



## Implementation of an e-pocket book to improve knowledge and perceive anemia in adolescents

Lisa Ratna Wijaya<sup>1</sup>, Siti Budi Utami<sup>1</sup>, Muhammad Primiaji Rialihanto<sup>1,2</sup>, Tri Siswati<sup>1,2</sup>

<sup>1</sup>Department of Nutrition, Politeknik Kesehatan Kemenkes Yogyakarta, 55293. Indonesia

<sup>2</sup>Center of Excellence in Health Science and Research for Applied Technology Innovation in The Field of Public Health (PUI\_Novakesmas), Politeknik Kesehatan Kemenkes Yogyakarta, Indonesia.

\*Correspondence: [tri.siswati@poltekkesjogja.ac.id](mailto:tri.siswati@poltekkesjogja.ac.id)

### ABSTRAK

**Latar Belakang:** Anemia remaja adalah masalah kesehatan masyarakat yang serius.

**Tujuan:** Penelitian ini bertujuan untuk mengetahui efektivitas edukasi dengan menggunakan e-pocket book berbasis Android dan poster.

**Metode:** Penelitian ini merupakan quasy eksperimental dengan desain pre-test post-test with desain control group design. Penelitian dilakukan di Kabupaten Magelang, Jawa Tengah, Indonesia, pada bulan Februari hingga April 2023. Kelompok perlakuan diberi edukasi gizi menggunakan e-pocket book, sedangkan kelompok kontrol diberi poster. Hasil yang diukur adalah pengetahuan dan persepsi sebelum intervensi, 3 hari setelah (post-test 1), dan 14 hari setelah intervensi (post-test 2). Subyek ditentukan dengan rumus Lemeshow, dengan kriteria inklusi bersedia menjadi responden, hadir saat penelitian dilakukan, memiliki data yang lengkap, dan khususnya kelompok perlakuan memiliki Android. Berdasarkan kriteria tersebut subyek sebanyak 49 remaja per kelompok. Analisis dilakukan dengan uji Mann-Whitney untuk sampel yang tidak berdistribusi normal dan independent t-test untuk sampel yang berdistribusi normal. Data diolah dengan SPSS.

**Hasil:** Skor pengetahuan dan persepsi kelompok intervensi pada awal, post-test 1, dan 2 lebih tinggi daripada kelompok kontrol. Ada perbedaan yang signifikan secara statistik skor pengetahuan antara post-test 1 dan 2 dan pretest. Namun, dalam hal persepsi, perbedaan signifikan hanya terdapat pada post-test 1.

**Kesimpulan:** Media e-pocket book dan poster meningkatkan pengetahuan dan persepsi tentang anemia. Namun, e-pocket book ternyata lebih efektif untuk meningkatkan pengetahuan remaja terhadap anemia dibandingkan poster. Edukasi baik menggunakan e-pocket book maupun poster memperbaiki persepsi remaja tentang anemia hanya dalam jangka pendek.

**KATA KUNCI:** anemia; e-pocket book; pengetahuan; persepsi; poster; remaja



## ABSTRACT

**Background:** The prevalence of anemia among adolescents is a serious public health problem.

**Objectives:** This study aims to determine the effectiveness of education using an e-pocket book based on an Android and poster.

**Methods:** A quasi-experimental study using a pre-test and post-test with a control group design. The study was conducted in Magelang Regency, Central Java, Indonesia, from February to April 2023. The treatment group focused on nutrition education using an e-pocket book, while the control group focused on posters. Outcomes measured were knowledge and perception before the intervention, 3 days after (follow-up 1), and 14 days after (follow-up 2) the intervention. Subjects were determined by the Lemeshow formula, with inclusion criteria being willingness to be respondents, present when the study was conducted, having complete data, and specifically the treatment group having android, which amounted to 49 persons per group. The analysis was conducted with the Mann-Whitney test for non-normally distributed samples and an independent T-test for normally distributed samples. We apply SPSS.

**Results:** Score knowledge and perception of the intervention group at baseline, follow-up 1, and 2 were higher than in the control group. There was a statistically significant difference in the knowledge scores between follow-ups 1 and 2 and the pretest. Education using both e-pocket books and posters improves adolescents' perceptions of anemia significantly only in post-test1.

