

**THE IMPACT OF HEALTH EDUCATION ON KNOWLEDGE, ATTITUDE, PRACTICE,  
AND PREVENTION OF IRON DEFICIENCY ANEMIA AMONG ADOLESCENT  
FEMALES: A SYSTEMATIC REVIEW**

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***Review article***

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## ABSTRACT

**Introduction:** Women in reproductive age are at high risk of iron deficiency anemia during the menstrual cycle. Adequate knowledge, attitudes, practices, and prevention towards anemia are necessary. There is a dearth of information on the evaluation of study characteristics and the overall quality of evidence of intervention studies in improving knowledge, attitudes and practices of anemia among adolescents.

**Aim:** The purpose of this study is to examine the impact of health education interventions on the knowledge, attitudes, practices, and prevention towards anemia in adolescent girls. Therefore, the review question are “What health education methods are best used to improve knowledge, attitudes, practices, and prevention of adolescent?”, “What is the effect of health education interventions on anemia in adolescent girls?”

**Methods:** This systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols) Checklist which involved studies published between 2000 to 2021 through the databases of PubMed, ScienceDirect, Willey online Library, Cochrane, in English version. Study quality assessed using the National Institutes of Health (NIH) on controlled intervention studies. The risk of bias of the studies included assessed using The Cochrane Risk of Bias Assessment Tool. Data of the studies included were synthesized thematically in order to understand the effectiveness of mobile application. At identification stage, there are 1,414 publications were discovered through backward searching of relevant papers. The full-text screening was conducted on 34 articles and the finding 22 articles failed to meet eligibility criteria at the full-text screening stage, and only 12 articles were finally eligible for further analysis. There are twelve studies included in this study, strengthening the components of health education and increasing Iron-Folic Acid (IFA) knowledge among adolescent girls is beneficial in reducing iron deficiency anemia in adolescent girls

**Results:** The results of the review article showed that health education interventions, giving iron supplements and multivitamins were effective in overcoming iron deficiency anemia in adolescent girls. Educational interventions also increase the knowledge of young women about iron deficiency anemia

**Conclusions:** Health Education intervention for the treatment of iron deficiency anemia among adolescent female improved their knowledge, attitude, practice, and prevention

**Keywords:** adolescent girl, health education, iron deficiency anemia, anemia

## INTRODUCTION

Anemia is a medical complication in which the number and size of red blood cells, or the hemoglobin concentration, falls below the reference range. It has the potential consequence of impairing or reducing the capacity of the blood to transport oxygen throughout the body [1–3]. Anemia is resulting from both poor nutritional status and/or poor health condition. Globally the most significant cause of anaemia is iron-deficiency (ID). The onset of anemia secondary to iron deficiency is generally assumed to account 50% of anemia occurred in the world [4].

Women of reproductive age (adolescent girls) are at a high-risk group so that 25% of students suffer iron deficiency anemia during the menstrual cycle [5,6]. Because in a period of growth and development, they need iron every day is more than 3 times that of young men [7]. The results study by Gunatmaningsih [8] showed that respondents in a period of menstruating have 1.842 times greater risk of anemia, the duration of menstruation is a predictor of anemia [9]. Blood loss during menstruation can lead the iron deficiency anemia. The amount of blood lost during one menstrual period ranges from 20-25 cc, iron loss 12.5-15 mg/month, or 0.4-0.5 mg/day. If this is added to the basal loss of 1.25 mg/day, then the total amount of iron lost is 1.25 mg/day. The volume of blood that comes out more than 80 ml occurs in adolescents who have long menstrual periods [10]. Menstrual problems can interfere the school activities and daily activities too [11].

Another factor that can exacerbate anemia in adolescent girls is the lack of iron intake, where iron in adolescent girls is needed to accelerate growth and development. The results of Shalini's research in India found that the intake of iron-rich foods low was 72% [12]. Tangerang indicated that the total iron intake in girls aged 10–12 years who suffered from anemia was only 5.4 mg/day or 25%, which is lower than the daily requirement of 20 mg/day according to the 2013 Nutritional Adequacy Ratio (RDA) [13].

