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THE EFFECT OF ANEMIA EDUCATION USING THE "REMINDME" APPLICATION ON KNOWLEDGE AND COMPLIANCE WITH IRON TABLET CONSUMPTION AMONG ADOLESCENT

Penggunaan Aplikasi "Remindme" terhadap Pengetahuan dan Kepatuhan Konsumsi Tablet Tambah Darah Pada Remaja Putri

Siti Rizkina Mahrorani[1], Aditya Nanda Priyatama[2*], Nur Hafidha Hikmayani[3]
[1]Program Studi Ilmu Gizi, Sekolah Pascasarjana, Universitas Sebelas Maret, Surakarta, Indonesia
[2]Fakultas Psikologi, Universitas Sebelas Maret, Surakarta, Indonesia
[3]Fakultas Kedokteran, Universitas Sebelas Maret, Surakarta, Indonesia
*Email: aditya_npriyatama@staff.uns.ac.id

ABSTRAK

Remaja putri memiliki risiko anemia yang relatif tinggi dibandingkan dengan orang dewasa. Intervensi edukasi gizi untuk meningkatkan pengetahuan dan kepatuhan konsumsi TTD merupakan salah satu pencegahan anemia pada remaja putri. Aplikasi Kesehatan "RemindMe" dapat digunakan oleh siswa untuk mencari informasi dan memberikan pengingat dalam minum tablet tambah darah. Penelitian bertujuan untuk mengetahui perbedaan edukasi anemia menggunakan aplikasi "remindme" terhadap pengetahuan dan kepatuhan konsumsi tablet tambah darah pada remaja putri. Penelitian ini merupakan penelitian quasy eksperimental dengan pre-posttest with control group design. Sampel dipilih secara Multistage Random Sampling dan terpilih 40 remaja yang terbagi menjadi kelompok kontrol dan kelompok intervensi. Kelompok kontrol diberi edukasi menggunakan ceramah, sedangkan kelompok intervensi diberikan edukasi menggunakan aplikasi "RemindMe". Analisis data dilakukan menggunakan wilcoxon singed ranks test. Terdapat perbedaan pengetahuan yang signifikan pada kelompok intervensi dengan dengan nilai p <0,001 dan terdapat perbedaan kepatuhan konsumsi TTD yang signifikan pada kelompok intervensi dengan nilai p=0,037. Edukasi anemia melalui aplikasi RemindMe tidak berpengaruh signifikan meningkatkan terhadap pengetahuan dan kepatuhan konsumsi TTD pada remaja putri.

Kata kunci: *aplikasi remindme, edukasi gizi, kepatuhan konsumsi, pengetahuan remaja putri, tablet tambah darah*

ABSTRACT

Adolescent girls had a relatively higher risk of anemia compared to adults. Nutritional education interventions were essential for improving knowledge and compliance with iron tablet consumption as a preventive measure against anemia. The "RemindMe" health application was used as a tool for students to access information and receive reminders to take iron tablets. This study aimed to utilize health applications to enhance knowledge, which can improve awareness and compliance with iron tablet consumption among adolescents. This study employed a quasi-experimental design with a pre-posttest with a control group. A total of 40 adolescents were selected using Multistage Random Sampling and divided into one control group and intervention groups. The control group was given education through lectures, while the intervention group was given education using the "RemindMe" application. Data were analyzed using the Wilcoxon signed-rank test. There was a significant improvement in knowledge in the intervention groups ($p < 0.001$), and a significant difference in compliance with iron tablet consumption was observed in the intervention groups ($p = 0.037$). Anemia education delivered through the "RemindMe" application not significantly improved adolescent girls' knowledge and compliance with iron tablet consumption.

