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THE IMPACT OF THE CEMARA APPLICATION ON THE PREVENTION OF ANEMIA IN ADOLESCENT GIRLS

Rina Patmawati[1], Teni Nurlatifah[2], Ardini Saptaningsih Raksanagara[3], Mamun Sutisna[4], Hidayat Wijayanegara[5]

[1,2]Master of Midwifery, STIKes Dharma Husada, Bandung, West Java
[3]Department of Public Health Sciences, Faculty of Medicine, Padjadjaran University, Bandung, West Java
[4]Politeknik Negeri Bandung, Bandung, West Java
[5]Magister of Midwifery, STIKes Dharma Husada, Bandung, West Java

Email correspondence: rinapatmawati9@gmail.com

ABSTRAK : PENGARUH PENGGUNAAN APLIKASI CEMARA DALAM PENCEGAHAN ANEMIA PADA REMAJA PUTRI

Latar Belakang: Remaja putri masih memerlukan perhatian khusus untuk terhindar dari anemia. Pengelolaan standar anemia dengan suplementasi tablet Fe masih belum maksimaldikarenakan beberapa hambatan salah satunya masalah kepatuhan karena rendahnya minat dalam konsumsi tablet Fe serta efek samping gastrointestinal yang ditimbulkan. Guna mengawasi seberapa banyaknya TTD yang diminum oleh remaja putri, peneliti mengembangkan aplikasi CEMARA, sebuah alat pencatatan dan pelaporan data elektronik.

Tujuan: Melihat seberapa baik Aplikasi CEMARA bekerja untuk menyelamatkan remaja dari anemia inilah yang menjadi pendorong dilakukannya penelitian ini.

Metode: Penelitian ini menggunakan metode kuantitatif dan desain kuasi-eksperimental. Pengambilan sampel kuantitatif digunakan. Terdapat total 78 partisipan yang dibagi secara merata antara kelompok intervensi dan kelompok kontrol dalam penelitian ini. Penelitian berlangsung selama dua bulan, dari 15 Februari 2024 hingga 16 April 2024. Data dianalisis menggunakan uji independen, dan jika data tidak berdistribusi normal, uji Mann-Whitney U digunakan untuk membandingkan hasil pra dan pasca tes kelompok

Hasil: Berdasarkan data yang diperoleh, diketahui bahwa terdapat perbedaan penggunaan aplikasi CEMARA sebelum dan sesudah intervensi. Secara spesifik, kelompok intervensi menggunakan aplikasi CEMARA sebanyak 32,0 kali, sedangkan kelompok kontrol menggunakan aplikasi CEMARA sebanyak 47,0 kali. Lebih lanjut, kita tahu bahwa penggunaan aplikasi CEMARA setelah intervensi adalah rata-rata 59,0 kali, dibandingkan dengan 20,0 kali pada kelompok kontrol. Nilai sig (2-tailed) untuk perbedaan ini adalah 0,00 < 0,05.

Kesimpulan: Terdapat perbedaan penggunaan aplikasi CEMARA antara kelompok intervensi dan kelompok kontrol

Saran: Aplikasi CEMARA berhasil mencegah terjadinya anemia pada remaja putri, dan terdapat peningkatan kadar hemoglobin darah setelah menggunakan aplikasi CEMARA dibandingkan dengan sebelumnya.

Kata Kunci : Anemia remaja putri, Aplikasi CEMARA, Efektivitas

ABSTRACT

Background: Adolescent girls require special attention to prevent anemia. The standard management of anemia through iron (Fe) tablet supplementation remains suboptimal due to several challenges, including issues of compliance stemming from a lack of interest in consuming Fe tablets and the gastrointestinal side effects they may cause. To monitor the amount of Fe tablets consumed by adolescent girls, researchers developed the CEMARA application, an electronic tool for data recording and reporting.

Objective: The effectiveness of the CEMARA App in preventing anemia among adolescents serves as the impetus for this research.

Methods: This research employed quantitative methods with a quasi-experimental design. A quantitative sampling technique was utilized, with a total of 78 participants evenly divided between the intervention and control groups. The research was conducted over a two-month period, from February 15, 2024, to April 16, 2024. Data analysis was performed using an independent t-test; however, if the data were not normally distributed, the Mann-Whitney U test was used to compare the pre- and post-test results of the groups.

Results: Based on the data obtained, it is known that there is a difference in the use of CEMARA application before and after the intervention. Specifically, the intervention group used the CEMARA app 32.0 times, while the control group used the CEMARA app 47.0 times. Furthermore, we know that the use of CEMARA app after the intervention was 59.0 times on average, compared to 20.0 times in the control group. The sig value (2-tailed) for this difference is 0.00 < 0.05.