Anemia causes fatigue, decreased learning concentration that impact learning achievement, can reduce work productivity [14] and quality of life in adults [15]. Anemia can reduce the body's

resistance so which can increase the risk of infection. The high prevalence of anemia among adolescents if not handled properly will continue into adulthood and contributed greatly to the increase in maternal mortality (MMR), the risk of giving birth to babies with low birth weight (LBW), and stunting [14,16].

WHO (2014), has a target in 2025 to reduce the prevalence of anemia in women of childbearing age by 50% [5]. In WHO (2011) recommendations for the prevention of anemia for adolescent girls and women of childbearing age by focusing on promotive and preventive activities, through efforts to increase consumption of nutrients that contain lots of Fe, provide blood-added tablets, and increase fortification of foodstuffs with iron and acid folate. Blood supplement tablets are iron folate tablets where each tablet contained 200 mg of ferrous sulfate as well as 60 mg of elemental iron and 0.025 mg of folic acid [17].

A few studies have shown that supplementation of tablets containing 200 mg of ferrous sulfate and 0.25 mg of folic acid that increases in average Hb in adolescent girls after being given treatment [18,19]. The results of the Singh RS research (2018), effective nutritional counseling and supplements play an important role in preventing nutritional deficiencies, such as anemia [20]. Education/counseling to parents increases the cure rate for anemia in preschool-aged children, through increasing adherence to IFA consumption [21]. Adolescence also is a unique point of intervention as people of this age group are more receptive to changes in lifestyle that may determine their life course later [22]. Previous studies showed that adolescents have poor knowledge, attitudes and practices about malnutrition and dietary intake [23],[24],[25],[26]. Providing them with knowledge about iron deficiency could prevent them from anemia and the impact later in life. Enhancing health education interventions on knowledge, attitudes and practices, especially among adolescents, is potentially important in reducing anemia and mitigating short and long term consequences associated with health outcomes and those of their future offspring. There is a dearth of information on the evaluation of study characteristics and the overall quality of

evidence of intervention studies in improving knowledge, attitudes and practices among adolescents especially in Asia region. Since the mid-1800s, when nursing was first acknowledged as a unique discipline, the responsibility for teaching has been recognized as an important role of nurses as caregivers. The focus of nurses' teaching efforts is on the care of the sick and promotion of the health of the well public. In accordance to this review topic, a nurse has a great responsibility to teach people regarding nutritional anaemia. This systematic review aimed to examine the impact of health education interventions on the knowledge, attitude, practice, and prevention of iron deficiency anemia among Asian adolescent girls. This review provides an overview of the importance of educational interventions, and nurses may play an important role in educating families about anaemia and empowering them to achieve the best possible outcomes for adolescent.

## MATERIAL AND METHODS

### Review Protocol

We used the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement 2020 in conducting this study [27]. The study analyzed the effectiveness of health education in preventing anemia among adolescent females based on peer-reviewed studies published from 2000 to 2021. The participants, intervention, comparator, outcome, and study design (PICOS) criteria outlined in Table 1 were used to select studies for inclusion in this review.

Criteria	Inclusion criteria
Participants	Adolescent female aged 12 to 20 years old
Intervention	Health education using a variety of methods, such as Group discussion, face to face, videos, etc
Comparisons	Treatments with a single arm and interventions with many arms (with a comparison intervention or nonintervention control group)
Outcomes	Knowledge, attitude, practice, prevention
Study Design	Experimental studies (eg, randomized controlled trials, quasi-experimental, pre- and post-test study with no control)

**Table 1.** *Studies Criteria based on PICOS*

## Searching strategy

Databases used in collecting relevant literature include Sciencedirect, Cochrane library (Central), Pubmed, and the Wiley Online Library. We could not use other databases due to limited access or are not free access. The defined keywords adhere to the Mesh term for health research. The keywords being used are varied because they are tailored to the search engine. The keywords focus on nutritional education, empowering, Educational intervention, peer education, health promotion OR Health information AND iron deficiency anemia OR anemia AND adolescent girls OR female students. A summary of keywords combination used in each database used is reported in Table 2.

