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A systematic scoping review of innovation on malaria prevention programs in pregnancy during pandemic

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Abstract--The World Health Organization (WHO) has warned that the prevalence of malaria among pregnant women in Indonesia could rise as a result of the COVID-19 pandemic. Malaria during pregnancy has a severe effect on both the mother and the fetus, and is particularly dangerous for those who are infected while pregnant. The study is intended to summarize the literature on strategies for preventing and treating malaria in pregnancy in Indonesia during the COVID-19 pandemic. The literature search strategy was systematically applied using keywords in the Springerlink database, Scopus, Google scholar, Garuda Portal. The inclusion criteria applied include Languages (English and Indonesian), which are the results of public health research, published since 2018. There are a total of 11 articles that

match the inclusion criteria for further qualitative descriptive analysis. it was discovered that several strategies and innovations, including the evaluation of pregnancy-specific malaria prevention programs, health promotion strategies, wire netting home modifications, and sustainable midwifery care, were implemented in Indonesia to prevent and treat malaria in pregnant women. This demonstrates how creativity can accelerate the elimination of malaria, especially for malaria in pregnant women, by promoting health and providing support while also taking into account the cultural aspects and local knowledge of the extremely diverse Indonesian population.

Keywords---malaria, pregnancy, strategy, prevention, pandemic.

Introduction

Malaria is still a major public health problem with high morbidity and mortality.. Malaria threatens over half of the world's population.(Liu et al., 2021) High-risk groups, such as newborns, toddlers (under five years old), and pregnant women, might experience catastrophic effects from malaria. Pregnant women are typically more susceptible to malaria than other high-risk categories.(Lestari, 2012; Sardjono & Fitri, 2019) Pregnant women are very susceptible to malaria because pregnancy will reduce a woman's immunity to malaria infection, this condition increases the risk of severe anemia and death, maternal malaria can also increase the risk of abortion, stillbirth, premature delivery and low birth weight. (Bharatwajan & Mahapatra, 2009; Kementerian Kesehatan,Dirjen P2PL, 2014; Lagerberg, 2008).

The malaria morbidity rate is described by the Annual Parasite Incidence (API) indicator per 1000 population. Globally, WHO (World Health Organization) estimates that 1.5 billion malaria cases and 7.5 million malaria deaths have been avoided in the period of 2019. Although globally there has been a decrease in the incidence of malaria by around 20 million malaria cases in 2021. However, most of the world's malaria cases are still found in Africa, Southeast Asia and the East Mediterranean. The Southeast Asia region accounts for 10% of malaria cases and 3% of malaria deaths. Indonesia is the second largest country with malaria incidence in Southeast Asia after India. (Sardjono & Fitri, 2019; WHO, 2021). Malaria incidence has decreased by more than 50% in the last decade, from API 1.96 per 1000 population in 2010 to 0.84 per 1000 population in 2018, but the decline in malaria cases has stalled from 2018 to 2021. This coincides with the ongoing COVID 19 (Corona Virus Disease) pandemic in Indonesia since March 2019. This stagnation in malaria reduction indicates that the intervention of the elimination program that has been implemented has not been sufficient to drastically reduce cases, and that, additionally, health workers are carrying a double burden in efforts to eliminate malaria in Indonesia due to the pandemic.(Indonesia, 2020; P2P, 2020; RI, 2020).

The incidence of malaria in Indonesia is still dominated by eastern Indonesia, namely Papua (API 63.12 per 1000 population), West Papua (10.15 per 1000 population) and East Nusa Tenggara (API 2.76 per 1000 population).(Indonesia,

2020). Malaria in pregnancy is most common in primigravida in high transmission areas, and the prevalence and density of all parasites decreases during subsequent pregnancies. In areas with low transmission, however, all gestational ages are at risk of *Plasmodium falciparum* and *Plasmodium vivax* malaria infection. (Sardjono & Fitri, 2019). Pregnant women are extremely susceptible to malaria, especially primigravida in regions with high transmission rates. The primary clinical symptom of malaria is frequently fever; therefore, when pregnant women are exposed to the disease, their morbidity and fatality rates will be higher than those of non-pregnant individuals. (Lagerberg, 2008; Rogerson et al., 2018)

