DETERMINANTS OF AMONG ANEMIA ADOLESCENT GIRLS: A SYSTEMATIC LITERATURE REVIEW

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Abstract
Anemia is common among adolescents, especially girls who have begun menstruating, and is associated with reduced immunity, physical activity, academic performance, and fitness, as well as increased risks of low birth weight and maternal–neonatal mortality if it continues into pregnancy. This study aimed to summarize factors influencing anemia among adolescent girls based on recent evidence. A literature review was conducted using Google Scholar, PubMed, and Scopus to identify primary full-text articles in Indonesian or English published between 2021 and 2025 with the keyword "anemia in adolescent girls." Anemia in adolescent girls is associated with nutritional status, menstrual cycle patterns, dietary habits, knowledge level, socioeconomic conditions, maternal education, adherence to iron tablet consumption, and physical activity. Anemia in adolescent girls is a multifactorial problem, requiring integrated prevention strategies that address nutrition, health behavior, and social determinants.
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INTRODUCTION

Anemia is considered an important health issue that continues to receive international attention because it has a broad impact on the quality of life and productivity of societies. The decrease in hemoglobin levels in red blood cells is the main cause of anemia, making the blood's ability to distribute oxygen less effective. According to the World Health Organization (WHO) guidelines, the normal hemoglobin level for women over 15 years old is >12.0 g/dl (>7.5 mmol). A lack of hemoglobin leads to reduced oxygen supply to body tissues, which can cause symptoms such as weakness, fatigue, dizziness, headaches, and blurred vision. Anemia not only reflects the health status of individuals, but also serves as an indicator of poor community nutrition that can affect a country's economic development. Therefore, anemia is classified as a global health problem. This is also supported by the Sustainable Development Goals (SDGs) 2030 agenda, specifically referring to target point 2.2 which emphasizes the urgency of eradicating all forms of malnutrition, including fulfilling the nutritional needs of adolescent girls as an effort to create a healthy and productive generation (1).

Although anemia affects various population groups, its occurrence among adolescent girls presents a more specific and complex public health concern. Adolescence is a transitional phase marked by rapid physical growth, psychological changes, and reproductive maturation. During this period, the body requires higher nutritional intake to support increased blood volume and tissue development. At the same time, the onset of menstruation contributes to regular blood loss, further increasing the risk of anemia. In Indonesia, adolescents are commonly defined as individuals aged 10–19 years who are not yet married, although broader definitions extend up to 24 years (2).

Anemia is a condition that very easily affects adolescent girls due to increased nutritional needs for growth, blood loss from monthly menstruation, low intake of nutrients, and unhealthy eating habits (3). Although adolescent girls require around 14.8 mg of iron per day to meet physiological needs and compensate for menstrual blood loss, this requirement is often unmet due to suboptimal dietary habits (4). If anemia is not treated during adolescence, it may persist into pregnancy and increase the risk of low birth weight and maternal and infant mortality (5).

Despite the growing number of studies on anemia among adolescent girls, the existing literature still shows important limitations. Many studies examine anemia in a broad manner without clearly identifying the relative contribution of specific determinants, while findings remain inconsistent across studies. Some emphasize nutritional intake as the main factor, whereas others highlight knowledge, behavior, or socioeconomic conditions, indicating that anemia in this population arises from multiple interacting factors rather than a single cause. However, evidence that systematically integrates these determinants is still limited, making it difficult to develop targeted and effective prevention strategies. Therefore, this study aims to systematically review and synthesize existing evidence to identify key determinants associated with anemia among adolescent girls and to provide a more comprehensive basis for effective and sustainable interventions.

METHODS

This study employed a systematic literature review design using the PRISMA 2020 approach to identify factors associated with anemia among adolescent girls. The literature search was conducted in three major databases, namely PubMed, Scopus, and Google Scholar, in January 2026, using a combination of Boolean operators as follows: ("anemia" OR "anaemia") AND ("adolescent girls" OR "female adolescents" OR "teenage girls") AND ("risk factors" OR "associated factors" OR "determinants"). The inclusion criteria were original research articles with observational study designs such as cross-sectional, cohort, or case-control, involving adolescent girls aged 10 to 19 years, discussing factors associated with anemia, published between 2021 and 2025, available in full text, and written in Indonesian or English. The exclusion criteria included review articles, community service reports, theses or dissertations, articles with incomplete data, and studies that did not specifically address anemia among adolescent girls.