**Conclusions:** Media e-pocket books and posters increase knowledge and perceptions about anemia. Education using both e-pocket books and posters improves adolescents' perceptions of anemia only in the short term.

**KEYWORD:** adolescent; anemia; e-pocket book, knowledge; perceive; poster

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## INTRODUCTION

Anaemia is a condition characterized by an abnormally low number of red blood cells or haemoglobin concentration. Iron deficiency, often known as iron-deficiency anemia (ID), is one of the most common dietary deficiencies that affects children and adolescents around the world(1). Anemia is characterized by a lack of the oxygen-carrying hemoglobin. If blood cells become slightly reddened, the blood's ability to transport oxygen to body tissues will decrease, resulting in lethargy, weakness, dizziness, and shortness of breath. Because adolescent girls and women of childbearing age or 14-49 year old menstruate, they are highly susceptible to be anemia. WHO

categories women of childbearing age with hemoglobin levels lower than 12 g/dL are anemic, with classified as 11-11,9 g/DL is mild anemia, 8-10.9 g/DL is moderate anemia, and <8 g/DL is severe anemia(2).

Iron-deficiency anemia was found to be the only non-fatal condition to rank in the top 10 global leading causes of disability-adjusted life years in the most recent report from the Global Burden of children and adolescents(3). WHO estimates that anemia affects 40% of children aged 6–59 months, 37% of pregnant women, and 30% of women aged 15–49 years across the globe(1). Surveys in Indonesia in 2013 and 2018 reported that the prevalence of female adolescent anemia

between 15 and 24 years old increased from 18,4%(4) to 32%(5). Based on a survey in Central Java in 2015, anemia in adolescents is a serious public health concern as many as 57,7%(6). Magelang regency was area the highest anemia prevalence among female adolescence. Local health office reported that between 754 of 2511 female adolescent were anemia (30,03%), while the highest of the anemia prevalence were Borobudur and Salam sub-district, that were 37,74% and 37,58% respectively(7).

Anemia throughout adolescence has the potential to produce a wide variety of functional effects throughout a person's life, some of which include decreased resistance to illness, diminished physical performance and neurodevelopment, and suboptimal schooling outcomes(8). Anemia in adolescent also may lead to possibly long-term effect particularly among women of childbearing age, lead to an increase in the rates of pregnancy problems, such as low birthweight, early births, and the mortality of newborns(9) as well as maternal mortality(10).

Multiple factors can lead to anemia, including nutrient deficiencies due to inadequate diets or inadequate absorption of nutrients, infections (such as malaria, parasitic infections, tuberculosis, and HIV), inflammation, chronic diseases, gynecological and obstetrical conditions, and inherited red blood cell disorders. Iron deficiency is the most common nutritional cause of anemia, but deficiencies in folate, vitamin B12, and vitamin A are also significant causes(1)(11)(12)(13)(14). Lack of proper knowledge, perceives, and practices surrounding optimal eating may also be a possible explanation for the high prevalence of anemia among adolescents. A number of studies have proven the link between knowledge, perceives, and behavior of adolescents with adequate food intake and optimal nutritional status. For instance, a cross-sectional study of 300 female secondary school students aged 13 to 16 years in Iran revealed that 23.3% of the students engaged in poor dietary practices and that 25.7% lacked knowledge about anemia, its manifestations, prevention, and treatment(15). In Ethiopia, a community-based cross-sectional study of 1,323 females aged 10 to 19 was

conducted, and its resulted that less than half of the sample were aware of anemia, and less than one-third was aware of the connection between iron-rich food intake and anemia(16).

Anemia is a preventable health problem. Several previous studies have proven educational interventions to increase adolescent knowledge in order to prevent and tackle anemia. For example study in Jordanian adolescent showed that education intervention group have higher of total knowledge, perceive, and practice scores post-program and significantly increased from pre- to post-test than control group(15). Implementation of PRECEDE model in Iran also showed significantly improve knowledge of study population(17). Researchers used media to encourage students to better assimilate learning materials, educational media including social media aids load and disseminate them more effectively and efficiently(18). Android-based media has many advantages, such as being portable, simple, requiring little storage space, being interactive, containing engaging image and sound features, and complementing the lifestyle of adolescents in accordance with the most recent technological advances(19). This study aims to determine the effect of android-based e-pocket books on improving knowledge and perceive of anemia in adolescents.

