Jurnal Aisyah: Jurnal Ilmu Kesehatan

Volume 10, Issue 1, 03 2025, p. 97-107
ISSN 2502-4825 (print), ISSN 2502-9495 (online)

Meta Analysis: Effect of Iron Supplement Consumption and Menstrual Duration on Anemia in Adolescent Girls

Author:

Guspianto[1*], Ummi Kalsum[2], Yunita Diastanti[3]

[1,2,3] Study Program of Public Health Science, Faculty of Medicine and Health Sciences, Universitas Jambi, Indonesia
*Corresponding Email: **guspianto@unja.ac.id*

About the Author

1. 1st Author : Dr. Guspianto, S.KM., M.KM
   Affiliation : Program Studi Ilmu Kesehatan Masyarakat, Fakultas Kedokteran dan Ilmu Kesehatan Universitas Jambi
   Mailing address : Jl. HOS Cokroaminoto, Lrg. Flamboyan III No.2 RT.10 Kelurahan Selamat Kecamatan Danau Sipin Kota Jambi-36129)
   Email of author : guspianto@unja.ac.id
   Orcid ID : http://orcid.org/0000-0002-1412-3832
   Google Scholar URL : https://scholar.google.com/citations?user=fnl4Vt4AAAAJ&hl=id
   Phone number : 082257486689

2. 2nd Author : Dr. Ummi Kalsum, S.KM., M.KM
   Affiliation : Program Studi Ilmu Kesehatan Masyarakat, Fakultas Kedokteran dan Ilmu Kesehatan Universitas Jambi
   Mailing address : Jalan Adityawarman no. 62 Kel. Thehok Kota Jambi.
   Email of author : ummi2103@unja.ac.id
   Orcid ID : https://orcid.org/0000-0002-7484-3954
   Google Scholar URL : https://scholar.google.com/citations?user=DTUpFHwAAAAJ
   Phone number : 081314385775

3. 3rd Author : Yunita Diastanti
   Affiliation : Program Studi Ilmu Kesehatan Masyarakat, Fakultas Kedokteran dan Ilmu Kesehatan Universitas Jambi
   Mailing address : Koto Tuo Pulau Tengah, RT. 03, Kecamatan Keliling Danau, Kabupaten Kerinci
   Email of author : diastantiyunita@gmail.com
   Orcid ID : https://orcid.org/0009-0001-3754-7101
   Google Scholar URL : -
   Phone number : 082290181392

ABSTRACT

Anemia has a negative impact on physical function, especially reproductive organ function in teenage girls. The prevalence of anemia in adolescent girls globally wass still high at 29.6%, including in Indonesia at 32%. The study purpose was to analyze the results of primary research findings regarding the occurance of anemia and consumption of iron supplements as well as the duration of menstruation in adolescent girls. A systematic review with a meta-analysis approach was carried out on articles sourced from databases, namely Google Scholar, Pubmed, and Scopus. Search for articles using the Publish or Perish applications, and selected according to inclusion criteria, namely Indonesian or English language, full-text from 2013 to 2022, cross-sectional study design with the adjusted odds ratio measure. The data analysis using RevMan 5.4. Total of 10 articles met the inclusion criteria from 11,425 articles identified. The average prevalence of anemia in adolescent girls was 34.55% (CI 95%: 19.49-49.60). This study results showed that iron supplement consumption (aOR= 6.17; 95% CI= 1.66-22.93; P-value < 0.01) and menstrual duration (aOR= 5.97; 95% CI= 3.60-27.66; P- value= 0.04) influences the occurence of anemia in adolescent girls. The adolescent girls were recommended to always consume iron supplements according to government programs, especially during menstruation

Keywords: Anemia, adolescent girls, iron supplement, menstrual duration

ABSTRAK

Anemia berdampak negatif terhadap fungsi fisik terutama fungsi organ reproduksi pada remaja putri. Prevalensi anemia remaja putri secara global masih tinggi sebesar 29,6%, termasuk di Indonesia 32%. Penelitian ini bertujuan menganalisis temuan penelitian terkait prevalensi anemia dan konsumsi suplemen zat besi serta lama menstruasi pada remaja putri. Systematic review dengan analisis meta dilakukan terhadap artikel yang bersumber dari basis data yaitu Google Scholar, Pubmed, dan Scopus. Pencarian artikel memakai aplikasi Publish or Perish dan dipilih sesuai kriteria inklusi yaitu berbahasa Indonesia atau Inggris, fulltext tahun 2013 hingga 2022, desain cross sectional dengan ukuran adjusted odds rasio. Analisis data menggunakan RevMan 5.4. Sebanyak 10 artikel memenuhi kriteria inklusi dari 11.425 artikel yang teridentifikasi. Rata-rata prevalensi anemia pada remaja putri adalah 34,55% (CI 95%: 19,49-49,60). Hasil meta-analisis menunjukkan konsumsi suplemen zat besi (aOR= 6.17; 95% CI= 1.66-22.93; P-value < 0.01) dan durasi menstruasi (aOR= 5.97; 95% CI= 3.60-27.66; P-value = 0,04) berpengaruh terhadap kejadian anemia pada remaja putri. Disarankan bagi remaja putri untuk selalu mengkonsumsi suplemen zat besi sesuai program pemerintah, terutama pada saat menstruasi.