The selection process was conducted in three stages: identification, title and abstract screening, and full-text review. A total of 23,594 articles were initially identified across the databases. Duplicate records were removed in the first step. Subsequently, title and abstract screening was performed to exclude studies that were not relevant to the research topic. Articles that passed this stage were then assessed through full text review based on eligibility criteria, including population relevance, variables examined, and completeness of reported data. Through this process, 11 articles met the inclusion criteria and were included in the final analysis. To ensure the quality of the included studies, only articles published in peer-reviewed scientific journals were considered, including those retrieved from Google Scholar. Sources such as theses, institutional repositories, and non-scientific publications were excluded. The quality of the studies was assessed using a critical appraisal approach based on study design, taking into account potential bias, sample size, and the validity of analytical methods. As most

of the included studies employed a cross sectional design, the findings were interpreted as associated factors rather than causal relationships.

The stages of literature search and screening are described in the following PRISMA flow diagram.

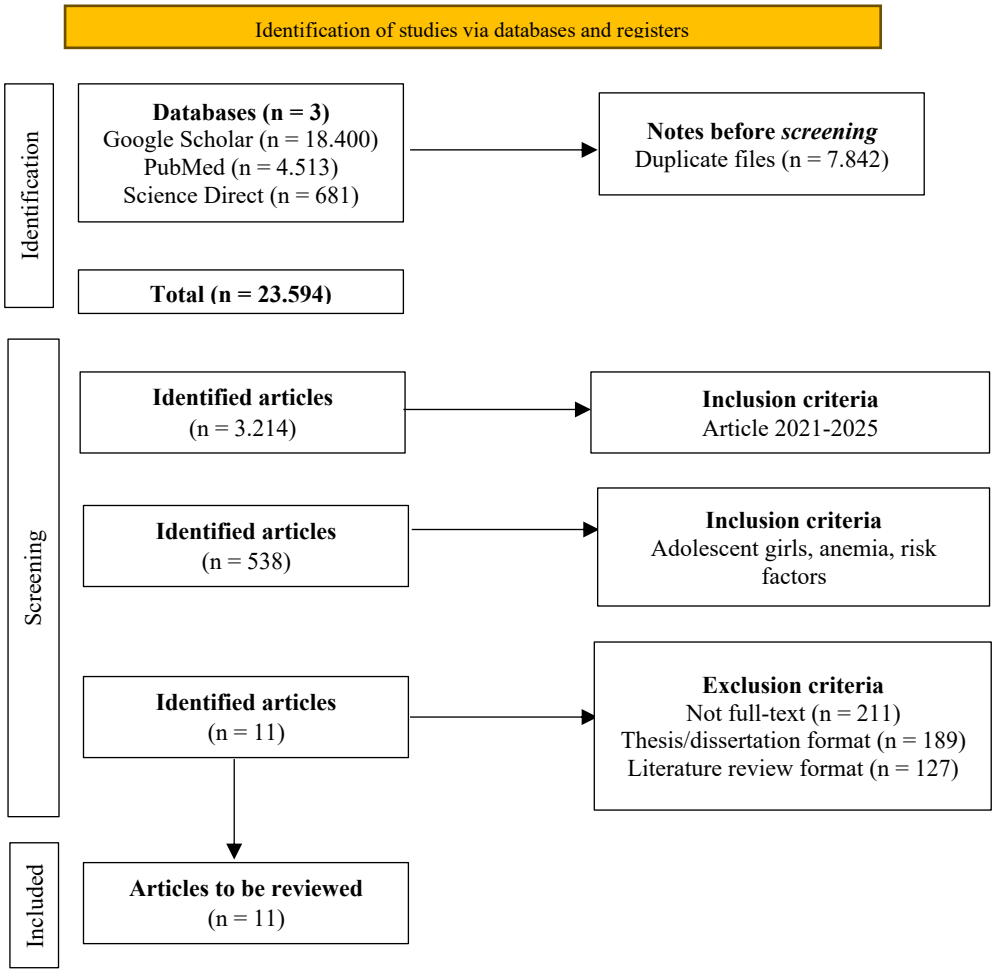

Figure 1. PRISMA Diagram

RESULTS

Based on the review of 11 studies, most used a cross-sectional design and consistently showed significant associations between multiple factors and menstrual health or anemia. Biological factors such as nutritional status and dietary patterns were strongly associated with outcomes, with one study reporting a strong correlation. Behavioral factors, including adherence to iron supplementation and physical activity, also played an important role. In addition, knowledge level and socioeconomic status were identified as key determinants, influencing both health behavior and access to nutrition. Evidence from cohort studies further supported the effectiveness of iron supplementation in reducing anemia prevalence.Overall, the findings indicate that menstrual disorders and anemia are multifactorial conditions influenced by the interaction of biological, behavioral, and socioeconomic factors.

The findings of the literature review are presented in table 1 format to enhance clarity and facilitate understanding.

Table 1 . Literature Review Result

No	Author's (Year)	Country	Design	Main Variabels	Main Result
1	Fita et al. (2025)	Indonesia	Cross-sectional	Nutritional status, menstrual cycle	Significant association ($p<0.05$)
2	Nur'aisah (2025)	Indonesia	Cross-sectional.	Dietary Pattern	Strong correlation ($r = -0.652$)