## **MATERIALS AND METHODS**

This was an experimental quasi-research study with a pre-test and post-test with a control group design. Intervention is education with Android-based e-pocket books, while control is education with posters. Research is carried out by providing education for 90 minutes, accompanied by WhatsApp group of each group to discuss using two way communication between researchers as experts and participants.

The study was conducted in Borobudur District, Magelang Regency, Central Java by considering the high problem of anemia in the region. The teenagers who participated were students of senior high school Muhammadiyah Borobudur as an intervention group and students of vocational secondary school Muhammadiyah Borobudur as a

control group. Subjects were determined by the Lemeshow formula(20) with reference to the difference in knowledge after the intervention(21), amounted to 49 students became participants in each group. The study was conducted from February to April 2023. The output measured was knowledge collected with a questionnaire of 15 questions with true score values of 1 and false 0, and perceive scores measured by a Likert scale with a range of 1 (strongly disagree) to 5 (strongly agree) with a total of 15 statements. Knowledge and perceives were measured at baseline, follow-up1 on 3 days after intervention and follow-up 2 on day 14 days after intervention. Educational media, both e-pocket books and posters, are tested for usability using PSSUQ with

a value of <2.82(22) so that this media is usable as an educational medium. While the questionnaire is tested for reliability and validity. Data were analyzed with Man Whitney and Independent T-test with SPSS. This research has approved by Institutional Review Board of the Poltekkes Kemenkes Yogyakarta No.e-KEPK/POLKESYO/0004/VII/2022 dated July 29, 2022.

## RESULTS AND DISCUSSIONS

### Sample tree

The subjects of this study were adolescent female aged 16-18 years with 49 students each group. The sample tree depicted in Figure 1.