Kata kunci: Anemia, remaja putri, suplemen zat besi, durasi menstruasi

INTRODUCTION

Anemia is a condition where hemoglobin or red blood cell levels are less than normal so that insufficient in its capacity carrying the oxygen to meet the body's physiological needs. The hemoglobin plays an major role in transporting oxygen throughout the body, and when a person's hemoglobin level is low, it reduces the ability of blood cells to deliver oxygen to all body tissues (WHO, 2023a). Anemia in adults if the hemoglobin level is <14 g/dL for men, and <12 g/dL for women of childbearing age and adolescent girls. Anemia is generally caused by excessive blood loss, insufficient production of red blood cells, or breakdown of red blood cells too quickly (Kemenkes RI, 2018). Globally, anemia was still a serious public health problem in adolescent girls and women, especially during menstruation, as well as mothers who are pregnant and giving birth. The World Health Organization (WHO) estimates that around 40% of children (6-59 months), 37% of pregnant, and 30% of women of reproductive age (15-49 years) suffer from anemia (WHO, 2023b).

The prevalence of anemia in Women in Childbearing Age (WCA) was 29.9% and in non-pregnant (adolescent) WCA was 29.6% (WHO, 2021). The highest cases of anemia are found in Africa and Southeast Asia, where it is estimated that in Africa there are 106 million women and 103 million children and in Southeast Asia there are 244 million women and 83 million children (WHO, 2023b). In the Southeast Asia region, the number of teenage girls who experience anemia, both mild and severe, ranges from 25-40% (WHO, 2015). Women suffer from anemia more often than men, due to the generally fact that women have lower hemoglobin levels than men, and women have higher iron requirements. Women between the ages of 13 to 29 years-old need 26 mg of iron every day, makes

teenagers most susceptible to anemia than others. The prevalence of anemia in teenage girls in Indonesia in 2018 was 32%, an increase from 2013 of 22.7% (Kemenkes, 2019).

Several conditions can cause anemia, where excessive red blood cell oxidation, low red blood cell synthesis, and excessive red blood cell loss are the main causes. Anemia in adolescent girls is thought to be related to lack of consumption of iron supplements, duration of menstruation, unhealthy eating patterns or diets, infectious diseases, economic status, and low knowledge (Ekasanti et al., 2020; Fentie et al., 2020; Gosdin et al., 2021; Mengistu et al., 2019). Teenagers who do not consume iron supplements, lack of knowledge about anemia, abnormal menstrual patterns, low family income, and poor nutritional status are strongly associated with the incidence of anemia (Dewayanti et al., 2021). Consuming iron supplements can increase the hemoglobin levels of adolescent girls so that anemia is prevented (Permatasari et al., 2020). The young women who do not consume iron supplements can cause anemia because young women menstruate and bleed a lot so they need a lot of iron (Agustina et al., 2021). Long menstrual duration is one of the causes of anemia in teenagers, apart from that, adolescent girls are also pursuing their growth period. The average amount of blood that comes out when a woman menstruates is 33.2 ± 16 cc (Yunarsih & Antono, 2017). The adolescent girls have a long period of menstruation, it can cause bleeding, causing adolescent girls to experience anemia (Anbesu et al., 2022). Some adolescent girls also pay close attention to their body shape, this causes many adolescent girls to follow unhealthy diets so that their eating patterns become unbalanced and their bodies lack the substances the body needs, including iron. Adolescent girls are advised to take iron supplements every day during menstruation, and once a week when not menstruating to prevent anemia (Kemenkes, 2018).

Studies on iron supplement consumption and menstrual duration as a factor causing anemia in adolescent girls have yielded different results in each primary study that has been conducted. It is important to conduct a systematic review by combining all existing studies based on eligibility criteria by conducting meta-analysis to obtain a certain measure of effect or level of relationship (Wibowo & Putri, 2021). This study aims to determine the effect of iron supplement consumption and menstrual duration on the occurrence of anemia in adolescent girls based on the results of previous primary research.

METHOD

A systematic review with a meta-analysis approach was conducted by searching for articles using the "Publish or Perish" software in 3 databases, namely Google Scholar, Pubmed, and Scopus, which were published from 2013 to 2022. The keywords used were (“Anemia” OR “Anaemia”) AND (“Zat Besi” OR “Fe” OR “Iron Supplement”) AND (“Masa Menstruasi” OR “Menstruation Duration”) AND Cross sectional AND (“Remaja Putri” OR “Teenage Girl” OR “Adolescent Girl”). The meta-analysis uses the following five steps: 1) Formulating research questions using PICO model (Population-Intervention-Comparison-Outcomes); 2) Searching for primary research articles from online databases; 3) Screening and assessing the quality of articles; 4) Extract and analyze data into RevMan 5.4 software; 5) Interpret the results and draw conclusions.

