Improving Knowledge and Attitudes in Pregnant, Postpartum, and Lactating Women toward Preventing COVID-19 Transmission and Self-Care with Health Education Packages using Android Applications

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Abstract

BACKGROUND: The Covid-19 outbreak is rapidly increasing as evidenced by the number of cases, deaths and countries affected. However, limited data is available on pregnant women with Covid-19 on which to base recommendations for pregnancy and post-partum care.

AIM: Identify the effectiveness of nursing intervention with health education via an android application about self-care and prevention of Covid-19 transmission toward the knowledge and attitudes of pregnant, post-partum and lactating women.

METHODS: This study was done in three stages. Stage one was identifying the existing nursing intervention for respondents with Covid-19, stage two involved the health education formulation and built it in to an android application, stage three measured the differences in knowledge attitude of respondents before and after health education by using the android application. 152 respondents pregnant, post-partum and lactating with Covid-19 women participated in this study.

RESULTS: Stage one showed that nursing intervention has been done comprehensively. Stage two established the health education: http://cegahcovidbumil.000webhostapp.com; Stage three found that there were differences between pre and post health education via an android application in the knowledge and attitudes during pregnancy, post-partum and lactating women in self-care and prevention of Covid-19 transmission. Significancy was found among post-partum and lactating women (p=0.018*).

CONCLUSION: There was a difference in knowledge and attitudes among respondents in self-care and prevention regarding the spread of Covid-19 before and after health education via an android application. Study recommended that health care providers use this method in their intervention to improve health status and prevent further spread of Covid-19. Further research to explore more health indicators is needed.

Introduction

Maternal mortality rate (MMR) is one indicator to evaluate the health status of women. Until the end of the MGDs, Indonesia was one of the countries that failed to reduce the MMR. Even after more than two decades of effort and hard work, the MMR is still quite high, reaching 177 per 100,000 live births. In contrast to many other countries, maternal mortality is very high, it actually occurred in the decade when Indonesia has entered the group of fairly prosperous countries. The results of the 2019 Indonesia Health Survey show that the MMR was reported at 177 in 2017 [1].

Based on the main causes of maternal death, it is closely related to the awareness of pregnant women to carry out pregnancy and health checks so that the mother and baby are conceived and born in a healthy condition. Pregnancy examination also has the aim of the early detection of irregularities and the possibility of complications during pregnancy, delivery, and postpartum. So that it is hoped that health workers, especially in the primary care settings, are able to detect early pregnancy complications.

This condition is exacerbated by the current state of world health, namely, at the end of December 2019, the Chinese health authorities confirmed the first case of the novel coronavirus (COVID-19) in Wuhan, the capital city of Hubei province, China, which then within 3 months spread to 26 countries around the world [2]. The World Health Organization (WHO) has been assessing this outbreak continuously and due to the alarming level of spread and severity, the WHO has determined that COVID-19 is categorized as a pandemic [3]. The spread of COVID-19 from person-to-person is through the same mechanisms as the common cold or influenza viruses, namely, direct contact with sneezing or coughing, or from contact with the secretions of an infected person results in rapid spread [4]. In May 2020, there were 17,025 confirmed cases of COVID-19 in Indonesia (www.covid19.go.id, 2020). The first case in Indonesia was found

in Jakarta in the early March 2020 with complaints of respiratory tract infections and that number continued to increase to 6575 cases in mid-April 2020 throughout Indonesia [5].

Until now, knowledge about COVID-19 infection in relation to pregnancy and the fetus is still limited and there are no specific recommendations for the treatment of pregnant women with COVID-19. Based on these limited data and several examples of cases in the treatment of the previous coronaviruses, (SARS-CoV and MERS-CoV) and some cases of COVID-19, it is believed that pregnant women are at higher risk of serious illness, morbidity, and mortality compared to the general population [6], [7].