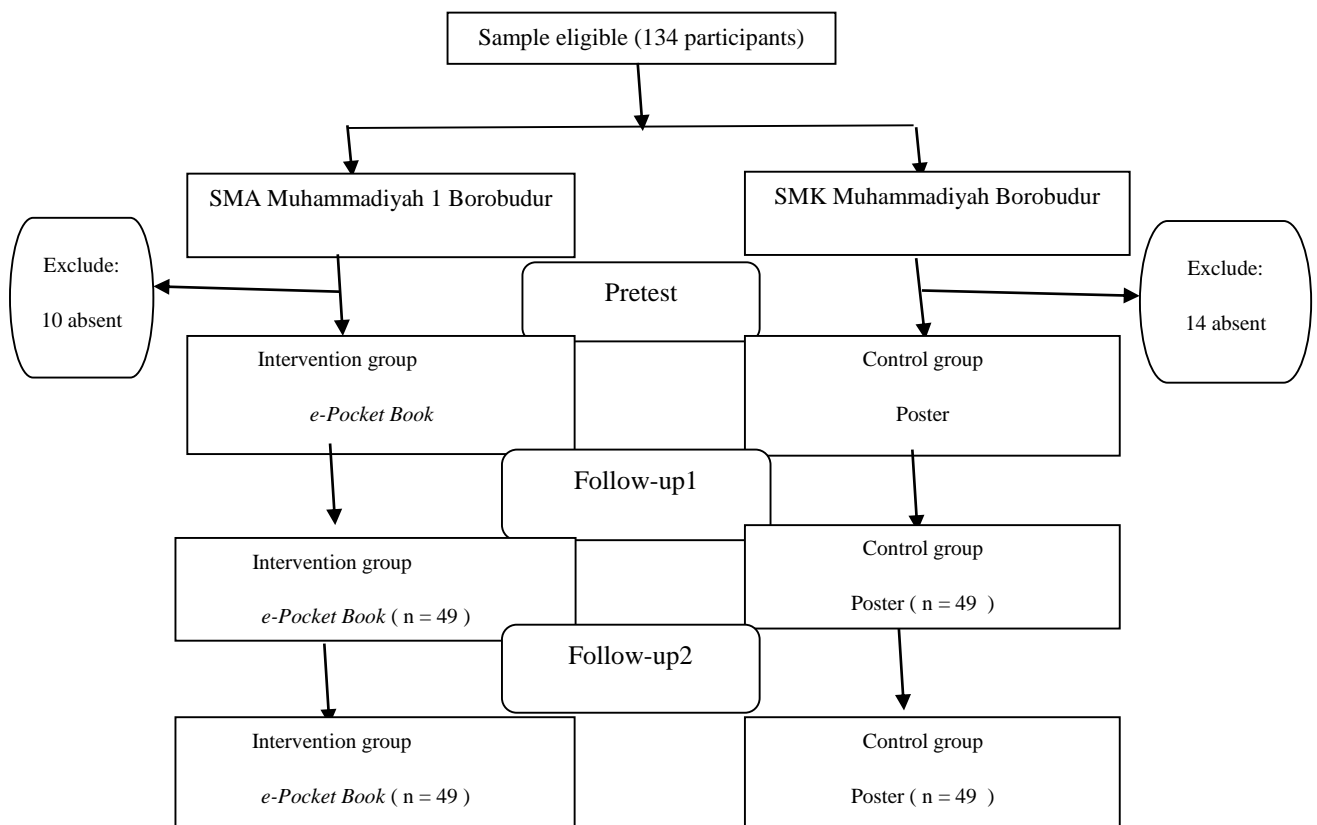
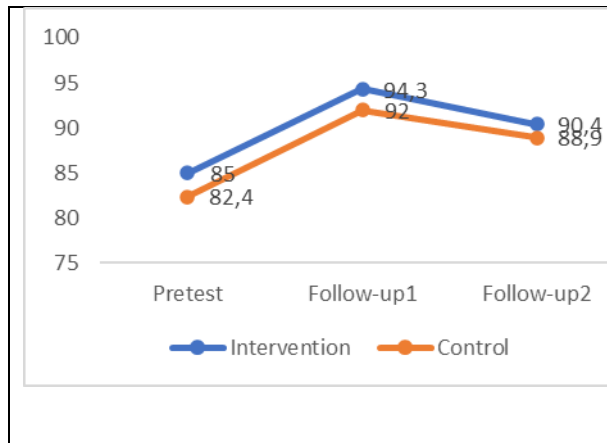


Figure 1. Sample tree and CONSORT diagram

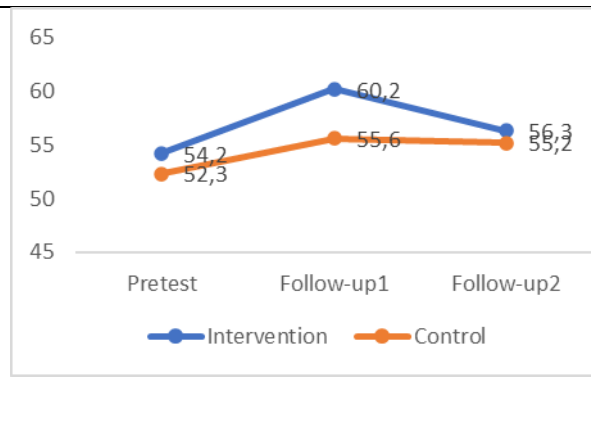
**Knowledge and perceive female adolescent regarding anemia**

The intervention increased the knowledge and perceives regarding anemia of adolescent girls; the increase in knowledge and perceives was higher in the intervention group than in the

control group. But unfortunately, the results of measuring knowledge and perceives in the follow-up period of both the treatment and control groups decreased. AS detail in Figures 2 and 3.



**Figure 2. Adolescent knowledge before and after the intervention**



**Figure 3. Adolescent attitude before and after the intervention**

Association between time and research outcome among different intervention groups. Result showed that there are significant improvement regarding knowledge of anemia between adolescent on follow-up1 dan 2 both in intervention and control group. But the significant

improvement regarding perceive of anemia between adolescent only showed on follow-up1 between control group. Among the treatment groups, only perceives of adolescent at follow-up 1 showed significant differences. As detailed in **Table 1**.

