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Pregnant Women's Experiences Using a Mobile Application for Iron Supplementation Adherence: A Phenomenological Approach

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Abstract

Iron deficiency anemia is a significant global public health concern that disproportionately affects young children and pregnant women. One effective method for monitoring medication in pregnant women is through mobile applications. This study aims to investigate pregnant women's experience with iron supplementation adherence management using a mobile application. A qualitative study with a phenomenology approach was conducted among 20 pregnant women and midwives. The qualitative method was used to explore participants' experience using a maternal application called "MySmart Bumil" to improve pregnant women's adherence to iron supplements. The study identified four themes: the factors of non-compliance, the motivation for taking iron supplements, and the benefits and the weaknesses of using the application. Mobile app reminders can help pregnant women check medication frequency, remind them to take iron tablets, and build more consistent medication habits. However, some pregnant women found that the reminder was ineffective. Pregnant women thought that the notifications should have alarms to be more effective. The mobile application has the potential to assist health providers in effectively monitoring the health state of pregnancy and improving adherence to iron supplementation.

INTRODUCTION

Anemia is a significant global public health concern that disproportionately impacts young children and pregnant women. Based on estimations provided by the World Health Organization (WHO), it is determined that approximately 42% of children below the age of 5 and 40% of pregnant women experience anemia on a global scale (World Health Organization, 2017). Pregnant women have experienced a decline in hematocrit and hemoglobin levels, leading to an increase in anemia from the first to the third trimester [2]. Based on the Basic Health Research (RISKESDAS) Indonesian data of 2018, the prevalence of anemia among pregnant women in Indonesia was recorded at 48.9%. This data represents a notable increase of 11.8% compared to the previous prevalence of 37.1% in 2013.

Iron deficiency anemia is a prevalent condition frequently occurring during pregnancy and has been associated with unfavorable pregnancy outcomes, including premature labor and low

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birth weight (Hwang et al., 2013)(Hwang et al., 2013). However, one study revealed that no correlation was found between maternal hemoglobin level and birth weight (Safithri et al., 2019). Nevertheless, given the significance of monitoring iron levels during pregnancy, it is recommended that laboratory testing commence as early as the initial trimester. The initial treatment for mild anemia often involves the administration of oral iron supplements (Garzon et al., 2020). Consistent taking supplements would result in enhanced adherence to iron-folic acid supplementation (IFAS), hence decreasing the prevalence of anemia among pregnant women. The improvement of maternal and newborn health outcomes on a national scale can be facilitated by a decrease in the prevalence of anemia among pregnant women (Felipe-Dimog et al. 2021)(Felipe-Dimog et al., 2021). The regular administration of iron supplements during pregnancy has been found to result in elevated levels of serum ferritin and hemoglobin and a decrease in the prevalence of iron deficiency anemia (Georgieff et al., 2019; World Health Organization, 2017). Hemoglobin levels are positively associated with iron dietary intake and blood-supplemented tablet consumption (Ambarsari et al., 2023).

A study revealed that inadequate awareness regarding the detrimental consequences of anemia, insufficient understanding of Iron and Folic Acid Supplementation (IFAS) and its side effect management, unfavorable attitudes towards IFAS, and the absence of an effective follow-up system were identified as significant factors contributing to suboptimal adherence (Lyoba et al., 2020). An additional study revealed that non-adherence to iron supplement intake among pregnant women was impacted by their perception of the associated negative effects and their level of understanding of the benefits of iron supplementation (Kamau et al., 2018). According to a separate investigation, the main factor contributing to missed doses among patients who were not adherent to their medication regimen was forgetfulness (Shakya Shrestha et al., 2020). Poor adherence to iron tablet intake among pregnant women has been found to be connected with a lack of information regarding iron supplementation and forgetfulness (Lyoba et al., 2020; Shakya Shrestha et al., 2020).