Side effects on the fetus in the form of preterm delivery have also been reported in pregnant women with COVID-19 infection. However, this information is very limited and it is not clear whether these complications are associated with infection in the mother. In two reports describing 18 pregnancies with COVID-19, all infected in the third trimester, the clinical findings in pregnant women were similar to those in non-pregnant adults [8]. Fetal distress and preterm labor were found in some cases. In two cases, a cesarean delivery was performed and testing for SARS-CoV-2 was found to be negative in all the infants examined. It is still unclear whether COVID-19 infection can pass through the transplacental route to the baby. Although there have been several reports, where infants on examination were found to be positive for the presence of the virus sometime after birth, this study needs further validation of whether this transmission occurs *in utero* or postnatally [8]. There is currently no data pointing to an increased risk of miscarriage associated with COVID-19. Case reports from the previous studies with SARS and MERS did not show a conclusive relationship between infection and the risk of miscarriage or fetal death in the second trimester. The US Centers for Disease Control and Prevention (CDC) points out that pregnant women face unique challenges amid the COVID-19 pandemic. The study found that pregnant women who develop COVID-19-related symptoms can become critically ill and have a high risk of delivering premature babies or possibly have miscarriages. The CDC study, published in the journal Morbidity and Mortality Weekly Report (MMWR) on Wednesday (9/16/2020), looked at the medical records of nearly 600 pregnant women between the ages of 18 and 45 in 14 US states. These 600 pregnant women were confirmed positive for COVID-19 and received hospital treatment.

The problem is the very fast spread and human-to-human transmission of COVID-19. On the other hand, we are faced with the problem of delays in referring to health facilities, this occurs because families and health-care providers are unable to detect early risk factors or deviations in pregnant women and the transmission of COVID-19.

POGI (2020) has compiled temporary guidance recommendations regarding the handling of COVID-19 infection in pregnant women based on scientific recommendations. In this guide, a comprehensive guide to prevent COVID-19 has been written in the community, especially pregnant women, handling pregnant women, intrapartum and postpartum mothers infected with COVID-19, and their management of these special populations [7]. However, how this guide can be felt directly by the community while keeping them from being infected by COVID-19 has not been studied.

Continuous nursing interventions are carried out to prevent the transmission of COVID-19 in this vulnerable group and nursing interventions on a prebiotic-probiotic basis in accordance with holistic nursing principles (bio-psycho-socio-cultural and spiritual) which are needed. This model will empower nursing management and can be implemented by nurses in hospitals and health centers in carrying out continuous care, (continuity of care) to prevent the transmission of COVID-19. It can also help pregnant and postnatal mothers to maintain their health and that of their babies, which, in turn, will contribute to reducing mortality rates of maternal and infant in line with achieving the SDGs. Therefore, it is necessary to develop health education media to increase the immunity of pregnant women through a simple application that can be used by pregnant women who are at risk of contracting or who have been affected by COVID-19, which will be detected and immediately treated. Using this application, mothers and health workers do not need to meet face-to-face so that the transmission rate is reduced. Mothers will receive guidance on how to solve their problems and carry out self-examinations on their pregnancies using the application. The research question is: whether the Health Education Application package based on holistic nursing interventions for pregnant women, maternity, and postpartum mothers will increase compliance in preventing the spread of COVID-19?

Objective

The objective of this study was to identify the effect of the Health Education application for pregnant, maternity, and postpartum women on compliance with the prevention of the spread of COVID-19.

Literature review susceptibility to and severity of COVID-19 in pregnancy

There is no data to inform whether pregnancy increases susceptibility to COVID-19. Previous data on SARS and MERS suggest that clinical findings during pregnancy can range from no symptoms to severe disease and death. The most common symptoms of COVID-19 are fever and cough, with more than 80% of hospitalized patients presenting with these

symptoms [9], [10]. It was reported that the pregnant women that diagnosed with COVID-19 during the third trimester of pregnancy experienced similar symptoms and signs as another COVID-19 patients such as fever, cough, myalgia, sore throat, and malaise. They also found a sign of lymphopenia and pneumonia. All women had a cesarean delivery, and Apgar scores were 8–9 at 1 min and 9–10 at 5 min.

Based on these limited reports and the available data from other respiratory pathogens such as SARS and influenza, it is unknown whether pregnant women with COVID-19 will experience more severe disease.