Inclusion criteria for article selection include 1) research outcome is anemia; 2) the dependent variables are iron supplement and menstruation duration; 3) study subjects were adolescent girls aged 10-19 years; 4) full text manuscript; 5) speak Indonesian or English; 6) cross sectional study design; and 7) have an adjusted odds ratio (aOR) association measure. Articles will be excluded if published before 2013 and cannot be downloaded. The quality assessment of the articles used in this study used the STROBE (Strengthening The Reporting Of Observational Studies In Epidemiology) a criteria for critical review assessment. The article determination procedure was depicted in the PRISMA flow diagram. Data analysis used the Review Manager 5.4 (RevMan 5.4) application to calculate effect

size and heterogeneity in determining the combined research model and forming the final results of the meta analysis. The analysis results are presented in the form of forest plots and funnel plots.

RESULTS

The results of the initial search process identified 11,425 articles consisting of Google Scholar = 10,857, Pubmed = 139, and Scopus = 429). 626 articles were removed and 10,799 articles were filtered out (screening). After going through two stages of filtering, 10,757 articles were released and 42 eligible full-text articles were obtained. Then 10 articles were included in the synthesis meta-analysis (see Figure 1).

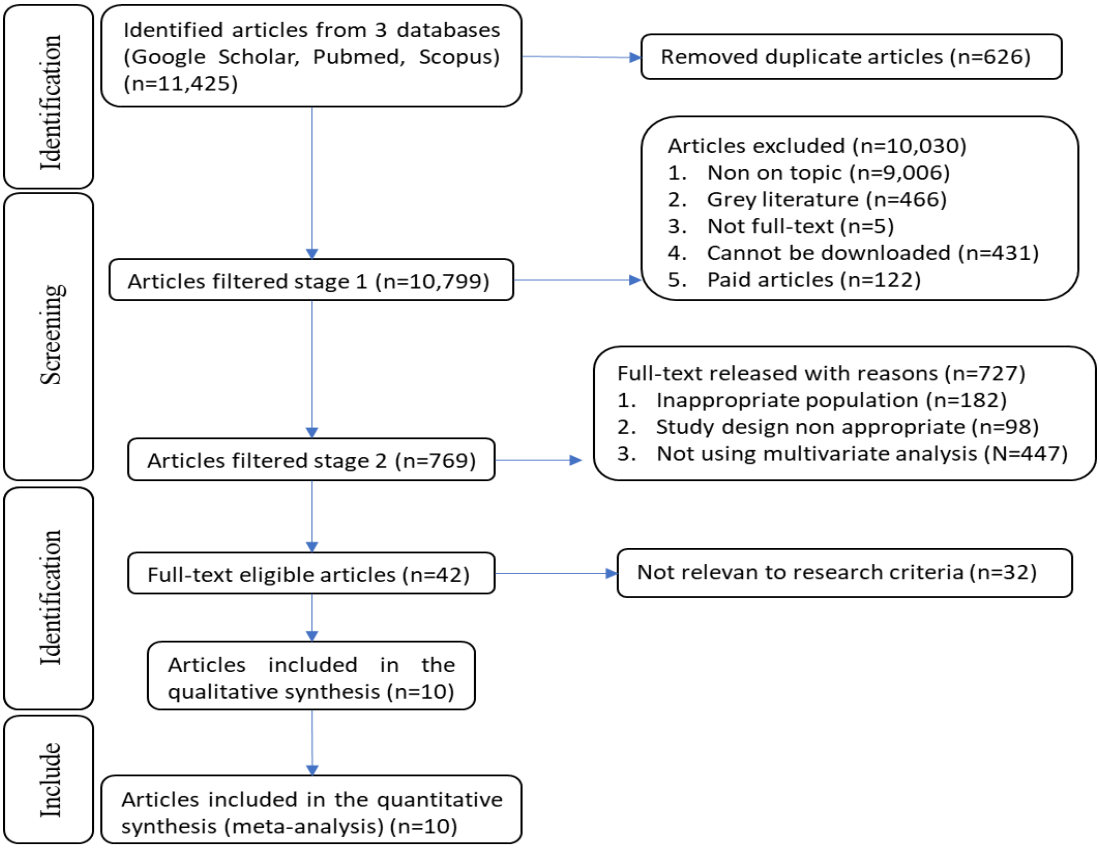

Figure 1. PRISMA Flow Diagram

The 10 study articles that met the inclusion criteria each came from African continent, namely Ethiopia (5 articles) and Asian continent, namely Indonesia (5 articles). The distribution area of the article is shown in Figure 2 below.

