

THE EFFECT OF REMINDER APPLICATION ON HEMOGLOBIN LEVELS IN PREGNANT WOMEN WITH ANEMIA

Anisah Tifani Maulidyanti¹*, Mika Oktarina²

^{1,2}Author's Full Affiliation ^{1,2}Midwifery Professional Education Study Program, STIKES Tri
Mandiri Sakti Bengkulu, Bengkulu, Indonesia

Correspondent: (anisahbidan23@gmail.com)

ABSTRACT

Anemia during pregnancy remains a major public health problem contributing to maternal and neonatal morbidity and mortality, particularly an increased risk of hemorrhage. Low adherence to iron tablet consumption and maternal knowledge are among the main contributing factors. Digital health interventions, such as reminder apps, offer a promising strategy to improve maternal health outcomes. This study aimed to analyze The Effect of Reminder Application on Hemoglobin Levels in Pregnant Women with Anemia. This study used a pre-experimental design with a single-group pretest–posttest approach. The sample consisted of 40 pregnant women with anemia, purposively sampled from three community health centers (Puskesmas) in Bengkulu City. The intervention involved the use of the Reminder App to encourage regular iron tablet consumption. Hemoglobin levels and knowledge were measured before and after the intervention. The results showed that most respondents were of non-risk reproductive age (80%), had secondary to higher education (77.5%), and were multiparous (67.5%). Statistical analysis showed a significant increase in hemoglobin levels and knowledge after the intervention ($p = 0.000$). The Reminder app effectively supported adherence to iron tablet consumption and improved mothers' understanding of anemia prevention. The Reminder app significantly improved hemoglobin levels and knowledge among pregnant women with anemia. This digital intervention has the potential to be integrated into antenatal care services as an innovative and sustainable strategy to prevent anemia during pregnancy.

Keywords: Hemoglobin, Anemia, Application, Pregnancy

INTRODUCTION

Maternal and child health has received significant attention from other countries, including being included in the 17 Sustainable Development Goals (SDGs) to be achieved by 2030, namely, Goal 1, which states "End poverty in all its forms everywhere," and Goal 2, which states "Eradicate hunger, achieve food security and improved nutrition, and promote sustainable agriculture." The SDGs are a transformation plan for the MDGs, implemented by 191 countries, including Indonesia. They aim to eradicate poverty and hunger, achieve universal primary education, promote gender equality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome), malaria, and other diseases, ensure environmental sustainability, and build global partnerships for development.¹

The Maternal Mortality Rate (MMR) is one indicator of the success of maternal health efforts. The MMR is the ratio of maternal deaths during pregnancy, childbirth, and the postpartum period caused by pregnancy, childbirth, and the postpartum period or their management, but not by other causes, such as accidents or incidents, per 100,000 live births.

As of 2017, the maternal mortality rate was still 177 per 100,000 live births. Achieving the 2030 SDG target of 70 per 100,000 requires hard work involving all elements of society and the government. Bleeding is one of the causes of maternal death, with anemia being a root cause that exacerbates maternal mortality. Currently, the incidence of anemia among pregnant women remains high.²

Anemia in pregnant women can increase the risk of premature birth, maternal and infant mortality, and infectious diseases. Iron deficiency anemia in the mother can affect the growth and development of the fetus/baby during and after pregnancy. Anemia is a major public health problem worldwide, especially for pregnant women. Pregnancy can cause fatigue, weakness, and decreased work capacity/ability or productivity. The most common causes of anemia in pregnancy are iron and folic acid deficiencies, and acute bleeding can occur due to the interaction between the two.³

Anemia in pregnant women can be caused by several factors. Direct factors include inadequate iron supplementation, pregnancy spacing, parity, nutritional status, and infectious diseases. The primary cause of anemia is insufficient iron intake in food or iron supplementation.⁴ The consumption of iron tablets remains low. Data from the 2018 Basic Health Research (Riskesdas) found that while 73.8% of pregnant women received iron tablets, only 63.8% consumed fewer than 90 iron tablets. This low consumption rate is due to individual factors, such as forgetfulness, a dislike of the taste, and nausea after taking iron tablets. Furthermore, low awareness and knowledge of the dangers of anemia are contributing factors to the low consumption of iron tablets by pregnant women.⁵

In Indonesia, the anemia prevention program for pregnant women is clearly stated in Minister of Health Regulation No. 97 of 2014 concerning the regulation of iron supplementation for pregnant women. To prevent iron deficiency anemia, every pregnant woman must receive at least 90 iron and folic acid tablets from the first contact. Compliance with iron supplementation is essential if the recommended dose is $\geq 90\%$. Compliance with iron supplementation is a crucial factor in ensuring increased hemoglobin levels. However, various factors, including poor knowledge, attitudes, and practices of pregnant women, and the side effects of iron supplements, can lead to poor adherence to iron supplementation, thus underachieving the goal of iron supplementation.⁶

