



## **STRENGTHENING ANEMIA PREVENTION AMONG ADOLESCENT IN TIMOR LESTE : A SYSTEMATIC REVIEW**

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### **Abstract**

*Anemia remains a significant public health concern in Timor-Leste, particularly among adolescents, primarily due to rapid developmental changes and inadequate nutrition. Its impact includes fatigue, diminished concentration, and lowered immune function. Promoting nutritional awareness among teenagers can lead to healthier eating habits, increased iron consumption, and better adherence to supplement regimens. Supplementing with iron and folic acid has proven effective in preventing iron deficiency and supporting proper growth. Enhancing education about nutrition is vital in mitigating anemia and fostering both academic performance and overall adolescent well-being. A systematic review was conducted in line with PRISMA guidelines, using databases such as PubMed, Google Scholar, and Science Direct to locate pertinent studies. The review focused on empirical investigations that aimed to improve adolescent anemia prevention, utilizing qualitative, quantitative, or mixed-method approaches. From an initial pool of 568 studies, 10 met the eligibility requirements and were included in the final synthesis. Key findings emphasized the critical role of nutrition education and the consistent use of iron supplements. The review also highlighted the need for future studies to concentrate on strategies that enhance long-term adherence.*

**Keywords:** *Strenhening, Prevention, Anemia, Adolescent*

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PENDAHULUAN

Anemia in adolescents can lead to poor academic performance, reduced attention span, memory impairment, and higher dropout rates. It may also weaken the immune system and increase susceptibility to infections. Iron and folic acid supplementation is a proven and effective strategy to address this widespread health issue and ensure that girls receive the essential nutrients needed for healthy growth and development

Strengthening anemia prevention programs for adolescent girls is essential and should be implemented through an integrated approach. This approach involves appropriate nutrition education in schools, active family and community engagement, as well as iron supplementation and food fortification. An effective strategy is to enhance adolescents’ capacity through interactive nutrition education programs that raise awareness of the importance of consuming nutritious foods

Adolescence is an opportune time for interventions to address anemia, as it is a period of rapid growth and development. Providing iron and folic acid supplementation during adolescence and continuing into adulthood can improve iron status and reduce the risk of iron deficiency and anemia. Iron and folic acid supplementation is a key public health intervention designed to fill the nutritional gap. In Timor-Leste, the distribution of free iron and folic acid tablets aims to help prevent anemia among adolescents.

Adolescent anemia is a rising public health concern linked to rapid growth, iron deficiency, poor diet and menstrual blood loss.Kounnavong et al.,( 2020) .Between 1990 and 2016, the number of adolescents worldwide with anemia increased by 20%, affecting nearly 1 in 4 adolescents. Iron deficiency is the primary cause, accounting for approximately 50% of all anemia cases globally Gillespie et al,(2023).

Anemia affects nearly one in four adolescent girls in Ethiopia, posing significant health risks during this critical stage of development. The risk is particularly high among older adolescents (ages 15–19), those living in rural areas, and individuals with limited dietary diversity and inadequate nutrient intake. These findings underscore the urgent need for targeted interventions especially in rural settings including nutritional education, iron supplementation, and dietary support for this vulnerable age group Habtegiorgis et al,(2022)

Nutrition education improved girls knowledge, dietary, diversity and and academic performance health belief model based strategies proved highly efectives.Yazew et al, (2024)

Health education significantly improved participants knowledge levels. Enhancing nutrition for adolescents particularly addressing anemia among girls is essential for interrupting the ongoing cycle of malnutrition from one generation

to the next.(Timor Leste Food and Nutrition Survey 2020).

About 23% of women in Timor-Leste suffer from anemia, with rates higher among the less educated and low-income groups. This reflects wider public health issues linked to poor diet, limited health knowledge, and access difficulties. Solutions include better nutrition and iron supplementation.(Survey &Finding,2016).

METHOD

This systematic review followed the PRISMA guidelines to ensure transparent and comprehensive reporting. The findings highlight the importance of enhancing prevention strategies particularly through nutritional education and behavioral interventions to effectively reduce anemia among adolescents in Timor Leste.

Literature Search Method

Common approaches for conducting literature searches involve using databases such as PubMed, Google Scholar, and Science Direct .