Conclusion: There is a difference in the use of CEMARA application between the intervention group and the control group.

Suggestion: The CEMARA app successfully prevented anemia in adolescent girls, and there was an increase in blood hemoglobin levels after using the CEMARA app compared to before.

Keywords: Anemia of adolescent girls, CEMARA App, Effectiveness

INTRODUCTION

When people, families and communities are healthy, they are better able to participate in society and the economy. Health services are part of this larger effort. Minimum service standards (MSS) for essential health services, which focus on prevention and promotion, are lacking (Ministry of Health, 2016; Ani, 2022).

Adolescent girls often have hemoglobin levels of 12-15 g/dl, which is below the normal range for their age group and gender; this is recognized as anemia. (Barasi, 2016). Anemia is defined as a condition in which the number of red blood cells is inadequate according to WHO. (Setiawan H, Nurani Asmara A, Zharfa Asmarani A and D, 2018).. Anemia is often experienced by adolescent girls for several reasons, including the fact that they are in the growth stage hence the need for more iron-rich nutrients, the fact that they lose a lot of blood during menstruation, and the fact that on average the human body excretes 0.6 mg of iron daily, mainly in the form of feces (Parasdia, 2017; Zimmerman M, 2023; Dewi *et al*., 2024)

Menstruation occurs every month in adolescent girls, where they lose about 1.25 milligrams of iron per day; iron deficiency anemia is the cause of anemia on a world scale. (Indonesian, 2016). Adolescent girls face real and future dangers due to anemia. Maternal mortality reached 305 per 100,000 live births in 2015, with 32.4% of deaths caused by preeclampsia and eclampsia and 20.3% by postpartum hemorrhage. LBW and stunting are more likely to occur in mothers who experience worsening anemia during pregnancy. (Purnamasari WM, Diana H, 2022). Adolescent girls also often experience iron deficiency anemia. Children aged 5-14 years had a prevalence of 26.4% in the 2013 Riskesda research; in 2018, the rate increased to 48.9%.

Anemia was recorded at 39.99% among pregnant women in 2014, according to a survey conducted by the Garut District Health Office. Since the beginning of the year, one of the plans suggested by WHO is to delegate authority to provincial policies to set the priority scale for each region (Purnamasari WM, Diana H, 2022; Davis, 1989)The anemia rate in the Garut Regency area is still high In 2021, 856 adolescent girls out of a total of 1672 adolescents who underwent hemoglobin level checks were diagnosed with anemia (Fathony Z, Amalia R, 2021; Fitriany and Saputri, 2018).

One of the efforts made by UPT Puskesmas Talegong District, Garut Regency is to develop the CEMARA (Prevent Teen Anemia) Application. Teenagers will learn more about the importance of preventing anemia and get encouragement to do so with this application. This application also reminds teenagers to consume blood supplement tablets (TTD), balanced nutritious food, and do physical activity regularly (Maulina, 2021).

The CEMARA application is a means of recording and reporting electronic data of money aimed at monitoring the consumption of blood supplement tablets (TTD) by adolescent girls. One of the benefits is that the CEMARA App can act as an effective reminder, compared to other Apps, the advantage is that there is a notification for adolescents who have not consumed Fe tablets, which is a ringing sound on the android cellphone concerned so that it helps young women to adhere to their blood supplement tablets consumption schedule. In addition, this application also presents important information about TTD and how to prevent anemia in more depth. This will shape healthy habits from an early age and spread important knowledge in adolescent girls' health.

RESEARCH METHODS

The quasi-experimental design method was used in this quantitative research design. The sample of this research consisted of female adolescents at SMAN 21 Garut which is located in the working area

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of the Talegong Health Center of Garut Regency in 2024. The sample of this research included female adolescents located in the area where the research was conducted using total sampling technique and included in the exclusion and inclusion criteria in data collection. The sample was divided into two groups: the control group consisting of 39 even-numbered adolescents who would not have access to the app and the intervention group consisting of 39 odd-numbered adolescents who would be given access to the app determined through hypothesis testing using the "Independent t- test", and if the data was not normally distributed, the "Mann Whitney" test was used to see the difference between pre and post for each group. This research was conducted in February and April 2024 and has obtained ethical clearance from STIKes Dharma Husada with number: 18/KEPK/SDHB/B/II/2024. This research lasted for two months.