Malaria and pregnancy both worsen the mother's and fetus's health. Malaria's physiological and pathological changes have a synergistic effect that makes it difficult for mothers and babies, as well as the health workers who care for them. Pregnant women living in malaria-endemic areas may experience malaria-related complications such as maternal anemia, parasite accumulation in the placenta, low birth weight due to prematurity and stunted fetal growth, parasite exposure of the fetus, congenital infection, and infant mortality associated with low birth weight. However, only a small percentage of pregnant women in malaria-endemic areas have access to effective interventions. Malaria prevention in pregnancy is critical due to the negative consequences for the mother and fetus. (Hill et al., 2014; Kementerian Kesehatan, Dirjen P2PL, 2014; P2P, 2020; Whidden et al., 2019)

The Indonesian government, through various government regulations, has a malaria prevention program in pregnancy. A single malaria screening policy is one of the government's malaria prevention programs for pregnant women. Pregnant women are integrated into MCH services (pregnant women are checked for malaria when they first see a health worker) and insecticide-treated mosquito nets are distributed. and the administration of antimalarial drugs if malaria is detected. If there are any complaints or complications, the malaria RDT examination in pregnant women can be repeated. DHP (Dihydroartemisinin Piperaquine) is the type of antimalarial drug given to pregnant women, but it must be administered under the supervision of a health worker. (Kementerian Kesehatan Republik Indonesia, 2020). However, it is believed that its implementation is still ineffective in reducing malaria cases in pregnancy, particularly in areas with high malaria endemicity.

Furthermore, during the COVID-19 pandemic, pregnant women's access to health services is limited, and there are several health protocols that must be followed by pregnant women; as a result, malaria screening for pregnant women cannot be carried out optimally. As a result, new innovations are required to support government programs for malaria prevention and treatment during pregnancy. This literature review aims to provide information on various malaria prevention and management strategies in pregnancy that were implemented in various regions of Indonesia during the COVID-19 pandemic. It is hoped that this study will provide information on appropriate innovations that can strengthen and support government programs, particularly those aimed at malaria prevention and control in pregnancy.

Methods

The following stages are involved in the preparation of a systematic scoping review of this literature:

- Determine a research topic and objectives
Based on the problem to be studied, the research team discusses and decides on the topic of the literature review, and then decides on the purpose of the literature review, which is to provide solutions to existing problems. The research team agreed at this point that the goal of this literature review is to gather information on various innovations in malaria prevention and management strategies in pregnancy in Indonesia during the COVID-19 pandemic..
- Create research question
After the team was successful in developing the research objectives, we developed research questions to serve as a guide in searching the literature. The research question being developed is: how are innovations and strategies for malaria prevention and treatment in pregnancy being implemented in Indonesia during the COVID-19 pandemic?
- Determine inclusion and exclusion criteria
Inclusion criteria for this literature search were developed based on the objectives and research questions. The inclusion criteria are: research articles published between 2018 and 2022; research conducted in Indonesia since 2018, written in Bahasa and English; and Open Access. The exclusion criteria are that the article is a literature review, biomedical research, experimental drug research, or genetic engineering, that it was not conducted in Indonesia, that it was conducted outside of 2018-2022, that it was not written in Bahasa or English, and that it could not be accessed by complete manuscripts.
- Searching for data resource and literature
After determining the inclusion and exclusion criteria, the next step is to develop a literature search strategy. We searched for articles in several databases, including Springerlink, Scopus, Google Scholar, and Garuda Portal. The keywords that we use in the Springerlink and Scopus databases are "Malaria in Pregnancy, Prevention and Control, Indonesia". The keywords on Google Scholar and the Garuda Portal are "Malaria dalam Kehamilan". All search results articles were recorded. All articles from search results are saved.
- Determine the articles that meet the criteria (pass the selection)
After collecting all search results, to avoid bias at least two researchers read each article to assess its relevance and conformity with the inclusion criteria. The EHPP (Effective Public Health Practice Project) instrument was then used to evaluate the quality of all articles. Articles meeting strong and moderate criteria will be scrutinized further. The total number of articles that we can find is 52. After removing the duplicated articles, of the remaining 47 articles, the articles that can be accessed in full manuscripts are 42 articles. The articles that are in accordance with the research topic and are included in the strong and moderate criteria from the results of the EHPP assessment comprise the remaining 11 articles. Thus, there are 11 articles which will then be analyzed further in this systematic scoping

review. We use qualitative analysis with content analysis to further analyze each article that meets the inclusion criteria.