Management of COVID-19 in pregnancy

General principles regarding management of COVID-19 during pregnancy include early isolation, aggressive infection control procedures, testing for SARS-CoV-2 and coinfection, oxygen therapy as needed, avoidance of fluid overload, empiric antibiotics, (against secondary bacterial infection risk), fetal and uterine contraction monitoring, early mechanical ventilation for progressive respiratory failure, individualized delivery planning, and a team-based approach with multispecialty consultations. Guidelines for the management COVID-19 in pregnancy have been announced by the Ministry of Health (2020) [7], and implemented in all health institutions across the country. Ability to provide surveillance for the early detection of a worsening maternal course of illness, as well as an ability to monitor for evidence of obstetric complications, (e.g., preterm labor or fetal compromise) are needed. Changes in fetal heart rate pattern may be an early indicator of maternal respiratory deterioration. Whether delivery provides benefit to a critically ill mother is unknown; decisions regarding delivery should consider the gestational age of the fetus and should be made in conjunction with the neonatologist [11]. All guidance should be considered subject to revision as additional data on pregnant women with COVID-19 becomes available.

Pre-probiotics proposed as intervention

Probiotics are bacteria in the digestive tract (gut health-promoting bacteria), while prebiotics are compounds in food that can stimulate the growth and activity of these bacteria [12]. A prebiotic and probiotic diet is a type of diet which adds probiotic bacteria or prebiotic compounds to the food or drink consumed. According to Hosoglu _et al._ [13], prebiotics and probiotics can improve appetite control. Probiotics are live micro-organisms which, when administered in adequate amounts, can provide health benefits to the body. The use of probiotics can affect the gut microbiota and have a positive effect on pregnancy. Lactobacillus and Bifidobacterium bacteria can

treat and prevent bacterial vaginosis by producing antibacterial substances including retrocyclin, organic acids, bacteriocin, reuterin, and hydrogen peroxide. Hydrogen peroxide (H_2O_2), Streptococcus, Escherichia, Lactobacillus, and Bifidobacterium bacteria can synthesize neurotransmitters in the autonomic nervous system, change blood vessel tone, alter endothelial function, and produce short-chain fatty acids (SCFA) to lower blood pressure. In addition, Lactobacillus rhamnoses GG and Bifidobacterium lactis BB12 were reported to reduce insulin levels and the risk of gestational diabetes mellitus (GDM) [12].

Pregnancy is a critical period of development for the fetus, the condition of the mother's health, certain stimuli, and the nutritional status of the mother can "program" the function and long-term health of the unborn fetus [14]. The maternal digestive system plays an important role in metabolic processes, fetal immunological programming, and supplying nutrients to both mother and fetus. On this basis, the maternal gut microbiota is thought to contribute to maternal and fetal health [15]. The use of probiotics is one method that can be used to maintain intestinal health, activating the microbiota so that it can be manipulated to obtain health benefits [16]. The use of probiotics in pregnancy has also been found to be useful for immunity, preventing atopic disorders, bacterial vaginosis, GDM, and hypertension [14], [17]. In pregnancy, the gut microbiota changes as the pregnancy progresses. In the second trimester, abundance of the genus Collinsella was positively correlated with insulin levels, while abundance of Odoribacter was negatively correlated with blood pressure. In the third trimester of pregnancy, intraindividual diversity, but an abundance of pro-inflammatory proteobacteria phylum is a key factor [18]. Probiotics for bacterial vaginosis in pregnancy can be beneficial. Bacterial vaginosis (BV) is a condition characterized by a decrease in the number of microbiota Lactobacillus spp. and followed by an increase in the number of other bacteria such as _Gardnerella vaginalis_, _Atopobium vaginale_, _Prevotella_ spp., _Mobilucus_ spp., and _Mycoplasma hominis_ [19], [20].

Complications of BV in pregnancy induce complications during pregnancy including premature rupture of membranes, postpartum endometritis, increased failure in development pregnancy, and premature birth [21], [22]. Probiotics fight bacterial vaginosis through various mechanisms, competition with pathogens, stabilization of the mucin layer, and prevention of the growth of pathogenic bacteria by producing antibacterial substances [20], [23], [24]. The gut microbiota has the potential to affect blood pressure through various mechanisms [25]. The gut microbiota affects the inflammatory response of the human body, altering endothelial function, which can have an impact on lowering blood pressure [26]. In addition, short-chain fatty acid (SCFA) production by gut microbiota is associated with the role of Bifidobacteria

