remaja Putri Di SMP Negeri 1 Tapen Kabupaten Bondowoso. Jurnal Keperawatan Profesional. 2020 Mar;8(1):49–61.