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Original Research

Knowledge, Attitude, and Practice Regarding Iron Deficiency Anemia Prevention Among Female Adolescents in Bogor City, Indonesia

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Abstract
Background: Iron deficiency anemia (IDA) is a significant public health issue due to its prevalence and numerous contributing factors, specifically among female adolescents.
Objective: The study aimed to examine the influence of knowledge and attitude on IDA prevention practice among female adolescents in Bogor City, Indonesia.
Methods: This cross-sectional study was carried out among 20 junior high schools in Bogor City, Indonesia. A total of 1.410 female students were selected through a non-probability sampling method. The Spearman rank correlation test was then used to examine the relationship between knowledge, attitude, and practice regarding IDA prevention.
Results: The results showed that the average scores for knowledge, attitude, and practice were 5.92 (out of 15), 11.56 (out of 15), and 8.95 (out of 12), respectively. In addition, knowledge had a significant correlation with attitude (p-value = 0.001, r = 0.185), and attitude showed a significant correlation with practice (p-value = 0.005, r = 0.075).
Conclusion: The limited understanding of female students concerning IDA may influence their attitude and practice towards its prevention. This indicates that the implementation of diverse strategies is essential to enhance understanding of anemia, thereby improving prevention behavior.
Keyword: Anemia, Chronic Diseases, Developing Countries, Female Student, School-Based

Background

Anemia is the world's third-leading cause of years lived with disability (YLD) (Institute for Health Metrics and Evaluation, 2023), underscoring its significance as a major public health challenge. Recognizing this burden, the World Health Organization (WHO) and the United Nations Sustainable Development Goals (SDGs) have set ambitious targets to reduce anemia prevalence (Hess et al., 2023). Despite these efforts, progress has been slow. In 2021, the global prevalence of anemia across all age groups was 24.3%, only slightly lower than 28.2% (27.8–28.5) in 1990 (Gardner, Razo, McHugh, Hagins, Kassebaum, et al., 2023). This marginal decline over three decades suggests persistent structural and systemic barriers such as nutritional deficiencies, infectious diseases, and inequities in healthcare access that hinder effective interventions. Consequently, achieving the SDG targets by 2030 remains unlikely without intensifying context-specific strategies (Daru, 2022).

Anemia is widely recognized as the most significant nutritional challenge among adolescents aged 10–19 years (Yusufu et al., 2023a). This life stage is marked by rapid physical growth and reproductive maturation, which substantially increase iron requirements, particularly among girls. Consequently, adolescent girls face a

heightened risk of anemia, driven by factors such as menstrual blood loss, inadequate dietary intake, and socio-cultural barriers to nutrition (Engidaw et al., 2018; Gardner, Razo, McHugh, Hagins, Moradi, et al., 2023; Yusufu et al., 2023a). The consequences extend beyond immediate health, impairing physical stamina, cognitive performance, and educational achievement, while also jeopardizing future maternal health outcomes (Gedefaw et al., 2015; World Health Organization & UNICEF, 2025). Economically, anemia imposes a considerable burden on healthcare systems and productivity. Currently, the annual global economic cost of inaction on anemia—considering health, human capital, and economic impacts—is estimated at US$113 billion for adolescent girls and women. This amount equals 0.1% of the world's income. The estimate is based on the combined gross national income (GNI) of all countries where the prevalence of each disease is known (Walters et al., 2025; World Health Organization & UNICEF, 2025).

Anemia remains a significant public health issue among Indonesian adolescents, particularly females. National surveys reported prevalence rates of 18.4% among individuals aged 15–24 years in 2013, increasing to 32% among female adolescents in 2018, indicating that nearly one-third were affected (KEMENKES, 2013, 2018). Although the 2023 survey shows a decline to 15.5% in this age group, the persistently high rates highlight the ongoing challenge of anemia among adolescent girls in Indonesia (Badan Kebijakan Pembangunan Kesehatan, 2025). In 2023, anemia impacted women's productivity, causing a loss of US$2.4 billion in Indonesia. Compared to India, it had experienced US$8.5 billion in lost economic value due to women's productivity being higher than Indonesia's (Jain et al., 2024). These figures highlight that anemia is not only a clinical concern but also a significant economic challenge, encompassing health expenditures, diminished quality of life, and reduced workforce productivity.

