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Influence of nutrition education media on anaemia and its effect on improving anaemia knowledge among adolescent girls

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

Abstract

Background: Anaemia is a major global health issue. Anaemia in adolescents has substantial dangers and is primarily caused by a lack of iron, which is strongly associated with the seriousness of the disorder. In addition, adolescent females who have anaemia are prone to acquiring anaemia during pregnancy. These factors can influence the growth and development of the fetus in the womb and increase the chances of complications during pregnancy and labour. Indonesia still grapples with several unresolved nutritional problems, with a specific focus on the high occurrence of anaemia among youths. Integrating nutrition education is a successful approach to reducing the prevalence of anaemia.

Purpose: To provide a thorough analysis of the impact of nutrition education media on anaemia, particularly in improving anaemia knowledge among adolescent females.

Method: A literature review study involves the systematic retrieval of pertinent scholarly papers from databases such as PubMed, Science Direct, Google Scholar, and WorldCat. The data was collected from scholarly publications published between 2018 and 2024, with a particular focus on Indonesian and English articles that are fully accessible.

Results: Indicated that the use of educational media on nutrition to address anaemia had a substantial effect on increasing awareness of anaemia among adolescent females. Nutrition education can be delivered through nutrition

Conclusion: Counselling, as well as using diverse media platforms like Healthy Millennial Cards, books, leaflets, posters, comics, flipcharts, motion videos, WhatsApp, Instagram, and Facebook. Furthermore, it can be disseminated through pedagogical approaches such as gamification, Team Game Tournaments (TGT), and peer group instruction.

Suggestion: To enhance the efficacy of research on the prevention of anaemia among adolescents, it is advisable to employ a wider range of research methodologies, conduct studies over an extended period, engage communities and families, conduct a more thorough analysis of influencing factors, utilize advanced educational technologies, and assess the impact of health policies.

Keywords: Adolescent Females; Anaemia; Nutritional Education.

INTRODUCTION

Anaemia remains a significant health issue in countries worldwide, including both developed and developing nations such as Indonesia. Anaemia is

the term used to describe levels of haemoglobin (Hb) that are below the normal range. Adolescent girls generally exhibit haemoglobin levels exceeding 12

g/dl. An adolescent female is termed anaemic if her Hb level exceeds 12 g/dl. The prevalence of anaemia among adolescents remains significant (Sulistiyan, Aisyah, Saputri, & Puspita, 2024).

According to the World Health Organization (WHO), around one-third of non-pregnant women of reproductive age are affected with anaemia. Prevalent throughout Africa and Asia, this form of anaemia is the most prevalent. Anaemia cases in Indonesia remain prevalent. Based on 2018 Basic Health Research data, around 30-40% of adolescents suffer from anemia, with a prevalence rate of 32%. This is caused by suboptimal dietary choices and a deficiency in physical exercise (Ministry of Health of the Republic of Indonesia, 2018)

Anaemia is a multifactorial disorder that can be caused by several variables such as malnutrition, infection, chronic disease, and genetic factors (Moorthy, Merrill, Namaste, & Iannotti, 2020). Adolescent girls undergo the menstrual phase and growth period, which necessitate an increased intake of nutrients, hence elevating the risk of developing anaemia (Solehah, Dewi, Lastyana, Rahmianti, Naktiany, & Jauhari, 2023).

Adolescent anaemia harms immunity, concentration, learning outcomes, physical fitness, and productivity (Aningsih & Fatah, 2024). Dietary requirements during the period of adolescence are of utmost importance for overall physical and psychological growth, particularly in the case of females. Inadequate nutrition can have a detrimental impact on both individuals and their offspring (Kim, Sununtnasuk, Berhane, Walissa, Oumer, Asrat, Sanghvi, Frongillo, & Menon, 2023).

The insufficient understanding of nutrition, anaemia, indicators, consequences, and strategies for addressing nutritional issues leads to unfulfilled nutritional requirements in teenagers (Murdiningrum, & Handayani, 2021). Nutrition education contributes to enhancing teenagers' understanding of their food consumption, enabling them to avoid unhealthy eating habits and achieve optimal nutritional well-being during adolescence (Fitriani, 2023).