Database	Keywords combination using Boolean operator
Sciencedirect	((((((("nutritional education"[Title/Abstract]) OR ("health promotion"[Title/Abstract])) OR ("adolescent educational"[Title/Abstract])) AND (((("knowledge"[Title/Abstract]) OR ("attitude"[Title/Abstract])) OR ("practice"[Title/Abstract])) AND ((("prevention"[Title/Abstract]) AND ((("anemia"[Title/Abstract]) OR ("iron deficiency"[Title/Abstract]))
CENTRAL (Cochrane)	((((((("health education"[Title/Abstract]) OR ("health promotion"[Title/Abstract])) OR ("peer education"[Title/Abstract])) OR ("community education"[Title/Abstract])) OR ("adolescent educational"[Title/Abstract])) AND (((("knowledge"[Title/Abstract]) OR ("attitude"[Title/Abstract])) OR ("practice"[Title/Abstract])) AND ((("prevention"[Title/Abstract]) OR ("prevent"[Title/Abstract])) AND ((("anemia"[Title/Abstract]) OR (anaemia[Title/Abstract])) OR ("iron deficiency"[Title/Abstract]))
Pubmed	((((((("health education"[Title/Abstract]) OR ("health promotion"[Title/Abstract])) OR ("peer education"[Title/Abstract])) OR ("community education"[Title/Abstract])) OR ("adolescent educational"[Title/Abstract])) AND (((("knowledge"[Title/Abstract]) OR ("attitude"[Title/Abstract])) OR ("practice"[Title/Abstract])) AND ((("prevention"[Title/Abstract]) OR ("prevent"[Title/Abstract])) AND ((("anemia"[Title/Abstract]) OR (anaemia[Title/Abstract])) OR ("iron deficiency"[Title/Abstract]))
Wiley Online Library	((((((("health promotion"[Title/Abstract])) OR ("peer education"[Title/Abstract])) OR ("community education"[Title/Abstract])) OR ("adolescent educational"[Title/Abstract])) AND (((("knowledge"[Title/Abstract]) OR ("attitude"[Title/Abstract])) OR ("practice"[Title/Abstract])) AND ((("prevention"[Title/Abstract]) AND ((("anemia"[Title/Abstract]) OR (anaemia[Title/Abstract])) OR ("iron deficiency"[Title/Abstract]))

**Table 2.** Search strings in databases

## **Eligibility Criteria**

We included all studies with evidence reporting the effectiveness of educational interventions in reducing and preventing iron deficiency anaemia, published from January 2000 to December 2021, written in English, and published in peer-reviewed journals. All studies using adolescent female or female students in either school or community-based settings are included in this review. Health education in any methods, intervention duration of three days at minimum, and followed up on a week, month, or year are also included in this study. Studies that reported incomplete information were excluded from duplicate publications, systematic reviews, commentaries, and letters to editors that did not provide primary data.

## **Information Source**

After compiling keywords that match the Mesh terms, the next step is to start searching the database with free access status. The time span determined by the authors has been mutually agreed upon and is considered sufficient to describe the theme raised. Literature searches on Sciencedirect were conducted in June 2021, Cochrane library in November and December 2021, Pubmed in May 2021, and the Wiley Online Library in December 2021. We also carried out a hand search of articles, comments, letters to editors, and proceedings. The articles obtained are then collected into separate folders, for further screening. We also got several articles from the results of a bibliography search in the article.

## **Selection Process**

Two authors independently screened each record (title/abstract), disagreement between the authors resolved by first author. Screening is done by adjusting the title, objectives, and conclusions. Other required information is obtained from the main body of the study. The screening focus was based on the inclusion criteria of this systematic review.



### **Study Quality**

Methodologically, article quality assessment used tools from the National Institutes of Health (NIH) on controlled intervention studies. There is an assessment sheet for assessing the methodology and compliance with the inclusion criteria of this study. Scores <30% of the criteria were classified as "poor", scores between 30 and 70% were classified as "moderate", and scores >70% were classified as "good" study quality. We agreed to include articles that fall into the "fair" and "good" categories.