There exist multiple strategies aimed at enhancing the adherence of pregnant women to iron tablet consumption, with one such approach involving the management of medication intake. One effective method for monitoring medication in pregnant women is through the use of mobile applications, which frequently offer features like health monitoring, patient education, communication with healthcare professionals, and reminders for medication and appointments, making it a comprehensive tool for managing prenatal care (Frid et al., 2021). (Pérez-Jover et al., 2019). A mobile application has the potential to aid health providers in effectively monitoring the health status of pregnant women. Additionally, it can serve as a decision support system for pregnant women (Singh & Varshney, 2019). Mobile applications in nursing interventions positively impact the improvement of pregnant women's knowledge and practices related to the management of iron deficiency anemia (Abd Elhaleem Ebraheem Elagamy et al., 2019). Pregnant women who underwent a mobile application-assisted nursing intervention for iron deficiency anemia treatment experienced an increase in their hemoglobin levels (Abd Elhaleem Ebraheem Elagamy et al., 2019). The consumption of iron tablets by pregnant women may also enhance their adherence to the prescribed regimen (Pérez-Jover et al., 2019)

An application called "MySmart Bumil" has been developed by researchers. This application was developed based on the findings of the previous study about the needs of pregnant women regarding virtual healthcare services (Dewi et al., 2023). This application consists of two types: the mobile app made for pregnant women and the website system for health workers. The mobile application and website system are synchronized. This study aims to explore pregnant women's experiences in using the mobile app to improve iron supplementation adherence.

METHOD

This study is a qualitative study with a phenomenology approach. Phenomenology explores the actual experiences that people have in their environment, analyzing how they perceive and comprehend these experiences (Badil et al., 2023). This study was carried out between May and July 2023. The participants of this study were 20 informants, consisting of 13 pregnant women and 7 midwives at four different primary healthcare facilities in Yogyakarta. Primary Healthcare was selected by several criteria, such as:

1. Primary healthcare that is part of the same network/ownership.
2. In the Current Electronic Medical Record system, pregnant women who utilized the application were selected by midwives with several criteria determined by researchers, such as:

1. Pregnant women were given iron supplementation.

2. Pregnant women underwent regular check-ups at the four primary healthcare centers where the research was conducted.

The qualitative study was used to explore participants' experience in using a maternal application called "MySmart Bumil." The "MySmart Bumil" application comprises a mobile phone application designed specifically for pregnant women and a website system for health workers (Figure 1). The mobile phone application is seamlessly integrated with the website system. This app contains several menus to support pregnant women in monitoring pregnancy, such as medication monitoring, including a reminder feature for iron supplementation, a summary of pregnancy status, and antenatal care, including physical examination and laboratory test results. This study consists of several steps as follows:

1. The health workers were introduced by researchers to the application and website system and were requested to utilize the system above independently. This step was conducted in May 2023.
2. Midwives have utilized the application among pregnant women. Midwives advised pregnant women to utilize the application for a minimum duration of one month (Figure 2). This stage was carried out between May and July 2023. Before the midwives were advised to utilize the app, the informed consent was carried out by midwives directly to pregnant women.
3. Researchers interviewed pregnant women and health workers. Before the interview was performed, the researchers provided informed consent directly to the participants.

The acquired data was analyzed using thematic analysis to identify recurrent patterns, topics, and trends in the talks and opinions articulated by the participants. The data was analyzed using OpenCode 4.2. with several steps, such as coding, categorizing, and developing themes. Prior to formulating the theme, researchers engage in collaborative discussions to ensure that the themes expressed in the manuscript are the result of consensus among all researchers.

This study has gained Ethical Approval from the Health Research Ethics Committee of the Faculty of Medicine and Health Science, Universitas Muhammadiyah Yogyakarta, with No. 097/EC-KEPK FKIK UMY/II/2023.

Figure 2 illustrates the integration of the app and website system. Midwives recommended that pregnant women who received antenatal care make use of the "MySmart Bumil" application. Once pregnant women have registered the application through their phone, the health