3	Julianti et al. (2025)	Indonesia	Cross-sectional	Knowledge level.	Significant association ($p<0.05$)
4	Riandini et al. (2025)	Indonesia	Cross-sectional	Fe supplementation adherence	Significant association ($p<0.05$)
5	Gore et al. (2024)	India	Cross-sectional	Socioeconomic status	Significant association ($p<0.001$)
6	Pavithran et al. (2024)	India	Cross-sectional	Diet, nutritional status	Significant association ($p<0.05$)
7	Wanti et al. (2023)	Indonesia	Cross-sectional	Physical activity, dietary patterns, physical activity	Significant association ($p<0.05$)
8	Poudel et al. (2023)	Nepal	Cross-sectional	Knowledge, education level, parental occupation	Associated with anemia ($p<0.05$)
9	Yamamoto et al. (2022)	Japan	Retrospective	Physical activity, iron status, exercise intensity	Increased anemia risk observed
10	Situmeang et al. (2022)	Indonesia	Cross-sectional	Socioeconomic status, knowledge, attitude	Associated with anemia ($p<0.05$)
11	Gosdin et al. (2021)	Ghana	Prospective cohort study	Iron supplementation, intervention exposure	Reduced anemia prevalence

DISCUSSION

Nutritional Status

Nutritional status consistently appears as the most prominent determinant associated with anemia among adolescent girls across the variables examined. A substantial body of evidence suggests that adolescents with inadequate nutritional status are more likely to experience anemia than those with sufficient nutritional conditions (6,7,8). This pattern highlights that nutritional status extends beyond a simple marker of health, reflecting long-term dietary adequacy. Rather than capturing a temporary state, it represents the cumulative effect of habitual intake. Supporting studies further emphasize that diet quality, particularly sufficient iron consumption, significantly contributes to variations in anemia incidence (9,10). Moreover, this association indicates that interventions centered merely on increasing intake volume, without addressing nutritional quality, are likely to yield limited outcomes. Thus, nutritional

status acts as a critical intersection between biological and behavioral dimensions in explaining anemia risk.

Menstrual Patterns

Menstrual patterns as a biological factor show a fairly consistent association with anemia, although not as strong as the influence of nutritional status. Adolescents who experience prolonged menstruation or irregular cycles tend to have a higher likelihood of anemia (11). Differences in how studies define and measure these variables lead to variation in the strength of the findings, even though the direction of the association remains consistent. This pattern indicates that biological factors play a stable role, yet their influence is often intertwined with other determinants, particularly nutritional status and dietary intake, suggesting the presence of interactions that require further investigation.