Iron deficiency anemia (IDA) among female adolescents is a major public health concern driven by inadequate intake of iron-rich foods and essential micronutrients. (Powers, 2024; Yusufu et al., 2023b). Dietary improvements and adherence to supplementation have shown positive outcomes. Aligning with Indonesia's national iron tablet program (Sari, Judistiani, et al., 2022; WHO, 2023), the Ministry of Health has implemented specific interventions to prevent anemia, including the provision of iron–folic acid supplements (commonly known as Tablet Tambah Darah, TTD) for adolescent girls and pregnant women, nutrition education, iron fortification in food products, and the promotion of clean and healthy living behaviors. Since 1997, prevention efforts have focused on adolescent girls as a strategic target group, recognizing that interventions during pregnancy alone are insufficient to address anemia. This approach aims to break the cycle of anemia across generations (Kementerian Kesehatan RI, 2021). Yet, a systematic review study indicated that the rates of compliance with iron supplement consumption among adolescent girls were still relatively low, at 26,2%. Poor knowledge, negative attitude and practice towards iron supplement consumption among adolescent girls were found as the themes that emerged from the previous studies (Tabita et al., 2023).

The Knowledge, Attitude, and Practice (KAP) paradigm provides a valuable perspective for examining health-related behaviors. For Indonesian adolescents, these insights can inform the creation of culturally tailored health education strategies designed to address both knowledge deficits and behavioral obstacles, in line with the study's aim to enhance the prevention and management of anemia (Yang et al., 2022). Based on that, the study objective was to examine knowledge, attitude, and practice of IDA prevention among female adolescents in Bogor City, Indonesia.

Method

This study employed a cross-sectional design to examine anemia-related factors among adolescents, chosen for its ability to capture prevalence and associations at a single point in time. Data were collected from May to June 2023 in 20 public junior high schools in Bogor, West Java, Indonesia. Participants were selected through purposive sampling based on predefined criteria. Eligible participants were female students in grades 7 and 8 who were present during data collection; grade 9 students were excluded due to national exam preparation.. The focus on female students was informed by evidence of higher anemia susceptibility compared to males, though cultural and local factors influencing this risk warrant further consideration.(Chauhan et al., 2022; Kassebaum et al., 2023; Lee, 2021). Moreover, in the Indonesian context, female students commonly exhibit irregular consumption of iron-rich foods alongside frequent intake of fast foods and sweetened beverages, which may further increase their risk of iron deficiency (Winarni, Shaluhiyah et al. 2024). A total of 1,410 students met the inclusion criteria. The minimum sample size was calculated using a hypothesis test for two population proportions based on the WHO sample size formula (Lwanga 1991). Using a 5% significance level, 90% power, and anticipated population proportions from a previous study, the required minimum sample size was 1,036 (Agustina, Wirawan et al. 2021).

The study instruments were organized into four sections. The first section captured sociodemographic characteristics, including school name, age, parents' education and occupation, religion, and pocket money. Religion and pocket money were akses as those may shape adolescents' pattern and ability to consume micronutrient-rich foods and have been associated with anemia risk (Chouraqui, Turck et al. 2021, Knijff, Roshita et al. 2021). The second section assessed students' knowledge, attitudes, and practices using items

adapted from the FAO Guidelines for Assessing Nutrition-Related Knowledge, Attitude, and Practice (Macías & Glasauer, 2014), which has been tested for validity and reliability for Indonesian communities (Sari, Herawati, et al., 2022). Knowledge was measured through 15 items covering definitions, symptoms, effects, causes, prevention, and food sources related to iron deficiency anemia (IDA), with response options of true, false, and don't know. Total score was calculated by adding up score for each question (1 point for a correct answer, 0 point for an incorrect, or if respondent selected "don't know"). Attitude was measured using six items addressing perceived susceptibility, severity, benefits and barriers to consuming iron-rich foods, and self-efficacy in preparing such foods, using a three-point likert scale (disagree, neutral, agree). For each question, negative answer was scored 1, neutral answer scored 2, and positive answer scored 3. Two preventive behaviors were assessed: dietary practices and personal hygiene. Dietary practices were evaluated by asking about consumption in the past 30 days, including iron–folic acid tablets, protein sources, iron-rich foods (e.g., liver, meat, fish, green vegetables), vitamin C–rich foods (e.g., oranges) which were considered as anemia preventing behavior; and foods inhibiting iron absorption (e.g., coffee, tea, soft drinks) which was the opposite behavior. A four point likert scale (never, several times in a month, several times in a week, everyday) was used to measure these indicators. Personal hygiene was measured through items on handwashing before eating and after using the bathroom with soap and running water, as well as weekly nail trimming, using a four-point Likert scale ranging from never to always.