Figure 2. Map of the study area

Table 1. Description of the primary study

Author (year/country)	Sampel Size	P	I	C	O	Prev. of anemia	AOR (95% CI)
Ahmed A & Mohammed A, (2022/ Ethiopia)	372	Adolescent Girls aged 15-19	Duration of Mens > 5 days	Duration of Mens ≤ 5 days	anemia	31.5%	0.9 (0.53-1.55)
Anbesu, et al (2022/ Ethiopia)	522	Adolescent Girls aged 10-19	Menstrual duration ≥ 5 days	Menstrual duration < 5 days	anemia	21.7%	2.34 (1.36-4.01)
Agustina, et al (2021/ Indonesia)	335	Adolescent Girls aged 12-19	No iron supplement consumption	Iron supplement consumption	anemia	44%	0.67 (0.18-2.46)
Putra KAD, et al. (2020/Indonesia)	106	Adolescent Girls aged 15-18	No iron supplement consumption	Iron supplement consumption	anemia	13.2%	14.7 (1.90-109.8)
Alemu, T & Gebremedhin, S (2020/Ethiopia)	406	Adolescent Girls aged 10-19	Menstrual duration 5-7 days	Menstrual duration < 5 days	anemia	15.2%	5.10 (1.43-18.15)
Fentie, et al (2020/ Ethiopia)	528	Adolescent Girls aged 14-19	Menstrual bleeding > 5 days	Menstrual bleeding ≤ 5 days	anemia	26.7%	2.25 (1.17-4.33)
Febianingsih, et al (2019/ Indonesia)	254	Adolescent Girls aged 15-19	Duration of Mens ≥ 6 days	Duration of Mens < 6 days	anemia	71.3%	1.39 (1.18-1.62)
Mengistu, et al (2019/ Ethiopia)	443	Adolescent Girls aged 10-19	Duration of menses ≥ 5 days	Duration of menses < 5 days	anemia	11.1%	2.4 (1.08-5.44)
Setianingsih (2017/ Indonesia)	172	Adolescent Girls aged 15-19	No iron supplement consumption	Iron supplement consumption	anemia	50%	2.185 (1,23-6,44)
			Menstrual duration ≥ 5 days	Menstrual duration < 5 days			2.203 (1,04-4,73)
Listiana, A (2016/ Indonesia)	255	Adolescent Girls aged 10-19	No iron supplement consumption	Iron supplement consumption	anemia	60.8%	2.344 (1,33-4,15)

Prevalence of Anemia

The results of primary studies review found that the anemia's prevalence in adolescent girls ranged from 11.1% based on Mengistu's study in Ethiopia (2019) to 71.3% based on Febianingsih's study in Indonesia (2021).

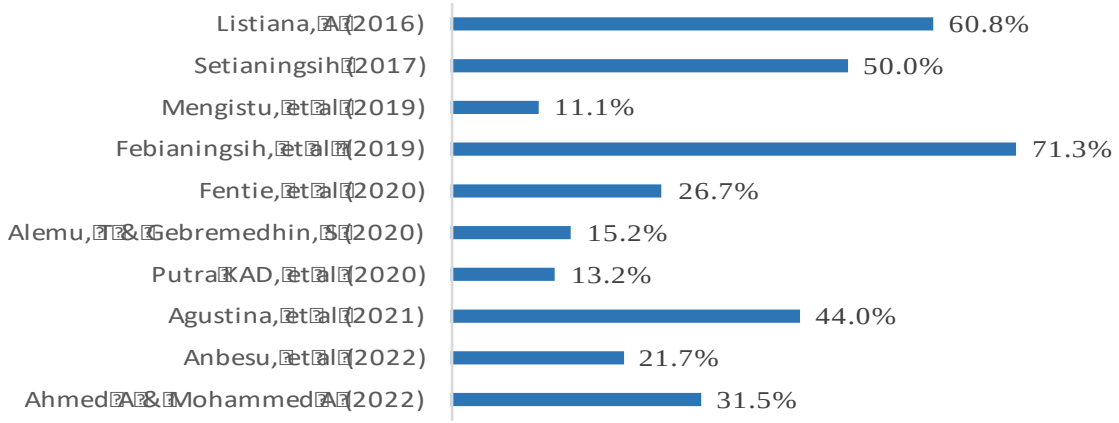

Figure 3. Prevalence of Anemia in Adolescent Girls

Table 2 show the average prevalence of anemia in adolescent girls from 10 primary study articles in this study was 34.55% (95% CI: 19.49-49.60) with a standard deviation of 21.03 which shows quite large variability.

Table 2. Prevalens of anemia

Min	*Max*	*Mean*	*95% CI*		*SD*
			Lower	*Upper*	
11,1	71,3	34,55	19,49	49,60	21,03

The effect of consuming iron supplements on anemia

The results show that there is a significant influence of iron supplement consumption on the occurance of anemia in adolescent girls. Adolescent girls who did not consume iron are at risk of developing anemia 6.17 times compared to those who consume iron (aOR= 6.17; 95% CI= 1.66-22.9; p<0.01). The forest plot show high heterogeneity in effect estimates between studies with I^2=84% (p<0.001), which means that the calculation of effect estimates using a random effect model approach (Figure 4). The funnel plot shows that the distribution of effect estimates between studies was symmetrical. The distribution of average effect estimates on the right is relatively the same as on the left of the vertical line. This indicates no publication bias.