The entire article selection process follows the PRISMA flow and is illustrated in the image below.

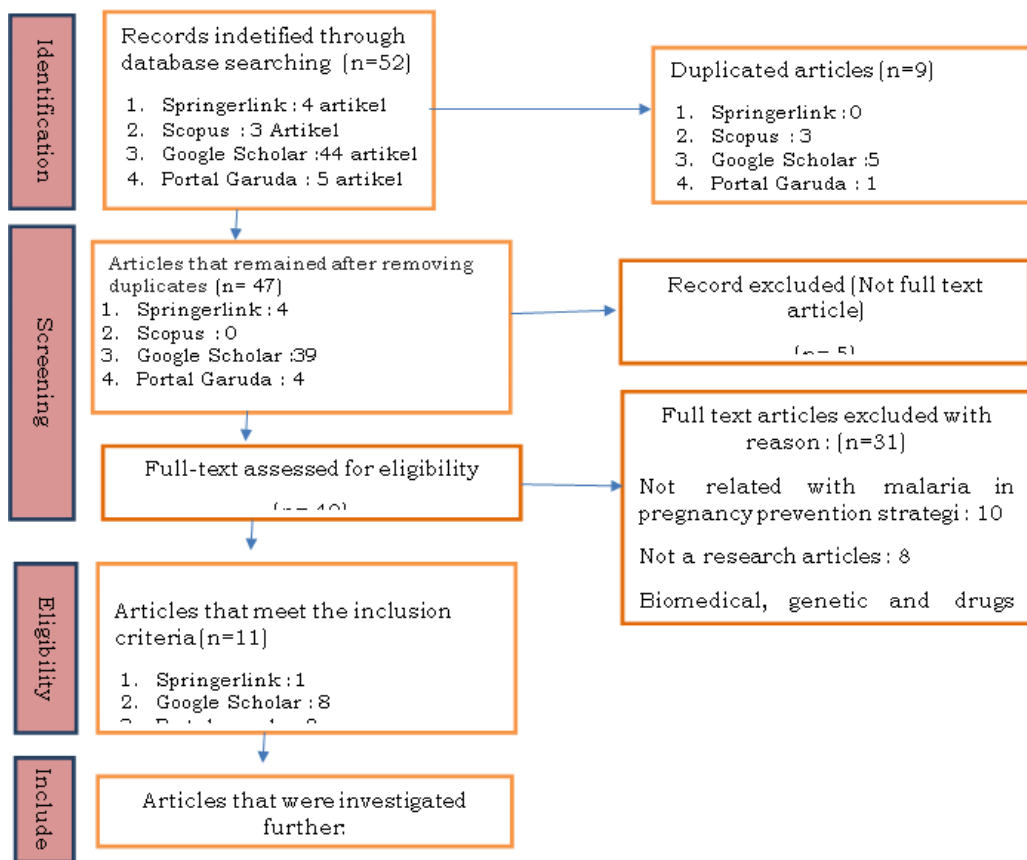


Figure 1. PRISMA Flowchart for the Article Selection Process

Results and Discussions

Malaria in pregnancy has a negative impact on both the mother and baby. This is not the case for mothers who live in areas with high malaria transmission (stable areas) and have had malaria. Pregnant women do not show symptoms of malaria (asymptomatic), but plasmodium infection in the body still causes pregnancy complications such as anemia, low birth weight, premature and abortion..(Hill et al., 2013; Hoyt et al., 2018). WHO recommends Intermittent Preventive Therapy with Sulfadoxine Pyrimethamine, use of insecticide-treated bed nets, and effective case management to prevent and treat malaria in pregnancy. (Menéndez et al., 2015; WHO, 2021).