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Keywords: *consumption compliance, iron tablet consumption, knowledge of adolescent girls, nutritional education, remindme application*

INTRODUCTION

Anemia is a condition in which hemoglobin levels are below the normal range. Normal hemoglobin levels for men are below 13 g/dL, while normal hemoglobin levels for women are below 12 g/dL[1]. Adolescent girls have a relatively high risk of anemia compared to adults; anemia remains the most studied sign of micronutrient deficiency among adolescent girls[2]. Anemia is common in Indonesia. In 2018, patients aged 5 to 14 years old reached 27.2% of the population, and patients aged 15 to 24 years old reached 37.1%. The Basic Health Research (Riskesdas) also concluded that women, especially adolescent girls, are at greater risk of developing anemia. Specifically in West Nusa Tenggara Province, the prevalence of anemia reached 48%. One of the districts in West Nusa Tenggara with a high incidence of anemia in adolescents, namely 79.8% (>20% of the standard incidence of anemia), is East Lombok[3].

A contributing factor to the prevalence of anemia in adolescents in East Lombok is the lack of educational programs provided by health workers, resulting in a lack of student knowledge regarding the importance of iron. Furthermore, inadequate family support and a small number of youth cadres are also contributing factors to the high prevalence of anemia in this area. Efforts to address adolescent health issues have not been a priority in health development in the region[4]. The coverage of adolescent girls in East Lombok who consume 26-52 iron tablets is 38.35%, particularly in the Terara, Aikmel, Pringgabaya, and Pringgasela sub-districts. This coverage has not yet reached the national target of 54%. This needs to be improved, such as by providing quality counseling/education or outreach[5]. Based on research at a vocational school in East Lombok, of the 30 female teenagers studied, the majority had little or no understanding of the use of Fe tablets, 13 people (43.3%), while only 8 people (26.7%) had sufficient information[6].

The government has taken steps to prevent anemia in adolescent girls through a program to distribute iron supplements (IFN), which is in accordance with the Regulation of the Minister of Health of the Republic of Indonesia No. 88 of 2014 concerning iron supplement standards for women of childbearing age and pregnant women[7].This program was initiated by the Ministry of Health in 2014, with iron supplement distribution conducted through schools. Schools are responsible for organizing iron supplement consumption activities, which are held once a week. Weekly iron supplementation, known as the Weekly Iron Folic Acid Supplementation (WIFS) program, has been proven effective in reducing the incidence of anemia in various countries[8]. Non-compliance of adolescent girls in taking iron supplements every week is a social barrier that is often found in various countries. The reasons for non-compliance are often associated with individual factors, namely forgetfulness, because of the side effects that arise, and negative perceptions about giving iron supplements[9].

Smartphone-based information and communication technology can be one way to overcome these problems [10],[11]. One example is Anderson's (2018) research, which created an mHealth intervention application as a medium to help involve child patients in their own self-management so as to increase compliance and knowledge[12]. Various studies in several countries also show that digital health interventions can overcome distance and access barriers, increase treatment adherence, and improve knowledge, attitudes, and skills[13]. Based on the explanation above, in this study, the researcher observed the use of digital media called "RemindMe," which the researcher had designed in previous research. The "RemindMe" app is specifically designed to improve knowledge and adherence to iron supplement (IBT) consumption among adolescent girls through interactive educational features. One of its key features is an automatic reminder, which helps adolescent girls schedule iron supplement consumption regularly

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according to recommendations, complete with friendly and motivating daily notifications. This feature can be customized to individual needs, such as the ideal consumption time. To increase understanding, the app provides educational modules on the importance of iron supplementation for adolescent girls' health, its benefits in preventing anemia, and its positive impact on productivity and long-term health. The material is presented in simple text and engaging infographics to ensure adolescent girls fully understand the information.

Figure 1. RemindMe Application as a Nutrition Education Media

The app also features a progress tracker, which monitors consistent iron tablet consumption and provides visual reports in the form of graphs or digital rewards to boost motivation. The app's community and discussion features allow young women to share experiences and tips on how to overcome challenges in maintaining healthy habits. For personalization, the app offers the option to customize themes and reminders to suit user preferences, creating a more engaging and relevant experience. The calendar and schedule feature helps users plan the best time to take iron tablets, synchronizing with specific days, such as when tablets are distributed at school. In addition to marking iron tablet consumption, app users can also mark their calendar and provide information about their menstrual cycle. Furthermore, the app provides motivational notifications in the form of short, inspiring messages, such as those highlighting the long-term benefits of iron tablets or relevant success stories. To further encourage engagement, the app utilizes gamification, with a points system and virtual rewards for users who consistently take iron tablets, creating a competitive yet healthy atmosphere. The app is designed with fun, informative features that support the active engagement of young women to improve their knowledge and adherence to regularly taking iron tablets.