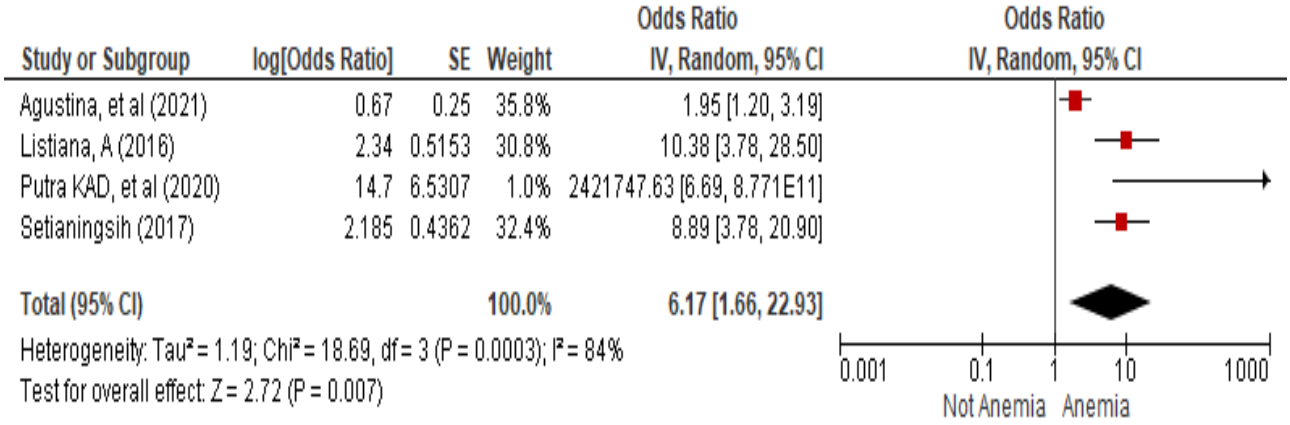

Fig 4. Forest Plot The effect of Iron Supplement Consumption on the Incidence of Anemia

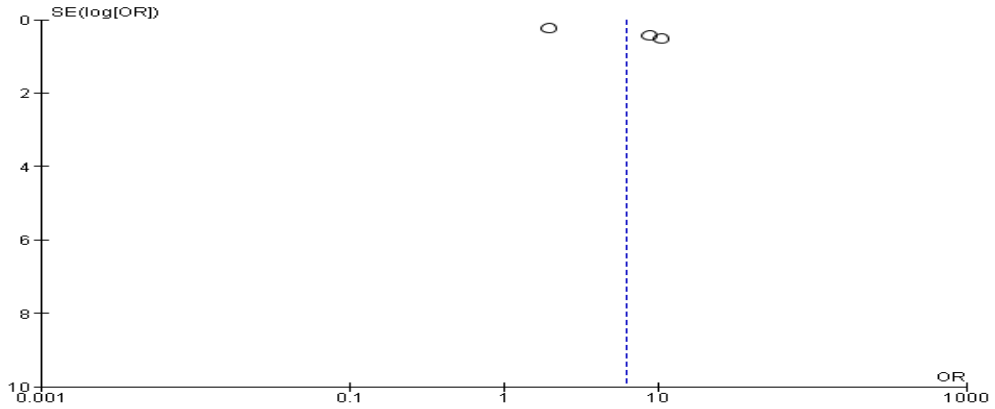

Fig 5. Funnel Plot The effect of Consuming Iron Supplements on the Incidence of Anemia

The effect of menstrual duration on anemia

The results of the Forrest Plot analysis show that there is a significant effect of menstrual duration on the incidence of anemia in adolescent girls (Figure 6). Adolescent girls with menstrual duration of ≥

5 days have a risk of anemia 5.97 times compared to menstrual duration of < 5 days (aOR= 5.97; 95% CI= 3.60 - 9.89; p<0.001). The results also shows a high level of heterogeneity in effect estimates between studies (I^2=73%; p=0.001), so the calculation of effect estimates using a random effect model approach. In Figure 7, the funnel plot shows the asymmetric distribution of effect estimates between studies, namely the distribution of effect estimates to the right of the vertical line is over estimated compared to the one on the left when divided into upper and lower halves. This indicates publication bias.

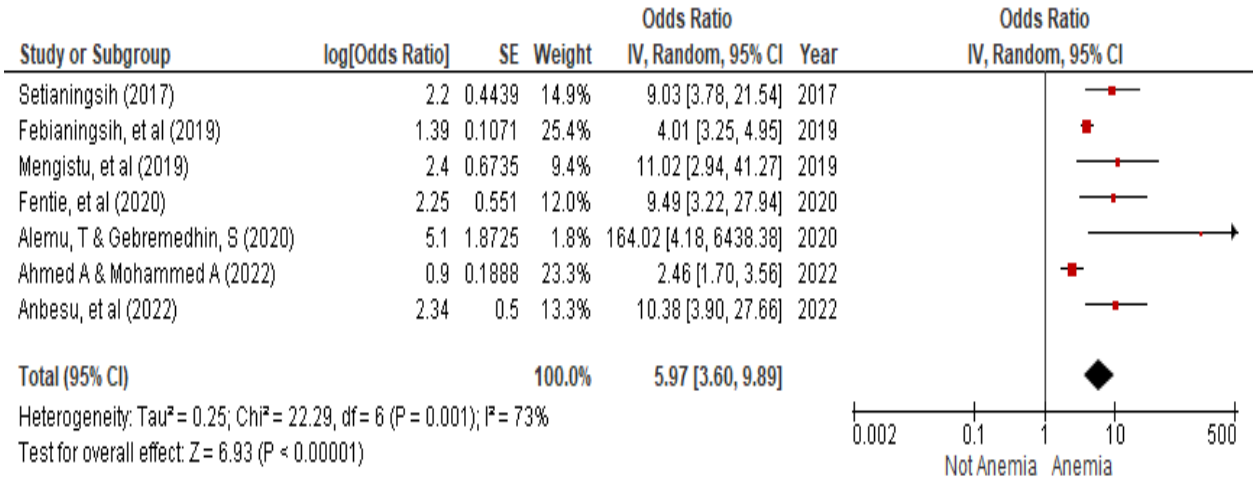

Fig 6. Forest Plot The Effect of Menstrual Duration on Anemia in Adolescent Girls