as SCFA-producing bacteria. Supplementation with probiotics is reported to reduce blood pressure, demonstrating the importance of the gut microbiota in the regulation of blood pressure during pregnancy [27]. With controlled blood pressure in pregnancy, the possibility of other comorbidities can be reduced. Blood pressure is very important during pregnancy, because high and uncontrolled blood pressure could signify the beginning of other complications such as pre-eclampsia and eclampsia. Women who are overweight or obese during pregnancy, who are characterized by a high maternal body mass index (BMI), have an increased risk of gestational diabetes mellitus (GDM). Maternal obesity can affect fetal growth in the early stages of life. Maternal GDM increases the risk of excessive fetal adiposity, macrosomia (birth weight more than 4000 g), and neonatal hypoglycemia [28]. Probiotics are live microorganisms which, when administered in adequate amounts, can provide health benefits to the body. Probiotics consist of individual or multiple species of live bacteria such as lactobacilli and bifidobacterial, in which after ingestion can alter the gut microbiota. Recent research suggests that the gut microbiota may play an important role in the development of obesity, obesity-related inflammation, and insulin resistance. An intervention study with capsules containing Lactobacillus rhamnosus GG and Bifidobacterium lactis BB12 in 256 normal-weight pregnant women, which reported a reduced risk of GDM from 34 to 13%, (p = 0.003) with combined dietary supplementation/probiotics. Another study related to the daily consumption of 200 g of conventional yogurt or probiotics, which found a significant difference in serum insulin levels: +1.2 ± 1.2 versus +5.0 ± 1.1 IU/ml (p = 0.020). The study concluded that consumption of probiotic yogurt maintains insulin levels in serum and could help prevent the development of insulin resistance during pregnancy [19], [29].

Methodology

Research design is based on three stages, namely:

The first stage is to identify the provision of holistic nursing interventions including pre-probiotic nutrition provided to hospitalized pregnant and postpartum mothers who experience COVID-19. This stage was carried out with a qualitative study by interview.

The second stage is to develop a continuity of care model on the basis of stage one data analysis and literature review. The health education packages consist of education in comprehensive pregnancy care during pandemic, self-care postnatal, and lactation care including pre-probiotic food consumption, exercises, hygiene, relaxation, spiritual care, and prevention of COVID-19 transmission. The Health Education Package is in the form of an android application.

Stage three involved measuring the effectiveness of the application in pregnant, childbirth, and breastfeeding women who are measured on physical, psychological adaptation, and comfort and safety of the group. The design is quasi-experimental without group control. Respondents were selected based on quota sampling, which was adjusted to the respondent's presence in the hospital, because the number of patients who are pregnant, giving birth, or postpartum women with COVID-19 is not high. The sample was selected according to the following inclusion criteria: Pregnant women, giving birth, or postpartum undergoing treatment for COVID-19, or self-isolating at home. A total of 152 respondents fulfilled the criteria and gave consent to participate in this study. The analysis was carried out with univariate, frequency distribution and bivariate, Chi-square tests before and after using the application. The variables that have been measured are the pregnancy self-care during COVID-19 pandemic, gaining information about antenatal care during the pandemic; the implementation of postpartum care during the pandemic and the Prevention of Transmission of COVID-19 in their breastfeeding period during the pandemic.

This study has been reviewed and conducted according to standard research ethics. It respects ethical principles based on the Belmont Report which consists of beneficence, respect for human dignity, and justice as follows [30]. The ethical consideration has been approved by ethical committee Faculty of Nursing University Indonesia in the ethical clearance letter No: Ket210/UN2.F12.D1.2.1/PPM.00.02/2021.

Results

The results of the first stage were the identification of nursing interventions for as many as 24 maternity and postpartum mothers with COVID-19. It was found that the interventions came through: isolation and close observation, muscle stretching exercises through the patient-nurse watch group, or care.com. Nutrients were provided via high protein food = 2400 kcal in the form of vegetables, side dishes, protein, fruit, and snacks. The nutrition counted the high calorie and high protein sources with pre-probiotic such as fragmented food for example tofu, "tempeh," and fishes.

The second stage was to produce an android application that was distributed through the internet: http://cegahcovidbumil.000webhostapp.com

The content of health education including bio, psycho, social and spiritual activities, and nutrition that are important for pregnant and breastfeeding mothers can also increase their immunity. This health education

package also strongly points out the prevention of transmission COVID-19 during pregnancy, postnatal care, and the breastfeeding period. The following data demonstrate the differences of each variable before and after the respondents used the application.

Table 1 shows the respondents' characteristics who participated in this study. It reveals that the age of the most of respondents was in the range 26–33 years old, (58.55%), and most of them had more than one child (63.16%). In addition, the education level most of them was an undergraduate qualification (61.18%).