### **Risk of bias**

The Cochrane Risk of Bias Assessment Tool was used to evaluate the types of bias in each of the studies. The Cochrane Collaboration Risk of Bias Tool scale contains 12 items, which assess the internal and external validity of studies. The review evaluated and rated the 12 items. Items rated 'yes' were scored as '1', while no or unable to determine or unclear or non-applicable were all scored as '0'. Higher scores and percentages indicate a lower risk of bias. The level of bias within each category for each study was rated as 'high risk' or 'low risk'. Each criterion had equal weight, or the same value; the total score was calculated as the percentage of the maximum value obtained. Studies with scores above the mean score were considered to have a low risk of bias, while studies below the mean value are considered to have a high risk of bias.

### **Data Extraction and synthesis**

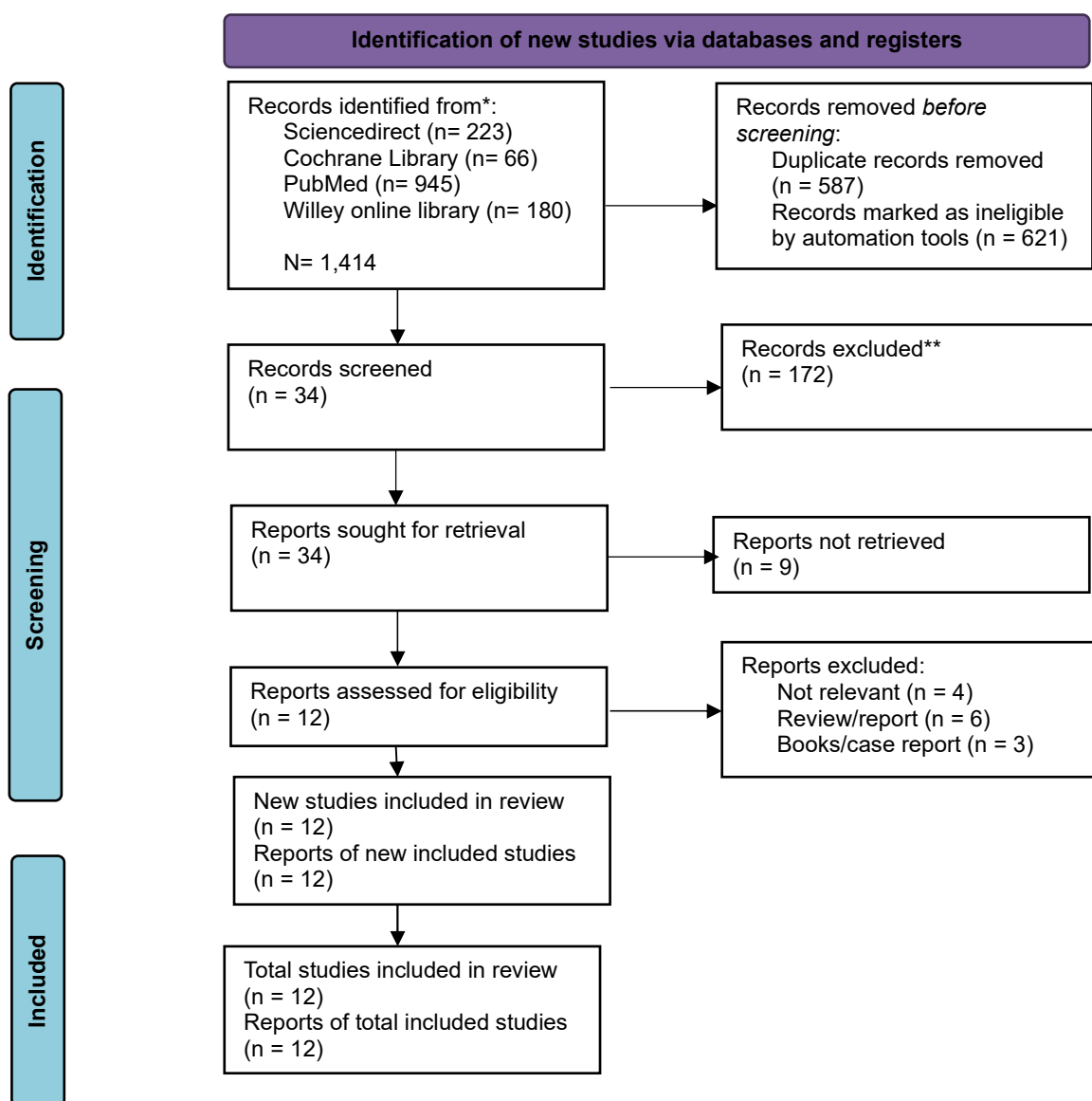
An independent author (SS, AJ) conducted the extraction. Discrepancies among those two authors are resolved by consensus after consulting with other investigators (MR) when failed to meet an agreement.

