

EFFECTIVENESS OF EDUCATIONAL MEDIA IN PREVENTING ANEMIA AMONG ADOLESCENT GIRL: A SCOPING REVIEW

Efektivitas Media Edukasi dalam Mencegah Anemia pada Remaja: Scoping Review

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ABSTRAK

Anemia adalah masalah kesehatan masyarakat yang utama secara global, terutama di kalangan remaja putri, dengan dampak yang signifikan terhadap perkembangan kognitif dan psikomotorik. Terlepas dari pentingnya pencegahan, anemia masih tersebar luas, terutama di negara-negara berkembang. Penelitian ini bertujuan untuk mengevaluasi efektivitas berbagai media edukasi dalam mencegah anemia pada remaja putri. Sebuah tinjauan cakupan dilakukan dengan mengikuti kerangka kerja Arksey dan O'Malley, dengan artikel yang diidentifikasi dari tiga database utama: ScienceDirect, PubMed, dan Scopus. Dari 2.560 artikel, tujuh penelitian memenuhi kriteria inklusi, dengan fokus pada format media seperti video edukasi animasi, model PAKEM (Pembelajaran Aktif, Kreatif, Efektif, dan Menyenangkan), serta materi cetak seperti buklet dan buku saku. Hasil penelitian menunjukkan bahwa media digital interaktif, khususnya video edukasi animasi, sangat efektif dalam meningkatkan pengetahuan, sikap, dan perilaku remaja terkait pencegahan anemia. Media-media ini, dengan fitur-fitur yang menarik seperti visual yang dinamis dan elemen-elemen interaktif, menarik perhatian remaja putri, memfasilitasi pemahaman yang lebih baik, dan perubahan perilaku. Model PAKEM juga menunjukkan hasil yang positif, terutama dalam meningkatkan kepatuhan terhadap suplementasi zat besi. Sebaliknya, media cetak tradisional, meskipun berguna sebagai alat bantu, kurang efektif dalam melibatkan remaja dibandingkan dengan media digital. Pendekatan gabungan yang menggunakan media digital dan media cetak, serta metode partisipatif seperti pendidikan teman sebaya, diidentifikasi sebagai strategi yang paling efektif. Hasil penelitian ini menekankan pentingnya penggunaan beragam media edukasi untuk meningkatkan upaya pencegahan anemia dan memberikan wawasan yang berharga untuk mengembangkan strategi intervensi kesehatan yang komprehensif dan efektif.

Kata kunci: efektivitas media edukasi, pencegahan anemia, remaja putri, scoping review

ABSTRACT

Anemia is a major public health issue globally, particularly among adolescent girls, with significant impacts on cognitive and psychomotor development. Despite the importance of prevention, anemia remains widespread, especially in developing countries. This study aimed to evaluate the effectiveness of various educational media in preventing anemia among adolescent girls. A scoping review was conducted following the Arksey and O'Malley framework, with articles identified from three major databases: ScienceDirect, PubMed, and Scopus. Out of 2,560 articles, seven studies met the inclusion criteria, focusing on media formats such as animated educational videos, PAKEM (Active, Creative, Effective, and Fun Learning) model, and print materials like booklets and pocketbooks. The findings reveal that interactive digital media, especially

animated educational videos, were highly effective in improving adolescents' knowledge, attitudes, and behaviors regarding anemia prevention. These media, with engaging features like dynamic visuals and interactive elements, captured the attention of adolescent girls, facilitating better understanding, and behavior change. The PAKEM model also showed positive results, particularly in increasing adherence to iron supplementation. In contrast, traditional print media, while useful as supplementary tools, were less effective in engaging adolescents compared to digital media. A combined approach using both digital and print media, along with participatory methods such as peer education, was identified as the most effective strategy. These results emphasize the importance of utilizing diverse educational media to enhance anemia prevention efforts and provide valuable insights for developing comprehensive, effective health intervention strategies.

