"Feel Supported and not Alone": A Qualitative Study of Supports Needed by Pregnant Women in Preventing Anemia

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ABSTRACT

***Background**: The ability of pregnant women to prevent anemia is influenced by their social environment support, such as family, husband, or health workers. However, it has not been known which sources of support are preferred and needed by pregnant women. **Aims**: This study aims to explore the support preferred and needed by pregnant women in preventing anemia. **Methods**: This study was qualitative research with a case study approach. Semi-structured interviews were conducted with 18 pregnant women at the gestational age starting from 16 weeks who had pregnancy checks at the Sangkrah, Kratonan, and Gilingan Primary Healthcare Centers, Surakarta City. Informants were obtained through a purposive sampling technique. This study used thematic data analysis. **Results**: Three emerging themes from this study include 1) pregnant women's perceived ability and motivation to prevent anemia; 2) the support needed to prevent anemia; and 3) information technology support for preventing anemia. Some women felt difficulties preventing anemia, especially in consuming IFA tablets and nutritious food; feeling supported and not alone was the motivation to prevent anemia. The most preferred support was from the husband, and the next was health workers. Pregnant women welcome an application with some features to support preventing anemia. **Conclusions**: Support from husband and health workers is the most preferred. Pregnant women perceive the benefits of using applications that support anemia prevention. It is necessary to develop applications that integrate support from husbands and health workers to create good conditions that enable and motivate pregnant women to practice anemia prevention behavior.*

***Keywords**: Anemia prevention, Pregnancy anemia, Support need*

INTRODUCTION

Anemia in pregnant women is a global priority health problem. The World Health Organization (WHO) estimated that the prevalence of anemia in pregnant women was 38% (WHO, 2015). Anemia during pregnancy indirectly contributes to an increased maternal death risk (Basnet *et al.*, 2022; Zamané *et al.*, 2019). This is also a priority health problem in Indonesia because the prevalence of anemia exceeds 40% (WHO, 2023). The prevalence of anemia in pregnant women based on 2018 Basic Health Research (Riskesdas) data is 48.9%. Anemia during pregnancy can increase the risk of low birth weight and infant death (Means, 2020). Based on data from the Surakarta Health Service in 2020, several Primary Healthcare Centers in Surakarta have a gap in the prevalence of anemia in pregnant women of 10.34%. However, several other Primary Healthcare Centers, such as Sangkrah Primary Healthcare Center, Gilingan Primary Healthcare Center, and Kratonan Primary Healthcare Center, still have a prevalence above 20%. Therefore, the issue of anemia in these areas needs to be addressed.

The WHO recommends preventing anemia in pregnant women through routine administration of Blood Supplement tablets or Iron and Folic Acid (IFA) tablets, nutritional education, and consumption of healthy foods (WHO, 2016, 2019). The Indonesian government has implemented a policy of providing a minimum of 90 IFA tablets to pregnant women, and the target achieved is above

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95% (Kemenkes RI, 2018). However, there is still a gap where pregnant women's IFA tablet consumption is not monitored thoroughly. Riskesdas data in 2018 showed that the percentage of pregnant women who took IFA tablets received during pregnancy checks was only 38.1% (Kemenkes RI, 2018). Research shows that many pregnant women do not comply with dietary recommendations to prevent anemia (Pathirathna *et al*., 2020).

Active subjects in preventing anemia during pregnancy, pregnant women need to be motivated to make various efforts to overcome anemia (Darmawati *et al*., 2020; Mishra *et al*., 2021). The Capability Opportunity Motivation for Behavior Change (COM-B) approach explains that three components facilitate behavior change: capability, motivation, and opportunity. Maternal capacity and motivation need to be increased to implement anemia prevention. Environmental support creates opportunities to implement anemia prevention behavior. Social support from several important sources, such as husbands, family, health workers, and health cadres, strengthens mothers' motivation to prevent anemia (Morrison *et al*., 2021). The results of the research show that the reasons why mothers do not follow recommendations for consuming IFA tablets and anemia prevention diets are a lack of information about the dangers of anemia to fetal health and a lack of solutions from health workers, as well as the difficulty of providing a diet menu that is following recommendations without the support of a husband or family (Williams *et al*., 2020). The results of qualitative research in South Asia show that synergy is needed between health workers, families, and communities to overcome anemia (Morrison *et al*., 2021). Meanwhile, it is not yet known what support source preferences are most desired by pregnant women in preventing anemia.

Support to prevent pregnant women from experiencing anemia is also starting to be carried out by utilizing information technology on smartphones (mobile health) (Andriani *et al*., 2022; Falah *et al*., 2022; Fertimah *et al*., 2022; Nurherliyany *et al*., 2022). This aims to increase program efficiency and overcome obstacles that health workers and cadres have in getting involved in the program. Previous research shows that mobile health has increased client empowerment and access to health services and health quality (Alaiad, 2019; Nsor-anabiah *et al*., 2019; Vo *et al*., 2019). Meanwhile, the Indonesian government has started using mHealth in some programs to report Antenatal Care services routinely, namely e-cohort. Another application for maintaining women's health during pregnancy is available via the private sector and used voluntarily by pregnant women. A preliminary study showed no unique application built for anemia prevention by the government sectors. In some areas of the study site, the health providers made a WhatsApp Group for pregnant women to provide online counseling for pregnant women in maintaining healthy pregnancy. Therefore, this study aims to 1) identify the support needed by pregnant women to prevent anemia, 2) identify the most preferred source of support, and 3) identify the need for support provided through information technology (applications).