The extraction items consist of First author/year, country, study design (Quasi-experimental, Randomized Controlled Trial), sample size, age, type of intervention, outcomes.

## RESULTS

### Study Selection

A systematic electronic search identified that 1,414 publications were discovered through backward searching of relevant papers. The full-text screening was conducted on 34 articles. A total of 22 articles failed to meet eligibility criteria at the full-text screening stage, and only 12 articles were finally eligible for further analysis. The search results follow the PRISMA 2020 flow diagram (Fig. 1).



**Figure 1.** *PRISMA flow diagram for literature search*

Author, Year	Design	Country	Setting	Intervention	Target Population	Outcomes
Kotecha et al., 2009 [28]	Quasi	India	School based	- Supervised iron supplementation/week - Dietary advice using LEC - Health education	Grade 8 to 12 (2860 female students)	Anemia and the severity prevalence decreased
Chaluvaraj TSI, et al., 2018 [29]	Cross-sectional intervention	India	School based	Health education using lecture, presentations Interactive discussions using posters, booklet, and brochures	14 to 16 years old (100 girls)	Increased KAP
Kamalaja, T., et al., 2018 [30]	Quasi	India	Community based	4 months nutritional educational programme (Audio-visual aids)	300 female, 13 to 17 years old	Reduced prevalence of anemia, Increase KAP
Gandhi S. 2019 [31]	Quasi	India	School based	45 minutes long structured teaching program (lecture-cum demonstration method)	150 girls 12 – 16 years old	Increased knowledge
Lanerolle P, et al., 2000 [32]	Quasi	Srilanka	School based	45 minutes lecture using designed cards and flip charts	915 girls 13-19 years old	Increased knowledge
Bhalsod AS, et al., 2019 [33]	Quasi	India	School based	45 minutes single educational interventional training using power point, charts, demonstration, and discussion	100 girls 17-19 years old	Improved knowledge and preventive measures
Jalambo, et al., 2017 [34]	RCT	Palestine	School based	3 months intervention through lectures, wall writings, video, booklets, and brochures	89 female students 15 – 19 years old	Improved KAP
Amani R, & Soflaei, 2006 [35]	Quasi	Iran	School based	2 months face to face group discussions, and simple pamphlets	89 female students 16 to 18 years old	Improve knowledge and lifestyle choices
Sharifirad G, et al., 2011 [36]	Quasi	Iran	School based	4 sessions (60 min each) lectures based on precede model using poster, booklets, and pamphlets. Teaching methods conducted short lecture, group discussion, and showing educational films	72 high school girls	Positive effects in preventive health cares (IDA prevention), increase awareness and attitude
Jeihooni AK, et al., 2021 [37]	Quasi	Iran	School based	6 sessions (45 – 50 min each) small group discussion, Q&A, practical demonstration, video, powerpoint, and booklets	160 female students 7 <sup>th</sup> and 8 <sup>th</sup> grade	Improve preventive behaviors
Abu-baker N, et al., 2021 [38]	Quasi	Jordania	School based	4 sessions (45 min each) lectures, videos, and brochures	400 female students 8 <sup>th</sup> to 10 <sup>th</sup> grade	Improve KAP

					13-15 years old	
Peyman N, & Abdollahi M. 2017 [39]	Quasi	Iran	School based	4 hours workshop using white boards, booklets, pamphlets, and power point	120 female students First grade	Positive effects in preventing iron deficiency anemia

**Table 3.** *Characteristics of the studies included*

### Study characteristics

Of the 12 studies that met the criteria for this review, 5 were studies conducted in India, 4 were studies in Iran, and one was conducted in Sri Lanka, Jordan, and Palestine. The study designs used were also quite varied, but most of the studies used a quasi-experimental design with a case-control approach (n= 10), and each study used an RCT and cross-sectional intervention design.