Keywords: adolescent girls, effectiveness of educational media, prevention of anemia, scoping review

INTRODUCTION

Anemia in adolescent girls is one of the significant global health problems, especially in developing countries such as Indonesia. Based on global data, the prevalence of anemia in 2019 reached 29.9% of the total world population [1]. In Indonesia, the Indonesian Demographic and Health Survey in 2022 explained that the prevalence of anemia aged 13-18 years in adolescent girls was 23% while in men it was 17%. Data from the Ministry of Health in 2020 found that anemia sufferers in adolescent girls amounted to 33.7% [2]. This figure shows that anemia is still a health challenge that needs serious attention. Iron deficiency anemia in adolescent girls can negatively impact physical, cognitive and academic development [3]. Lack of hemoglobin in the blood can cause fatigue, decrease concentration, and affect academic performance [4]. In addition, anemia can also affect the menstrual cycle and increase the risk of reproductive health problems [5]. According to WHO, a person is categorized as having anemia if the hemoglobin level in the blood is less than 12 g/dL. The main causes of anemia in adolescent girls include iron loss due to menstruation, rapid growth, and an unbalanced diet that lacks iron, folate, and vitamin B12 [6].

The long-term impact of anemia in adolescent girls not only affects individual health conditions, but also has implications for the health of mothers and children in the future [7]. Anemic adolescent girls are at a higher risk of complications during pregnancy, such as abortion, low birth weight (LBW), preterm labor, and increased risk of postpartum haemorrhage [8]. In addition, babies born to anemic mothers are more likely to be stunted due to nutritional deficiencies in the womb. Therefore, the prevention of anemia in adolescent girls is an important part of efforts to improve the quality of health of future generations [9].

Efforts to prevent anemia in adolescent girls have been carried out through various strategies, such as supplementation of blood supplement tablets, promotion of nutritious food consumption, and increasing knowledge and awareness through health education [1]. However, one of the main challenges faced is the low level of adherence of adolescents to consuming blood supplement tablets regularly. Factors affecting adherence include lack of understanding of the importance of iron supplementation, side effects of blood supplement tablets consumption, and lack of motivation and support from the surrounding environment [10]. Health education is one of the effective approaches to increasing adolescents' awareness and understanding of the importance of anemia prevention [11]. Providing information that is interesting and easy to understand can help adolescents adopt healthy habits that support iron sufficiency in the body. Various educational media have been developed to support this effort, including lectures, animated videos, pocketbooks, posters, and technology-based digital

applications [12]. Interactive and engaging educational media are believed to increase understanding and encourage more positive behavior change in preventing anemia [13].

Based on research by Sari (2024), shows that the use of educational media in increasing awareness and knowledge of adolescent girls about anemia provides mixed results [14]. The study reported that visual media, such as animated videos, were more effective than conventional lecture methods in improving adolescents' understanding and recall of health information [15]. In addition, digital technologies such as web-based applications and social media also have the potential to be educational tools that have a wider reach and can be accessed at any time by adolescents [16].

Based on the urgency of the problem, this study aims to review the effectiveness of various educational media in improving the knowledge, attitudes, and behavior of adolescent girls in preventing anemia. Through a scoping review approach, this study will identify the types of educational media that have been used in anemia prevention interventions, evaluate their effectiveness, and explore the factors that contribute to the successful implementation of these educational media. The results of this review are expected to provide evidence-based recommendations for the development of more optimal educational strategies in efforts to prevent anemia in adolescent girls.