The "RemindMe" application was designed to make it easier for students to find information and receive reminders about taking iron tablets. The "RemindMe" application is an Android-based digital application that has been validated by material experts and two media experts with a score of 85.8%. Furthermore, this application has also passed the trial phase on 12 adolescent girls outside the research subjects. Therefore, this study aims to test the use of the RemindMe application on the knowledge and compliance of adolescent girls in taking iron tablets in the school environment.

METHODS

This research was a quantitative study using a quasi-experimental pretest-posttest with a control group design. The independent variable in this study is the use of the "RemindMe" application, which functions as an intervention or treatment given to adolescent girls. The dependent variable consists of two aspects, namely knowledge of

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iron supplement consumption and adherence to iron supplement consumption. Knowledge of iron supplement consumption includes adolescent girls' understanding of the importance, benefits, and procedures for consuming iron supplement tablets to prevent anemia and improve health. Compliance with iron supplement consumption refers to the consistency of adolescent girls in following the iron supplement consumption schedule according to the recommendations given. The main focus of this study is to test the use of the "RemindMe" application to improve adolescent girls' knowledge and adherence to iron supplement consumption. Adolescent girls' knowledge related to anemia and iron supplement tablets is known based on filling out a questionnaire containing 20 questions using the Guttman scale. Compliance with iron supplement consumption is measured using an observation sheet to see student consumption compliance. The results of this study are expected to contribute to efforts to improve the health behavior of adolescent girls, especially in preventing anemia.

The study was conducted in April-May 2024 after obtaining ethical approval from the ethics committee with Letter Number 49/UN27.06.11/KEP/EC2024 on February 23, 2024. The study location was a public high school in East Lombok Regency. Multistage random sampling was used as the sampling method, by grouping the population into several groups. Sample selection was based on inclusion criteria, namely being registered as an active high school student, aged 16-18 years, not on a specific diet, and willing to be studied. Samples were excluded if they had a history of chronic diseases, for example, breast cancer and infectious diseases, typhus in the past year. In a simple experiment, the number of samples is at least between 10 and 20 people. In this study, the research sample was 40 adolescent girls consisting of 20 adolescent girls for the intervention group and 20 adolescent girls for the control group[13].

The control group received no education, while the intervention group received education using the "RemindMe" app. The intervention group underwent four educational sessions using the "RemindMe" app. Each session lasted 30–45 minutes. The first session aimed to introduce the app, explain its use, and build awareness of the topics discussed. The second session focused on exploration and independent practice, where participants explored the app's features, completed case studies, and developed personal action plans. The third session was used to evaluate progress, provide feedback, and address challenges in using the app. The fourth session emphasized strengthening the girls' commitment to maintaining positive habits. The four sessions lasted 120–180 minutes in total. These sessions included the distribution of iron tablets to the girls.

The data from this study will be analyzed using a paired-sample t-test or Wilcoxon test to determine differences in knowledge and adherence to iron supplementation among adolescent girls in each study group. An independent-sample t-test or Mann-Whitney U-test will also be used to determine differences in post-test results between the control and intervention groups.

RESULTS

Characteristics of research subjects

Respondents in this study were female adolescents from two senior high schools (SMA) in East Lombok Regency: SMAN 1 Labuan Haji, the control group, and SMAN 2 Selong, the intervention group. Subject characteristics are shown in Table 1.