### Quality Assessment

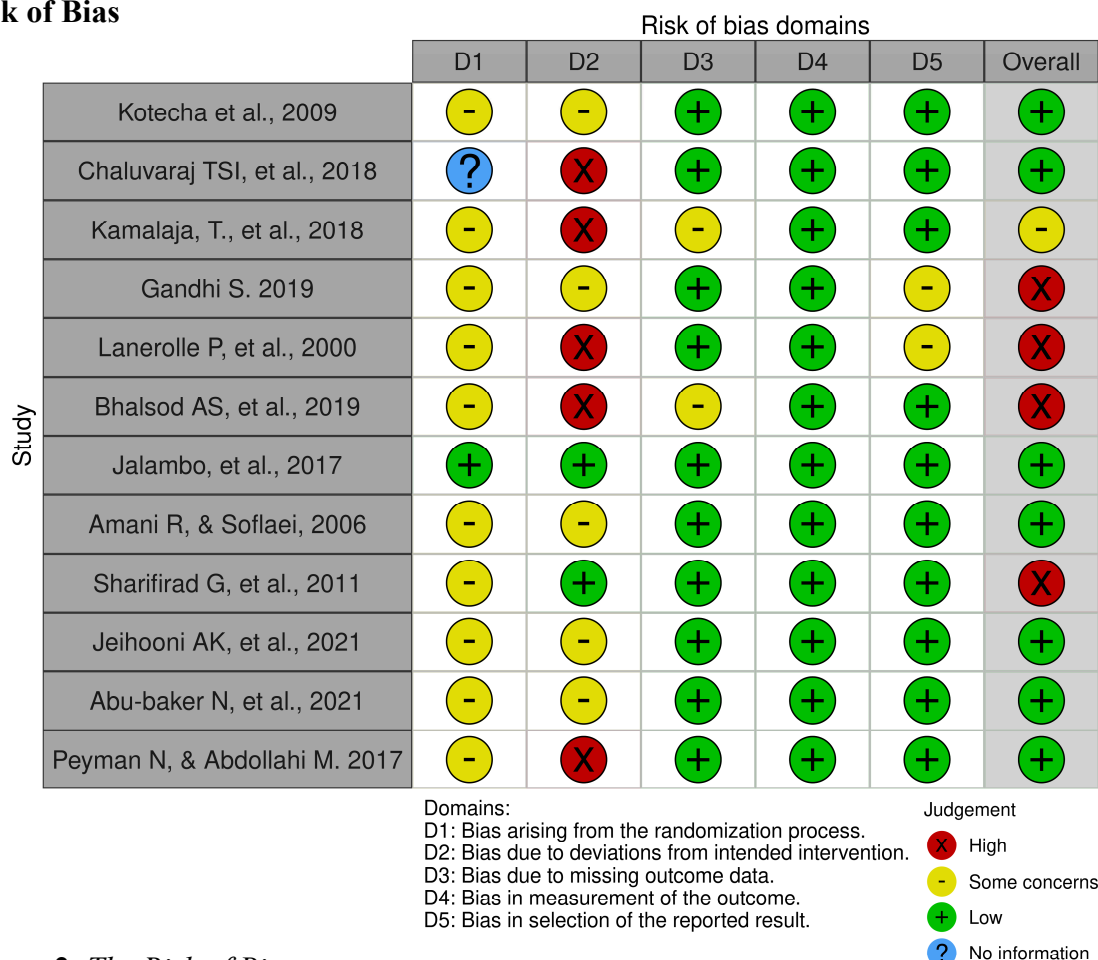
Assessment of the methodological quality of studies resulted in 6 studies with a good quality score [38] and 6 studies with a fair quality score [28].