Data was collected by 20 study assistants with public health science backgrounds. All data collection assistants participated in a structured one-day training session that included demonstrations, guided practice, and exercises to ensure consistency across observers. To maintain data quality, the research team conducted continuous supervision throughout the data collection period, including daily briefings and routine spot checks. Study permits were obtained from the Bogor City Education Service. Study teams also requested permission and coordinated with each school before the data collection process. To manage potential disruptions or refusals, data collection schedules were arranged in advance with school administrators and adjusted when necessary to avoid conflicts with examinations or school activities.

Data collection was performed in the classroom setting using an online questionnaire without the teacher's presence. During data collection, all participating students had personal access to smartphones and stable internet connections, with additional support provided by the research assistant for those who did not. The research assistant also assisted students if they encountered any issues while completing the online questionnaire. To ensure confidentiality and encourage honest responses, students completed the online questionnaire individually using their own devices, with adequate spacing arranged to maintain privacy. No identifying information, such as names or student IDs, was collected, and participation was entirely voluntary. Students were informed that their answers would remain anonymous and would not be shared with teachers or school administrators, which helped minimise social desirability bias during classroom-based data collection. The assistant explained the purpose and scope of the study before data collection began. Each participating student gave informed consent in the approval sheet before filling out the online questionnaire. No sanction was given to students who declined to participate in this study. This study was approved by the ethical review committee of the Faculty of Health Sciences Syarif Hidayatullah State Islamic University Jakarta with reference number 01/F.10/KP.01.1/KE.SP/07.08.014/2023.

This study used RStudio version 2023.12.0+369 to conduct descriptive and bivariate analyses. A descriptive analysis was performed to show the number and percentage of socio-demographic characteristics, knowledge, attitude, and practice of students related to preventing anemia. Meanwhile, a bivariate analysis was conducted to examine the relationship between knowledge, attitude, and practice related to anemia prevention using Spearman's rank correlation test. A significant association was considered when a p-value below 0.05 was obtained from the analysis.

Results

Table 1 described the socio-demographic characteristics of respondents. The study had 1407 respondents, with the majority aged 14 years (93.1%). The majority of participants had parents with secondary-level education—60.5% of fathers and 57.7% of mothers—and almost all respondents were Muslim (96.3%).

Variables	n	%
Age		
14 years old	1310	93.1
15 years old	97	6.9
Father's education level		
Primary	134	9.5
Secondary	851	60.5
Tertiary	422	30.0

Variables	n	%
Mother's education level		
Primary	207	14.7
Secondary	812	57.7
Tertiary	388	27.6
Father's occupation status		
Entrepreneur		
Daily worker	247	17.6
Private sector	385	27.4
Agriculture/plantation	493	35.0
Freelancers	8	0.6
Factory worker	93	6.6
Not working	69	4.9
Already death	24	1.7
	88	6.3
Mother's occupation status		
Entrepreneur		
Daily worker	99	7.0
Private sector	37	2.6
Agriculture/plantation	159	11.3
Freelancers	1	0.1
Factory worker	28	2.0
Not working	20	1.4
Already death	1035	73.6
	28	2.0
Religion		
Islam	1355	96.3
Catholic	10	0.7
Protestant	39	2.8
Hindu	3	0.2

In Table 2, respondents' correct answers on IDA prevention knowledge were described. The least correct answers were for questions related to chocolate as an iron-containing food (7.8%), preventing infectious diseases could contribute to the prevention of anemia (8.4%), and specific dietary intake prevented anemia (11.9%).