Developers have extensively produced educational media to enhance individuals' need for

knowledge. This is predicated on the notion that an individual can attain knowledge by employing their sensory faculties (Lubis, & Mavianti, 2022). Community nutrition greatly benefits from nutrition education as it enhances knowledge of health and nutrition, encompassing conditions such as anaemia (Febrianti, Ayu, Anidha, & Mahmudiono, 2023).

The author's inclination towards conducting literature review research is evident from the preceding background description. The objective of the literature review is to examine the different forms of nutrition education media employed to enhance the understanding of anaemia in adolescent females. This study aims to provide a comprehensive analysis of the methods, channels, purposes, and effectiveness of nutrition education in increasing the knowledge of adolescent girls on anaemia. Therefore, this study provides a selection of nutrition education media that can be utilized and enhanced to enhance anaemia awareness, to prevent and decrease anaemia prevalence among teenage girls.

RESEARCH METHOD

Literature review methodology to investigate the impact of nutrition education in the media on anemia awareness among adolescent girls, to improve their knowledge about anemia. The literature review method is used to thoroughly investigate the subject matter and answer questions previously set by the author. The author uses Population is "adolescents", Exposure is "Nutrition", "Education", and "Media". The outcome result is "Improvement" and "Knowledge". The keywords used are "nutrition education," "knowledge," "anemia," and "adolescent girls". Inclusion criteria are Research articles published in 2018-2024, articles in English and Indonesian, articles have full text, quantitative research design. Exclusion criteria are books, blogs, paid full text access.

The authors followed the PRISMA criteria for compiling this literature review. In addition, they provided a PRISMA diagram illustrating the flow of literature selection. This diagram displayed the number of search results, screening processes, research that met the criteria, and publications included in the full analysis (Figure 1).