Criteria	[28]	[29]	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]
1	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA
2	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA
3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	NR	Y	Y	NR	Y	NR	Y	Y	NR	Y	Y	Y
8	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
9	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
11	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
12	Y	Y	NR	NR	Y	Y	Y	Y	NR	Y	NR	Y
13	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
14	Y	Y	Y	Y	NR	Y	Y	NR	Y	NR	Y	NR

**Table 4.** *Summary of studies quality assessment based on NIH*

\*Y: yes; NA: not applicable; NR: not reported

## Risk of Bias



**Figure 2.** *The Risk of Bias summary*

## Study setting and participants

Only 1 out of 12 studies met the inclusion criteria using a community-based setting [30]. Participants involved in the whole study were in the age range between 12-19 years old (First grade to twelfth grade), which was categorized into adolescence. Furthermore, for the gender of the participants, many of the studies we excluded were using male and female participants.

## Types of intervention

The following interventions alone or in any combination were reviewed, such as Health education [28–31,33,36], Nutrition education [32,34,35,37,38], health information [39], and micronutrient supplementation (Iron) and dietary advice [28,32,34]. The shortest intervention

duration was 45 minutes [29,31–33] while the longest duration was three months [34].

### **Types of Outcomes**

We included all studies that met the inclusion criteria and limited access to relevant studies in other databases meant that we could not continue this review in the meta-analysis. For primary outcomes determined are Knowledge [31–33,35], Attitude, practice [29,30,34,38]. Meanwhile, secondary outcomes include decreased anaemia prevalence [28,30], improved prevention behaviour [33,36,37,39].

### **Knowledge, Attitude, Practice**

In their study, Chaluvraj et al. explained that despite numerous health education sessions in school, most female adolescents lack knowledge about anemia, its causes, prevention, and management. The study's overall findings indicated that female adolescents' knowledge, attitudes, and practices were moving in a desirable direction after the intervention. Adolescent healthcare services and facilities must be improved. Comprehensive nutritional education about anemia and its consequences for adolescents can pay considerable dividends in women's future lives [29].

According to the Kamalaja et al. study, rural adolescent girls lack essential health, food, and nutrition information. It could be due to a lack of purchasing power, access to nutritious food, false beliefs and taboos, and a lack of mass media such as TV, radio, and newspapers. Those methods provide information on good nutrition and a lack of government and non-government programs available for the health and well-being of adolescents. The health and nutrition education intervention significantly impacted subjects' nutrition knowledge [30].

Adolescent girls in the Gandhi study had moderately sufficient knowledge, attitude, practice of anemia prior to the teaching program. The majority (76.6 percent) of the adolescent children's knowledge became adequate after the structured video teaching program. Furthermore, there was no

correlation between knowledge level and selected demographic variables such as age, gender, education, family type, father's job, mother's job, and monthly income [31].

Balshod et al. discovered that a single educational session significantly improves adolescent girls' knowledge of anemia. Such education interventions are to be carried out regularly in order to improve their knowledge. It encourages them to live healthy lifestyles, preventing anemia and other micronutrient deficiencies [33].

Iron deficient female adolescents in Gaza were discovered to have insufficient nutrition knowledge, attitude, and practice which could contribute to their haemoglobin and ferritin levels. Normal ferritin and hemoglobin levels, on the other hand, necessitate good knowledge, a positive attitude, and good practice. A nutrition education intervention was found to significantly improve knowledge, attitude, and practice [34].

Amani and Soflaei study aimed to improve knowledge of adolescent through the nutrition campaign. The intervention resulted in a significant change in nutritional knowledge and food-group scores consumption of adolescent girls taking part in the public education campaign [35].

Abu-Baker et al. found that more than half of the participants had adequate overall knowledge, attitude, and practice of IDA, many had insufficient knowledge of related issues, such as prior knowledge of anemia, its consequences, or foods that increase iron absorption. Implementing a nutrition education program would effectively improve female adolescents' knowledge, attitude, and practice regarding IDA. The intervention group significantly improved in these aspects after the intervention compared to the control group. Prior research has shown that implementing a structured and comprehensive educational program, even if it is a short-term program, is an effective strategy for improving knowledge, attitude, and practice among adolescents [38].