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Table 1. Characteristics of Research Subjects

Characteristics	Control (n=20)		Treatment (n=20)		Total (n=40)	
	n	%	n	%	n	%
Age						
16 years	15	75	12	60	27	67.5
17 years	5	25	6	30	11	27.5
18 years	0	0	2	10	2	5
Father's occupation						
Civil Servants/TNI/POLRI	5	25	11	55	16	40
Private sector employee	1	5	4	20	5	12.5
Self-employed	14	70	5	25	19	47.5
Mother's Job						
Civil Servants/TNI/POLRI	0	0	8	40	8	20
housewife	20	100	12	60	21	80

The Impact of Education Using the "Remindme" Application on Knowledge

The Wilcoxon test results, as shown in Table 2, demonstrate a significant difference in knowledge between the treatment group before and after the RemindMe application intervention. In the intervention group, the p-value was <0.001, while there was no significant change in knowledge in the control group, with a p-value >0.05.

Table2. Differences in Knowledge Before and After Intervention

Group	n	Median ± SD	Z	*p*
Control				
Pre-test	20	65 ± 9.85	-1,058	
Post-test		70 ± 10.46		0.290
Treatment				
Pre-test	20	62.5 ± 9.9	-3,654	
Post-test		75 ± 8.27		<0.001

Table 3 shows the results of the Mann-Whitney analysis on the knowledge variable with a p-value of 0.683, which means there is no difference in the knowledge of the intervention and control groups.

Table 3. Test Results*Mann Whitney Post-Test of Knowledge*

Group	n	Mean	U	*p*
Control	20	4.25	5.00	0.683
Intervention		3.67		

The Effect of Education Using the "Remindme" Application on Compliance with Iron Supplement Tablet (TTD) Consumption

Table 3.The Effect of TTD Consumption Levels Before and After Intervention

Group	n	Median ± SD	Z	*p*
Control				
Pre-test	20	3 ± 1.34	-2,235	
Post-test		4 ± 1.14		0.025
Treatment				
Pre-test	20	3 ± 1.02	-2,089	
Post-test		4 ± 0.78		0.037

The results of the analysis in Table 4 show the results of the Mann-Whitney analysis on the knowledge variable with a p-value of 0.467, which means there is no difference in compliance with TTD consumption in adolescents in the intervention and control groups.

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Table 4 Results of the Mann Whitney Post-Test of Iron Tablet Consumption Compliance

Group	n	Mean	U	*p*
Control Intervention	20	11.5 10.25	28	0.467

DISCUSSION

In this study, 40 adolescent girls aged 15 to 17 participated. This age range represents a period of growth and development in the life cycle, encompassing intellectual, psychological, and physical maturity[15]. In addition, adolescents at this age have begun to reproduce with the onset of menstruation because their sexuality and reproductive systems have matured. Peer influence grows throughout adolescence, and at this age, adolescents are able to relate to and form friendships with others who share many of their personality traits[16]. Respondents in this study were 16 years old (67.5%), and only two respondents were 18 years old (5%). The average female respondents had fathers who were entrepreneurs (47.5%), while 80% of mothers were housewives.

The Impact of Education Using the "Remindme" Application on Knowledge

Based on expert assessments, the RemindMe app is deemed suitable for use as an educational tool with a feasibility score of 85%. This is evidenced by the increase in knowledge scores regarding anemia among adolescent girls. The results of the difference test on knowledge regarding anemia among adolescent girls showed a p-value of <0.001 in the intervention group, while there was no significant difference in knowledge in the control group (p-value of 0.290). This finding aligns with previous research that education about anemia in adolescents is a solution to achieve positive behavioral change[17]. However, encouragement from within adolescents is needed to achieve consistent, positive behavioral change. Furthermore, adolescents are easily influenced by their environment, so creating a positive environment and fostering curiosity can positively impact knowledge and ultimately behavioral change[18].

The intervention group in this study received education about anemia using RemindMe for four weeks. Baseline knowledge measurements before the education revealed that most adolescents had sufficient knowledge (52.5%). Adolescents understood the definition and symptoms of anemia, but did not yet understand its impact on adolescence. This finding aligns with Agustina's 2021 study, which found that only one-third of adolescents had heard of anemia and understood its impact[19].