**Table 1. Association between time and research outcome among different intervention groups.**

Variable	Pretest	Follow-up1	Follow-up2	Follow-up1 vs pretest (p)	Follow-up2 vs pretest (p)
Knowledge					
Intervention <sup>a</sup>	82.4±11.9	92.0±9.1	88.9±11.8	9.6 (0.000)*	6.5 (0.006)*
Control <sup>b</sup>	85.0±10.1	94.3±8.6	90.4±10.7	9.3 (0.000)*	5.4 (0.044)*
p-value	0.263	0.122	0.569		
Perceive					
Intervention <sup>c</sup>	54.2±5.5	60.1±7.3	56.3±4.8	5.9 (0.000)*	2.1 (0.065)
Control <sup>d</sup>	52.3±3.4	55.6±4.9	55.2±5.8	3.3 (0.000)*	2.9 (0.070)
p-value	0.06	0.001*	0.317		

<sup>a</sup>Wilcoxon <sup>b</sup>Mann Whitney <sup>c</sup>Paired Sample T-test <sup>d</sup>Independent Sample T-Test

\*: p<0.05

Teenagers are a high age of curiosity. Providing education to adolescents is one of the efforts to overcome health problems, while fulfilling their rights to develop themselves through education including education in the health sector(23). There are several educational benefits provided at an early age, including their high interest in new information, adequate learning power and ability, adaptation to high science and technology, as well as the possibility of very broad implementation potential both for himself, a good influence on peers(24), influencing the environment and his family in the future(25). Education about anemia in adolescent girls, in particular, is expected to provide good knowledge(26) and perceive so that they can avoid anemia(27), have good learning outcomes, more productive and prevent long anemia during childbearing age, pregnancy, and get quality birth outcomes(26) (27). Thus, nation-building can be achieved through a healthy and accomplished generation(23).

In this research, android-based educational intervention is a form of technology utilization in the field of health, education with this method has proven successful in several previous studies (28–31) This finding showed that knowledge and perception increased at follow-up 1 between two group, but decreased at follow-up 2. This happens because naturally a person's memory on the information obtained will tend to decrease after day by day or weeks(32). In addition, the education provided only provides short information, which is 90 minutes long so that it does not touch the competence of adolescents to understand, analyze or apply the information that has been received.

When compared to the measured outcomes, knowledge at follow-up 1 and 2 is significantly different from perceive which is only significant at follow-up-1. This occurred in both treatment and control groups. The results of this study mean that to change one's perception, education may not be enough, but it must be accompanied by active involvement of adolescents so that behaviour change communication, as previous study to increase knowledge and practice of

healty living movement (or Gerakan Masyarakat Hidup Sehat or Germas in bahasa) in adolescents(33).

Several previous studies have proven the effectivity of android app as educational intervention, for instance education of Ibu Sehati to prevent anemia in pregnancy (20), education for healty eating diet in DM patients(34), health education for vulnerable people(35), as well as education for maternal and children health(36). Additionally, the various advantages of android features, appealing images, and opportunities for direct interaction between experts and users tend to increase user sensory involvement(37). Thus, according to Edgar Dale the chances for retention of the information obtained are higher when compared to visual media such as posters(38). The knowledge and attitudes of adolescent girls increased in follow-up 1 but decreased in follow-up 2, besides that Android-based e-pocket books are more effective in increasing adolescent knowledge and attitudes about anemia than control groups.

## CONCLUSIONS AND RECOMMENDATIONS

Media e-pocket book and poster increase knowledge and perceptions about anemia. However, e-pocket book media is more effective at improving adolescents perceptions of anemia than poster.

This program can be continued as an effort to prevent and overcome anemia of adolescent girls by combining with other methods that provide opportunities for more active involvement of adolescents so that they can maintain knowledge and perceive even changes in health behavior are expected.

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## CONFLICT OF INTEREST

The authors declare have no conflict of interest

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