Table 2. Percentage of participants who have correct knowledge regarding anemia prevention topics (n=1407)

Knowledge related to…	Correct answer	
	n	%
Iron deficiency anemia definition	733	52.1
Iron deficiency anemia symptoms	1174	83.4
Impact of anemia on physics and mental of adolescent	765	54.4
Impact of anemia on pregnancy	526	37.4
Heavy menstrual bleeding as a cause of IDA	269	19.1
Infectious diseases as a cause of IDA	237	16.8
Poor dietary intake as a cause of IDA	887	63.0
Iron rich food for preventing anemia	167	11.9

Knowledge related to…	Correct answer	
	n	%
Foods high in vitamin C can help with the absorption of non-heme iron	721	51.2
Prevent infectious diseases could help prevent an IDA	118	8.4
Meat as a source of iron	709	50.4
Vegetables as a source of iron	749	53.2
Chocolate as a source of iron	110	7.8
Citrus fruits as a source of iron	846	60.1
Coffee and tea can inhibit the absorption of iron	314	22.3

Table 3 shows that 17.8% of adolescent girls were perceived to be at risk of anemia. In addition, less than half of respondents felt that anemia did not seriously impact their health (42.1%) and found it challenging to obtain iron-rich foods (41.8%).

Table 3. Percentage of participants regarding Attitude on prevention of anemia

Statement	Positive attitude	
	n	%
Perceived susceptibility to anemia	250	17.8
Perceived seriousness of anemia	593	42.1
Perceived benefits of high iron food	969	68.9
Perceived barrier to obtain high iron food	588	41.8
Perceived barrier to eat high iron food such as meat and vegetables	723	51.4
Self-efficacy to prepare high iron food	609	43.3

Table 4 explained practice of anemia prevention. Around 17.8% respondents consumed Fe tablets in the last 30 days. Approximately 47% of respondents reported consuming vitamin C–rich foods; however, about half still consumed foods that can inhibit iron absorption. In terms of hygiene behaviors, 86% stated that they regularly washed their hands with soap under running water. Additionally, over 70% regularly washed their hands before meals and after using the toilet.

Table 4. Percentage of participants who have correct and incorrect practice regarding prevention of anemia

Anemia Prevention Practices	n	%
Dietary practice (consumption of .. in last a day)		
Fe tablet	250	17.8
Protein and high iron sources food	1175	83.5
Vitamin C sources food	662	47.1

Anemia Prevention Practices	n	%
Iron absorption inhibitor foods	695	49.4
Good Personal Hygiene (often and always)		
Handwashing before eating	1089	77.4
Handwashing after using the toilet	989	70.3
Handwashing with soap and running water	1210	86.0
Nail trimming once a week	854	60.7

On average, respondents scored 5.92 out of 15 points for knowledge, 11.56 out of 18 for attitude, and 8.95 out of 12 points for practice, as presented in Table 5. This study revealed that the average knowledge and attitude scores were below the median score. Furthermore, the score for IDA prevention practices remained below the maximum level.

Table 5. Descriptive statistics of knowledge, attitude, and, practice of prevention of anemia among respondents

Variable	Mean	SD	Median	Range
Total knowledge score	5.92	3.24	6	0-15
Total attitude score	11.56	1.58	12	6-15
Total practice score	8.95	1.37	9	4-12

This study showed no correlation between knowledge and practice, with a p-value of 0.257. Knowledge significantly had a positive correlation with attitude (p-values = 0.000), and attitude significantly had a positive correlation with practice (p-values=0.005). However, it was also noted that the correlation values between knowledge to attitude and attitude to practice indicated low correlation values of 0.185 and 0.075, respectively (Table 6).

Table 6. Correlation table between knowledge, attitude, and practice

Variables	Correlation value (r)	p-value
Knowledge – Behavior	0.030	0.257
Attitude – Behavior	0.075	0.005*
Knowledge – Attitude	0.185	0.000*

Discussion

This study showed that the average value of knowledge related to anemia prevention was still below the average of the maximum scores. Another study in Indonesia also showed that the median (range) of the total KAP score was low, which was 7 (3-10) of 18 (maximum score) (Agustina et al., 2021). Another study also revealed that 66% of adolescents had low knowledge related to anemia (Mularsih, 2017). A study in Ghana showed that only 30% to 40% of adolescents knew IDA and its causes.