Tabel 1. search term for Strengthening anemia prevention among adolescents in Timor Leste

No	Keyword	Search
1	Strengthening anemia prevention	"iron supplementation" OR "iron tablets" OR "compliance" OR "adherence" OR "monitoring" OR "anemia"
2	Adolescents	"adolescent girls" "adolescent girls"

Data Abstraction

To be considered in the article review, each study must fulfill specific inclusion criteria and demonstrate relevance to the research focus. Selected studies are then organized into a table summarizing key details such as the researcher's name, study location, research design, sample characteristics, and findings. Studies involving pregnant women or children are excluded based on the predetermined exclusion criteria.

RESULT AND DISCUSSION

Data collection process: initial search retrieved 568 articles using database Pubmedm Scioncedirect, Google Scholar, after removing 94 duplicates, 474 titles /abstracts were screened, 40 full-text article were reviewed , final selection 10 studies that met all inclusiona criteria.

Studies showed key strategies nutrition education, compliance factors, knowledge gains, and improved hemoglobin and anemia rates.

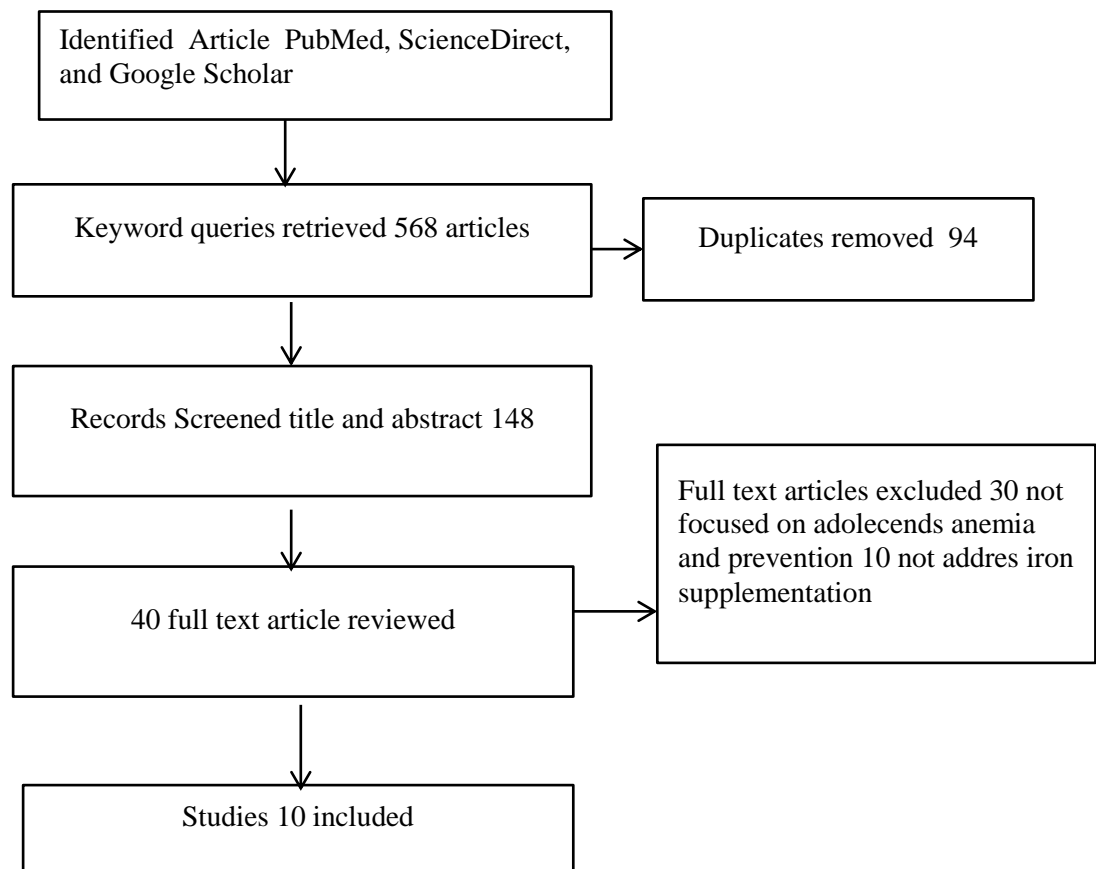


Figure 1. Flowchart outlining the study selection process using the PRISMA framework.