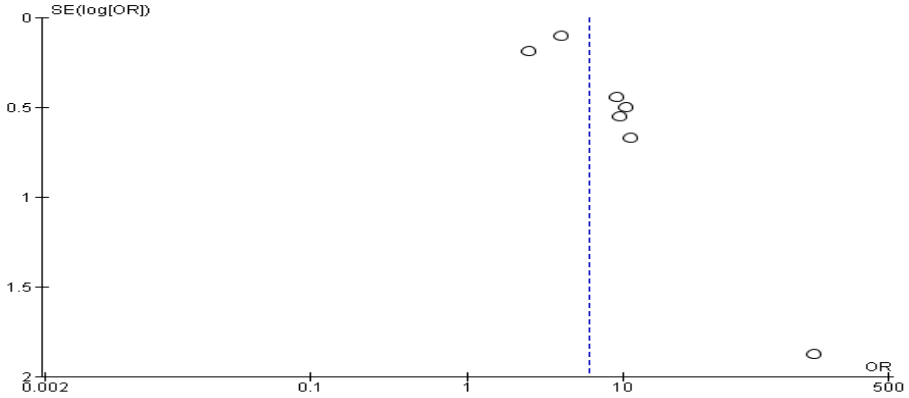

Figure 7. Funnel Plot The Effect of Menstrual Duration on Anemia in Adolescent Girls

DISCUSSION

The most common cause of anemia is iron deficiency, including increased loss of iron from the body during menstruation (WHO, 2014). This research found that consumption of iron supplements was proven to have a statistically significant influence on the occurance of anemia in adolescent girls. The main study in 4 articles found that adolescent girls who did not consume iron supplements had a 6.17 times risk of developing anemia compared to adolescent girls who consumed iron supplements (aOR=6.17; 95% CI= 1.66 to 22.9; p<0.01). This finding is in line with many previous primary studies which found the influence of consuming iron supplements on the occurance of anemia in adolescent girls, where not consuming iron supplements increased the risk of anemia in adolescent girls, among others, by 14.7 times (Putra et al., 2020), 2.185 times (Setianingsih et al., 2017), 2.344 times (Listiana, 2016)), and 3.22 times (Dewayanti et al., 2021). Different results were shown by research by Agustina, et al (2021) which concluded that consumption of iron supplements had no effect on the occurrence of anemia in adolescent girls (P-Value= 0.540; aOR; 0.67; 95% CI= 0.18-2.46).

Iron supplements are especially important for adolescent girls because they experience the menstrual process which can cause a lot of blood loss containing red blood cells and hemoglobin. Iron is an essential mineral required for a variety of biological functions, including oxygen transport, energy production, and immune system function. Daily blood loss during menstruation is calculated from the iron content in the blood lost within one month. During menstruation, women lose blood on average 30 ml/day which requires additional iron of 0.5 mg per day, and around 10% of women will lose blood as much as 80 ml/day which is equivalent to 1 mg of iron (Putra et al., 2020).

Supplementation of blood supplement tablets (TTD) for adolescent girls is one of the government's efforts to provide sufficient iron intake to prevent anemia with a target of 90% of adolescent girls consuming TTD, but in fact compliance by these adolescent girls is still minimal. BKKBN data reports that 76.2% of adolescent girls admitted that they had received blood supplement tablets from school, but only 0.9% regularly consumed TTD. A literature study found that adherence to TTD consumption was significantly related to the incidence of anemia in adolescent girls (Larasati et al., 2021).

Our study found that the duration of menstruation has a significant effect on the occurance of anemia in adolescent girls. Adolescent girls with menstrual duration ≥5 days are at 5.97 times greater risk of experiencing anemia than adolescent girls with menstrual duration <5 days (aOR= 5.97; 95% CI= 3.60 to 9.89; p<0.001). This is most likely due to the fact of blood loss during menstruation. The result was in line with the majority of previous primary research that the duration of menstruation has a significant effect on the incidence of anemia in adolescent girls, namely aOR= 2.34; 95% CI= 1.36 to 4.01 (Anbesu et al., 2022), aOR= 5.10; ; 95% CI= 1.43 to 18.15 (Alemu & Gebremedhin, 2020); aOR= 2.25; 95% CI= 1.17 to 4.33 (Fentie et al., 2020); aOR= 1.39; 95% CI= 1.18-1.62 (Febianingsih et al., 2019); and aOR= 2.4; 95% CI= 1.08-5.44 (Mengistu et al., 2019). These findings also support other meta-analysis studies which prove that blood flow during menstruation ≥ 5 days was a significant factor influencing the incidence of anemia in Ethiopian adolescent girls (Berhe et al., 2022; Endale et al., 2022). However, there is different research result that show that there is no effect of menstrual duration on the occurance of anemia in adolescent girls (Ahmed & Mohammed, 2022).