Adolescents still had insufficient or problematic health literacy and had poor health information analysis and appraisal ability (Chu-Ko et al., 2021). Various actors including journalists, teachers, health workers, family members and peers could be involved to improve adolescents' health literacy (Indriasari et al., 2024). In the Indonesian context, the relationship between public health institutions and educational institutions has been systematically established. In 1959, the government initiated the school health unit (Usaha Kesehatan Sekolah) which included students, teachers, and health workers to promote a healthy school

environment (Warnaini et al., 2025). This presents an opportunity to develop strategies to improve adolescents' literacy and even their overall health. In the short term, students, teachers, parents, and guardians needed to receive education about anemia prevention (Verma & Baniya, 2022). This activity aimed to raise awareness among all parties regarding anemia. Moreover, health workers could give training to students to serve as peer educators to their colleagues in improving anemia prevention-related knowledge and awareness (Warnaini et al., 2025).

This study showed that more than half of students perceived barriers to accessing high-iron foods, which are essential to prevent IDA. More than half respondents also lacked the self-efficacy to prepare high-iron foods. One of the strategies to improve student's nutrition was providing a school-based meals program. A previous study in Indonesia showed that school lunch and nutritional education program together had a significant impact, increasing hemoglobin level and reducing the prevalence of anemia from 42.6% to 21.7% (Rimbawan et al., 2023). However, a study indicated that there were still several limitations in the implementation of the program, such as the quality of planning, monitoring, and evaluation of the program; inefficiency of the program budget, and issues of fulfilling nutrition and food security (Rimbawan et al., 2023). In terms of behavior, this study found that adolescents lacked regular dietary habits involving iron-rich foods and foods that promote iron absorption. Another study also showed that Indonesian adolescents tended to drink coffee and tea which contained tannins that could inhibit iron absorption (Wati et al., 2023). Adolescents explored their dietary environment and consumed visually appealing foods without considering their nutritional needs (Wiafe et al., 2023). In addition, the variety of fast food and beverages available in Indonesia allowed adolescents to consume less nutritious food. The education departments and schools, working together with the health department, should implement targeted programs to support anemia prevention. These measures included conducting multiple educational sessions, regulating the nutritional quality of school canteen foods, providing iron tablet supplements to students, promoting good personal hygiene, and offering regular anemia screenings.

School canteens are also a key means of fostering healthy eating behaviors and better nutrition in students. Students spend one-third of their time in school and were exposed to a variety of foods at school canteens (Hadi et al., 2021). Regulating the sale of certain foods and drinks in school canteens remained challenging, as Indonesian government could not provide specific guidelines, particularly regarding safety laws and dietary guidelines (Rachmadewi et al., 2021). School canteens typically operated under informal management with limited supervision and regulation on the types of food marketed. However, efforts to implement several school-based adolescent nutrition interventions, including providing healthy canteens, had begun to emerge (Octaria et al., 2021).

This study has several limitations. Due to the resource limitations, this study only involved students from public junior high schools in a city in Indonesia, the results were not generalizable enough to describe students' condition in other types of high schools such as religious-based schools or private high schools that could have students with different socio-demographic backgrounds with this study. Furthermore, the exclusion of 9th-grade students due to the national exam may limit the generalizability of the findings to the broader student population. Moreover, this study employed purposive sampling which may introduce selection bias and limit representativeness. The assessment of dietary practices using a 30-day recall period may be subject to recall bias, particularly among adolescent participants. However, the 30-day recall period was chosen to capture habitual dietary patterns rather than short-term fluctuations, following approaches used in similar nutrition studies. Future research could consider shorter recall periods or complementary dietary assessment methods to reduce potential bias.

This study used KAP frameworks to identify IDA prevention behaviour. In the context of anaemia research, relying solely on KAP may oversimplify these dynamics as behaviour change is influenced by intricate social, cultural, and environmental factors (Alsaleh et al., 2023). This study assessed personal hygiene using only two behaviors may not fully capture the multidimensional nature of hygiene practices. Our selection was guided by behaviors most directly linked to anemia risk and commonly used in similar school-based studies. Therefore, broader hygiene dimensions such as menstrual hygiene, environmental sanitation, and water safety could be incorporated in future research to provide a more comprehensive understanding. Moreover, further study could be conducted to identify implemented strategies related to the prevention of IDA in schools and its associated factors.