METHODS

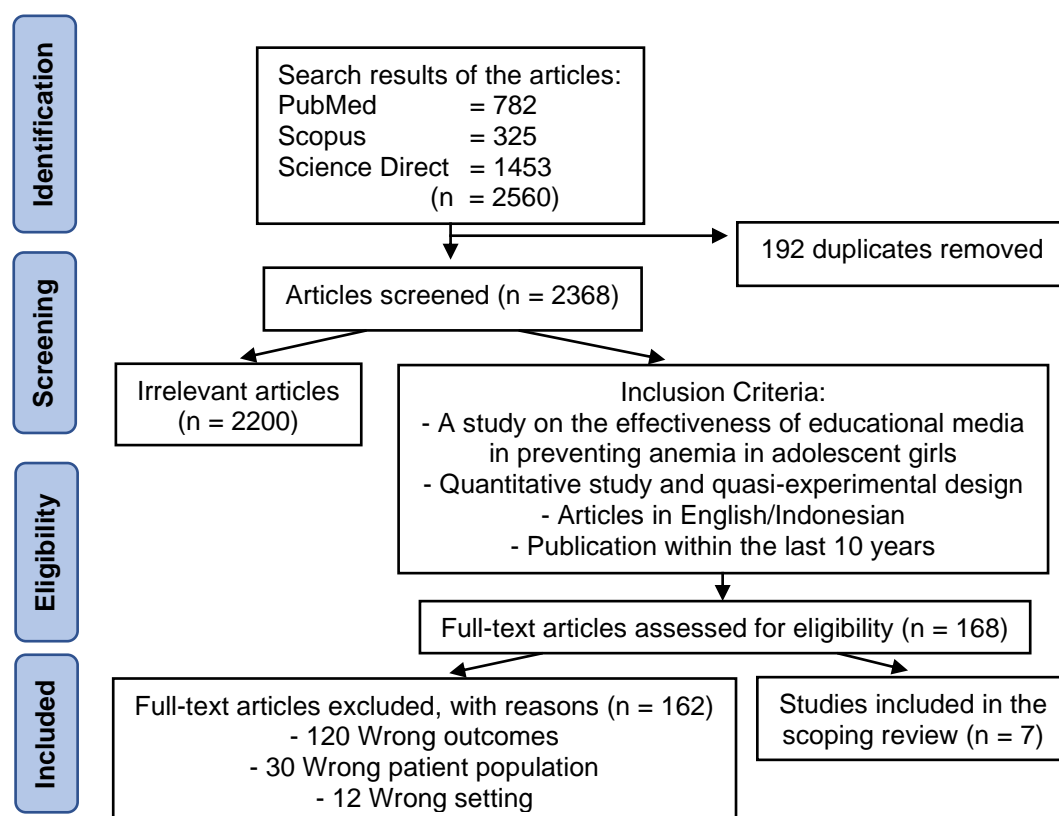


Figure 1. PRISMA Flowchart

The method used in this scoping review follows the Arksey and O'Malley framework, which is a systematic approach to mapping the existing evidence on a research topic. The first process in this scoping review was to conduct a thorough literature search in three major scientific databases, namely ScienceDirect, PubMed, and Scopus. Arksey and O'Malley's framework, as a methodological guide, includes the stages of: identifying relevant sources, selecting studies, mapping data, and finally compiling, summarizing,

and reporting findings. The keywords used in the article search were: ("female youth" OR teenager OR "adolescent girl") AND (education) AND (media) AND (anemia) AND (prevention). Articles collected in this review were accessed from December 2024, with publication year restriction from 2014 to 2024. Inclusion criteria included studies that evaluated the effectiveness of educational media in preventing anemia in adolescent girls, used quasi-experimental or experimental research designs, were available in full-text English, and were conducted in developing countries. Articles that did not meet these criteria, such as studies that were only literature reviews, used qualitative methods without experimental interventions, or examined populations other than adolescent girls, were excluded from the analysis.

Article search results from the three databases yielded 2,560 articles (1,453 from ScienceDirect, 782 from PubMed, and 325 from Scopus). An initial screening process was conducted based on title, with 2,200 articles declared irrelevant and 192 articles identified as duplicates. Next, 168 articles were screened in full text, and finally, 7 articles were found that met the criteria. Therefore, seven articles were used in this scoping review. The search results were documented in the PRISMA Flowchart (Figure 1), which focuses on reporting reviews of randomized trials, but can also be used as a basis for reporting systematic reviews on other types of research, especially evaluations of interventions.

RESULT

The researchers evaluated the quality of the article through critical appraisal, which is a systematic process of assessing the reliability, relevance and contribution of research to evidence-based health practice. This evaluation includes an analysis of the research methodology as well as how the results can be applied in health policies and interventions. The review showed that the majority of articles that met the inclusion criteria were from Indonesia, with one study from Malaysia. This is likely due to the limited accessibility of studies from other developing countries, either because they were not available in open access or did not specifically evaluate the effectiveness of educational media in anemia prevention. In addition, Indonesia has more publications focusing on health education strategies for adolescent girls, which is in line with government intervention programs and academic focus on anemia prevention. With this critical assessment, the selected studies may provide more accurate and relevant insights, although limitations in geographical coverage remain to be considered in the interpretation of results and health policy implications.