Adolescents who have a long menstrual duration are very susceptible to anemia. A study by Mengistu, et al (2019) found that around 67.7% of adolescent girls had menstruated, and around 44% had a menstrual duration of ≥5 days in each cycle which was proven to influence the incidence of anemia. During menstruation, the blood released from the uterus comes from the shed endometrium, including red blood cells, mucus, uterine tissue, hemoglobin and other fluids. The number of red blood cells and hemoglobin in menstrual blood may vary from woman to woman and from one cycle to the next. However, some women experience chronic menstruation, namely blood loss of more than 80 ml and with a long duration, causing more red blood cells and hemoglobin to be released, resulting in iron deficiency (Mengistu et al., 2019).

The long duration of menstruation reflects the high volume of blood loss which can increase the risk of anemia (Putra et al., 2020). A long menstrual cycle is an important factor contributing to anemia. Cooke, et al (2016) and Power, et al (2018) stated that long menstrual duration is likely to cause a lot of blood loss which results in anemia in adolescent girls (Alemu & Gebremedhin, 2020).

CONCLUSION AND RECOMMENDATION

The average prevalence of anemia from meta-analysis results in 10 primary studies was 34.55%. Consumption of iron supplements and duration of menstruation have been proven to have a statistically significant effect on the incidence of anemia in adolescent girls. The risk of anemia occurs in adolescent girls who do not consume iron supplements (6.17 times) and adolescent girls with menstrual duration ≥5 days (5.97 times).

It is especially recommended for policy makers to develop educational programs in schools to increase understanding and awareness of young women about the importance of consuming iron supplements to prevent anemia. In addition, iron supplementation programs for adolescent girls in schools and in primary care need to be maintained and compliance increased so that they have a positive impact on reducing the prevalence of anemia.

ACKNOWLEDGMENTS

We would like to thanks and high appreciation to the Public Library of Jambi City and the Study Program of Public Health Science Library, Universitas of Jambi, which facilitated and supported this research process.

AUTHOR CONTRIBUTIONS

GUS: Conceptualization, methodology, software, formal analysis, data curation, writing-original draft. YD: Validation, analysis, data curation, writing, editing. UK: Conceptualization, methodology, validation, review and project administration.

CONFLICTS OF INTEREST

There is no conflicts of interest regarding the publication of this paper.

REFERENCES

Agustina, R., Wirawan, F., Sadariskar, A. A., Setianingsing, A. A., Nadiya, K., Prafiantini, E., Asri, E. K., Purwanti, T. S., Kusyuniati, S., Karyadi, E., & Raut, M. K. (2021). Associations of Knowledge, Attitude, and Practices toward Anemia with Anemia Prevalence and Height-for-Age Z-Score among Indonesian Adolescent Girls. Food and Nutrition Bulletin, 42(1_suppl), S92–S108. https://doi.org/10.1177/03795721211011136

Ahmed, A., & Mohammed, A. (2022). Anemia and its associated factor among adolescent school girls in GODEY and DEGEHABUR council Somali region, eastern Ethiopia. BMC Nutrition, 8(1). https://doi.org/10.1186/s40795-022-00548-1

Alemu, T., & Gebremedhin, S. (2020). Prevalence and Predictors of Anaemia Among Adolescent Girls in Rural Hadero Tunto District, Southern Ethiopia: Community Based Study. International Journal of Nutrition and Food Sciences, 9(1), 16. https://doi.org/10.11648/j.ijnfs.20200901.14

Anbesu, E., Mulaw, G., Mare, K., & Kahssay, M. (2022). Anemia, a moderate public health problem among adolescent school girls in Aysaita district, the pastoral community of the Afar region, Ethiopia. Nutrition and Food Science, 52(8). https://doi.org/10.1108/NFS-12-2021-0392

Berhe, K., Gebrearegay, F., Gebreegziabher, H., Weldegerima, L., Kahsay, A., Hadush, H., Gebremariam, B., Fseha, B., Gebremariam, G., Etsay, N., & Hailu, M. (2022). Magnitude and associated factors of anemia among adolescent girls in Ethiopia: a systematic review and meta-analysis. In Archives of Public Health (Vol. 80, Issue 1). https://doi.org/10.1186/s13690-022-00942-y

Dewayanti, N., Sulaeman, S., & Murti, B. (2021). Multilevel Analysis on the Ecological Effect of School on the Risk of Anemia among Female High School Students in Klaten Central Java. Journal of Maternal and Child Health, 01, 1–14. https://doi.org/10.26911/thejmch.2021.06.01.01

Ekasanti, I., Adi, A. C., Yono, M., Nirmala G, F., & Isfandiari, M. A. (2020). Determinants of Anemia among Early Adolescent Girls in Kendari City. Amerta Nutrition, 4(4). https://doi.org/10.20473/amnt.v4i4.2020.271-279