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

RESEARCH RESULT

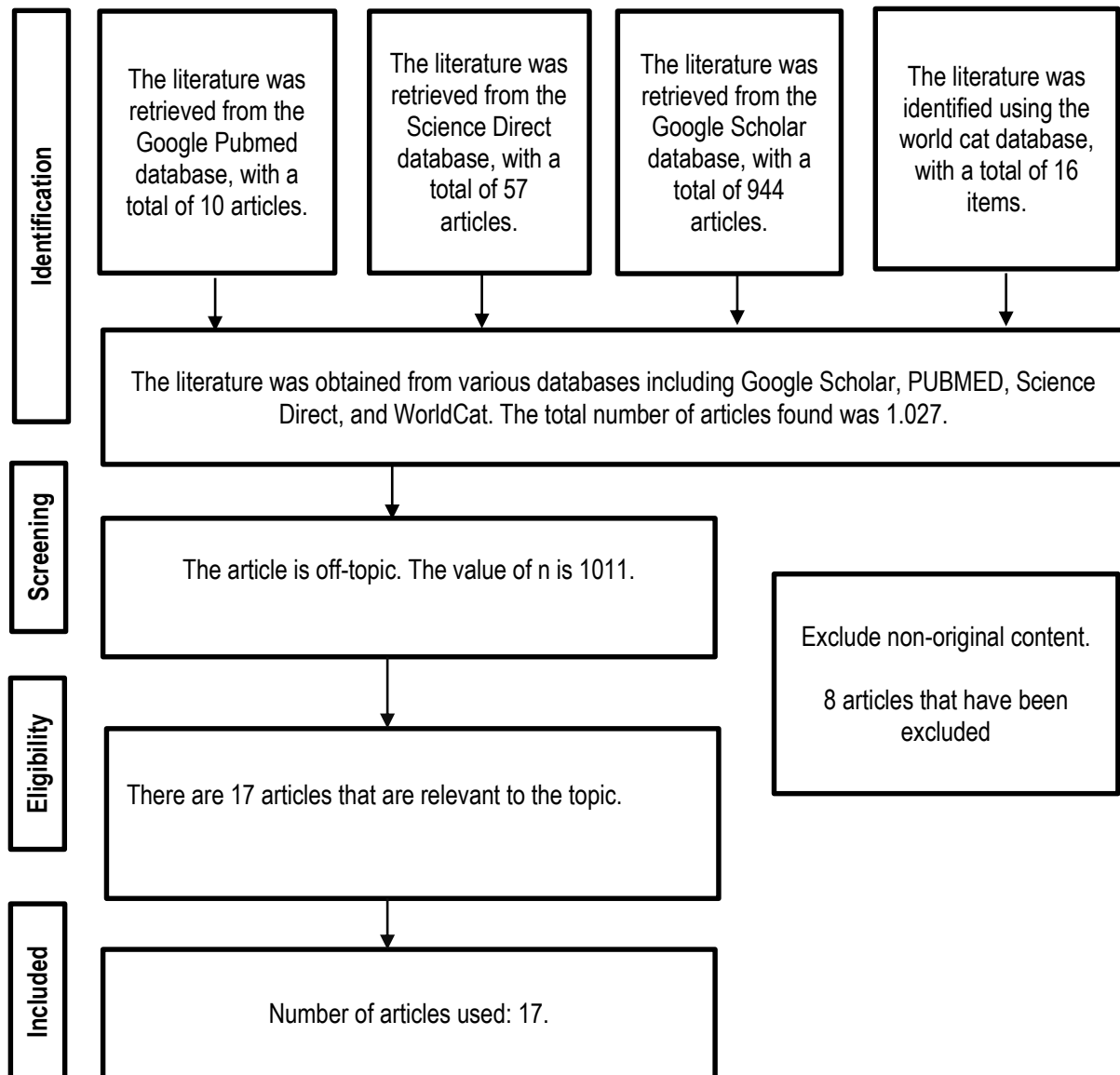


Figure 1. Prisma Diagram

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

DOI: <https://doi.org/10.33024/minh.v7i12.656>

Table 1. Summary of included studies

(Author, Year) (Country)	Method	Summary
(Syakir, 2018) (Indonesia)	In this pre-experimental study, a pretest-posttest strategy was employed to gather data from a systematic random sample of 300 high school students in grades X, XI, and XII in Bandar Lampung City. The total population of the city is 27,487.	Nutrition education delivered through animated media has a substantial impact on the attitudes and knowledge of adolescent females on anaemia. Animated media can serve as an effective instructional resource for nutrition.
(Waluyo, et al 2018) (Indonesia)	This study employs a quasi-experimental design known as pretest-posttest with a control group.	There was a significant disparity in knowledge levels before and after the nutrition education intervention on anaemia in both the control group ($p = 0.001$) and the intervention group ($p = 0.000$). The intervention group, which received both a leaflet and a written assessment, experienced a significantly greater increase in mean knowledge compared to the control group, which only received a leaflet.
(Khotimah, 2019) (Indonesia)	A study was conducted using an experimental design with a single group and pretest-posttest measurements. Treatment was administered via Facebook media, followed by a posttest conducted after the educational session to assess alterations in knowledge and nutritious consumption.	The awareness of adolescent females regarding anaemia experienced a substantial rise following nutrition instruction using Facebook media ($p = 0.000$).
(Cornelius, et al 2021) (Indonesia)	This study employed a genuine experimental design, utilizing a pre-test and post-test methodology to compare control and treatment groups. The study included a total of 27 treatment groups and 27 control groups. The data was gathered via questionnaires completed by participants and subsequently	The data analysis reveals that nutrition provision significantly affects students' knowledge of anaemia ($p = 0.000$), and there is a significant influence of nutrition education on students' attitudes about anaemia ($p = 0.000$). - The provision of nutrition education has an impact on the knowledge