Table 1. Data Charting

No	Author(s)/Year/ Title/ Country	Objective	Method	Result
1	Aisah, et al. (2022) / "Animated educational video using health belief model on the knowledge of anemia prevention among female adolescents: An intervention study" Country: Malaysia	To evaluate the effectiveness of animated educational videos based on the Health Belief Model (HBM) in increasing knowledge about anemia prevention among adolescent girls.	A Quantitative research method was concuded in 2021 with a randomized quasi-experimental design and 161 were recruited through stratified random sampling and with inclusion criteria of 14-19 years.	The animated educational video played three times significantly improved the knowledge of the intervention group. The animated educational video effectively and significantly improved knowledge about anemia prevention, including nine HBM indicators.
2	Rusdin, et al. (2021) / "Educational Model	This study aims to determine the effect of the	A quasi-experimental study was concuded in 2020 with a randomized	The PAKEM education model had a greater effect than leaflet and

	of PAKEM in Compliance with Fe Tablet Consumption of Adolescent Girls” Country: Indonesia	PAKEM education model on Fe tablet consumption compliance.	pre-test and post-test control group design. The population of this study was 249 adolescent girls in class XI, while the research sample was obtained by random sampling as many as 70 respondents.	audiovisual media on Fe tablet consumption compliance among adolescent girls. Health workers and educators are strongly advised to use the PAKEM education model as an effective strategy in the prevention of anemia in adolescent girls, to improve their overall health.
3	Madestria, et al. (2021) / “Effect of education through video and packaging modifications of iron tablets on female adolescent behavior in the iron supplementation intake in SMPN 2 and SMPN 1 Parigi” Country: Indonesia	Determine the effect of providing education through videos and modifying the packaging of iron tablets on the behavior of adolescent girls in taking iron supplements at SMPN 2 and SMP 1 Parigi.	A quasi-experimental study was concuded in 2020 with a pretest-posttest control group design using stratified random sampling of 62 respondents.	The development of educational media for iron tablet intake through modified iron tablet packaging videos has a significant effect on the knowledge, attitudes, and intentions of adolescent girls in taking iron supplementation.
4	Mahmudiyah and Kurniasari. (2024) / “The Effect of Providing Educational Media on Anemia and Nutrition on The Prevention of Anemia in Young Women in Bekasi City” Country: Indonesia	Determine the effect of providing educational media on anemia and nutrition on the prevention of anemia in adolescent girls in Bekasi City.	A pre-experimental study was concuded in 2022 with a pre-test and post-test design. The sample in this study amounted to 60 adolescent girls who were divided into three intervention groups and given three different educational media, namely leaflets, animated videos and QuizWhizzer game innovation media. Samples were obtained using purposive sampling.	The results of this study indicate that the provision of educational media on anemia and nutrition has an influence on the prevention of anemia in adolescent girls with. The results of the paired t-test in the three groups showed a change in knowledge improvement in each education, with a p-value in the leaflet group of 0.000, in the animation video group of 0.017, and in the quizwhizzer game group of 0.012.
5	Syarief, et al. (2021) / “The Effect of Nutrition Education Using Pocketbook Media on Iron and Protein Intake” Country: Indonesia	Determine the effect of nutrition education using pocketbook media on protein and iron intake in adolescent girls.	A quasi-experimental study was concuded in 2020 with control group pretest and posttest design and a sample of 50 adolescent girls with purposive sampling method.	This study showed a significant effect of nutrition education using a pocketbook on protin and iron intake.
6	Riyanti, et al. (2018) / “The Use of Education Booklet for Anemia Prevention on Teenage Girls”	Determine the effect of using educational booklets for the prevention of	A quasi-experimental was concuded in 2017 with pre-test and post-test with control group design with the intervention of using	There is a significant increase in knowledge, attitudes, and behavior after the use of booklet and module media on anemia prevention in peer