METHODS

This study was qualitative research with a case study approach from April to August 2023 in three work areas: Sangkrah Primary Healthcare Center, Kratonan Primary Healthcare Center, and Gilingan Primary Healthcare Center in Surakarta City, Central Java Province. This study has received ethical permission number 4997/B.2KEPK-FKUMS/VIII/2023 from the Health Research Ethics Committee, Faculty of Medicine, Universitas Muhammadiyah Surakarta. The primary informants were pregnant women with a gestational age of more than 16 weeks with anemia status or without anemia status, who underwent antenatal care (more than once) at the Gilingan or Sangkrah or Kratonan Primary Healthcare Center in Surakarta City. The number of main informants involved in the research was 18 pregnant women, consisting of nine pregnant women who had anemia and nine who did not have anemia. This study used a purposive sampling technique. The researchers met the informants during their visit to the primary healthcare centers following the direction of the midwife coordinator of every primary healthcare center. The

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researchers then made interview appointments with pregnant women willing to become informants at the agreed location. This study used source triangulation techniques to increase the credibility of the research data. The triangulation informants were three husbands of pregnant women, three midwives, and three nutrition officers at the three health centers above. In total, there were nine triangulation informants.

Data collection was carried out using semi-structured interviews with an interview guide. Interviews were conducted for 20-45 minutes at an agreed-upon place by every informant. The interview guide was prepared by researchers based on a literature review regarding mothers' abilities to prevent anemia and motivation and opportunities to make behavior changes (Whittal *et al.*, 2021). The guide was reviewed by two experts (not researchers). One example of a question in the interview was: "In your opinion, how difficult do you feel when preventing anemia?" Participants were also asked about what support they needed to help prevent anemia during pregnancy, the difficulties they experienced, whose support they needed most, their opinions on whether they received support through information technology, and what features they needed. The researchers used recorders and notepads to record and jot down notes during data collection.

Data analysis was carried out using thematic analysis. First, the researcher transcribed the interviews. Then, the researchers reduced the data through coding and categorization using ATLAS.ti software (web version). Finally, the researchers interpreted and presented the data. The research results were divided into three themes that answer the research objectives.

RESULTS AND DISCUSSION

There were 18 main participants as subjects of this study. The characteristics of the informants based on age, education level, occupation, gestational age, parity, and anemia status are shown in Table 1. Nearly half of the total informants were aged between 26-30 years. Nearly a third of the informants were high school graduates, half of whom were housewives. Eight out of 18 informants were pregnant with their first child.

Table 1. Participants Characteristics

Characteristics	Frequency (n)	Percentage (%)
Age		
20-25	5	27.8
26-30	8	44.4
>30	5	27.8
Min; Max	20; 38	
Mean ± SD	28.02 ± 4.6	
Education		
Junior high school	1	5.6
Senior high school	12	66.6
D3/S1	5	27.8
Work		
Employee	5	27.8
Self-employed	3	16.7
Housewife	10	55.5
Gestational age		
Trimester 2	3	16.7
Trimester 3	15	83.3
Hemoglobin Level		
Anemia	9	50
Normal	9	50
Pregnancy		
1	8	44.4
2	5	27.8
3	5	27.8

The interviews showed that all pregnant women had received services from health workers to prevent anemia during pregnancy checks. Almost all informants stated that blood supplement tablets were a service provided by health workers to prevent anemia. Some informants received additional services such as checking hemoglobin levels, classes for pregnant women, and education about nutrition. Informants who experienced anemia said they were advised to take more blood-enhancing tablets (twice a day). Some anemic informants received additional side dishes (PMT) in their diet. The main informant conveyed the prevention of anemia by the triangulation informant about the anemia prevention program given during the pregnancy check-up. The actions differed from measures to prevent anemia for pregnant women and countermeasures if pregnant women had anemia. Triangulation informants stated that pregnant women who did not experience anemia were recommended to consume IFA tablets once a day. However, pregnant women who experienced anemia were asked to consume it twice daily. Some informants were given additional

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side dishes (PMT) and referred to the nutrition clinic for nutritional counseling.

Based on interviews related to identifying the support needed by pregnant women to prevent anemia, three themes emerged. They include 1) the perceived ability and motivation of pregnant women to prevent anemia, 2) the support needed to prevent anemia, and 3) information technology support for preventing anemia.

1) Perceived ability and motivation of pregnant women to prevent anemia

The first and second themes that emerged from the results of the data analysis were the ability and motivation of pregnant women to carry out recommendations from health workers to prevent anemia. There are two subthemes here, namely 1) perception of the ability to prevent anemia during pregnancy and 2) motivation to prevent pregnancy.