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

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(Author, Year) (Country)	Method	Summary
	evaluated using statistical methods such as the Mann-Whitney test, independent t-test, and repeated measures ANOVA.	and attitudes of students at SMP Negeri 31 Semarang City about anaemia.
(Fitriani, et al., 2019) (Indonesia)	Pre- and post-test designs are commonly used in quasi-experimental research to assess the effects of an intervention on a single group. A selection of female pupils from the eleventh grade at Bina Muda High School in Cicalengka, Bandung.	The intervention utilizing motion video media resulted in a significant increase in knowledge and attitude towards nutritional anaemia. The average knowledge score increased from 5.10 to 8.71, and the attitude score increased from 23.19 to 25.51. Furthermore, the attitudes and knowledge of adolescent girls regarding nutritional anaemia were significantly affected, as indicated by a p-value of 0.001 for attitudes and 0.000 for knowledge.
(Astuti & Suryani, 2020) (Indonesia)	The study employed a quasi-experimental design, specifically a pretest-posttest with a control group. The research sample consisted of 84 adolescent girls residing in Trimurti Village, Bantul.	The level of understanding of anaemia among adolescent girls rose after receiving peer group education, both in the treatment group (p = 0.001) and control group (p = 0.037), as observed during the pre-and post-intervention periods. The treatment group experienced a significant favourable improvement in adolescent girls' views towards anaemia between the pre-intervention and post-intervention stages..
(Hannanti, et al., 2021) (Indonesia)	(pre-post test group) The nutrition education in this study was conveyed to 126 female students of Senior High School Negeri 14 Jakarta through the use of comic media and booklets.	The study revealed a substantial increase (p = 0.000) in the nutrition knowledge of adolescent females following the intervention, which involved the use of comedic media and booklets for nutrition education. The efficacy of comic media surpassed that of leaflets.
(Muwakhidah, et al., 2021) (Indonesia)	Single-group pretest-posttest design	The comprehension of anaemia among adolescent girls differs after being exposed to nutrition education through booklets, pamphlets, and

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnassl095@gmail.com

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(Author, Year) (Country)	Method	Summary
		posters ($p = 0.000$). Booklets are more successful than leaflets and posters as a medium of communication.
(Abu-Baker, et al., 2021) (Jordan)	A quasi-experimental study was conducted with a sample of 363 female students from four Jordanian public high schools. The study consisted of a pretest-posttest group, where an intervention was implemented. The intervention involved a one-month nutrition education program specifically designed for the intervention group. The haemoglobin level was assessed using both a blood test and a self-report questionnaire.	The KAP scores of the intervention group were significantly higher than those of the instructor group. - The intervention program successfully enhanced knowledge, attitudes, and practices about IDA.
(Damayanti, et al., 2021) (Indonesia)	The study utilized a simple random sample method and a quasi-experimental design incorporating pre-and post-tests. The study utilized a questionnaire, SPSS version 20, and employed data analysis using the Mann-Whitney U-test.	The results indicate a significant enhancement in knowledge, attitude, and behaviour after the intervention. The utilization of vlogs in education can enhance knowledge, attitudes, and behaviours related to the prevention of anaemia.
(Styaningrum & Metty, 2021) (Indonesia)	A pre-experimental study was conducted utilizing a pretest-posttest design with one group. Stratified random sampling was employed to pick 41 schoolgirls out of a total of 120. The research utilized a questionnaire that underwent rigorous testing to ensure its validity and reliability. The Wilcoxon Sign-Rank Test was employed to assess the hypothesis.	The study demonstrated a notable rise in the median score, from 78.6 to 92.9, following education. Furthermore, there was a significant disparity in knowledge scores ($p = 0.00$). Consequently, it can be concluded that the utilization of the Healthy Millennial Card (KMS) Games media in education has a positive impact on enhancing the knowledge of adolescent girls regarding the prevention of anaemia.

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

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(Author, Year) (Country)	Method	Summary
(Sulistiani, et al., 2021) (Indonesia)	A quasi-experimental study (one group pre-post test) was conducted on the population of teenage females in class XI at Senior High School N 2 Semarang City. The samples were selected using simple random selection. The study involved 58 adolescent females aged 14 to 18.	The intervention resulted in a significant 36.1% increase ($p = 0.00$) in the knowledge of anaemia among adolescent girls. Therefore, it can be concluded that the nutritional knowledge of adolescent girls is impacted by nutrition education that integrates both lecture-based instruction and team game tournaments.
(Sasmita, et al., 2022) (India)	An intervention study was conducted on school pupils at Kendriya Vidyalaya in Belgaum, India. We employed questionnaires as a means of evaluating knowledge, attitude, and behaviour. The data was analyzed using a paired T-test and McNemar test.	Nutrition education exerts a positive influence on enhancing understanding and altering attitudes around anaemia, while also promoting greater intake of foods high in iron. Educating individuals on nutrition is a cost-effective and sustainable approach to reducing the prevalence of anaemia.
(Andini & Agestika, 2022) (Indonesia)	This quasi-experimental utilized pre-and post-tests, along with a non-randomized control group. The study included 70 participants from SMPN 1 and MTS N 3 Arjawinangun. The data was gathered through the methods of observation, interview, and questionnaire, and subsequently examined using the Chi-Square Test and Wilcoxon Test.	The implementation of digital peer-group education significantly enhanced the understanding and compliance of adolescents about the ingestion of iron tablets. There was no significant difference between the groups that received education and intervention. Peer group education is a novel approach to avoiding anaemia in adolescents, which has proven to be beneficial when implemented for more than one month.
(Djannah, et al., 2023) (Indonesia)	This study employed a quasi-experimental design utilizing the "Pretest Posttest with Control Group" methodology. The sample consisted of 44 adolescent females aged 12-14 years, who were separated into intervention groups and educators. An extension is offered through WhatsApp groups, which	The study assessed the impact of nutrition education and anaemia on the cognitive understanding of teenagers. Following one month of schooling, the intervention group exhibited substantial enhancement in knowledge, with the majority of participants displaying a commendable level of understanding.