	Country: Indonesia	anemia in adolescent girls.	booklets and peer education modules on the prevention of anemia in adolescent girls. The population of this study were female high school students in Palangkaraya City and the research sample was 60 female adolescents. The sampling method in this study is using probability sampling with simple random sampling technique.	education in adolescent girls. The use of leaflet and booklet media has the same effectiveness in improving the knowledge, attitudes, and behavior of adolescent girls about anemia prevention.
7	Nurhayani, et al. (2019) / "The Effect of Edutainment Usage on Improving Knowledge, Attitudes, Balanced Nutrition Fulfilling Behavior in the Prevention of Anemia and Changes in Hemoglobin Levels in Adolescent Girl" Country: Indonesia	Analyze the effect of using edutainment on increasing knowledge, attitudes, behavior of fulfilling balanced nutrition in the prevention of anemia, and changes in hemoglobin levels in adolescent girls.	A quasi-experimental study was concuded in 2018 with a pre-test and post-test group design approach. The sample size was 90 adolescent girls who were taken with purposive sampling technique. The data obtained were then analyzed using Paired T-Test and Wilcoxon statistical tests for paired t-tests, as well as Anova and Kruskall Wallis tests for unpaired t-tests, followed by Post Hoc tests for Anova and Mann Whitney tests for Kruskall Wallis tests.	The results of statistical analysis show that the overall p value obtained <0.05 indicates that edutainment booklets and edutainment videos have a different effect before and after the intervention on increasing knowledge, attitudes, and behavior of balanced nutrition in the prevention of anemia, as well as changes in hemoglobin levels in adolescent girls.

The articles used in this scope review cover various years of publication, namely one article (14.29%) from 2018, one article (14.29%) from 2019, three articles (42.86%) from 2021, one article (14.29%) from 2022, and one article (14.29%) from 2024. Of the seven articles reviewed, all articles used quasi-experimental methods. Based on the characteristics of the research location, six articles (85.71%) were from Indonesia and one article (14.29%) was from Malaysia (Tabel 1). Thus, all studies (100%) were conducted in developing countries, reflecting that anemia is still a significant public health problem in these regions. The high prevalence of anemia in developing countries is attributed to less nutritious diets, high rates of iron loss due to menstruation, and challenges in access to health services.

Animated Video

Animated videos are the most effective educational medium for increasing knowledge and changing behavior among adolescent girls regarding anemia prevention. Aisah et al. (2022) demonstrated that Health Belief Model-based videos shown three times significantly improved understanding and nine HBM indicators [17]. However, Mahmudiyah & Kurniasari (2024) emphasized that the effectiveness of videos may decrease if interactive elements or background music are uninteresting [18]. Compared to print media such as booklets and leaflets, animated videos are more engaging due to their dynamic and interactive visuals. Madestria et al. (2021) also found that combining educational videos with modified iron tablet packaging improved adolescents'

compliance in taking supplements [19]. Thus, animated videos not only excel in conveying information but also in fostering better behavior compared to other media.

Booklet

Booklets are printed media that are widely used in health education. The study by Riyanti et al. (2018) showed that booklets combined with peer education methods can improve adolescents' knowledge, attitudes, and behavior in preventing anemia [20]. However, compared to animated videos, booklets have limitations in attracting adolescents' attention, because they are passive and less interactive. Research by Nurhayani et al. (2019) also showed that the combination of booklets and edutainment videos provided better results than the use of booklets alone [21]. This means that booklets still have benefits, but are more effective if used as supporting media in a multimodal educational strategy that combines various types of media.

Leaflet

Leaflets are a more concise print medium than booklets. Mahmudiyah & Kurniasari (2024) showed that attractive designs and simple language in leaflets can improve adolescents' understanding of anemia, although their effectiveness is lower than that of animated videos and interactive games [18]. Due to their passive nature, leaflets are less effective at encouraging active engagement in learning. Therefore, leaflets should be used as a supporting medium and combined with more interactive educational methods.

Pocketbook

Pocketbooks are small, practical, and easy-to-carry printed media. According to Syarief et al. (2021), nutrition education using pocketbooks can increase iron and protein intake among adolescent girls, although its effectiveness is still below that of digital media [22]. Pocketbooks have the advantage of serving as a long-term reference since they can be accessed anytime without relying on technology. However, compared to animated videos and edutainment, this medium is less appealing to adolescents because it is passive and requires more effort to read. Therefore, pocketbooks are more suitable as supplementary media, and their effectiveness can be enhanced when combined with interactive methods such as group discussions or peer education.