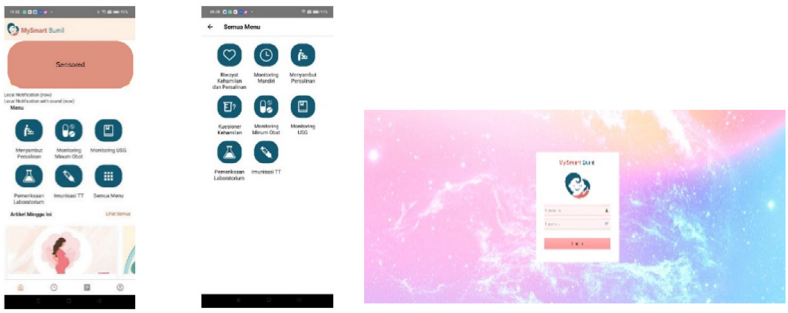

Figure 1. MySmart Bumil Mobile Application and Website System

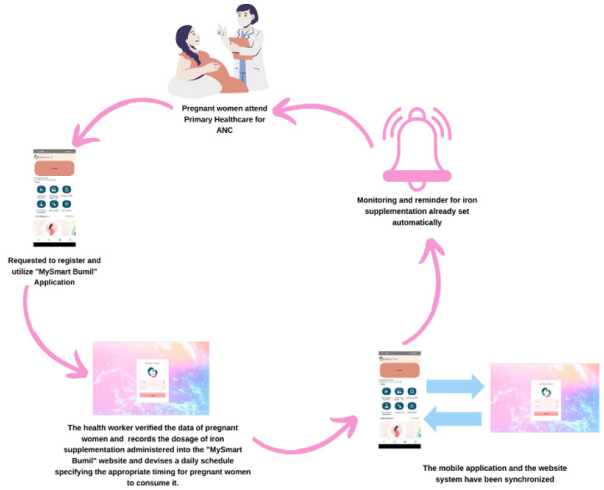

Figure 2. The app utilization

worker will authenticate the data of pregnant women using the website system at their healthcare facility. The health workers input the iron supplement dosage records into the "MySmart Bumil" website and create a daily schedule that specifies the optimal timing for pregnant women to take it. Once the mobile app and website system have been synchronized, the reminder is immediately established.

RESULT AND DISCUSSION

This study was performed among 20 pregnant women and midwives, consisting of 13 pregnant women and 7 midwives. The characteristics of the informants in this study are described in Table 1 and Table 2.

Table 1 indicates that a significant proportion of pregnant women come up within the age range of 25 to 30 years, accounting for a total of 8 pregnant women. Furthermore, the second trimester of pregnancy appears to be the most prevalent, with 7 pregnant women in this stage, and the majority of pregnancies observed are second pregnancies, with a total of 6 pregnant women in this category. A significant proportion of midwives are between the age range of 25 – 30 years old. The duration of professional experience in the field of midwifery often ranges from 6 – 10 years, whereas the duration of employment in the current primary healthcare setting typically spans from 1 – 5 years.

Table 1. Characteristic of Informants

Characteristic	The number of Informants (n = 20)	
	Pregnant Women (n= 13)	Midwives (n= 7)
Age		
25 - 30	8	5
31 - 35	4	1
36 - 40	1	1
Pregnancy Trimesters		
Trimester 1	1	-
Trimester 2	7	-
Trimester 3	5	-
Gravida		
First	5	-
Second	6	-
Third	2	-
Length of Working as Midwifery		
1 – 5 years	-	2
6 – 10 years	-	3
11 – 15 years	-	1
16 – 20 years	-	1
Length of Working at Current Primary Healthcare		
1 – 5 years	-	5
6 – 10 years	-	2

This study performed the analysis of the themes through the Health Belief Model framework (figure 3) to give an overview of the experience in using the application for improving compliance to take iron supplementation (figure 4). The Health Belief Model is a theoretical framework that can be employed to analyze the views of individuals. This model comprises various components, including Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, Perceived Self-Efficacy, and Cues to Action. According to the Health Belief Model idea, an individual's perspective or acceptance may be influenced by various aspects, including age, gender, culture, personality, socio-economic status, and information (Champion & Skinner, 2008)

This study identified four themes: the factors of non-compliance for iron supplementation, the motivation for taking iron supplementation,

and the benefits and the weaknesses of using the app. Each theme contains several categories and subcategories, summarized in Table 2.