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

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(Author, Year) (Country)	Method	Summary
	include young messages as well as educational videos on nutrition and anaemia.	
(Syahidah, et al., 2023) (Indonesia)	This study employed a pre-experimental approach, specifically a one-group pretest-posttest design. The sample of 222 respondents was selected via stratified random selection.	The findings demonstrated that there were disparities in the level of comprehension about anaemia on Instagram and other social media platforms both before and following the provision of nutrition education. The statistical examination of the Wilcoxon test findings indicates strong evidence in favour of the hypothesis, as demonstrated by a p-value of 0.000 ($p < 0.05$).
(Wiafe, et al., 2023) (Ghana)	This study conducted a randomized controlled trial with 137 teenagers (aged 10-14 years) in Ghana. The intervention consisted of six months of nutrition education and counselling. The analysis employed chi-square, binary logistic regression, and t-test.	Among the 100 participants, divided evenly into two groups of 50, no notable disparities were observed between the groups in terms of body weight, haemoglobin levels, ferritin levels, iron intake, and vitamin C consumption. After the intervention, all markers exhibited average increases except for ferritin in the intervention group. The intervention group experienced an increase in iron and vitamin C intake and a decrease in anaemia as a result of nutrition education

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

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DISCUSSION

Upon searching, a total of 17 articles were found that corresponded to the study keywords. The review articles yielded results from diverse countries, encompassing both developed and developing nations. The article review encompasses several developing countries, such as India, Africa, and Indonesia. The article includes research locations in Jordan, as well as other developed countries.

This review article examines the efficacy of nutrition education in improving adolescents' understanding of anaemia, with a specific focus on anaemia knowledge. The primary focus of this review article is to examine the impact of educational media on individuals comprehension of anaemia. anaemia knowledge. The study collected in the

publications is original and adopts a quantitative research design.

The 2018 guidebook on anaemia prevention and control in adolescent girls and women of childbearing age highlights the importance of following the 2011 WHO recommendations. These recommendations emphasize the need to focus on health promotion activities and prevention strategies to address anaemia in repatriates (adolescent girls) and women of childbearing age (World Health Organization, 2018). The review of papers examines several forms of educational media that can be utilized to impact the effectiveness of health promotion efforts and the prevention of anaemia. These media types are organized into themes and primary subjects, as shown in Table 2.

Table 2. Results of article synthesis

Theme	Subject
Effectiveness of an Anaemia Nutrition Education Programme	Evaluation of Anaemia Nutrition Education Programme (9, 17, and 20) Effect of Nutrition Education (4, 13, and 15)
Anaemia Nutrition Education Media Innovation	Print media (booklets (8), posters (8), leaflets (2, 7, and 8), comics (7)) Electronic media (animation (1 and 5), video vlog (10)) Social Media (WhatsApp (2 and 15), Facebook (3), Instagram (16)) Media Games (Teman Sabaya (peer group) (6), Healthy Millennial Cards (11), and Team Game Tournament (TGT) (12))

Studies indicate that intervention programs have a significant impact on enhancing knowledge, attitudes, and behaviours associated with Iron Deficiency anaemia (IDA) (Abu-Baker, Eyadat, & Khamaiseh, 2021). A further study demonstrated that education and counselling had a significant impact on enhancing teenagers' comprehension of anaemia, resulting in a noticeable rise in post-intervention measures. The intervention group experienced an increase in iron and vitamin C intake and a decrease in anaemia as a result of nutrition education (Wiafe, Apprey, & Annan, 2023). The provision of nutrition education led to a notable improvement in knowledge and a shift in attitude towards anaemia, as well as a notable rise in the consumption of foods high in iron. Nutrition education is a highly effective

and enduring strategy for reducing the occurrence of anaemia (Sasmita, Mubashir, & Vijaya, 2022).