Dietary Patterns

Dietary patterns consistently emerge alongside nutritional status as key determinants of anemia. Several studies indicate that unbalanced diets are associated with an increased prevalence of anemia among adolescent girls (7,12). In addition, low consumption of iron rich foods and limited dietary diversity further contribute to this condition (9). These findings suggest that anemia is not merely linked to the quantity of food intake but also to its quality and composition. Dietary patterns hold a strategic position because they are among the most modifiable factors through intervention, although changes in diet cannot be separated from socioeconomic conditions that shape food access. Therefore, dietary patterns function as a link between individual behavior and broader social structures.

Knowledge

The association between knowledge and anemia appears inconsistent across studies. While some findings highlight a link between knowledge levels and anemia incidence (13,14), other studies reveal that having good knowledge does not necessarily translate into appropriate practices (15,16). This pattern indicates that knowledge does not exert a direct effect on anemia but instead plays a facilitating role in shaping behavior. Its effectiveness depends on contextual factors such as environment, access to resources, and social support. Consequently, educational interventions should be complemented by structural strategies to ensure more effective and sustained changes, as knowledge alone is rarely sufficient to alter behavior in the absence of supportive conditions.

Socioeconomic Status

Socioeconomic status shows a stable association with anemia incidence. Adolescents from lower income families tend to have higher rates of anemia, largely driven by limited access to adequate nutrition and health information (17,18). Moreover, this factor plays a role as a core determinant that influences other variables such as dietary intake and health related behavior. As such, socioeconomic status contributes to anemia through both direct and indirect mechanisms. It can be understood as an upstream factor that shapes various determinants simultaneously, which helps explain why interventions that focus only on individual behavior often produce limited outcomes without broader social improvements.

Iron (Fe) Tablet Adherence

Iron supplementation adherence is clearly linked to anemia outcomes. Studies suggest that adolescents who maintain higher levels of compliance with iron tablet intake are less likely to develop anemia (19,20). However, the impact of this intervention depends on sustained adherence at the individual level. The availability of supplementation programs alone is insufficient without consistent use. This finding indicates that the primary challenge lies in ensuring effective implementation rather than simply providing the intervention. Factors such as individual perceptions, side effects, and environmental support may influence adherence, although they are not always systematically measured in the literature.

Physical Activity

The relationship between physical activity and anemia is more variable compared to other factors. Evidence from some studies indicates that high intensity activity is associated with increased anemia risk(21,22). However, this association is not consistently observed, likely due to differences in measurement and the lack of consideration for confounding factors such as nutrition. These findings suggest that physical activity acts as a contextual factor rather than a direct determinant. Its impact depends on the balance between physical demands and nutritional intake, where inadequate nutrition combined with high activity levels may aggravate anemia.

Integrated Synthesis of Determinants

Anemia among adolescent girls remains a significant public health concern globally, particularly in settings where nutritional and social challenges are closely intertwined (23,24). When the findings are examined in an integrated manner, anemia appears to be most strongly associated with the interaction between nutritional status, dietary patterns, and socioeconomic conditions, which together shape both biological and structural vulnerability. These three factors consistently emerge across studies and do not operate independently, but rather reinforce one another through complex mechanisms such as limited access to nutritious foods and poor dietary quality (6,7,17). In this context, nutritional status reflects not only the adequacy of intake but also serves as a cumulative indicator of socioeconomic conditions that influence food choices and availability. At the same time, unbalanced dietary patterns, particularly low intake of iron and protein, accelerate nutritional deficiencies that lead to anemia. Other factors, including menstrual patterns, adherence to supplementation, and level of knowledge, act as secondary determinants that may either amplify or reduce risk, although findings related to these factors tend to be more variable. These observations suggest that anemia is a multifactorial condition arising from an imbalance between physiological needs and nutrient intake, shaped by multiple determinants simultaneously. From a methodological perspective, the predominance of cross sectional designs in the reviewed studies limits the findings to associative relationships, which are insufficient to establish clear causal links (1). Therefore, further research using longitudinal or experimental designs is needed to better capture causal dynamics and strengthen the evidence base for intervention policies.