Conclusion

In conclusion, this study showed that students had a low level of knowledge and attitude regarding the prevention of anemia. Knowledge was significantly correlated with attitude, and attitude was significantly correlated with practice of preventing anemia. Multiple strategies requiring various stakeholders such as the district health office, parents, and school could be conducted to improve students' knowledge of anemia prevention. Moreover, improving knowledge and providing a supportive environment to enable students to have good dietary practice must be carried out to prevent IDA in the school-based setting.

Declaration Conflicting Interest

The authors have no conflicts of interest to declare.

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Author Contribution

Conceptualization: RKW, MIN, Y; Data curation: RKW, MIN, Y, DUI; Formal analysis: MIN, Y; Funding acquisition: RKW; Investigation: RKW, MIN, Y, DUI, FJR; Methodology: RKW, MIN, Y ; Project administration: RKW; Resources: RKW; Software: RKW, MIN, Y; Supervision: RKW, MIN, Y, DUI, FJR; Validation: all authors; Visualization: RKW, MIN, Y; Writing–original draft: RKW, MIN, Y, DUI; Writing–review & editing: RKW, MIN, Y.

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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/SUPPL_FILE/SJ-PDF-5-FNB-10.1177_03795721211011136.PDF

Alsaleh, F. M., Elzain, M., Alsairafi, Z. K., & Naser, A. Y. (2023). Perceived Knowledge, Attitude, and Practices (KAP) and Fear toward COVID-19 among Patients with Diabetes Attending Primary Healthcare Centers in Kuwait. International Journal of Environmental Research and Public Health, 20(3), 2369. https://doi.org/10.3390/ijerph20032369

Badan Kebijakan Pembangunan Kesehatan, K. K. R. (2025). Survei Kesehatan Indonesia (SKI) 2023. kemkes.or.id

Chauhan, S., Kumar, P., Marbaniang, S. P., Srivastava, S., & Patel, R. (2022). Prevalence and predictors of anaemia among adolescents in Bihar and Uttar Pradesh, India. Scientific Reports, 12(1), 8197. https://doi.org/10.1038/s41598-022-12258-6

Chu-Ko, F., Chong, M. L., Chung, C. J., Chang, C. C., Liu, H. Y., & Huang, L. C. (2021). Exploring the factors related to adolescent health literacy, health-promoting lifestyle profile, and health status. BMC Public Health, 21(1), 1–12. https://doi.org/10.1186/S12889-021-12239-W/TABLES/5

Daru, J. (2022). Sustainable Development Goals for anaemia: 20 years later, where are we now? The Lancet Global Health, 10(5), e586–e587. https://doi.org/10.1016/S2214-109X(22)00127-9

Engidaw, M. T., Wassie, M. M., & Teferra, A. S. (2018). Anemia and associated factors among adolescent girls living in Aw-Barre refugee camp, Somali regional state, Southeast Ethiopia. PLOS ONE, 13(10), e0205381. https://doi.org/10.1371/journal.pone.0205381

Gardner, W. M., Razo, C., McHugh, T. A., Hagins, H., Vilchis-Tella, V. M., Hennessy, C., Taylor, H. J., Perumal, N., Fuller, K., Cercy, K. M., Zoeckler, L. Z., Chen, C. S., Lim, S. S., Aali, A., Abate, K. H., Abd-Elsalam, S., Abdurehman, A. M., Abebe, G., Abidi, H., … Kassebaum, N. J. (2023). Prevalence, years lived with disability, and trends in anaemia burden by severity and cause, 1990–2021: findings from the Global