### **Prevention, Behavioral changes**

Kotecha et al. In their study conducted IFA supplementation intervention once a week. It has

proved its potential of not only improving haemoglobin but also improvement of iron stores. The serum ferritin data of over 800 girls confirmed the validity and consistency of the finding. Thus, this strategy of once a week IFA supplementation when given under supervision was effective [28].

The PRECEDE educational model was used in the Sharifirad et al. study. The PRECEDE educational model emphasizes self-care, incentives, and self-reliance through training. This method was the most effective in increasing participant knowledge and changing their attitudes toward behavior change. The PRECEDE framework is a systematic health education process that has been used in numerous studies to help organize a procedure for systematically developing programs. The main advantage of using this framework is that it delineates the factors associated with healthy behavior. It was discovered that educational programs based on the PRECEDE model were effective in controlling IDA and achieving success in other fields of study [36].

## **DISCUSSION**

This review summarizes findings from a total of 12 studies and including 5,355 participants. Most of the studies included in this review were Quasi experimental and assessed the impact of educational intervention on the knowledge and health status among adolescents regarding iron deficiency anemia (IDA). The interventions included Nutrition education, health information, dietary advice, and supplementary micronutrient (Iron).

Given the WHO building block framework, the service delivery platform in all included studies was schools. The nutrition intervention was delivered through school teachers, student classroom monitors, and the research team. None of the included studies detailed details relating to health information systems. In all included studies, researchers provided nutritional supplements, and various non-profit organizations provided some funding. In all included studies, the investigator directly led the intervention. High school girls are one of the most important high-risk groups regarding IDA. That is why this age group was considered as a study subject.



Among the main results, we can confirm that educational intervention can positively impact knowledge, attitudes, practices, behaviour, awareness, and improvement of anaemia conditions in participants with anaemia. Giving daily or weekly iron supplements reduced the severity of anaemia experienced by participants. Only a small number of studies have provided participants with iron supplementation in addition to providing education or health information, so we cannot fully believe in the effectiveness of micronutrient supplementation. These findings require caution in interpretation since there have been very few studies, and because the quality of the results is low or very low, so they can only be seen as preliminary findings.

Booklets are the most widely used media in the studies included in this review [29,34,36,37,39]. These media used by combining several other media such as videos, power points, pamphlets, in channelling or transferring knowledge about anaemia, the results obtained show a positive effect where KAP has increased [29,34].

The overall quality of evidence-based was moderate. It indicates the reliability of the overall intervention approach and determination. The results propose the need to (i) improve the standards and procedures in intervention strategy and outcome apprising in randomized controlled trials to pinpoint actual outcomes relevant to the study population. (ii) Identify the outcomes that tend to improve the significance of health/nutrition education interventions. (iii) To enable the comparison of the methodology of the study in order to determine the factors that promote the effectiveness of health/nutrition education interventions among adolescents. Improving the methodological quality, such as random sequence generators, allocation concealment, blinding of participants, managing the dropout, including matter-of-fact reporting, and follow-up after the intervention will increase the study's quality and the overall quality outcome. More detailed and appropriate studies should focus on middle and low-income countries as they bear more global malnutrition and early marriage burden, especially adolescent females. In low- and middle-income countries, most adolescent girls have become mothers with inadequate knowledge concerning malnutrition and its consequences.

Focusing on young women is crucial for themselves and their children in a short time in preventing the intergenerational cycle of IDA transmission.

The limitations of the review include limited access to the several databases which make we were unable to gain possible relevant studies. We are unable to continue with meta analysis because we only collect very few studies with moderate quality. Randomized controlled trials should be followed up to ensure continuity of the intervention. Future studies are expected to include follow-up in their research protocol. Furthermore, future studies should focus on underprivileged low- and middle-income populations through either school-based or community-based interventions.

## **CONCLUSIONS**

Based on the studies in the review, it showed that Educational intervention for the treatment of iron deficiency anemia among adolescent female give positive impact on knowledge, attitude, practice, behavior, and awareness

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## **Authors contribution**

All authors equally contributed to preparing this article

## **Conflict of interests**

The authors declared no conflict of interest.

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