To promote the success of the Iron Tablet (TTD) program, an effective Information and Education Communication (IEC) strategy is needed. Creative and innovative health promotion media must be continuously encouraged to support the success of a health program. Rapid technological developments and the increasing number of smartphone and internet users in Indonesia create a good market for educational media. Currently, there are 132.7 million smartphone and internet users, or 51.8% of the total population.⁷ Several studies have shown that the use of reminder apps significantly improves adherence to iron tablet consumption and reduces the incidence of anemia during pregnancy.⁸ Therefore, the use of simple digital media such as apps has great potential as an innovative solution for maternal health interventions, particularly in preventing anemia in pregnant women. This study aims to analyze The Effect of Reminder Application on Hemoglobin Levels in Pregnant Women with Anemia.

METHODS

This study used a pre-experimental design with a one-group pretest-posttest approach.

The population in this study were all pregnant women attending prenatal classes. The sample consisted of 40 pregnant women in their third trimester of anemia. The sample was selected using a purposive sampling technique. This study was conducted in the working areas of the Penurunan Community Health Center, Nusa Indah Community Health Center, and Padang Serai Community Health Center from June to August 2025. The instruments used in this study were the Reminder application and a questionnaire on knowledge of iron tablet consumption. Furthermore, the post-test group was analysed whether pregnant women have an increased hemoglobin value by prick test after 30 extra tablets and whether pregnant women have an increased hemoglobin value by remaining regularly to consume tablets fe. The inclusion criteria for this study were pregnant women with anemia who had consumed 30 iron tablets, as recorded using a reminder app. Exclusion criteria were pregnant women with a history of autoimmune disorders or obstetric problems.

RESULTS AND DISCUSSIONS

Table 1
Frequency Distribution of Age, Education and Parity

Variable	Reminder Application	
	n	%
Age		
Risk	8	20
Not Risk	32	80
Education		
Elementary School	9	22.5
Secondary School	20	50
University	11	27.5
Parity		
Multipara	27	67.5
Primipara	13	32.5
Nulipara	0	0

From table 1, it can be seen that in the Reminder Application group, almost all respondents (80%) were of non-risk age, half of the respondents (50%) had completed secondary education and the majority of respondents (67.5%) were multiparous. Based on Table 1, the majority of respondents in the Reminder Application group were in the non-risk age category (80%). This indicates that the majority of mothers are in a safe reproductive age range, which is physiologically and psychologically more prepared to receive health information and follow recommendations provided through digital media. A non-risk reproductive age is also associated with better adaptability to health technology, including the use of reminder applications to support adherence and health behavior change.

Regarding education level, half of respondents (50%) had a secondary education, followed by higher education (27.5%) and primary education (22.5%). Education level is an important factor influencing an individual's ability to understand health information and apply it in their daily lives. Secondary to higher education tends to be associated with better health literacy, thus supporting the effectiveness of using reminder applications in delivering health messages accurately and sustainably. This aligns with the theory that higher education levels

improve the acceptance and utilization of health information.⁹

Based on parity, the majority of respondents were multiparous (67.5%), while primiparous respondents made up 32.5%, and there were no nulliparous respondents. Multiparous mothers generally have prior experience with pregnancy and healthcare, making it easier for them to understand the importance of monitoring their health and following prescribed interventions. This experience can increase their readiness to utilize reminder apps as a tool to help them adhere to health recommendations. Meanwhile, primiparous mothers, despite having more limited experience, still demonstrate a high potential for receptiveness to technology-based interventions due to their greater need for information during pregnancy.¹⁰

Table 2.
Average Hb Level, Knowledge

Variabel	Reminder Application				SD
	Min	Max	Mean	Median	
Hb level					
Pre	7,10	10,90	9,7	10	1,024
Post	10	15,80	12,2	12,1	1,132
Knowledge					
Pre	4	11	8,50	9	1,533
Post	9	12	11,50	12	0,784

Table 2 shows that of the 40 pregnant women in the Reminder Application group, they had an average Hb level of 12.2, a knowledge score of 12.