PAKEM (Active, Creative, Effective, and Fun Learning)

The PAKEM (Active, Creative, Effective, and Fun Learning) model has been shown to be a more effective educational approach than print media, especially in improving adherence to blood supplementation tablet consumption. A study by Rusdin et al. (2021) showed that the PAKEM model was more influential than leaflets and audiovisuals in improving adolescents' adherence to iron tablet consumption. The advantage of PAKEM over other media is that its approach encourages active participation of adolescents in the learning process, so that they better understand the importance of anemia prevention and are more motivated to adopt healthy behaviors. Therefore, the PAKEM method may be a better option than passive print-based educational approaches [23].

QuizWhizzer Game

QuizWhizzer Game is a digital-based educational media that combines interactive quizzes with game elements. A study by Mahmudiyah & Kurniasari (2024) showed that adolescents who were given education using QuizWhizzer Game experienced a significant increase in understanding compared to those who only received education through leaflets or booklets [18]. Compared to animated videos, the effectiveness of QuizWhizzer Game is almost equivalent in increasing understanding, but superior in the aspect of user engagement. Interactive games provide additional motivation for adolescents to actively learn the material, in contrast to videos which, although engaging, are passive. Therefore, QuizWhizzer Game can be a more engaging educational

alternative to print media and even more effective than video in encouraging active engagement of adolescents.

Edutainment

Edutainment combines entertainment and learning, such as story-based educational videos or interactive games. Nurhayani et al. (2019) showed that the combination of edutainment videos and booklets is more effective than using either medium alone. The advantage of edutainment lies in its ability to create a more engaging and memorable learning experience for teenagers. Compared to regular animated videos, edutainment is more entertaining and less boring, making it highly recommended as part of a multimodal education strategy [21].

DISCUSSION

The results of this review show that various educational media have different effectiveness in improving the knowledge, attitude, and practice of adolescent girls towards anemia prevention [24]. Digital and interactive media, such as animated videos, QuizWhizzer Game, and edutainment, proved to be more effective than print media, such as booklets, pocketbooks, and leaflets. The advantage of digital and interactive media lies in its ability to attract adolescents' attention, increase active engagement, and facilitate understanding through visual and interactive elements [17], [19]. In contrast, print media is more effective when combined with discussion or mentoring sessions, due to its passive nature [20], [22].

In addition to the type of media, the mode of presentation, frequency and duration of the intervention affect its effectiveness. Animated videos are most effective with screening in short sessions of three times with a duration of 5-10 minutes per session [17]. Print media such as booklets and pocketbooks provide more optimal results with 2 weeks of administration with the assistance of health workers, or combined with peer education in 2 sessions for 1 week [20], [22]. Interactive and gamification-based approaches, such as QuizWhizzer Game, show high effectiveness with 15-20 minutes per session for 2-3 weeks, as they increase adolescent motivation and engagement better than passive media [18].

PAKEM has a strong impact on forming healthy habits with 4 weeks of implementation with a frequency of 2 times per week [23]. Edutainment, which combines entertainment with education, is more effective with delivery in 3 consecutive sessions over 3 weeks, with a duration of 10-15 minutes per session [21],[25]. Thus, the frequency and duration of presentation determine the effectiveness of educational media. Digital and interactive media are more optimal with delivery in short, repeated sessions, while print media are more effective when combined with other more participatory methods [26].

Benefits of anemia education with a combination of media

The main benefit of combining digital and audiovisual media in anemia education is its ability to present information in a more engaging, interactive and easy-to-understand way [27]. Media such as animated videos can simplify complex concepts into easily digestible visuals, improving understanding and retention of information among adolescents. Moreover, this format allows flexibility in the learning process, as adolescents can access educational materials anytime and anywhere according to their needs [18].

The integration of digital media with traditional learning methods also enables a more comprehensive approach. For example, after receiving information from educational videos, adolescents can discuss the material in peer education sessions or PAKEM-based learning groups, reinforcing understanding through direct interaction and discussion [20]. Pocketbooks or leaflets can then be used as additional reference materials, helping adolescents to recall the information learned [21].