Burden of Disease Study 2021. The Lancet Haematology, 10(9), e713–e734. https://doi.org/10.1016/S2352-3026(23)00160-6
Gedefaw, L., Tesfaye, M., Yemane, T., Adisu, W., & Asres, Y. (2015). Anemia and iron deficiency among school adolescents: burden, severity, and determinant factors in southwest Ethiopia. Adolescent Health, Medicine and Therapeutics, 189. https://doi.org/10.2147/AHMT.S94865
World Health Organization, & UNICEF. (2025). Global nutrition targets 2030: anaemia brief. https://www.who.int/health-topics/anaemia#tab=tab_1
Hadi, H., Triastanti, R. K., Anggraeni, D., Nurwanti, E., Lewis, E. C., Colon-Ramos, U., Kang, Y., Yamaguchi, M., & Gittelsohn, J. (2021). The role of the school food environment in improving the healthiness of school canteens and readiness to reopen post COVID-19 pandemic: A study conducted in Indonesia. Journal of Public Health Research, 11(1), 2287. https://doi.org/10.4081/JPHR.2021.2287
Hess, S. Y., Owais, A., Jefferds, M. E. D., Young, M. F., Cahill, A., & Rogers, L. M. (2023). Accelerating action to reduce anemia: Review of causes and risk factors and related data needs. Annals of the New York Academy of Sciences, 1523(1), 11–23. https://doi.org/10.1111/nyas.14985
Indriasari, R., Mansur, M. A., & Rachmat, M. (2024). Comprehensive knowledge and supports from closest relatives are crucial to improve awareness and participation of Indonesian adolescent girls in anemia prevention program. International Journal of Adolescent Medicine and Health, 36(5). https://doi.org/10.1515/IJAMH-2024-0064,
Institute for Health Metrics and Evaluation. (2023, July 31). The Lancet: New study reveals global anemia cases remain persistently high among women and children. IMHE. https://www.healthdata.org/news-events/newsroom/news-releases/lancet-new-study-reveals-global-anemia-cases-remain-persistently#:~:text=In%202021%2C%201.92%20billion%20people,shift%20toward%20less%20severe%20anemia
Jain, S., Ahsan, S., Robb, Z., Crowley, B., & Walters, D. (2024). The cost of inaction: A global tool to inform nutrition policy and investment decisions on global nutrition targets. Health Policy and Planning, 39(8), 819–830. https://doi.org/10.1093/heapol/czae056
Kassebaum, N., Gardner, W., & McHugh, T. (2023, July 31). Anemia remains stubbornly common for women and children. https://www.healthdata.org/news-events/insights-blog/global-health-insights/podcast-anemia-remains-stubbornly-common-women-and
KEMENKES. (2013). Laporan Nasional Riset Kesehatan Dasar 2013. https://repository.badankebijakan.kemkes.go.id/id/eprint/4428/1/LAPORAN%20NASIONAL%20RISKESDAS%20TAHUN%202013%20DALAM%20BENTUK%20ANGKA.pdf
KEMENKES. (2018). Laporan Nasional Riset Kesehatan Dasar 2018.
Kementerian Kesehatan RI. (2021, January). Remaja Sehat Komponen Utama Pembangunan SDM Indonesia. Kementerian Kesehatan, RI. https://kemkes.go.id/id/remaja-sehat-komponen-utama-pembangunan-sdm-indonesia
Lee, J. M. (2021). Time to pay attention to anemia in female adolescents. Clinical and Experimental Pediatrics, 64(2), 78–79. https://doi.org/10.3345/cep.2020.02117
Macías, Y. F., & Glasauer, P. (2014). Guidelines for assessing nutrition-related knowledge, attitudes and practices : KAP manual. https://www.fao.org/family-farming/detail/en/c/284518/
Mularsih, S. (2017). Hubungan Pengetahuan Remaja Putri Tentang Anemia Dengan Perilaku Pencegahan Anemia Pada Saat Menstruasi Di SMK Nusa Bhakti Kota Semarang. Jurnal Kebidanan, 6(2), 80. https://doi.org/10.26714/JK.6.2.2017.80-85
Octaria, Y., Apriningsih, A., Dwiriani, C. M., & Februhartanty, J. (2021). School readiness to adopt a school-based adolescent nutrition intervention in urban Indonesia. Public Health Nutrition, 24(S2), s72–s83. https://doi.org/10.1017/S1368980020001299
Powers, J. M. (2024). Iron requirements and iron deficiency in adolescents. UptoDate. https://www.uptodate.com/contents/iron-requirements-and-iron-deficiency-in-adolescents#:~:text=Adolescent%20girls%20are%20at%20particular,iron%20imbalance%2C%20specifically%20low%20iron
Rachmadewi, A., Soekarjo, D., Maehara, M., Alwi, B., Mulati, E., & Rah, J. H. (2021). School Canteens in Selected Areas in Indonesia: A Situation Analysis. Food and Nutrition Bulletin, 42(2), 225–246. https://doi.org/10.1177/03795721211008021
Rimbawan, R., Nurdiani, R., Rachman, P. H., Kawamata, Y., & Nozawa, Y. (2023). School Lunch Programs and Nutritional Education Improve Knowledge, Attitudes, and Practices and Reduce the Prevalence of Anemia: A Pre-Post Intervention Study in an Indonesian Islamic Boarding School. Nutrients, 15(4), 1055. https://doi.org/10.3390/NU15041055/S1
Sari, P., Herawati, D. M. D., Dhamayanti, M., Ma'ruf, T. L. H., & Hilmanto, D. (2022). The Effect of Mobile Health (m-Health) Education Based on WANTER Application on Knowledge, Attitude, and Practice (KAP) Regarding Anemia among Female Students in a Rural Area of Indonesia. Healthcare, 10(10), 1933. https://doi.org/10.3390/healthcare10101933