RESEARCH AND DISCUSSION

Table 1
Number of Respondents

Description	P	L	Total
X-MIPA 1	19	9	28
X-MIPA 2	20	9	29
X-IPS 1	14	9	23
X-IPS 2	14	9	23
X-IPS 3	11	11	22

Table 2
Frequency Distribution of Respondents' Characteristics Before Intervention

Characteristics	Intervention Group (n=39)		Control Group (n=39)	
	Frequency	Percentage	Frequency	Percentage
IMT				
Skinny	9	23,1%	8	20,5%
Normal	24	61,5%	22	56,4%
Overwight	4	10,3%	8	20,5%
Obesity	2	5,1%	1	2,6%
Menstrual Cycle				
< 28 Days	36	92,3%	35	89,7%
28 - 35 Days	3	7,7%	4	10,3%
Duration of Menstruation				
1 - 7 Days	35	89,7%	33	84,6%
> 8 Days	4	10,3%	6	15,4%

Table 3
Frequency Distribution of Respondent Characteristics After Intervention

Characteristics	Intervention Group (n=39)		Control Group (n=39)	
	Frequency	Percentage	Frequency	Percentage
IMT				
Skinny	7	17,9%	8	20,5%5
Normal	26	66,7%	22	56,4%
Overwight	6	15,4%	8	20,5%
Obesity			1	2,6%
Menstrual Cycle				
< 28 Days	37	94,9%	35	89,7%
28 - 35 Days	2	5,1%	4	10,3%
Duration of Menstruation				
1 - 7 Days	35	89,7%	33	84,6%
> 8 Days	4	10,3%	6	15,4%

Table 4
Frequency distribution of hemoglobin levels before and after intervention

Before	Intervention Group (n=39)		Control Group (n=39)	
	Frequency	Percentage	Frequency	Percentage
No Anemia	7	17,9%	8	20,5%
Mild Anemia	30	76,9%	20	51,3%
Moderate Anemia	2	5,1%	11	28,2%
After				
No Anemia	34	87,2%	11	28,2%
Mild Anemia	3	7,7%	16	41,0%
Moderate Anemia	2	5,1%	12	30,8%

Table 5
Frequency Distribution of CEMARA Application Before Intervention

CEMARA App	Intervention Group (n=39)		Control Group (n=39)	
	Frequency	Percentage	Frequency	Percentage
Not used	31	79,5%	39	92,3%
Used	8	20,5%	3	7,7%

Table 6
Frequency Distribution of CEMARA Application after Intervention

CEMARA App	Intervention Group (n=39)		Control Group (n=39)	
	Frequency	Percentage	Frequency	Percentage
Not used			39	100%
Used	39	100%		

Table 7
Differences in the use of CEMARA App between intervention and control groups

Difference	Before			After		
	Intervention Control		P value	Intervention Control		P value
	Mean	Mean		Mean	Mean	
CEMARA App	32,0	47,0	0,00	59,0	20,0	0,00

Table 8
Effectiveness table before intervention

Variabel	Before Intervention				After Intervention			
	df	Mean	Std. Deviation	P-value	df	Mean	Std. Deviation	P-value
Post test - pre test	76	0,128	0,78	0,10	76	0,949	0,36	0,00

DISCUSSION

The Prevent Anemia in Adolescents (CEMARA) application is an important tool in preventing and monitoring health conditions, especially in the context of anemia in adolescents. The app can provide information about what anemia is, including its causes, symptoms, and impact on adolescent health. This helps to increase adolescents' awareness about health conditions. The CEMARA app can allow users to monitor their own hemoglobin levels periodically by using sensor devices or manual input. The data collected can then be used to monitor changes in hemoglobin levels and alert users in case of a significant drop. Information on the importance of balanced nutrition in preventing and overcoming anemia. This includes information on foods rich in iron, vitamin B12, and folic acid that can help increase hemoglobin levels in the app can help users to set up a schedule for taking supplements or iron-rich foods on a regular basis.

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The reminder feature can also be used to remind users to do regular health check-ups.

The results showed that the difference in the use of the CEMARA application before intervention in the intervention group and control group with an average intervention group of 32.0 and the control group with an average of 47.0 was known that the sig value (2-tailed) 0.00 <0.05 and the use of the fir application after intervention in the intervention group and control group with an average intervention group of 59.0 and control group of 20.0, it was known that the sig value (2-tailed) 0.00 <0.05, it can be concluded that there is a difference in the use of the CEMARA application in the intervention group and control group before and after the intervention.