Endale, F., Woldeyohannes, D., Belayneh, F., Tamene, A., Habte, A., Gizachew, A., Sulamo, D., Kebede, Y., Yohannes, J., Mekonen, T., & Akiso, D. (2022). Menstrual abnormality, maternal illiteracy, and household factors as main predictors of anemia among adolescent girls in Ethiopia: Systematic review and meta-analysis. In Women's Health (Vol. 18). https://doi.org/10.1177/17455057221129398

Febianingsih, N. P. E., Putra, K. A. D., & Putra, G. Y. (2019). Prevalensi Dan Faktor Risiko Anemia Pada Remaja Putri Di SMAN I Abiansemal Badung. Bali Health Published Journal, 1(1). https://doi.org/10.47859/bhpj.v1i1.102

Fentie, K., Wakayo, T., & Gizaw, G. (2020). Prevalence of Anemia and Associated Factors among Secondary School Adolescent Girls in Jimma Town, Oromia Regional State, Southwest Ethiopia. Anemia, 2020. https://doi.org/10.1155/2020/5043646

Gosdin, L., Sharma, A. J., Tripp, K., Amoaful, E. F., Mahama, A. B., Selenje, L., Jefferds, M. E., Martorell, R., Ramakrishnan, U., & Addo, O. Y. (2021). A School-Based Weekly Iron and Folic Acid Supplementation Program Effectively Reduces Anemia in a Prospective Cohort of Ghanaian Adolescent Girls. Journal of Nutrition, 151(6). https://doi.org/10.1093/jn/nxab024

Kemenkes. (2018). Pedoman Pencegahan dan Penanggulangan Anemia pada Remaja Putri dan Wanita Usia Subur (WUS). Direktorat Jenderal Kesehatan Masyarakat. Kementerian Kesehatan. https://ayosehat.kemkes.go.id/buku-pedoman-pencegahan-dan-penanggulangan-anemia-pada-remaja-putri-dan-wanita-usia-subur

Kemenkes. (2019). Laporan Nasional Riskesdas 2018, Kementerian Kesehatan RI. In Badan Penelitian dan Pengembangan Kesehatan (Vol. 10).

Kemenkes RI. (2018). Pedoman Pencegahan dan Penanggulangan Anemia Pada Remaja Putri dan Wanita Usia Subur (WUS).

Larasati, D. K., Mahmudiono, T., & Atmaka, D. R. (2021). Hubungan Pengetahuan dan Kepatuhan Mengkonsumsi Tablet Tambah Darah dengan Kejadian Anemia Defisiensi Besi: Literature Review. Media Gizi Kesmas, 10(2). https://doi.org/10.20473/mgk.v10i2.2021.298-306

Listiana, A. (2016). Analisis Faktor-Faktor yang Berhubungan Dengan Kejadian Anemia Gizi Besi pada Remaja Putri di SMKN 1 Terbanggi Besar Lampung Tengah. Jurnal Kesehatan, 7(3). https://doi.org/10.26630/jk.v7i3.230

Mengistu, G., Azage, M., & Gutema, H. (2019). Iron Deficiency Anemia among In-School Adolescent Girls in Rural Area of Bahir Dar City Administration, North West Ethiopia. Anemia, 2019. https://doi.org/10.1155/2019/1097547

Permatasari, T., Briawan, D., & Madanijah, S. (2020). Hubungan Asupan Zat Besi Dengan Status Anemia Remaja Putri Di Kota Bogor. PREPOTIF : Jurnal Kesehatan Masyarakat, 4(2), 95–101. https://doi.org/10.31004/prepotif.v4i2.935

Putra, K. A. D., Yuliyatni, P. C. D., & Sutiari, N. K. (2020). The relationship between body image and tea drinking habits with anemia among adolescent girls in Badung District, Bali, Indonesia. Public Health and Preventive Medicine Archive, 8(1), 24–31. https://doi.org/10.15562/phpma.v8i1.248

Setianingsih, W., Suharyo, & Trihadi, D. (2017). Berbagai Faktor Risiko Kejadian Anemia Pada Remaja Putri (Studi di Kabupaten Rembang). Eprints.Undip, 1–9. http://eprints.undip.ac.id/58032/1/artikel_Oktoberr_2017.pdf

WHO. (2015). The Global Prevalence of Anaemia in 2011. In Who. https://iris.who.int/handle/10665/177094

WHO. (2021). Anaemia in women and children [Internet]. https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children

WHO. (2023a). Anaemia [Internet]. https://www.who.int/health-topics/anaemia#tab=tab_1

WHO. (2023b). Anaemia [Internet]. https://www.who.int/news-room/fact-sheets/detail/ANAEMIA

Wibowo, A., & Putri, S. (2021). Pedoman Praktis Penyusunan Naskah Ilmiah Dengan Metode Systematic Review. https://doi.org/10.13140/RG.2.2.17871.20640

WHO. (2014). Global Nutrition Targets 2025: Anemia Policy Brief. https://www.who.int/publications/i/item/WHO-NMH-NHD-14.4

Yunarsih, Y., & Antono, S. D. (2017). Hubungan Pola Menstruasi Dengan Kejadian Anemia Pada Remaja Putri Kelas VII SMPN 6 Kediri. Jurnal Ilmu Kesehatan, 3(1), 25. https://doi.org/10.32831/jik.v3i1.42