Based on the perception of the ability to prevent anemia, 13 out of 18 informants stated that they could prevent anemia during pregnancy and did not experience difficulties in preventing anemia. They did not mind consuming IFA tablets and nutritious foods helpful in preventing anemia, such as animal protein sources high in iron.

> *"I don't have any difficulty consuming blood-boosting tablets because I drink them with orange juice. I was advised to drink it with orange juice." IU 1, pregnant woman with anemia*

> *"Easy. The health worker gave me blood-boosting tablets. I didn't encounter any problems." IU 5, pregnant woman with anemia*

> *"It's not difficult." IU 4 pregnant women with anemia, IU 7, IU 9 pregnant women without anemia*

> *"It's not difficult. I am still allowed to eat meat." IU 16, pregnant woman without anemia*

> *"I often eat chicken liver. They say this is good for raising hemoglobin levels." IU 18, pregnant woman with anemia*

On the other hand, five pregnant women stated they experienced difficulties preventing anemia. Among their reasons were a lack of motivation and avoidance of the unpleasant side effects of IFA tablets.

> *"Sometimes, I am lazy about following the doctor's recommendations. I only took it once, even though it was recommended twice. Most of the time, it's because I don't feel dizzy or nauseous; that's why I don't feel the need to consume it twice a day." IU 2, pregnant woman with anemia*

> *"I don't like the smell of the tablets. I only took it once, and I vomited. I can't stand the smell." IU 11, pregnant woman with anemia*

This follows the triangulation informant, who stated that one of the obstacles in the anemia prevention program for pregnant women is the non-compliance of pregnant women in consuming IFA tablets, as shown below.

> *"Getting them to comply with the doctor's recommendations is not easy. They did not finish their tablets because of dizziness, nausea, and vomiting. We know this when we do home visits. They said they still had tablets left even though they should have been used. This means that they did not follow the doctor's recommendations." IT 1*

The Capability Opportunity Motivation for Behavior Change (COM-B) model explains that three components facilitate behavior change: capability, motivation, and opportunity. The findings of this study showed that most mothers perceived they could overcome anemia by regularly consuming IFA tablets. However, some mothers were unable to consume IFA tablets regularly. This difficulty in consuming IFA tablets regularly aligns with previous research conducted in seven countries in Africa and Asia, which found that non-compliance with IFA tablet consumption was one of the problems preventing anemia. Internal barriers such as experiencing side effects made pregnant women less motivated to consume IFA tablets (Siekmans *et al*.,

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2018). Another study in India also found that negative attitudes arising from the experience of these side effects overpowered the desire to take IFA tablets even though they knew its benefits for preventing anemia (Sedlander *et al.*, 2020). Another study also showed that a low perception of susceptibility to experiencing anemia (as a result of not feeling any symptoms indicating anemia and feeling healthy) can reduce motivation to continue taking IFA tablets regularly when experiencing side effects (Triharini *et al.*, 2023).

Some informants said that it was difficult to prevent anemia because they could not avoid consuming foods or drinks that could inhibit iron absorption, such as tea. They expressed difficulty consuming foods that increase hemoglobin levels (a source of animal protein), as shown below.

> *"I had difficulty following what the doctor told me to do. The doctor said I shouldn't drink this or that, but I drank it instead. I realize this is not good, but I really have difficulty controlling my cravings." IU 18, pregnant woman with anemia*

> *"I have little appetite. I prefer to eat vegetables without rice because it doesn't make me nauseous. So, I just get my iron intake from vegetables. But I wonder why my hemoglobin levels have dropped." IU 12*

This also follows the explanation from the triangulation informant who said that, apart from problems in consuming IFA tablets, some pregnant women still have problems regarding their food consumption behavior, which can prevent anemia, as stated below.

> *"Some do not get enough iron in their daily diet. Some pregnant women eat only vegetables without meat. Apart from that, some pregnant women cannot eliminate their habit of drinking tea or coffee, which can affect iron absorption. Their awareness of the importance of nutritional health is still low." IT 3*

Anemia prevention behavior, including consumption of IFA tablets and foods high in iron, can be motivated by anemia-related knowledge, such as concepts, symptoms, and impacts, obtained from counseling sessions (Mekonnen *et al.*, 2021). Most pregnant women understand anemia as a lack of hemoglobin levels. Some added that anemia is characterized by dizziness, nausea, and low Hb levels. Two informants shared what to do if anemia occurs during pregnancy. They explained that pregnant women with anemia should prepare to donate blood during the birth process in case bleeding occurs, as shown below:

> *"Anemia is a lack of blood, red blood cells," IU 10, IU 7, IU 8*

> *"This occurs when the hemoglobin level does not meet the standard." IU 1*

> *"Blood deficiency, characterized by dizziness, nausea, and low Hb." IU 4*

> *"... it is hazardous if it happens to pregnant women later during birth... so at birth, the Hb must be sufficient. Otherwise you will have to prepare a donor for the birth process," IU 2*

Based on the motivation aspect, the desire of pregnant women to avoid the effects of anemia could motivate them to consume IFA tablets and eat nutritious food to prevent anemia. Research in Vietnam found that the underlying factor for pregnant women who did not regularly consume supplements was a low perception of the severity of the impact of anemia (Nechitilo *et al.*, 2016). Having good knowledge about anemia, including its symptoms and impacts, increases motivation to engage in behaviors that can avoid anemia (Wiradnyani *et al.*, 2016). Pregnant women who know the benefits of consuming IFA tablets for their babies can also motivate themselves to continue consuming IFA tablets (Lyoba *et al.*, 2020). This was acknowledged by some informants, as shown below.