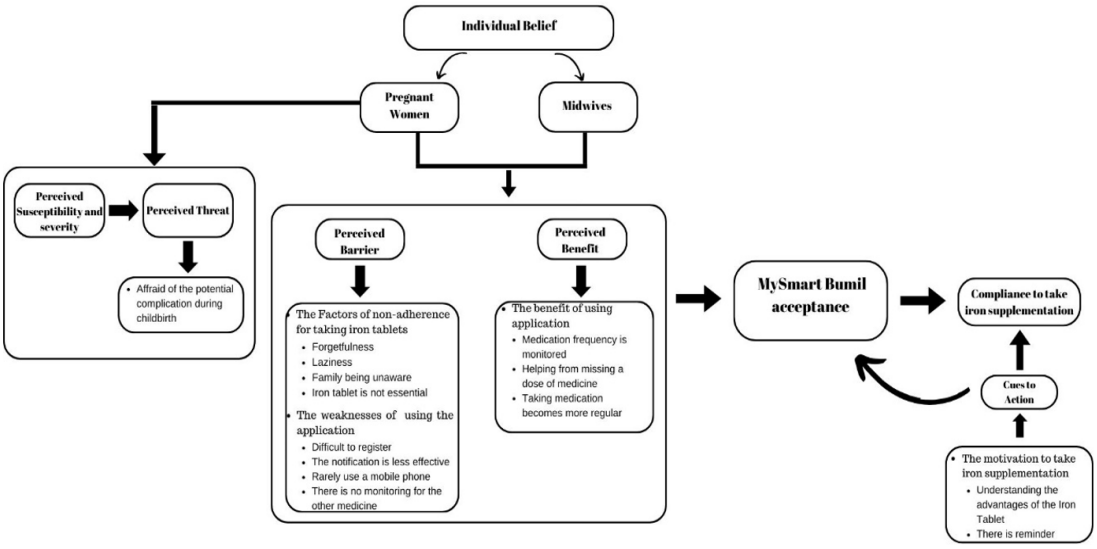

Figure 3. The overview of the informants' experience through the Health Belief Model

Table 2. Summary of the themes

Themes	**Categories**	**Subcategories**
The Factors of non-adherence for taking iron tablets	Lack of discipline	Lack of discipline in taking iron tablets Forgetting where to keep the medicine Lack of discipline in taking the tablets while traveling
	Laziness	Too many activities Feeling exhausted
	Family being unaware	No reminder from the family members
	Iron tablets are not essential	Having taken another vitamin Needed only when the hemoglobin is low Taking too much medicine already
The motivation for taking iron tablets	Understanding the advantages of the Iron Tablet	Having a positive impact on fetal development Essential for the body during pregnancy
	Afraid of the potential of complications during childbirth	Skipping iron tablets will affect childbirth
	Reminder	Reminded by family Reminded by application
The benefits of using the app	Medication frequency is monitored.	Determine the quantity of medication consumed. Healthcare professionals monitor the administration and consumption of doses.
	Help from missing a dose of medicine	Never missing a dose since using the app A checklist is available to administer medication.
	Taking medication becomes more regular.	The checklist for taking medicine is available by date Reminder adjusted based on healthcare's timetable

Themes	Categories	Subcategories
The weaknesses of using the application	Having difficulties to register	Not knowing the steps to register The email provided was not eligible for registration
	Ineffective notification	No alarm available Only a pop-up text notification
	Not regularly checking phone	Missing the notification Restricted from using mobile phone
	Having weak connection/ signals	Have laggy connection
	Having no supervision for taking other medicine	No reminders from family members or others Having another medicine that is not being monitored by the app

The Factors of Non-adherence to Taking Iron Tablets

Based on the interview, several factors caused non-compliance of pregnant women to take iron supplementation, such as lack of discipline, laziness, family being unaware, and assuming that iron tablets are not essential.

Lack of Discipline

Several factors cause a lack of discipline in taking iron supplementation among pregnant women. They tend to forget to take iron tablets, where they keep the medicine, and forget to take the iron tablets while traveling.

> *"I placed the medicine in a box, but sometimes I forgot where I keep the medicine as it's not visible."* (Informant 1)
>
> *"If I am going somewhere, I often forgot to bring the medicine, and when I have to sleepover then I didn't take it as I forgot to bring it."* (Informant 4)
>
> *"I just forget to take it (medicine)."* (Informant 5)

Non-compliance with iron supplementation is a commonly observed concern, especially when individuals are faced with multiple daily obligations and time constraints. Ensuring constant compliance with iron supplementation is of paramount significance, particularly for persons in the context of pregnancy.

Another study also proved that primary factors contributing to pregnant women's nonadherence to iron tablet consumption include forgetfulness, fatigue resulting from the daily regimen, limited accessibility to the tablets, and the occurrence of gastrointestinal side effects (Fouelifack et al., 2019). Given that lack of discipline is a prevalent factor contributing to non-compliant behavior, pregnant women must ensure the convenient accessibility of their iron tablets.