An Interesting Conflict

In an effort to educate adolescent girls about anemia prevention, there is a significant conflict between the use of traditional educational media and more modern digital media. Traditional media, such as handbooks and leaflets, while contributing positively to knowledge improvement, tend to be less effective in capturing the attention and maintaining the engagement of adolescents who are more interested in technology [22]. These media are often perceived as boring or less relevant by adolescents who are used to visual and interactive content [28]. However, certain print media, such as edutainment booklets, have shown better retention rates when combined with digital media, highlighting the potential for integrating both approaches [21].

Therefore, the optimal strategy is to adopt a hybrid approach, which combines digital and traditional media. This approach not only ensures that information is accessible to everyone, but also capitalizes on the strengths of each medium to achieve more holistic and effective educational outcomes [29].

Expectations of anemia education with a combination of various media

Digital media such as animated videos have been proven effective in improving adolescents' knowledge, attitudes, and behaviors related to anemia prevention [21], while the PAKEM model encourages compliance with iron tablet consumption through active engagement [23]. Print media such as booklets still serve as information reinforcers, and combining edutainment videos with booklets yields stronger learning outcomes [30]. Future educational strategies are recommended to combine various formats such as classroom discussions, mobile apps, videos, peer education, and print materials to reach a broader audience [31]. Adding gamification elements such as quizzes and interactive stories can also enhance learning motivation [18].

A multimodal approach to health education is considered effective in expanding the reach of information, increasing adolescent engagement, and encouraging more positive behavioral changes in anemia prevention [32]. Presenting diverse and engaging content can also strengthen participants' motivation and understanding [33]. Additionally, selecting media that align with adolescents' characteristics and local contexts significantly influences the success of message delivery [34]. While digital media, such as animated videos, have proven effective, their success heavily depends on the quality of presentation. Elements such as dynamic background music, attractive visuals, and interactive features are crucial in maintaining participants' interest and focus [17]. Conversely, suboptimal presentation can lead to boredom and reduce the effectiveness of material delivery [21]. Another challenge to consider is the limited access to technology in some areas, making print media such as leaflets and pocketbooks still necessary as easily accessible alternatives [20].

This study indicates that combining digital media, participatory approaches like PAKEM and peer education, and print media can create a more relevant, interactive, and effective learning experience in improving adolescents' understanding and compliance with iron tablet consumption [23].

Research Implications

This study implies the importance of implementing an educational approach that combines various types of media, both digital and print, in improving adolescents' understanding and involvement in anemia prevention [22]. The use of digital media, particularly animated educational videos, can be a key strategy in health education that is more dynamic and accessible to adolescents, especially in the current technological era [21]. However, despite the effectiveness of digital media, print media still has an important role as a more accessible reference material, especially in areas with limited technological infrastructure. In addition, the results of this study indicate the need to implement more participatory learning models, such as PAKEM and peer education, to strengthen adolescents' understanding and improve adherence to Fe tablet consumption [23]. Therefore, the implementation of learning strategies based on a combination of

digital and traditional media can increase the effectiveness of health education programs in anemia prevention among adolescents [35].

Learning strategies based on a combination of digital and traditional media are effective in improving health education because they attract attention, increase understanding, and strengthen information retention and behavior change. Digital media offers interactivity and flexibility, while traditional media ensures accessibility for all groups. However, the main challenges in its implementation are large resource requirements, differences in effectiveness between media, complex coordination, and technology access gaps. Therefore, careful planning, good integration, and support from health workers and educators are needed for this strategy to be optimally implemented in the prevention of anemia in adolescent girls [21].

CONCLUSION

This study concludes that the use of various educational media is effective in improving adolescent girls' knowledge, attitudes, and behaviors toward anemia prevention. Interactive media such as animated videos, quizzes, and simulations show high engagement, while traditional media such as leaflets and pocketbooks are more appropriate as information reinforcers. A combination approach using both digital and traditional media has proven to be the most optimal in improving understanding and the reach of educational efforts. Further research should explore the integration of gamification elements, mobile applications, and the long-term effectiveness of these approaches in changing behavior and adherence to iron tablet consumption, including an evaluation of the cost-effectiveness of the intervention.

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