> *"Instill in ourselves to be healthier to enjoy more time with our family. If we are anemic, we will get sick, affecting our children." IU 9, pregnant woman without anemia.*

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"To ensure that our fetus is healthy, our body must first be healthy." IU 16, pregnant woman without anemia.

The opportunity to carry out anemia prevention behavior also arises if the mother is motivated by her husband and family. The majority of research informants said they received motivation from their husbands and family, where they were often reminded to eat nutritious food and regularly take blood supplement tablets.

"I am reminded to eat this and that (nutritious food). Sometimes someone cooks for me." IU 12, pregnant woman with anemia

"My husband likes to remind me to take blood-boosting tablets before bed." IU 1, pregnant woman with anemia

Informants stated that the support and motivation provided by family and close people such as husbands made mothers more enthusiastic about making efforts to maintain pregnancy and prevent anemia, as stated by the following informant.

"I feel more enthusiastic when my family pays attention to me. It makes me feel supported and not alone." IU 9, pregnant woman without anemia

Family support increases the mother's motivation to make various efforts to prevent anemia. This is supported by previous research, which shows that the family plays an essential role in reminding people to take IFA tablets (Siekmans *et al*., 2018). Research in Tanzania also found similar findings that the family plays a role as a prominent reminder (Lyoba *et al*., 2020). A quantitative study in Indonesia also found that mothers who received their husband's support were 90% more likely to adhere to taking IFA tablets regularly (Wiradnyani *et al*., 2016). This is related to the motivation provided apart from being a reminder to consume IFA tablets. If the mother's self-ability and motivation to prevent anemia are still lacking, the mother needs support to continue carrying out anemia-prevention behavior.

2) The support needed to prevent anemia

The second theme has subthemes that are preferred support and required support. Regarding preferred support, ten out of 18 informants preferred their husbands as the primary source of support; three informants preferred their husbands and family as their primary support system, while the rest preferred support from friends and health workers.

"My husband has become a part of my life, so that's the most important thing." IU 12

"I prefer support from family and husband, of course." IU 9

"Of course, support from my husband. Other than that, maybe support from health workers because they are experts." IU 1, pregnant woman with anemia.

"I prefer support from health workers rather than parents. That's because health workers have a related educational background and understand pregnancy." IU 18, pregnant woman with anemia

Support from husbands is considered the most critical source of support for most pregnant women. This follows the results of previous research, which shows that husbands can perform various roles apart from being a reminder to consume IFA tablets. The husband provides other necessary support, such as taking check-ups when the supplements have run out, buying various necessary supplements, and buying nutritious food for the wife (Williams *et al*., 2020). Husband support is the primary support at various stages of maternal reproduction, including during pregnancy, as an effort to prevent various health problems, as stated in several research results (Darmawati *et al*., 2022; Lyoba *et al*., 2020; Siekmans *et al*., 2018; Wiradnyani *et al*., 2016). The husband's supportive role is to help with a positive attitude, provide instrumental and emotional support, and provide appropriate responses at critical moments, including when the wife is diagnosed with a health problem (Eddy & Fife, 2021; Kusumawati *et al*., 2022). Husbands who are aware of

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the health problems experienced by their wives and try to help their wives make their wives more motivated to maintain their health. This is in line with the results of interviews regarding the source of support preferred by pregnant women, where they want their husbands to continue encouraging them to eat nutritious food, including buying them nutritious food and reminding them to take blood supplement tablets. Therefore, husbands must be equipped with the knowledge to support their partners in preventing anemia. The involvement of husbands in every counseling session in pregnancy checks, class activities for pregnant women, or educational sessions is necessary so that husbands have the knowledge to support pregnant women in preventing anemia (Talegawkar *et al*., 2021).

Apart from husbands, health workers are also considered as another important source of support. Previous research shows that support in the form of counseling regarding information and the importance of preventing anemia is significantly related to compliance with IFA tablet consumption (Noptriani & Simbolon, 2022; Palivela *et al*., 2021). Consistent counseling from health workers regarding the implementation of behaviors that can prevent anemia and strategies to overcome side effects or difficulties has been proven to be able to overcome obstacles in treating anemia in pregnant women (Arifah *et al*., 2023; Nahrisah *et al*., 2020; Siekmans *et al*., 2018).

Some informants wished that health workers could have provided more support. They wished they would focus not only on the fetus's health but also on the pregnant mother's health, as shown below.