Additionally, the provision of support from family members can serve as a valuable reminder for pregnant women (Fouelifack et al., 2019; Tegodan et al., 2021).

Laziness

One prevalent obstacle encountered by pregnant women in relation to iron supplementation is the laziness of the consumption of iron tablets. Multiple factors can account for this phenomenon. Based on the interview, the factors of laziness were too many daily activities and exhaustion.

> *"…. I'm just lazy to take it, as I've so many things to do the whole day."* (Informant 2)
>
> *"….as sometimes I was exhausted to take the medicine at night, then I skipped it."* (Informant 5)

It is feasible that certain pregnant women may possess a limited comprehension of the significance of iron supplementation during pregnancy. This matter necessitates careful consideration and warrants prompt action.

Family Being Unaware

Based on the interview, several informants experienced that their family was not aware of the iron supplementation schedule. There was no reminding from their family if the informant forgot to take iron supplementation.

> *"If I forgot to take iron tablets, my husband just ignored he didn't try to remind me."* (Informant 1)
>
> *"I remind myself alone."* (Informant 1)

To achieve a holistic approach to maternal health, health workers must involve pregnant women and their families actively. Health workers have the potential to enhance the pregnancy experience for both mother and baby by educating families regarding the importance of iron supplementation throughout pregnancy. The influence of family members can substantially have an impact on increasing compliance with iron supplementation schedules among pregnant women (Triharini et al., 2018).

Families have the potential to provide valuable assistance for pregnant women through consistent monitoring and a variety of supports, including emotional, physical, instrumental, and informational assistance (Triharini et al., 2018). Healthcare providers promote the consumption of iron tablets among pregnant women by improving their self-efficacy. Additionally, their family might serve as a motivating factor in enhancing their self-efficacy to ingest iron tablets (Puspita et al., 2019). Iron tablets are unnecessary.

Several informants assumed that an iron tablet was not essential if the hemoglobin levels were within the normal range, and some of them thought that they did not need to take iron supplementation since they had taken another vitamin.

> *"I only take the iron tablets if I got a headache and being lightheadedness like about to pass out."* (Informant 2)
>
> *"I have taken another vitamin, so I think that's enough."* (Informant 6)

Pregnant women may possess limited comprehension regarding the physiological alterations and iron demands that occur over the course of pregnancy. The individuals in question may possess limited knowledge of the potential hazards and advantages associated with iron deficiency. The findings of another study indicated that a contributing factor to the lack of adherence among pregnant women was a deficiency in knowledge pertaining to iron and folic acid supplementation (IFAS) as well as the proper management of associated side effects. Another study also found that the adherence of pregnant women was influenced by various factors, including their knowledge about folic acid supplementation, current anemia status, and receiving appropriate consultation (Demisse et al., 2021).

Providing pregnant women with information regarding the significance of iron supplementation and the potential hazards associated with iron deficiency anemia can contribute to enhancing compliance. It is imperative for healthcare providers to effectively communicate the advantages of iron supplementation, the hazards associated with iron deficiency anemia, and the potential adverse effects of iron supplements (Georgieff et al., 2019; World Health Organization, 2018).

The Motivation to Take Iron Supplementation

Based on the interview, several factors influence pregnant women to take iron supplementation regularly, such as understanding the advantages of iron supplementation during pregnancy, being afraid of the potential of complications during childbirth, and being reminded.

Understand the advantages of iron supplementation during pregnancy.

Informants perceived that iron supplementation is essential for the body and contributes to fetal development.

> *"The things come to my mind that the vitamin include iron tablet is important during pregnancy."* (Informant 10)
>
> *"Iron is helping to carry out the nutrition into the whole body, so If the amount of the iron is less than the normal is, something serious will happen, I guess."* (Informant 10)

While iron supplementation is important for pregnant women, healthcare professionals should determine iron supplementation dosage and duration for pregnant women, considering factors such as the individual's iron status, overall health, and specific pregnancy-related disorders. The provision of consistent prenatal care and monitoring is necessary to guarantee the utmost well-being of both the mother and the baby. It is imperative to provide educational interventions and counseling sessions that underscore the benefits of iron supplementation throughout pregnancy to optimize pregnant women's adherence to iron supplementation. Healthcare workers, particularly midwives, can play a crucial role in providing accurate information and addressing any concerns or misconceptions that pregnant women may have.