The results of this research are in line with research (Rohani T, 2021) It was found that the difference between the intervention group and the control group had a p-value of 0.00. So with the activities of providing blood supplement tablets that are reserved by the government have provided very good results. it is recommended that such activities continue to be carried out starting with screening activities to providing blood supplement tablets for those in need. So that the incidence of anemia, especially in adolescent girls in Indonesia, will decrease and adolescent girls in Indonesia will grow healthier and be able to give birth to healthy children in the future.

The results showed that the effectiveness test using independent sample test in the intervention group and control group before the intervention can be seen that the P-value is 0.10 (<0.05) which means that there is no effectiveness in the CEMARA Application before the intervention. Thus, the identification of the level of adherence to the consumption of blood supplement tablets before the intervention in the CEMARA Application at SMAN 21 Garut the results of the comparison between the intervention group and the control group provide an overview of the problem of adherence in consuming blood supplement tablets among adolescents. In contrast to the results of a previous research, the knowledge and attitudes of adolescent girls about anemia prevention were shown to be positively influenced by the intervention using Android-based media applications in a research conducted at SMKN 9 Padang City. The average value of respondents' knowledge before getting the intervention was 11.04, after getting the intervention through Android-based media applications to 15.56 or an increase of 4.52%. Wilcoxon test showed a difference of 0.0001 (p<0.05) (Viljoen K, 2015; Aini and Nian Afrian Nuari, 2024).

Understanding of Anemia Before using the App, adolescents may have varying levels of understanding of anemia. Some may have a good knowledge of the condition, while others may lack understanding of the causes, symptoms, and impact of anemia on health. Adolescents' nutritional condition may vary depending on their diet, social environment, and access to nutritious food (Indartanti D, 2014; Fitriyani *et al*., 2022). Some adolescents may have a healthy and balanced diet, while others may experience certain nutrient deficiencies that can increase the risk of anemia (Pratiwi E, 2019; Rima Andini and Agestika, 2022) . Prior to using the App, adolescents may have different levels of access to health services, including routine health check-ups and medical consultations. Factors such as geographical location, economic status and family support may influence such access. Adolescents' level of awareness and motivation to take care of their health may also vary (Saraswati RS, Kartini A, 2020). Some adolescents may be very concerned with health and strive to take preventive measures, while others may be less concerned or unaware of the importance of anemia prevention. Level of Engagement in Healthy Behaviors Prior to using the App, some adolescents may already be actively engaged in healthy behaviors such as exercise, good sleep patterns, and avoiding habits that are detrimental to health. However, others may need additional encouragement to adopt such healthy behaviors (Sulistiani D, Rahayu SR, 2021).

This is also supported by the theory of Notoatmodjo 2014, anemia knowledge on application is the result that a person gets of something through his senses. after someone is given health promotion, his senses gain knowledge, meaning his knowledge increases. Knowledge is the final consequence of realizing, just as realizing can lead to knowing. It can be detected by humans through their eyes, ears, nose, mouth, and skin. Humans rely heavily on their senses of sight and hearing to gain knowledge (Sulistiani D, Rahayu SR, 2021; Astuti, Munigar and Lukman, 2019).

The researcher assumed that the respondents' understanding of anemia in the CEMARA Application was the value of the respondents' knowledge because the android-based application media in this research could convey messages to the target through the senses of sight and hearing, where most of a person's knowledge is obtained through the eyes and ears. So that with the content of different health problems, Android-based applications still make changes in knowledge on the target. The results above show that the effectiveness test using an independent sample test on the intervention group and control group after the intervention can be seen that the P-value is 0.00

(<0.05) which means that there is effectiveness in the CEMARA Application after the intervention.

The results of this research are similar to the previous research obtained the results of the Android Studio Application significantly increased the knowledge of the Application after the intervention on nutrition with the results of statistical analysis with the Wilcoxon test showed that the p value was 0.000 ≤ 0.05. After the application of the CEMARA Application, the results of bivariate analysis showed a comparison of the level of compliance using the CEMARA Application in the intervention group at SMAN 21 Garut. from the results of the research there were all respondents using the CEMARA Application for the prevention of anemia. The P-value showed that 0.00 (<0.05) which means there is effectiveness on CEMARA Application related to anemia prevention.