Table 1: The demographic data of respondents in Depok Hospital, 2021, n = 152

Characteristics	Frequency	%
Age (year)		
18–25	28	18.42
26–33	89	58.55
>33	35	23.03
Parity		
Primigravida/primipara	56	36.84
Multigravida/multipara	96	63.16
Education		
High school	0	33.55
Vocational/diploma	51	61.18
Undergraduate	93	5.26
Postgraduate	8	

Figure 1 illustrates that the difference before and after respondents used the application to gain information about antenatal care during the COVID-19 pandemic. After using the application, they acquired more information about ANC and prevented COVID-19 transmission.

Figure 1: The different of getting information of ANC during a COVID-19 Pandemic before and after using application, 2021 (n:152)

Table 2 shows that there was a significant difference before and after intervention (p = 0.013).

Table 2: The different of getting information on ANC during COVID-19 pandemic before and after using application 2021 (n = 152)

	Did not get information		Got information		p
	F	%	F	%	
Before	49	32.2	103	67.8	p = 0.013*
After	30	19.7	122	80.3	

*p < 0.05.

Figure 2 shows that the difference before and after respondents used the application in implementation of pregnancy self-care during the COVID-19 pandemic. After using the application, they were implementing more pregnancy self-care to improve their immunity and prevent COVID-19 transmission.

Table 3 shows that there was no significant different between before and after intervention (p = 0.081).

Figure 3 shows that the difference before and after respondents used the application in carrying out
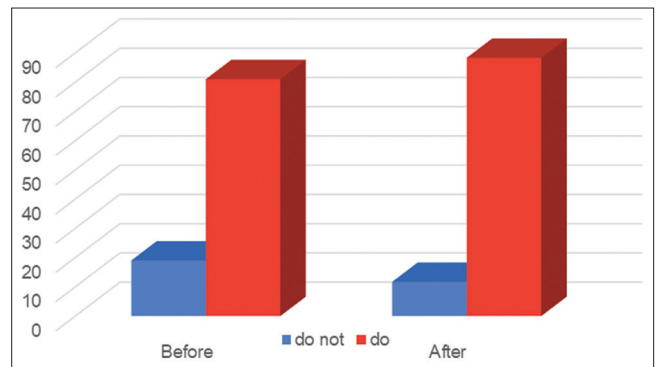

Figure 2: The Different Implementation of Pregnancy Self-Care during the COVID-19 Pandemic before and after using application, 2021 (n-152)

postpartum care during the COVID-19 pandemic. After using application, they implemented more postpartum care thereby reducing COVID-19 transmission. Table 4 shows that there was a significant different between before and after intervention (p = 0.018*).
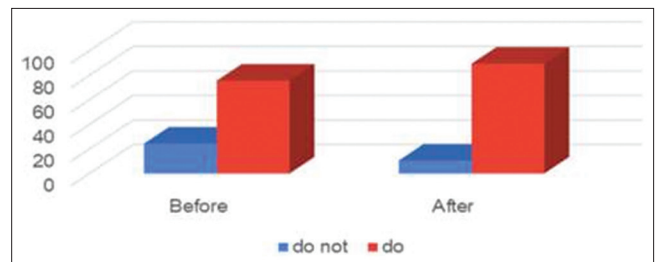

Figure 3: The different to carry out postpartum care during COVID-19 pandemic, before and after using application, 2021 (n:152)

Figure 4 shows the difference before and after respondents used the application in prevention of COVID-19 transmission in their breastfeeding process. After using application, they were more effective in preventing COVID-19 transmissions when providing breast milk to their baby. Table 5 shows that there

Table 3: The Different implementation of pregnancy self-care during the COVID-19 pandemic before and after using application, 2021 (n = 152)

	Do not		Do		p-value
	F	%	F	%	
Before	29	19.0	123	81.0	0.081
After	18	11.7	134	88.3	

*p < 0.05

was a significant difference between pre- and post-intervention (p = 0.018).