> *"I think health workers are still more focused on the fetus. If the mother doesn't complain about her health, then nothing happens." IU 15, pregnant woman without anemia*

This follows the results of previous qualitative research in Indonesia, which found that health workers did not provide adequate counseling to pregnant women during pregnancy check-up sessions. Counseling is only given according to what pregnant women ask or complain about (Rahmawati *et al*., 2021). This may occur due to several obstacles, such as the absence of specific guidelines for anemia management during pregnancy and health workers (midwives) having never received training in interpersonal communication or anemia counseling (Darmawati *et al*., 2020). Therefore, training to improve communication skills during ANC visits is needed by health workers to support pregnant women to avoid anemia (McGowan *et al*., 2023).

3) Information technology support for preventing anemia.

The third theme has subthemes: perceived usefulness of information technology support for preventing anemia and preferred information technology support. Some of the respondents joined in the WhatsApp Group consisting of pregnant women in each healthcare center coordinated by the health professionals. Some of them already used an application related to pregnancy. The majority of pregnant women anticipated the use of information technology to support them in preventing anemia. Several mothers stated that information technology, such as mobile applications, can make things easier because they are used to smartphones in everyday life and they suit the needs of today's young people. Some informants stated that using the application could reduce obstacles, such as feeling embarrassed if they wanted to ask health workers about certain things. Some informants also stated that they had used applications related to pregnancy and utilized the information received through the application to overcome problems during pregnancy. The following are informants' statement regarding this matter.

> *"Mobile applications make things easier because we always carry our phone anytime, anywhere." IU 12, pregnant woman without anemia.*

> *"I think it's good because it keeps up with current technology and needs." IU 13, pregnant woman with anemia*

> *"I also like opening apps related to pregnancy. I like to follow their advice if I think it's good." IU 18, pregnant woman with anemia*

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"Sometimes I don't dare ask [health workers], so I choose to find certain information via apps." IU 13, pregnant woman with anemia

In their research, Siekmans *et al*. (2018) and Pathirathna *et al*. (2020) recommend using innovative technology to remind pregnant women to take IFA tablets. A systematic review of interventions to prevent anemia also recommends using information technology for anemia prevention because access to information technology in LMICs has grown dramatically over the last decade (Gomes *et al*., 2021). Most informants in the study supported using apps to support pregnant women to prevent anemiaas illustrated by the results of a survey on mobile Health (mHealth) users in Indonesia in 2020 by the Katadata Survey, which showed that mHealth users in Indonesia reached 57%. Many users use mHealth to overcome health problems (Pusparisa, 2020). This also shows the acceptance of Indonesian society for using apps to overcome health problems. A systematic review of app use among pregnant women showed good acceptance of the various existing apps to support pregnancy (Carter *et al*., 2019). This shows the potential for developing a support system for anemia prevention through information technology.

Pregnant women who support using apps to prevent anemia stated several features they expected to find in an app. Most pregnant women and their husbands stated that online consultation with health workers was the most needed feature. Apart from that, another feature mentioned as necessary by informants and triangulation informants was the reminder to take daily blood supplement tablets. Several informants also conveyed other essential features, such as a short video related to pregnancy knowledge, motivational messages to encourage IFA tablet consumption, and other efforts to prevent anemia, as well as features to provide food recommendations that can overcome anemia along with explanations of the iron content in foods, as shown below.

"I find online consultation helpful." IU 1, pregnant woman with anemia

"I can communicate with experts via the app." IU 5, pregnant woman with anemia

"I can chat with health workers easily via the app [mention the name of a consultation app with a known doctor]." IU 6, pregnant woman with anemia

"I like it because the consultation is free. I think it's important that we are accompanied by experts." IT 4

"This is very useful, especially the reminder feature for IFA tablet consumption. Let's say we haven't taken the supplement today; the app will notify us to check." IU 15, pregnant woman without anemia

"The app presents us with nutritional facts of food, like how much spinach can increase our Hb levels, etc." IU 9, pregnant woman without anemia

"The app gives us information about what is good and not for pregnant women. We need that." IU 14, pregnant woman without anemia

"I can find information to avoid foods that are not good for pregnant women via the app." IU 18, pregnant woman with anemia

"I hope the apps start adding video content. The article content is good, but sometimes we're too lazy to read. It's more engaging with video because it can provide some demonstrations, too." IU 5, pregnant woman with anemia

These desired features follow the results of a scoping review on the use of mobile apps in pregnancy, which shows that mobile apps offer many features and functions (multifunction), with the primary function being data collection and communication (Carter *et al*., 2019). Collecting personal data that can be processed to provide unique feedback for every individual according to their needs (personalized) is a superior feature. Thus, future application development can be directed at collecting data about IFA tablet consumption and consumption

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patterns of pregnant women and then providing appropriate feedback to improve this behavior.

The essential element is communication features between patients and health workers and facilitation for groups with lower levels of health literacy using photos and explanatory videos (Ambarwati & Sulastri, 2023; Carter *et al*., 2019). The potential for app utilization will increase if the app meets user needs. Therefore, developers need to focus on providing features that are considered essential and can answer user questions, especially in dealing with anemia. What increases the use of mHealth is the trust of app users in the application developer or manager (Octavius & Antonio, 2021). Hence, collaboration with related parties trusted by users (health workers) is expected to increase the use of the app.