The results of this study indicate that the average hemoglobin (Hb) level of pregnant women in the Reminder Application group was 12.2 g/dL, which is considered non-anemic. This finding aligns with research conducted by Susanti et al. (2020), which stated that the use of digital reminders can help pregnant women maintain Hb levels within normal limits by increasing adherence to iron tablet consumption. Regular reminders play a role in preventing forgetting to take iron tablets, which is a major cause of anemia in pregnancy.¹¹

Furthermore, research by Rahmawati and Handayani (2021) showed that pregnant women who received health education accompanied by supporting media, such as applications or text messages, had better Hb levels than those who only received conventional counseling. This supports the findings of this study that technology-based interventions have the potential to positively impact the hemoglobin status of pregnant women.¹²

Regarding knowledge, the average knowledge score of 12 indicates a fair to good level of knowledge. These results align with research by Widiningati et al. (2024) found that the use of digital educational media among pregnant women significantly improved understanding of anemia, the importance of iron, and anemia-preventing behaviors. Digital media allows for repeated, easily accessible, and personalized information delivery, thereby increasing user absorption.¹³

Another study by the WHO (2025) also confirmed that increasing pregnant women's knowledge about nutrition and iron supplementation is a key factor in preventing anemia during pregnancy. Good knowledge encourages positive behavioral changes, such as adherence to iron tablet consumption and nutritious food choices, which ultimately impacts increasing or maintaining hemoglobin levels.¹⁴

However, differences in results from other studies may be influenced by respondent characteristics, such as age, education level, and parity. In this study, the majority of respondents were of a non-risk age group and had secondary to higher education, which, according to Maulidyanti (2023), is a key contributing factor in accepting health information and changing behavior. This may explain why the average hemoglobin and knowledge levels in the Reminder Application group were considered good.¹⁵

Table 3

The effect of reminder applications on Hb levels and knowledge

Variable	Mean Rank	p-value	Z
Hb level			
Pre	0	0.000*	5.512
Post	20.50		
Knowledge			
Pre	0	0.000*	5.545
Post	20.50		

*Wilcoxon

Table 3 shows that there is an effect of the reminder application on increasing Hb levels (p value = 0.000), and knowledge (p value = 0.000).

Based on Table 3, the Wilcoxon test results indicate a significant effect of using the Reminder App on increasing hemoglobin (Hb) levels and knowledge of pregnant women. A p-value of 0.000 ($p < 0.05$) for both variables indicates a significant difference between pre- and post-intervention conditions. The Z-value of 5.512 for Hb levels and 5.545 for knowledge indicates a substantial intervention effect.

The increase in Hb levels after using the Reminder App can be explained by the reminder mechanism, which helps pregnant women be more compliant in taking iron tablets and adopting a diet that supports iron absorption. One of the main causes of anemia in pregnancy is non-compliance with iron tablet consumption, primarily due to forgetfulness. The Reminder App acts as a consistent stimulus, helping to form positive habits and increasing adherence to health recommendations for pregnant women.¹⁶

In addition to impacting Hb levels, the use of the Reminder App has also been shown to significantly improve pregnant women's knowledge. The repeated and easily accessible health information provided through the app allows pregnant women to better understand the importance of anemia prevention, the benefits of iron, and the consequences of anemia for the mother and fetus. With a reminder app, mothers are better able to manage their time and awareness to meet their nutritional needs. Studies show that consistent reminders can significantly improve adherence by creating more disciplined and focused behavior patterns. This increased knowledge is a supporting factor for sustainable health behavior changes.¹⁷

Psychologically, reminder apps also give the pregnant woman the impression that she's being cared for, thus increasing her sense of responsibility for her own and her fetus' health. Regular repetition of information can strengthen memory and form new, positive habits. Furthermore, reminders containing prompts and information also serve as an indirect educational tool that's easily accessible at any time.¹⁶

The results of this study align with those of Alfiah et al. (2024), which stated that technology-based interventions, such as apps or reminder messages, significantly increase adherence to iron tablet consumption and contribute to increased hemoglobin levels in pregnant women.¹⁸ These findings indicate that the use of the Reminder App not only plays a role in increasing knowledge but also has a significant impact on improving the health status of pregnant women, as reflected in increased hemoglobin levels. This intervention has the potential to be an innovative strategy that can be integrated into antenatal care services, particularly in anemia prevention programs during pregnancy.

CONCLUSIONS

The results of this study indicate that the Reminder App is effective in improving knowledge and Hb levels among pregnant women, and has the potential to be an innovative strategy in pregnancy anemia prevention programs. Integrating the reminder app into antenatal care services could be a practical and sustainable solution, particularly in the digital era and for pregnant women with access to technology.

ACKNOWLEDGEMENT

We would like to thank the midwives and our pregnant women at the Penurunan Health Center, Nusa Indah Health Center and Padang Seraai Health Center who have contributed to the field work.

CONFLICT OF INTEREST AND FUNDING DISCLOSURE

All authors have no conflict of interest in this article. This research was funded by Kemdiktisaintek 2025.

AUTHOR CONTRIBUTIONS

ATM: conceptualization, investigation, methodology, supervision, writing review and editing; MO: methodology, writing original draft, writing review and editing.