Discussion

This study found that there was no major difference before and after using the application in pregnancy self-care. However, the results do show a slight increase in doing pregnancy self-care after they read health education package through the application. This situation can be attributed to a massive health

Table 4: The difference of implementation postpartum self-care before and after using the application during the COVID-19 pandemic, 2021 (n = 152)

	Did not		Did		p
	F	%	F	%	
Before	48	31.6	104	68.4	0.018*
After	30	19.7	122	80.3	

*p < 0.05.

promotion from the government toward limiting the transmission of COVID-19 nationally. All sectors and every Indonesian citizen must adhere to the health protocols to prevent spreading COVID-19. This result is in line with the statement of [31] that it is important to be vigilant about the spread of the disease and be able to provide rapid implementation of outbreak control and management measures once the virus reaches a community. Standard interventions to manage any severe respiratory infection is the foundation of care for any pregnant woman with COVID-19 and should be implemented aggressively through a team-based care model.

The next finding of this research was that there was a significant different between pre- and post-intervention in getting information about protocols for antenatal care. After reading health education package through application, the respondents understood the regulation of antenatal care during the COVID-19 pandemic. The specific information about the protocol for antenatal care was published by OBGYN association guidelines and in the new regulation of health services for pregnant women during COVID-19 pandemic [5]. The result of this study is in line with statement of [31] that the prevention of viral transmission is very important especially in this vulnerable group. The guidance of antenatal care provided must be considered based on the situation of the pandemic and should follow the health promotion programs. Improvements in the knowledge and effort of pregnant women, postpartum, and lactating women who participated in this research showed that this health education package is needed. A medium that is easy to follow and easy to assess by the general community increases their motivation to read and follow the guidelines.

That, in turn, improves their knowledge and encourages better behaviors. Furthermore, the nutrition that they consume which is also a section in the HE packages in application, makes them more aware, that hopefully will be implemented in their daily food consumption. Probiotics are bacteria in the digestive tract (gut health-promoting bacteria), while prebiotics are compounds in food that can stimulate the growth and activity of these bacteria [12]. Prebiotic and

Table 5: The difference in prevention of transmission of COVID-19 before and after using the application during breastfeeding, 2021 (n = 152)

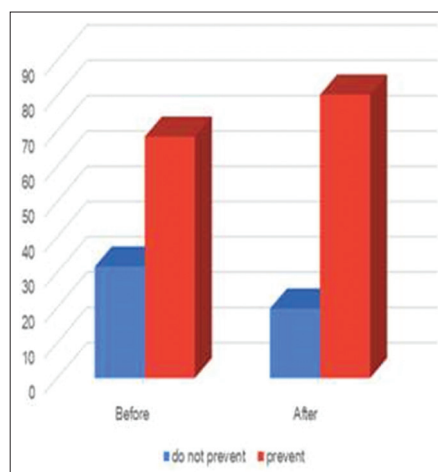|	Did not prevent		Did prevent		p
	F	%	F	%	
Before	48	31.6	104	68.4	0.018*
After	30	19.7	122	80.3	

*p < 0.05.

Figure 4: The different prevention of transmission of COVID-19 during breastfeeding before and after using application 2021 (n:150)

probiotic diets contain additional probiotic bacteria or prebiotic compounds in the food and drinks consumed. These bacteria are usually present in fermented foods or beverages, such as yogurt and tempeh or foods that are intentionally enhanced with probiotic bacteria (probiotic fortified foods), and deep-sea fish species such as salmon are probiotic food ingredients [12]. This probiotic and prebiotic diet is sufficient to maintain a healthy digestive tract but must be accompanied by a balanced diet. In addition, the comprehensive interventions which include bio, psycho, socio, cultural, and spiritual forms provided in the health education packages online make it more useful to solve the problem of maternal and child health especially during COVID-19 pandemic. This situation, in turn, will improve their immunity and improve their overall health status.

Study limitations

This study did not evaluate the biochemistry results of respondents as markers of the high immunity of the respondents due to changing their habits. Food consumption, physical exercises, and health promotion activities as per the government's guidelines all improve awareness in mothers and child health and these are included in the health education packages using the android application. This situation could not be done avoided due to time and financial constraints. A larger population sample is needed for further study as Indonesia is a large country with a high population density and many remote areas spread across the thousands of islands.

Conclusion

The study found that there are significant differences in knowledge and attitudes among pregnant, postnatal, and lactating mothers in their

awareness to improve their self-care and prevention of COVID-19 transmission. This result recommends further study to measure the effectiveness of this health education packages on the immunity status of pregnant, postpartum, and lactating women by evaluating their biochemistry markers. Furthermore, this study needs to be conducted on larger population cohort. Using the android application, it is much easier to reach respondents everywhere.

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