Enhancing the nutritional status of teenagers can be achieved through targeted and tactful interventions, such as providing nutrition education (Syahidah, Devriany, & Akhiat 2024). The study findings indicated that nutrition education at SMP Negeri 31 in Semarang City had a significant influence on the attitudes of female students towards anaemia, as well as their understanding of the illness (Putra, Supadi, & Wijaningsih, 2019). Additional research has shown that the understanding of anaemia prevention among teenagers was impacted by both nutrition and anaemia education. The majority of participants in the intervention group

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

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exhibited a high level of knowledge (Diannah, Wisudawati, Karya, & Husada, 2023).

In addition to leaflets, posters and booklets are frequently utilized as educational materials (Kusuma, 2022). The research findings indicated that booklets were more efficacious than posters and pamphlets in enhancing knowledge about anaemia among adolescent girls. Moreover, the utilization of posters and pamphlets resulted in enhanced knowledge among the participants. The booklet comprises content consisting of diverse and vibrant visual elements, including both text and pictures. This captivates the reader. Booklet media offers a more comprehensive presentation of information compared to leaflets and posters (Muwakhidah, Fatih, & Primadani, 2021). Additionally, another study found that the intervention group, which utilized both leaflets and WhatsApp, experienced a significantly higher average improvement in knowledge compared to the control group, which just used leaflets (Waluyo, Hidayanty, & Seweng, 2018).

A study investigating the efficacy of comics and leaflets as a means of nutrition education revealed a noteworthy enhancement in knowledge among female students in classes X and XI at Senior High School Negeri 14 Jakarta following the intervention (Hannanti, IImi, & Syah, 2021). This medium is believed to be advantageous in augmenting the knowledge of adolescent females as it enables the reader to comprehend the content more effectively via the use of pictures and other aspects. Comics enhance the appeal of education, foster pupils' motivation to acquire knowledge and heighten their level of attentiveness. Comics are a form of printed media that typically feature practical and portable illustrations or narratives. They are designed to be easily comprehensible due to the use of simple visuals and everyday language. Moreover, the utilization of comedic media facilitates the assimilation of the material by students, leading to the successful attainment of the learning objectives (Masri, Wahyuni, & Rini, 2019).

The integration of technological advancements with nutrition education can enhance the distribution and calibre of nutrition information (Alfiah, Yusuf, & Puspa, 2024). Health education is the most effective method for enhancing public knowledge and

understanding of the prevention and treatment of iron-deficient anaemia (Kasmarini, & Kurniasari 2022).

Studies suggest that providing nutrition education through video blogs, commonly known as vlogs, has a significant impact on the attitudes, knowledge, and behaviours of adolescent females about preventing anaemia (Damayanti, Herawati, & Syahri, 2021). Knowledge plays a crucial role in the formation of new behaviours, starting from how individuals interact with specific materials or objects. Engaging in nutrition education or counselling activities particularly focused on nutrition, is a means to enhance one's knowledge (Fitriani, Umamah, Rosmana, Rahmat, & Mulyo, 2019).

Utilizing animated media in nutrition education can yield a very effective and efficient method of learning, enhancing the retention of information (Aisah, Ismail, & Margawa, 2021). Studies demonstrate that providing adolescent females with education on nutrition through animation media has a substantial impact on their understanding and perspectives toward anaemia (Syakir, 2018). The study conducted at Senior High School Bina Muda Cicalengka Bandung revealed that nutritional anaemia counselling through motion video media led to an increase in knowledge and attitudes among adolescent girls (Fitriani, et al., 2019).

Social media can serve as a platform for digital learning and educational content presentation, facilitating the discovery of new information, the enrichment of current content, and the exchange of knowledge among users (Fitriani, 2021). The research conducted on adolescent females living in the Tebas Kuala Village region of Sambas Regency unveiled a rise in the girls' awareness of anaemia both before and after receiving nutrition education through Facebook media (Khotimah, 2019).