Sytematic Review

This systematic review explores both strategies for preventing anemia and the use of blood supplementation tablets, selecting studies based on established research criteria.

Author &Year	Method	Sample Size	Findings	Recommendations
(Habtegiorgis et al., 2022)	Cross Sectional Quantitative	5,547 adolescent girls of Ethiopia	<b>Anemia: 23.02%</b> (95% CI: 17.21%–28.84%).	Ethiopian adolescent anemia stems from older age, rural residence, and limited dietary diversity and nutrients.
(Silitonga et al., 2023)	Mix -method	20 studies sample sizes varied	Compliance varied (26.2%–80%), influenced by misconceptions; education and peer support improved adherence.	Adherence is hindered by multiple factors holistic community focused strategies and consistent support are key to improving compliance sustainably
(da Silva Lopes et al., 2021)	A quantitative research method	4 reviews focused specifically on adolescents	Iron and folic acid supplements raised hemoglobin; counseling effectively reduced adolescent anemia risk.	Confirms that daily iron supplements are effective for boosting blood iron across life stages.
(Gillespie et al., 2023)	Qualitative	Total adolescent participants: 39 due to their higher risk of anemia	Many teen girls lacked anemia awareness and understanding, peer influence, and cultural limitations	Strengthen school nutrition education with support from families, communities, and health sectors to raise awareness and tackle adolescent anemia effectively

(Purnadhibrata, 2019)	Quantitative	100 adolescent girls	Nutrition education boosted knowledge scores significantly improved iron tablet intake.	Anemia education improved awareness timely school Fe distribution and ongoing outreach are vital for protecting vulnerable adolescent groups
(Saputri, 2023)	Pre experimental study	43 adolescent girls	Most girls (55.8%) skipped weekly iron tablets anemia prevalence dropped slightly from 55.82 % to 44.18% after intervention	Low adherence to iron tablet use stemmed from minimal understanding and support; improving cooperation and school monitoring is advised
(Samson et al., 2022)	Mix Method	Adolescent from diverse regions including Asia, Africa, Europe and North total 50	Iron supplements occasionally enhanced school scores and focus but memory and intelligence gains were limited many studies lacked strong reliability	Iron’s role in learning is uncertain; findings hint at benefits, but stronger studies are needed. School iron programs may help adolescents.
(Pai et al., 2023)	Qualitative approach	Experts’ varied expertise guided Delphi consensus, shaping tailored women’s health recommendations across Asia-Pacific.	Delphi consensus shaped clinical pathways; 84% agreement on detection, prevention, and treatment of ID/IDA.	The study created region-specific ID/IDA guidelines, prioritizing prevention for overlooked women using expert consensus.
(Abdulkadir et al., 2019)	Quantitative study grounded in epidemiological data.	24 studies covering 14,062 participants Meta-Analysis: 20 studies including 12,288 children and adolescents	42.1% of adolescents are anemic girls are at higher risk due to diet, menstruation, and infections.	Bangladeshi adolescent anemia remains high; girls face greater risks from nutrition gaps and infections.
(Mbou et al., 2025)	Quantitative study	511 randomly selected Douala adolescents (50.7% girls) were studied mid-2023 across four diverse school districts.	Anemia affected 40.3% of Douala adolescents; rural living, menarche, illness, and no supplements raised risk.	Study highlights 40.3% anemia in Douala adolescents, urging school nutrition, iron aid, and targeted rural interventions.