Moreover, it is feasible to employ tactics with the objective of reducing the frequency of negative consequences and improving the level of acceptance of iron supplements, thus fostering adherence. The level of pregnant women's knowledge and awareness related to iron supplementation has the potential to influence their willingness to adhere to iron supplement treatments. A correlation exists between limited knowledge and factors such as younger age, lower educational attainment, and lower per capita income (Titto & Augustine, 2018).

Afraid of the potential of complications during childbirth

Pregnant women are afraid of complications during childbirth. Hence, they need motivation to take iron tablets consistently.

> *"I'm afraid if I didn't take the iron tablets, it would affect me and the baby during childbirth."* (Informant 13)

Gaining a comprehensive understanding of labor, including its complications and relevant medical interventions, should be of greatest concern. Gaining comprehension of the methodology has the potential to alleviate feelings of anxiousness.

Reminder

Based on the interviews, reminders are one of the factors that influence pregnant women to take iron supplementation. Family members can remind pregnant women to take iron supplements. It is also what the app is trying to do, to be an additional reminder.

> *"My husband reminds me sometimes, so I've to take the tablets."* (Informant 7)
>
> *"The app sends me a notification."* (Informant 9)

Mobile applications have the potential to assist pregnant women in adhering to iron supplementation schedules. Mobile applications can provide reminders, instructions, and support, thereby mitigating obstacles to compliance. It is also imperative for mobile applications to offer pregnant women the ability to monitor their compliance with iron supplementation and observe their progress over a particular period (Ferka & Kumi-Kyereme, 2023; Sontakke et al., 2022).

Mobile applications can transmit reminders to pregnant individuals, prompting them to adhere to their prescribed iron supplement regimen at designated intervals. This technological intervention can potentially enhance compliance with iron supplementation among pregnant women (Sontakke et al., 2022).

The efficacy of employing a smartphone application for monitoring the adherence of pregnant women to iron supplementation has been established. This prompt can serve as a reminder for women to adhere to their supplementation regimen (Susilawati et al., 2021).

The Benefits of Using the App

The informants perceived several benefits while using the application in monitoring iron supplementation, such as medication frequency, reminding to take iron tablets, and taking medication more regularly.

Medication Frequency is Monitored

Based on the interview, both pregnant women and midwives had the perspective that using the app could monitor the quantity of medication consumed and monitor the administration and consumption of doses.

> *"This application helps us to monitor the medicine that we have been taken or haven't taken yet, and also being monitored by the midwife that we are compliance or not."* (Informant 9)

The advantages are also derived from the midwives, as the system has the potential to aid in monitoring the dosage administered to pregnant women. Therefore, the medication becomes controlled.

> *"The app makes it easier to monitor patients."* (Midwife 2)

The potential benefits of using a mobile application designed to monitor medication adherence among pregnant women are evident in its ability to enhance the health status of both the pregnant woman and the fetus.

Help From Missing a Dose of Medicine

The interviews showed that the application helps pregnant women avoid missing a dose of iron supplementation, as the application provides a reminder and contains a checklist to administer the medicine.

> *"I used to forget to take the tablets, and the application helped me as I get the notification."* (Informant 1)
>
> *"The app is helpful; it could remind me to take the tablet so I didn't miss it."* (Informant 7)
>
> *"I have to give the checklist if I have taken the tablets. It helps me as I often forget if I have taken the medicine or not."* (Informant 8)

Taking Medication Becomes More Regular

According to the interviews, pregnant women perceived benefits after using the application. They become more regular to take the iron tablets.

> *"I used to take medicine only when I remember, no matter what time it was. After the midwife asked me to use this app, I take the medicine according to the time which have been determined."* (Informant 11)

Technology integration is emerging as an instrument that helps promote regularity and adherence to treatment regimens. Maintaining compliance with medication is critical to achieving optimal health outcomes and treating medical disorders effectively.

Using a mobile app can assist healthcare providers in efficiently monitoring the health condition of pregnant women. Moreover, it can function as a decision-support system for pregnant women (Singh & Varshney, 2019). The use of mobile applications in nursing interventions has a favorable effect on enhancing pregnant women's understanding and implementation of strategies to control iron deficiency anemia (Abd Elhaleem Ebraheem Elagamy et al., 2019).