Inadequate awareness of health concerns, including anaemia, can result in individuals opting for items with low iron content, so impeding their ability to obtain sufficient iron through their diet (Wahyuni, & Amareta, 2019). The effectiveness of digital-based nutrition education has been established in increasing adolescents' understanding and adherence to iron tablet use. Peer-group education through the WhatsApp digital platform can be utilized

Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

to achieve this outcome (Andini & Agestika, 2022). Research on the utilization of educational media, booklets, and WhatsApp for anaemia nutrition education indicates that the intervention group had a greater improvement in knowledge compared to the control group (Waluyo et al., 2018). Education delivered through Instagram accounts has an impact on anaemia knowledge, as observed in the study on Nutrition Education Through Instagram Accounts. This effect is in addition to the influence of Facebook and WhatsApp (Syahidah et al., 2024).

Multiple nutrition education methodologies can be employed to enhance respondents' knowledge, including the utilization of media games. The findings of the study, which utilized card games designed for healthy millennials as instructional tools for preventing anaemia in adolescent girls, revealed that educating teenage girls about anaemia prevention through the use of these games had a positive effect on their knowledge (Styaningrum & Metty, 2021).

The study showed that including both lecture and Team Games Tournament (TGT), a cooperative learning method, resulted in improved information acquisition. This was achieved by creating a dynamic and relaxed environment, developing collaboration, and enhancing communication skills (Sulistiani, Fitriyanti, & Dewi, 2021).

Adolescence is a period of development where an individual's behavior is greatly impacted by their peers and the immediate surroundings. Adolescents are greatly influenced by their peers as they seek acceptability within their social surroundings. The research project on Peer Group Education as a means of preventing iron nutritional anemia in adolescents aims to enhance the knowledge of adolescent girls on anaemia both before and after the intervention. Additionally, it seeks to have a positive influence on the attitudes of adolescent girls towards preventing anaemia. Adolescents, who have received education from their peers, experience a greater sense of openness and confidence while expressing their thoughts, as they are already acquainted with their teachers. This eradicates the physical separation and apprehension associated with engaging, inquiring, expressing oneself, and articulating one's viewpoints. Furthermore, peer-group education enhances teenagers' consciousness

and inclination to emulate their fellow group members, leading to dynamic exchanges and mutual assistance (Astuti & Suryani, 2020). Utilizing digital platforms for peer-group education is an excellent method for enhancing knowledge and promoting consistent consumption of iron tablets among teenagers (Andini & Agestika, 2022).

CONCLUSION

Based on the review, it can be concluded that nutrition education significantly contributes to the prevention of anaemia in teenage girls by enhancing their knowledge, fostering more positive attitudes, and increasing their haemoglobin levels. A wide range of media formats can be employed to disseminate knowledge about nutrition, encompassing technological media like as video clips, as well as print media like booklets, pamphlets, posters, comics, and health-conscious millennial cards. Moreover, social media platforms such as Instagram, WhatsApp, and Facebook can be employed. In addition to the diverse range of nutrition education media, instructional methods such as games, instructions, seminars, and Team Game Tournaments (TGT) can be utilized. Furthermore, nutrition education provided by friends, peer groups, or other organizations can be utilized to enhance its efficacy in preventing anaemia among teenage girls.

SUGGESTION

To enhance the efficacy of research on the prevention of anaemia among adolescents, it is advisable to employ a wider range of research methodologies, conduct studies over an extended period, engage communities and families, conduct a more thorough analysis of influencing factors, utilize advanced educational technologies, and assess the impact of health policies.

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Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

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Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

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Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnassi095@gmail.com

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Krisna Siska Septiana^{1*}, Qorinah Estiningtyas Sakilah Adnani², Hadi Susiarno³

¹Magister Kebidanan Fakultas Kedokteran Universitas Padjajaran

²Departemen Ilmu Kesehatan Masyarakat Fakultas Kedokteran Universitas Padjajaran

³Departemen Obstetri dan Ginekologi Fakultas Kedokteran Universitas Padjajaran

Corresponding author: *E-mail: krisnass1095@gmail.com

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