CONCLUSION AND RECOMMENDATION

Anemia among adolescent girls emerges as a multifactorial condition shaped by the dynamic interaction between nutritional status, dietary patterns, and socioeconomic conditions, which consistently appear as the most influential determinants across studies. These findings highlight that the risk of anemia is not driven by isolated factors, but by interconnected mechanisms that simultaneously affect nutritional intake, physiological needs, and access to resources. Consequently, interventions that focus on a single aspect, such as supplementation or education alone, are unlikely to produce optimal outcomes. A more effective strategy requires an integrated approach that combines nutritional improvement, sustainable dietary behavior change, and strengthened socioeconomic support, particularly for vulnerable groups. This study contributes by providing an integrated synthesis that clarifies how these determinants interact rather than operate independently in shaping anemia among adolescent girls. Future research should therefore move beyond cross-sectional designs and prioritize longitudinal and interventional approaches to better capture causal pathways and to inform more precise and sustainable prevention strategies.

REFERENCES

1. Rahman RA, Fajar NA. Analisis Faktor Risiko Kejadian Anemia pada Remaja Putri: Literatur Review. Jurnal kesehatan komunitas (Journal of community health). 2024 Apr 6;10(1):133–40. doi:10.25311/keskom.vol10.iss1.1403
2. Utaminingtyas F, Mufidaturrosida A, Maria A, Agustina CE, Wahyuni I, Sasanti SD. Penyuluhan Kesehatan Tentang Mengenal Ciri-Ciri Pubertas Pada Remaja Melalui Media E-Booklet. Jurnal Pengabdian Masyarakat Aufa (JPMA. 2024. Report.
3. Harun A, Amir F, Imran A. Karakteristik Siswi Dengan Kejadian Anemia Pada Remaja Putri di Kota Makassar. Jurnal Media Kesehatan Politeknik Kesehatan Makassar. 2025 Jun. doi:10.32382/medkes.v20i1
4. Suaib F, Sahariah Rowa S, Adwiah W. Hubungan Kepatuhan Konsumsi Tablet Tambah Darah Dengan Kejadian Anemia Pada Remaja Putri. Jurnal Media Kesehatan Politeknik Kesehatan Masyarakat Makassar. 2024 Jun;19(1). doi:10.32382/medkes.v19i1
5. Ariana R, Fajar NA. Analisis Faktor Risiko Kejadian Anemia pada Remaja Putri: Literatur Review. Jurnal kesehatan komunitas (Journal of community health). 2024 Apr 6;10(1):133–40. doi:10.25311/keskom.vol10.iss1.1403
6. Wanti S, Suhadi, Meliahsari R. Hubungan Antara Status Gizi, Pola Makan Dan Aktivitas Fisik Dengan Anemia Pada Temaja Putri Di Simpn 02 Libureng Kabupaten Bone. Jurnal Gizi dan Kesehatan Indonesia. 2023 Oct;5:2797–5894. doi:10.37887/jgki.v2i4
7. Pavithran S, Patil SK. The prevalence of anaemia in rural adolescent girls – A cross-sectional study to understand the sociodemographic and dietary determinants in Dharwad District, India. J Family Med Prim Care. 2024 Aug;13(8):2886–91. doi:10.4103/jfmpc.jfmpc_1732_23
8. Fitri Sevrilianti Boimau, Afrona E. L Takaeb, Maselinus Laga Nur. Faktor-Faktor yang Berhubungan dengan Kejadian Anemia pada Remaja Putri di SMA Negeri 2 Kupang Tengah. SEHATMAS: Jurnal Ilmiah Kesehatan Masyarakat. 2024 Jan 28;3(1):185–92. doi:10.55123/sehatmas.v3i1.3158