REFERENCES

1. Adhyanti & Nurtiansi, B. Kepatuhan Konsumsi Tablet Tambah Darah Pada Ibu Hamil Di Wilayah Kerja Puskesmas Mambo. *SVASTA HARENA J. Ilm. Gizi* **3**, 19–25 (2022).
2. Nova Isabella Marianne br. Napitupulu, Ariska Fauzianty & Sonia Novita Sari. Hubungan Pengetahuan Ibu Hamil Dengan Kepatuhan Konsumsi Tablet Tambah Darah Di Klinik Fina Sembiring Kecamatan Medan Polonia Kota Medan. *J. Ilm. Kedokt. dan Kesehat.* **2**, 196–204 (2023).
3. Wulansari, D., Rayani, T. & Wijayanti, A. Pengaruh Pemberian Pisang Ambon Terhadap Kenaikan Hemoglobin Pada Ibu Hamil Trimester 3 Di Polindes Kecamatan Krejengan Kabupaten Probolinggo. *Afiasi J. Kesehat. Masy.* **10**, 118–123 (2025).
4. Nurhayati, L., Marhamah, E., Fuady, A., Berliana, N. & Olivia, P. Pengetahuan Anemia dan Tablet Fe Terhadap Kepatuhan Minum Tablet Fe. *J. Keperawatan Karya Bhakti* **10**, 45–53 (2024).
5. Kemenkes RI. Hasil Riset Kesehatan Dasar Tahun 2018. *Kementrian Kesehat. RI* **22** (2018).
6. Kemenkes. *Laporan Nasional RISKESDAS 2018. Kementerian Kesehatan Indonesia* (2019).

7. Mulalinda, A. M. F., Ahmar, H., Jabiy, F., Ernawati & Suarsih, A. Kepatuhan Ibu Hamil Trimester I Ditinjau dari Tingkat Pengetahuan dan Sikap dalam Konsumsi Asam Folat. *J. Keperawatan Muhammadiyah* **9**, 85–92 (2024).
8. Krismawati, E., Widjanarko, B. & Rahfiludin, M. Z. Pengaruh Aplikasi Sahabat Ibu Hamil (ASIH) terhadap Kepatuhan Minum Tablet Fe dan Kadar Hb Ibu Hamil. *J. Keperawatan* **14**, 121–128 (2022).
9. Pamungkas, C. E. *et al.* Efektivitas Suplementasi Mikronutrien Pada Ibu Hamil Anemia Terhadap Peningkatan Kadar Hemoglobin (Hb) Di Kabupaten. *Midwifery J. J. Kebidanan UM Mataram* **10**, 63–69 (2025).
10. Marpaung, J. *et al.* Differences in Ferritin and Hemoglobin Levels Before and After Administration of Iron Sucrose Injection to Second or Third Trimester Pregnant Women at Araskabu Public Health Center, Deli Serdang. *Open Access Maced. J. Med. Sci.* **11**, 23–31 (2023).
11. Susanti, I. Y. & Hety, D. S. Dukungan Keluarga Dengan Pemberian Asi Eksklusif Di Puskesmas Mojosari Kabupaten Mojokerto. *Hosp. Majapahit* **13**, 116–128 (2021).
12. Handayani, Y., Winarso, S. & Ningtyias, F. W. The Effectiveness Of Android Based Applications An Adherence Monitoring System For Adolescent Female Consumption Fe Tablets. *J. Kesehat. dr. Soebandi* **9**, 115–124 (2021).
13. Widiningati, Ernawati, I. & Ekasari, T. Pengaruh Pemberian Fe Terhadap Perubahan Kadar Hb Pada Ibu Hamil di Puskesmas Sumber. *Heal. Res. J.* **2**, 52–61 (2024).
14. World Health Organization. *Anaemia*. <https://www.who.int/news-room/fact-sheets/detail/anaemia> (2025).
15. Maulidyanti, A. T. & Sahiratmadja, E. K. Pengetahuan dan Kepatuhan Ibu Hamil Trimester III Dalam Konsumsi Tablet Tambah Darah di Puskesmas Beringin Raya Kota Bengkulu. *J. Kebidanan Harapan Ibu Pekalongan* **10**, 134–141 (2023).
16. Andriani, L., Dewi, R. & Novrianti, S. Pengaruh Penggunaan Aplikasi Deteksi Anemia Berbasis Android (Si-Mia) Terhadap Perilaku Deteksi Anemia Pada Ibu Hamil Di Kota Bengkulu. *J. Media Kesehat.* **15**, 181–191 (2022).
17. He, M. *et al.* Detection of postpartum women anemia and its impact on their offspring in Zhejiang Province, China. *Front. Nutr.* **12**, 1–10 (2025).
18. Alfiah, E., Yusuf, A. M. & Puspa, A. R. Pengembangan Media Edukasi Anemia dan Pangan Halal Sumber Zat Besi Berbasis Video, Website dan E-Leaflet. *MPPKI* **7**, 177–184 (2024).