Basically, this result shows that the control group experienced a significant change in the level of adherence using the CEMARA App. This could indicate several things, such as the incompatibility of the intervention in the control group, the lack of effectiveness of the CEMARA App in the control group or the presence of other factors affecting adherence levels that were not detected in this research. This outcome is in line with previous research which states that not all use of technology Apps can significantly increase one's adherence to health. According to L green's theory in the research stated that a person's health behavior can be influenced by predisposing factors, enabling factors, and enabling factors and other thematic driving factors in the research also mentioned that factors that influence the compliance of female students in taking blood supplement tablets are with the support of teachers from the school. (Utami B, Sunjani S, 2015;Hanifah, 2023;Resmiati, Eru PM, 2022).

Digital technology can be utilized in efforts to improve health services by increasing access to information, access to care, prevention, and health education can be done by integrating mobile technology in health as a strategy in solving existing problems (Ardiyanti, Artatanaya and Adnyana, 2022). Digital technology can be packaged with a more attractive approach that can be given to adolescent girls in an effort to remind adherence to iron supplements, health education about anemia, behavior change communication and other health promotion communication (Manik, 2021). Research in several countries around the world suggests that digital health interventions can solve problems of distance and access, medication adherence, improved knowledge, attitudes and skills (Ani L, 2022; Risma Oktaria and Evi Martha, 2023).

Currently, the CEMARA application is widely used as an approach to solve health service problems so as to reduce costs and improve the quality of health services and change behavior to improve prevention aimed at achieving good services. It can improve health education and behavior change through changes in knowledge and behavior change for the better. The CEMARA application can be an approach in solving health service problems of limited human resources, distance of health services, expanding target respondents and others. (Zimmerman M, 2023). After using the App, adolescents are expected to have a better understanding of anemia, including its causes, symptoms, and the importance of prevention. Evaluation can be done by measuring the increase in adolescent knowledge through knowledge tests before and after the intervention. Nutrition Behavior Change is expected to influence adolescents' behavior regarding their diet. Evaluation of its effectiveness can be done by looking at changes in adolescents' diet, including increased consumption of foods rich in iron, vitamin B12, and folic acid. Health Monitoring can use the App, through the health monitoring feature its effectiveness can be evaluated based on its ability to help adolescents monitor their health conditions, including changes in hemoglobin levels and symptoms of anemia (Yasa N, Ratnaningrum L, 2014). Ease of Access and Use Evaluation of the effectiveness of an App can also consider how accessible and easy to use it is for adolescents after the intervention. If the App is easy to access and use, then it is likely that adolescents will be more active in using it. The characteristics of respondents based on BMI showed that the average respondent had a Body Mass Index (BMI) before being given the intervention in the intervention group in the normal category 61.5% and in the control group in the normal category 56.4%. While after being given the intervention in the intervention group in the normal category 66.7% and the control group 56.4%. The outcomes of this research corroborate the results of other studies which show that macronutrient consumption has a greater impact on nutritional status as measured by body mass index, compared to food factors alone (Yunarsih, 2014; Reina, 2010).

Hemoglobin before being given intervention in the intervention group respondents had Hb levels in the mild anemia category 87.2% and in the control group respondents had Hb levels mild anemia 41%. Whereas after the intervention was given, the intervention group had Hb levels in the non-anemia category 87.2% and in the control group respondents had Hb levels of mild anemia 41%. The menstrual

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cycle before being given the intervention in the intervention group was mostly <28 days by 94.9% and in the control group 89.7%. Meanwhile, after the intervention, the majority of the intervention group had a menstrual cycle <28 days by 94.9% and the control group had a menstrual cycle <28 days by 89.7%. The results of this research are in line with previous research which states that 52.05% of respondents who have a normal menstrual cycle experience anemia due to factors such as irregular diet, stress, menstrual complaints, and weight changes (Hanifah, 2023; Reina, 2010). Perioperative menstrual cycle duration With 89.7% in the intervention group and 84.6% in the control group, the majority of adolescent girls who participated in the survey reported a menstrual cycle duration of 1 to 7 days. In contrast, 84.6% of control group adolescent girls experienced menstruation lasting 1-7 days after receiving the intervention, while 89.7% of intervention group adolescent girls did not experience menstruation. Excessive blood loss, which results in the removal of red blood cells during menstruation, is the main cause of anemia in individuals with irregular menstrual duration, according to previous studies. The results of this research stated that some anemic adolescent girl respondents did not experience abnormal menstruation.

CONCLUSION

There is an increase in Hb level after using CEMARA App compared to before using CEMARA App. There is an effectiveness of using CEMARA App in preventing anemia in adolescent girls.

SUGGESTION

The CEMARA application can be used as a tool to record, report and monitor the consumption of Fe blood supplement tablets in adolescent girls.

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