Sari, P., Judistiani, R. T. D., Hilmanto, D., Herawati, D. M. D., & Dhamayanti, M. (2022). Iron Deficiency Anemia and Associated Factors Among Adolescent Girls and Women in a Rural Area of Jatinangor, Indonesia. International Journal of Women's Health, 14, 1137–1147. https://doi.org/10.2147/IJWH.S376023

Tabita, H., Silitonga, H., Salim, L. A., Nurmala, I., & Wartiningsih, M. (2023). Compliance of Iron Supplementation and Determinants among Adolescent Girls: A Systematic Review. In Iran J Public Health (Vol. 52, Issue 1). https://creativecommons.org/licenses/by-nc/4.0/

Verma, K., & Baniya, G. C. (2022). Prevalence, knowledge, and related factor of anemia among school-going adolescent girls in a remote area of western Rajasthan. Journal of Family Medicine and Primary Care, 11(4), 1474–1481. https://doi.org/10.4103/jfmpc.jfmpc_1372_21

Walters, D., Kakietek, J., Dayton Eberwein, J., & Shekar, M. (2025). An Investment Framework for Meeting the Global Nutrition Target for Anemia. https://doi.org/10.1596/978-1

Warnaini, C., Haq, A. D., Kadriyan, H., Shibuya, F., & Kobayashi, J. (2025). A dynamic journey of comprehensive school health policy implementation in response to the COVID-19 pandemic in Lombok, Indonesia. Tropical Medicine and Health, 53(1), 25. https://doi.org/10.1186/S41182-025-00690-Z

Wati, E., Sistiarani, C., & Rahardjo, S. (2023). Diet behavior and consumption of iron inhibitors: Incidence anemia in adolescent girls. Journal of Public Health in Africa, 14(12), 6. https://doi.org/10.4081/jphia.2023.2593

WHO. (2023). Anaemia. https://www.who.int/news-room/fact-sheets/detail/anaemia#:~:text=Treatment%20and%20prevention&text=Changes%20in%20diet%20can%20help,health%2Dcare%20provider%20recommends%20them

Wiafe, M. A., Ayenu, J., & Eli-Cophie, D. (2023). A Review of the Risk Factors for Iron Deficiency Anaemia among Adolescents in Developing Countries. Anemia, 2023, 1–11. https://doi.org/10.1155/2023/6406286

Yang, J., Liao, Y., Hua, Q., Sun, C., & Lv, H. (2022). Knowledge, attitudes, and practices toward COVID-19: A cross-sectional study during normal management of the epidemic in China. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.913478

Yusufu, I., Cliffer, I. R., Yussuf, M. H., Anthony, C., Mapendo, F., Abdulla, S., Masanja, M., Tinkasimile, A., Ali, A. S., Mwanyika-Sando, M., & Fawzi, W. (2023a). Factors associated with anemia among school-going adolescents aged 10–17 years in Zanzibar, Tanzania: a cross sectional study. BMC Public Health, 23(1). https://doi.org/10.1186/s12889-023-16611-w

Yusufu, I., Cliffer, I. R., Yussuf, M. H., Anthony, C., Mapendo, F., Abdulla, S., Masanja, M., Tinkasimile, A., Ali, A. S., Mwanyika-Sando, M., & Fawzi, W. (2023b). Factors associated with anemia among school-going adolescents aged 10–17 years in Zanzibar, Tanzania: a cross sectional study. BMC Public Health, 23(1), 1814. https://doi.org/10.1186/s12889-023-16611-w