All in all, the findings of this study show that husbands are the source of support most pregnant women need. Another desired source of support is support from health workers. The findings of this study regarding the perceived usefulness and acceptance of using apps to prevent anemia show the potential for developing a support system for preventing anemia using apps. Thus, future studies should be able to develop a support system for pregnant women to prevent anemia through apps by providing features that are considered necessary according to the results of this study. The features in the app can be designed primarily to connect pregnant women with health workers more efficiently so that they can fulfill their counseling and education needs outside of pregnancy check-ups. Husbands' involvement in monitoring their wives' IFA tablet consumption and diet can be facilitated through features in the application. Involving these critical sources of support using applications is necessary to create more efficient opportunities for pregnant women to increase their ability and motivation to prevent anemia. Even so, there are weaknesses in this study. This study did not explore in depth the perspectives of husbands or health workers regarding obstacles in supporting pregnant women to prevent anemia. Therefore, future researchers are expected to focus on exploring this issue.

CONCLUSION

Some pregnant women perceived that they could prevent anemia during pregnancy. However, some others found it difficult to take measures to prevent anemia. Therefore, it requires support from various parties, such as husbands, families, and health workers, to help pregnant women avoid anemia. Most pregnant women stated that the source of support they most needed was their husbands. After their husbands, they felt they needed support from health workers. Based on the research findings, it was concluded that pregnant women perceived the benefits of using apps to support the prevention of anemia. According to the findings of this study, it is necessary to develop apps with the features that pregnant women need. Support from husbands and health workers can be integrated through apps that create good conditions to enable and motivate pregnant women to practice anemia prevention behavior.

REFERENCES

Alaiad, A. (2019). *The Determinants of M-Health Adoption in Developing Countries : An Empirical Investigation*. *Applied Clinical Informatics, 10*(5), 820–840.

Ambarwati, I., & Sulastri, S. (2023). The Influence of Health Education Using Media Booklets About the Importance of Hemoglobin Levels to Increase Knowledge of Pregnant Women in the Work Area of the Ngemplak Public Health Center. *Contagion: Scientific Periodical Journal of Public Health and Coastal Health*, *5*(3), 824. https://doi.org/10.30829/contagion.v5i3.15364

Andriani, L., Dewi, R., & Novrianti, S. (2022). Pengaruh Penggunaan Aplikasi Deteksi Anemia Berbasis Android (Si-Mia) Terhadap Perilaku Deteksi Anemia Pada Ibu Hamil Di Kota Bengkulu. *Jurnal Media Kesehatan*, *12*(2), 181–191.

Arifah, I., Pambarep, T. S. A., Khoiriyah, L., Kusumaningrum, T. A. I., Werdani, K. E., & Ngadiyono, N. (2023). Effectiveness of daily educational message on pregnancy anemia prevention behavior and knowledge: A pilot randomized controlled trial.

Received: 07-10-2023, Accepted: 09-11-2023, Published Online: 02-09-2024

Journal of Education and Health Promotion, *12*(296), 1–6. https://doi.org/10.4103/jehp.jehp

Basnet, T., Sitaula, S., Sah, M. K., & Yadav, P. (2022). Analysis of Causes and Contributory Factors for Maternal Mortality during Covid-19 Lockdown. *International Research Journal of Multidisciplinary Scope*, *3*(02), 22–28. https://doi.org/10.47857/irjms.2022.v03i02.075

Carter, J., Sandall, J., Shennan, A. H., & Tribe, R. M. (2019). Mobile phone apps for clinical decision support in pregnancy: a scoping review. *BMC Medical Informatics and Decision Making*, *19*(1), 1–13. https://doi.org/10.1186/s12911-019-0954-1

Darmawati, D., Nizwan-Siregar, T., Kamil, H., & Tahlil, T. (2022). Exploring Indonesian mothers' perspectives on anemia during pregnancy: A qualitative approach. *Enfermeria Clinica*, *32*, S31–S37. https://doi.org/10.1016/j.enfcli.2020.11.002

Darmawati, D., Siregar, T. N., Kamil, H., & Tahlil, T. (2020). Barriers to Health Workers in Iron Deficiency Anemia Prevention among Indonesian Pregnant Women. *Anemia*, *2020*, 1–6. https://doi.org/10.1155/2020/8597174

Eddy, B. P., & Fife, S. T. (2021). Active Husband Involvement During Pregnancy: A Grounded Theory. *Family Relations*, *70*(4), 1222–1237. https://doi.org/10.1111/fare.12486

Falah, Y. F., Alamsyah, S. S., Dwi, A. A., Sari, P., Sekar, N. A., Sari, A., Priyambudi, Z. S., & Arifah, I. (2022). Anedoc APP: Sistem Pengingat, Pemantau, dan Edukasi Konsumsi Tablet Tambah Darah Ibu Hamil di Puskesmas Sangkrah Kota Surakarta. *Jurnal Warta LPM*, *25*(3).