The control group in this study did not receive any education on using RemindMe. However, after a final knowledge measurement after four weeks, the number of adolescents with good knowledge of anemia increased to 15% from 10%. This can be influenced by various factors, such as experience gained through various media, culture, peer influence, and cognitive aspects such as beliefs, convictions, and habits[20].

The test of differences between the control and intervention groups showed no significant difference in post-test knowledge scores after receiving education via the application. Education in this study was provided only once a week, which may have influenced the results. Febritasanti reported that a single session could change attitudes, while Siregar found that three sessions increased knowledge[21]. This suggests that the frequency of education is an important factor affecting knowledge outcomes[22].

The Effect of Education Using the "Remindme" Application on Compliance with Iron Supplement Tablet (TTD) Consumption

A test of differences in the variable of adherence to iron tablet consumption by adolescent girls before and after four weeks of education showed a significant difference between the two groups. The control group had a p-value of 0.025, while the control group had a p-value of 0.037. The difference in adherence to iron tablet consumption in the treatment group was the impact of the four-week intervention using the RemindMe application, while the significant difference in adherence to iron tablet consumption in

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the control group was due to reinforcement in the form of support from teachers and researchers. This support increased the motivation of adolescent girls to regularly consume iron tablet every week.Teachers play an important role in increasing compliance with TTD consumption when provided in the school environment because they are considered to be able to provide positive information about TTD, thereby increasing positive attitudes in adolescent girls [23]. This finding is in line with previous research which found that compliance interventions with digital applications had a higher proportion than groups receiving conventional compliance interventions[24].The RemindMe app in this study has advantages and disadvantages that impact adolescent girls' compliance. RemindMe's advantage lies in its availability on smartphones, which adolescents use daily, making it more likely to be used frequently. However, the RemindMe app is only available on Android devices, so it may not be available on certain phone models.

The difference test between the control and intervention groups showed that there was no significant difference in the compliance variable for consuming iron supplements according to the post-test results of the intervention group and the control group after receiving education using the application. Scientists found that the time to form a habit was an average of 66 days, with a range of 18 to 254 days. Other studies have also found that opinions about how long it takes to change a habit can vary depending on the habit itself and the individual factors involved, based on research by psychologist BJ Fogg, who stated that a habit takes a minimum of 21 days to start forming and can reach a high level of automaticity[25]. So, some people may see changes in their behavior within a few days or weeks. Therefore, strong and automatic habits usually require more time and consistency.

Compliance with TTD consumption by adolescent girls at school is also influenced by several things, such as support from the school environment, known benefits, perceived obstacles, and the level of adolescent self-confidence[26].In this study, student compliance in consuming iron tablets in both groups was influenced by support from the school environment, namely teachers and researchers, which motivated students. Several factors influencing the habits of school adolescents in Indonesia in consuming iron tablets include perceived threats, perceived benefits, perceived barriers, and self-confidence[27]. Threat perception showed a positive relationship with the desire to take iron tablets[28]. Perceived benefits are also positively correlated with these intentions, as perceived benefits have been shown to be a strong indicator in encouraging changes in adolescent health behavior to prevent anemia[29]. Conversely, perceived barriers showed a negative relationship with the intention to take iron tablets, as barriers such as environmental influences can reduce this intention. Meanwhile, self-efficacy had a positive correlation with the desire to take iron tablets, which was strengthened by peer support and reliable information[30].

CONCLUSION

Anemia education through the RemindMe app did not significantly improve knowledge and adherence to iron tablet consumption among adolescent girls. The RemindMe app is effective in delivering information interactively and helps maintain consistent, healthy behaviors through its reminder feature. These findings suggest that the RemindMe app should be adopted more widely and developed into adolescent health programs, such as in schools, integrated health posts (Posyandu), or youth communities. Furthermore, training is needed for teachers and health cadres to assist in the use of this app and ensure its optimal implementation. The government and health institutions are also advised to support similar technological innovations in anemia prevention campaigns and other health programs, to expand their reach and impact among adolescents. Future researchers are advised to add consumption tracking and personal health data integration features, considering that these two features are not yet available in the

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RemindMe app. Further research to observe changes in student behavior will require a longer period of time and more frequent education.

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