9. Nurhidayati VA, Khomsan A, Riyadi H, Prasetya G, Rizkiriani A, Amelia R. Frekuensi Konsumsi Pangan Sumber Zat Besi serta Pangan Pendukung dan Penghambat Penyerapannya pada Remaja Putri. Pontianak Nutrition Joournal. 2025 Mar;8.
10. Novita TL, Ningtyias FW, Ratnawati LY. Hubungan Ketahanan Pangan Keluarga Dan Tingkat Konsumsi Zat Besi Dengan Kejadian Anemia Dan Prestasi Belajar Pada Remaja Putri. Journal of Nutrition College. 2024;13(3).
11. Martiasari A, Susaldi, Mariana Mangoto S, Rizky Salsabilla D, Muhayaroh, Saraswati P, et al. Hubungan Pengetahuan Status Gizi dan Pola Menstruasi Pada Anemia Remaja Putri. SIMFISIS Jurnal Kebidanan Indonesia. 2022 Feb 28;1(3):131–7. doi:10.53801/sjki.v1i3.18
12. Handayani L, Dewi Iswandari N, Studi Sarjana Kebidana P, Kesehatan F, Sari Mulia U, Studi Pendidikan Profesi Bidan P, et al. Hubungan Pola Makan Dengan Kejadian Anemia Pada Remaja Putri di Madrasah Aliyah Swasta Normal Islam Puteri Rakha Amuntai. Health Research Journal of Indonesia (HRJI). 2025. Report.
13. Juliyanti A, Prasetyo Budi N, Sari RP, Studi MP, Keperawatan I, Madani Y, et al. Hubungan Tingkat Pengetahuan Dengan Kejadian Anemia Pada Remaja Putri Di SMAN 25 Kabupaten Tangerang. Jurnal Penelitian Nusantara. 2025;1:82–6. doi:10.59435/menulis.v1i10.662
14. Poudel S, Panta G. Knowledge regarding of Iron Deficiency Anemia among Adolescent Girls of Chitwan. Pragya Darshan. 2023 Aug;5(2):2542–634.
15. Yusmaharani Y, Ratih RH, Nurmaliza N. Hubungan Pengetahuan Dan Jenis Makanan Yang Di Konsumsi Untuk Mencegah Anemia Pada Remaja Di Pekanbaru. JOMIS (Journal of Midwifery Science). 2023 Jan 28;7(1):1–8. doi:10.36341/jomis.v7i1.2798
16. Damayanti Y, Saputri EE, Ratnasari F, Tangerang SY. Gambaran Tingkat Pengetahuan Remaja Putri Tentang Anemia Di Sma Babus Salam Kota Tangerang. Nusantara Hasana Journal. 2021 Aug;1(3):Page.
17. Gore MN, Drozd ME, Patil RS. Anemia Prevalence and Socioeconomic Status among Adolescent Girls in Rural Western India: A Cross-Sectional Study. Ethiop J Health Sci. 2024;34(1):57. doi:10.4314/ejhs
18. Situmeang AMN, Apriningsih A, Makkiyah FA, Wahyuningtyas W. Hubungan Pengetahuan, Sikap, dan Sosioekonomi dengan Perilaku Pencegahan Anemia pada Remaja Putri di Desa Sirnagalih, Bogor. Jurnal Kesehatan Komunitas. 2022 Apr 30;8(1):32–9. doi:10.25311/keskom.vol8.iss1.1126
19. Riandi I, Yuniarti, Hipni R, Hapisah. Hubungan Kepatuhan Konsumsi Tablet FE Dengan Kejadian Anemia Pada Remaja Putri di SMPN 2 Karang Intan Wilayah Kerja Puskesmas Karang Intan 2 Kabupaten Banjar Tahun 2024. Jurnal Penelitian Multidisiplin Bangsa. 2025;(8).
20. Gosdin L, Sharma AJ, Tripp K, Amoaful EF, Mahama AB, Selenje L, et al. A School-Based Weekly Iron and Folic Acid Supplementation Program Effectively Reduces Anemia in a Prospective Cohort of Ghanaian Adolescent Girls. Journal of Nutrition. 2021 Jun 1;151(6):1646–55. doi:10.1093/jn/nxab024 PubMed PMID: 33758915.
21. Yamamoto K, Takita M, Kami M, Tsubokura M, Tanimoto T, Kitamura T, et al. Profiles of anemia in adolescent students with sports club membership in an outpatient clinic setting: A retrospective study. PeerJ. 2022 Feb 25;10. doi:10.7717/peerj.13004

22. Putri HP, Fauziyah A. Knowledge about Anemia and Physical Activity with the Incidence of Anemia Among Adolescent Girls. Jurnal Ilmiah Kesehatan (JIKA). 2023 Aug 31;5(2). doi:10.36590/jika.v5i2.520
23. World Health Organization. Anaemia in women and children: Global estimates and trends [Internet]. 2023. Report. Available from: https://www.who.int
24. UNICEF. Adolescent nutrition: The neglected dimension of global health. 2023. Report.