An effective anemia prevention program for adolescents particularly in Timor Leste should take a multifaceted approach, incorporating nutritional education, iron supplementation, and active support from schools and families to boost adherence to iron tablet intake. Key elements that enhance the success of such programs:

1. Nutrition Education

Nutrition education improved girls knowledge, dietary, diversity and academic performance health belief model based strategies proved highly effective. (Yazew et al., 2024) There is a clear need to establish educational initiatives aimed at preventing iron deficiency anaemia, especially ones that are accessible and effective for all at-risk populations.(Purnadhibrata, 2019) Bangladeshi

adolescent girls face elevated anaemia risk; gaps in nutrition, data, and healthcare highlight need for action.(Abdulkadir et al., 2019) Nutrition education improved iron intake, reduced anaemia, boosted nutrition knowledge, and promoted healthier eating among Ghanaian adolescents.(Wiafe et al., 2023) Iron-deficiency anaemia in adolescents may impair attention and concentration, potentially affecting academic achievement and cognitive performance.(Samson et al., 2022) Global study maps anaemia in 82 LMICs progress slow, subnational disparities persist iron deficiency and malnutrition major causes.(Kinyoki et al., 2021).

Nutrition education plays a crucial role in improving iron intake, knowledge, and academic achievement in adolescent girls. A good strategy

for nutrition education involves conducting baseline surveys. These surveys are conducted in schools and communities, especially for adolescent girls in low- and middle-income countries (LMICs), highlighting the urgent need for accessible initiatives. Iron deficiency anaemia impairs cognitive function, reinforcing the importance of targeted nutrition interventions for vulnerable adolescents.

## 2. Consistency and Commitment in Iron Tablet Consumption

Adherence to weekly iron tablet intake among female adolescents remains low, influenced by environmental factors, teachers, and individual commitment. Strengthening self-discipline and consistent consumption can effectively lower anaemia rates in this group.(Saputri, 2023). Anaemia affected 40.3% of Douala adolescents, worsened by rural living and lack of supplements. Consequences include impaired growth and cognitive skills, compounded by emotional strain from unstable family conditions. Action needed: school nutrition, iron access, and targeted rural programs.(Mbou et al., 2025). Prevention is emphasized, with WHO and Delphi experts endorsing daily or intermittent iron supplementation for all women—in high-prevalence regions. Oral ferrous iron is recommended as the first-line treatment, with intravenous iron reserved for specific cases. Multinutrient combinations also gained support.(Pai et al., 2023). Study found 37.7% anaemia prevalence in Bangladeshi girls, linked to under nutrition, irregular lunch, working mothers, poor sanitation habits. (Rahman et al., 2024) Providing iron supplements, especially for adolescent girls, can significantly enhance blood health and raise haemoglobin levels, especially when combined with folic acid.(da Silva Lopes et al., 2021) About 66.1% of girls consistently took supplements for three months. Compliance was boosted by strong collaboration. Barriers included absenteeism, side effects, misconceptions, and poor knowledge. Improved education, flexible scheduling, and family support could enhance adherence.(Haile et al., 2024) Adolescent iron compliance varies widely influenced by personal belief, support system, side effects, education and community engagement efforts.(Silitonga et al., 2023) Adolescent face iron deficiency risk from poor diet, menstruation, and growth, Dietary counselling and tailored supplementation improve outcomes.(Cohen & Powers, 2024)

Iron tablet consumption among adolescent girls remains low, influenced by environmental factors, personal perceptions, self-confidence, and lack of support. Effective strategies include nutrition education, family and school support, access to supplements, community-based programs, especially in vulnerable areas, and strengthening close supervision.

## Implications and Finding Research

The findings of this study confirm that an educational and participatory approach is an effective strategy for preventing anemia in adolescents, particularly through nutrition education, iron supplementation, and school and family involvement. Future research should explore strategies for rigorous and effective monitoring.

## CONCLUSION

Preventing anemia in adolescent girls requires a holistic and sustainable strategy. Nutrition education plays a crucial role in improving their understanding, attitudes, and behaviors regarding nutrient intake, particularly iron, which is crucial during growth and reproductive development. With consistent and focused educational efforts, adolescent girls will become more aware of how anemia can impact their health, academic performance, and long-term well-being.

However, the effectiveness of anemia prevention does not depend solely on iron supplementation. True success depends on adolescents' commitment to regular iron consumption, which requires not only access but also strong motivation and personal awareness. To encourage sustainable behavior change, initiatives must be supported by schools, families, and healthcare providers.

When nutrition education is sustained and paired with strong encouragement to consistently take iron supplements, anemia prevention efforts can become more impactful, far-reaching, and enduring—ultimately promoting better health for today's adolescents and generations to come.

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