Fertimah, A. R., Widyawati, W., & Mulyani, S. (2022). Efektifitas Penggunaan Media Audiovisual dan Aplikasi Permitasi Terhadap Pengetahuan dan Kepatuhan Ibu Meminum Tablet Besi. *Jurnal Keperawatan Klinis Dan Komunitas*, *5*(3), 134. https://doi.org/10.22146/jkkk.44276

Gomes, F., King, S. E., Dallmann, D., Golan, J., Carolina, A., Silva, F., Hurley, K. M., Bergeron, G., & Bourassa, M. W. (2021). Supplementation During Pregnancy : a Systematic Review. *Annals of the New York Academy of Sciences*, *1493*(1), 41–58. https://doi.org/10.1111/nyas.14545.Interventions

Kemenkes RI. (2018). *Laporan Hasil Riset Kesehatan Dasar tahun 2018*. Badan Penelitian dan Pengembangan Kesehatan Kemenkes RI.

Kusumawati, Y., Widyawati, W., & Dewi, F. S. T. (2022). Vulnerable to mental health problems: Pregnant women and husband's perception in Surakarta, Indonesia. *Enfermeria Clinica*, *32*(5), 334–343. https://doi.org/10.1016/j.enfcli.2021.12.004

Lyoba, W. B., Mwakatoga, J. D., Festo, C., Mrema, J., & Elisaria, E. (2020). Adherence to Iron-Folic Acid Supplementation and Associated Factors among Pregnant Women in Kasulu Communities in North-Western Tanzania. *International Journal of Reproductive Medicine*, *2020*, 1–11. https://doi.org/10.1155/2020/3127245

McGowan, L., Astuti, A., Hafidz, F., Pratiwi, C., Yulian, V., Hughes, E., Pratiwi, A., Indomo, E. N., & Fu, Y. (2023). The effect of COVID-19 on women's experiences of pregnancy, birth and postpartum in Indonesia: a rapid online survey. *BMC Pregnancy and Childbirth*, *23*(1), 1–10. https://doi.org/10.1186/s12884-023-05566-w

Means, R. T. (2020). Iron deficiency and iron deficiency anemia: Implications and impact in pregnancy, fetal development, and early childhood parameters. *Nutrients*, *12*(2). https://doi.org/10.3390/nu12020447

Mekonnen, A., Alemnew, W., Abebe, Z., & Demissie, G. D. (2021). Adherence to iron with folic acid supplementation among pregnant women attending antenatal care in public health centers in simada district, northwest ethiopia: Using health belief model perspective. *Patient Preference and Adherence*, *15*, 843–851. https://doi.org/10.2147/PPA.S299294

Mishra, A., Marwah, S., Divedi, P., Dewan, R., Ahluwalia, H., Mishra, A., Marwah, S., Divedi, P., Dewan, R., & Ahluwalia, H. (2021). A Cross-Sectional

Received: 07-10-2023, Accepted: 09-11-2023, Published Online: 02-09-2024

Study of Barriers in Prevention of Anemia in Pregnancy. *Cureus*, *13*(1). https://doi.org/10.7759/CUREUS.12802

Morrison, J., Giri, R., Arjyal, A., Kharel, C., Harris-Fry, H., James, P., Baral, S., Saville, N., & Hillman, S. (2021). Addressing anaemia in pregnancy in rural plains Nepal: A qualitative, formative study. *Maternal and Child Nutrition*, *17*(S1), 1–15. https://doi.org/10.1111/mcn.13170

Nahrisah, P., Somrongthong, R., Viriyautsahakul, N., Viwattanakulvanid, P., & Plianbangchang, S. (2020). Effect of Integrated Pictorial Handbook Education and Counseling on Improving Anemia Status, Knowledge, Food Intake, and Iron Tablet Compliance Among Anemic Pregnant Women in Indonesia: A Quasi-Experimental Study. *Journal of Multidisciplinary Healthcare*, *13*, 43. https://doi.org/10.2147/JMDH.S213550

Nechitilo, M., Nguyen, P., Webb-Girard, A., Gonzalez-Casanova, I., Martorell, R., DiGirolamo, A., & Ramakrishnan, U. (2016). A Qualitative Study of Factors Influencing Initiation and Adherence to Micronutrient Supplementation among Women of Reproductive Age in Vietnam. *Food and Nutrition Bulletin*, *37*(4), 461–474. https://doi.org/10.1177/0379572116647830

Noptriani, S., & Simbolon, D. (2022). Probability of non-compliance to the consumption of Iron Tablets in pregnant women in Indonesia. *Journal of Preventive Medicine and Hygiene*, *63*(3), E456–E463. https://doi.org/10.15167/2421-4248/jpmh2022.63.3.2340

Nsor-anabiah, I. S., Udunwa, U., & Malathi, S. (2019). Review of the Prospects and Challenges of mHealth Implementation in Developing Countries. *International Journal of Applied Engineering Research*, *14*(12), 2897–2903.

Nurherliyany, M., Herry Garna, H., Wijayanegara, H., Ciamis, S. M., Dharma, S., & Bandung, H. (2022). Pengaruh aplikasi fe-mnhy terhadap keberhasilan pemantauan, pengetahuan dan sikap mengonsumsi tablet fe pada ibu hamil di puskesmas ciamis kabupaten ciamis periode 2021. *Jurnal Kesehatan Edisi*, *14*(1), 2022.