Pregnant women who received a nursing intervention for the treatment of iron deficiency anemia through a mobile application showed a significant rise in their hemoglobin levels. (Abd Elhaleem Ebraheem Elagamy et al., 2019). Indonesia has had substantial ownership and use of gadgets and mobile phones since 2023. According to a survey by DataReportal, the country had 370.1 million mobile connections or around 133.3% of the total population. A significant

number of persons possess multiple mobile devices. The total count of internet users reached 215 million, which accounts for nearly 77% of the population (Kemp, 2023).

The App's Weakness

The informant perceived that the weaknesses of using the app are that the notification is less effective and that there is no monitoring for the other medicine.

Difficult to Register

According to the interview, midwives reported encountering challenges in assisting pregnant women with the registration process for the app.

> *"We have to accompany them while doing the registration, as they didn't understand how to do it. I think if they did it by themselves, it would be difficult for them."* (Midwife 1)

Some pregnant women also said that they faced difficulty during the registration, and they asked for some help from the midwives.

> *"I couldn't do the registration, and I was confused, so I asked the midwife to help me."* (Informant 1)

Less Effective Notification

Some pregnant women argued that if the notification was only text, it appeared to be less effective. If the reminder could be connected to the alarm on the phone, it would be more effective.

> *"It was helpful, but if there was some alarm, I think it would be more helpful."* (Informant 1)
> *"I often missed the notification as it's only text appears with a little bit sound like a text message."* (Informant 12)

When faced with multiple notifications from various applications, including medication reminder applications, individuals may develop a tendency to ignore or fail to pay attention to the medication reminder, resulting in missing scheduled doses.

Not Regularly Checking Phone

Based on the interviews, some pregnant women rarely checked their notifications, which was caused by several factors such as habit, being restricted from using a mobile phone, and cell phone error.

> *"I rarely looked at my mobile phone, and I often left my phone everywhere, so I missed the reminder."* (Informant 2)
> *"As my mobile phone always in trouble, so I rarely use it then I skipped to fill out the medicine monitoring in the application."* (Informant 3)

Designing user-friendly applications that provide user needs, ensure privacy, and give flexibility is important to be considered. Pregnant women may utilize this application as a supplementary resource alongside routine interactions with healthcare providers.

Weak Signal/Connection

The laggy signal is a challenge when assessing the application. According to the interview, there was an informant who experienced a delay in signal transmission, failing to apply the app successfully.

> *"I always face the weak signal, then I barely use the app."* (Informant 12)

The functionality of a reminder application is contingent upon the device on which it is installed. In the event that the device experiences malfunctions, a lagging signal, or lacks access to the program, its usability may be compromised.

In developing nations with low incomes, women's mobile phones may be constrained by economic and social barriers. The mobile app for monitoring iron supplementation may be hindered among pregnant women (Kola et al., 2021; Pendse et al., 2022). The development of mobile applications designed to monitor iron supplementation should prioritize user-friendliness and intuitive navigation, especially for pregnant women who may have limited technological proficiency (Sontakke et al., 2022). In order for mobile applications to operate effectively, they must have access to a reliable mobile network and a stable internet connection. Pregnant women residing in regions characterized by inadequate network coverage or limited internet accessibility may encounter difficulties in maintaining consistent usage of these applications (Kibria et al., 2023). Certain pregnant women may possess limited knowledge or confidence in utilizing mobile phones and applications for mobile devices, thereby impeding their capacity to effectively employ monitoring applications (Pendse et al., 2022).

This study had some significant strengths, such as the use of a mobile application that was effective in monitoring the frequency and regularity of iron supplement consumption by pregnant women and the health benefits obtained, including improved maternal and fetal health status. However, this study also had a weakness. It only monitored iron supplement consumption and did not provide reminders for other medications that may also be important for pregnant women.

CONCLUSION

There was a positive impact of using the app among pregnant women in improving compliance with iron supplementation. The pregnant women have perceived benefits such as medica-

tion frequency being monitored, reminding them to take iron tablets, and taking medication more regularly. The mobile apps can be used to enhance pregnant mothers' compliance with the consumption of iron supplements, resulting in positive effects on the health of both the mother and the fetus. This application assists in monitoring the frequency and regularity of supplement use, as well as providing reminders to prevent missed doses. Nevertheless, the app has weaknesses, such as some pregnant women perceived that the reminder notification was not effective as it only popped up with text. Pregnant women need the app to provide an alarm.

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