Octavius, G. S., & Antonio, F. (2021). Antecedents of Intention to Adopt Mobile Health (mHealth) Application and Its Impact on Intention to Recommend: An Evidence from Indonesian Customers. *International Journal of Telemedicine and Applications*, *2021*(March 2019). https://doi.org/10.1155/2021/6698627

Palivela, D., Shehnaz, S. I., & Chaturvedula, L. (2021). Effect of direct monitoring by family members and counseling by health professionals on iron-folic acid supplementation: A cross-sectional study among pregnant women in Puducherry, India. *Journal of Family and Community Medicine*, *28*(2), 85–93. https://doi.org/10.4103/jfcm.JFCM_445_20

Pathirathna, M. L., Wimalasiri, K. M. S., Sekijima, K., & Sadakata, M. (2020). Maternal Compliance to Recommended Iron and Folic Acid Supplementation in Pregnancy, Sri Lanka: A Hospital-Based Cross-Sectional Study. *Nutrients*, *12*, 3266.

Pusparisa, Y. (2020). *Indonesia Peringkat ke-3 Global Memanfaatkan Aplikasi Kesehatan*. Katadata Media Network. https://databoks.katadata.co.id/datapublish/2020/10/13/indonesia-peringkat-ke-3-global-memanfaatkan-aplikasi-kesehatan

Rahmawati, W., van der Pligt, P., Worsley, A., & Willcox, J. C. (2021). Indonesian antenatal nutrition education: A qualitative study of healthcare professional views. *Women's Health*, *17*. https://doi.org/10.1177/17455065211066077

Sedlander, E., Long, M. W., Mohanty, S., Munjral, A., Bingenheimer, J. B., Yilma, H., & Rimal, R. N. (2020). Moving beyond individual barriers and identifying multi-level strategies to reduce anemia in Odisha India. *BMC Public Health*, *20*(1), 1–16. https://doi.org/10.1186/s12889-020-08574-z

Siekmans, K., Roche, M., Kung'u, J. K., Desrochers, R. E., & De-Regil, L. M. (2018). Barriers and enablers for iron folic acid (IFA) supplementation in pregnant women. *Maternal and Child*

Received: 07-10-2023, Accepted: 09-11-2023, Published Online: 02-09-2024

Nutrition, *14*(July 2017), 1–13. https://doi.org/10.1111/mcn.12532

Talegawkar, S. A., Jin, Y., Sedlander, E., Ganjoo, R., Behera, S., Dipietro, L., & Rimal, R. (2021). A social norms-based intervention improves dietary diversity among women in rural india: The reduction in anemia through normative innovations (rani) project. *Nutrients*, *13*(8). https://doi.org/10.3390/nu13082822

Triharini, M., Mar'Ah Has, E. M., & Nofita, G. (2023). Determinant factors of anemia in pregnancy based on health belief model: a correlational study. *Jurnal Ners*, *18*(1), 50–56. https://doi.org/10.20473/jn.v18i1.43704

Vo, V., Auroy, L., & Sarradon-Eck, A. (2019). Patients' perceptions of mhealth apps: Meta-ethnographic review of qualitative studies. *JMIR MHealth and UHealth*, *7*(7), 1–20. https://doi.org/10.2196/13817

Whittal, A., Atkins, L., & Herber, O. R. (2021). What the guide does not tell you: reflections on and lessons learned from applying the COM-B behavior model for designing real life interventions. *Translational Behavioral Medicine*, *11*(5), 1122–1126. https://doi.org/10.1093/tbm/ibaa116

WHO. (2015). *Global nutrition targets 2025 - anaemia*. https://www.who.int/multi-media/details/infographics-anaemia

WHO. (2016). *WHO recommendations on antenatal care for a positive pregnancy experience*. . WHO

WHO. (2019). *Daily iron and folic acid supplementation during pregnancy*. W http://www.who.int/elena/titles/daily_iron_pregnancy/en/

WHO. (2023). *Anaemia*. https://www.who.int/data/nutrition/nlis/info/anaemia

Williams, P. A., Poehlman, J., Moran, K., Siddiqui, M., Kataria, I., Rego, A. M., Mehrotra, P., & Saldanha, N. (2020). Strategies to address anaemia among pregnant and lactating women in India: A formative research study. *Public Health Nutrition*, *23*(5), 795–805. https://doi.org/10.1017/S1368980019003938

Wiradnyani, L. A. A., Khusun, H., Achadi, E. L., Ocviyanti, D., & Shankar, A. H. (2016). Role of family support and women's knowledge on pregnancy-related risks in adherence to maternal iron-folic acid supplementation in Indonesia. *Public Health Nutrition*, *19*(15), 2818–2828. https://doi.org/10.1017/S1368980016001002

Zamané, H., Sow, H. E., Kain, D. P., Bicaba, B. W., Kiemtoré, S., Yameogo, I., Bonané-Thieba, B., & Sawadogo, M. (2019). Maternal Mortality at the Dori Regional Hospital in Northern Burkina Faso, 2014-2016. *International Journal of Maternal and Child Health and AIDS (IJMA)*, *7*(2), 235–241. https://doi.org/10.21106/ijma.263

Received: 07-10-2023, Accepted: 09-11-2023, Published Online: 02-09-2024