The Indonesian government has malaria management guidelines. Malaria prevention efforts are based on the principles of vigilance against the risk of malaria, mosquito bite prevention, prophylactic drugs, and proper diagnosis and

treatment according to these guidelines. So, if you notice symptoms of malaria, it is hoped that you will seek medical attention right away. Insecticide-treated mosquito nets, repellents, mosquito nets, and other methods can be used to avoid mosquito bites. Pregnant women and children under the age of eight cannot receive malaria prophylactic therapy with doxycycline 100 mg/day. (Kementerian Kesehatan Republik Indonesia, 2020).

During the COVID-19 pandemic, the Indonesian government issued a malaria service protocol to prevent an increase in cases and deaths due to malaria, namely by ensuring physical distancing between health workers and the public in carrying out their activities. Meanwhile, early detection of malaria in pregnancy is still carried out by screening for malaria at the first visit with a malaria RDT examination, providing mosquito nets, and treating positive results. While social constraints are considered and communication and health promotion strategies are still implemented to prevent an increase in malaria morbidity and mortality during the COVID-19 pandemic, malaria services are still provided in health facilities while malaria services are still provided. Furthermore, in areas with high malaria endemicity, malaria blood tests with RDT should be performed in addition to testing for COVID-19 (antigen or PCT), including in people who do not have symptoms. (RI, 2020). Based on the 11 articles that have been selected, the articles are then analyzed qualitatively using content analysis, and the results can be seen in table 1 below:

Table 1
Summary of literature review

No	Title	Innovation or strategy carried out
1	Evaluation of the national policy of single screening and treatment for the prevention of malaria in pregnancy in two districts in eastern Indonesia : health provider perceptions (Hill et al., 2018)	A single treatment and screening program that is carried out is a strategy that can be accepted by all health agencies. However, implementation is still inconsistent and varies in the same district, differs between different levels of health facilities and differs between cadres in the same health facility.
2	Assistance for continuity of care related to malaria and anemia by activating Pustu in Doyo Baru Village, Jayapura Regency (Wahyuni et al., 2022)	Assistance for pregnant women by midwives and health analysts with the concept of COC (Continuity of Care) pregnancy. It turned out to be able to increase the knowledge of pregnant women about malaria in pregnancy and access to health facilities (ANC).
3	"Pelai Berangkak" video on malaria prevention compliance among pregnant women in the working area of the Penimbung Public Health Center. (Rizki & Yuniarni, 2022)	The obedience of pregnant women in the prevention and transmission of malaria after the intervention of educational video "pelai berangkaka" experienced a significant increase in the use of video education more effectively than power point.
4	Effects of the "MISERI	The MISERI (Malaria Intervention Support Early

	Package" on the Ability of Pregnant Women in the Early Prevention of Malaria in Jayapura District.(Fakhri Inayati Said et al., 2019)	Prevention) package in the form of an information booklet includes: malaria, its causes, modes of transmission, the effects of malaria during pregnancy, and preventing malaria. It is more effective to increase knowledge of mothers and families about malaria in pregnancy and its prevention efforts than health promotion by using mass counseling methods and distributing leaflets.
5	Education on giving bitter gourd juice to prevent malaria in pregnant women in 2021.(Desi et al., 2021)	Pregnant women understand the benefits of bitter melon. and limit the consumption of bitter melon or bitter melon juice during pregnancy and postpartum because it is thought to trigger uterine contractions, thereby increasing the risk of miscarriage.
6	The effect of health promotion using a booklet on increasing malaria sufferers' knowledge and attitudes toward malaria prevention in Bengkulu City. (Shilvi et.al, 2021)	Health promotion using booklet media is more influential in increasing knowledge and attitudes of malaria sufferers compared to leaflet media.
7	Use of insecticide-treated mosquito nets and wire gauze in the prevention of malaria in pregnancy in Sangaji Village.(Mustafa et al., 2018)	The use of wire netting can be used as a supplement in malaria prevention at the household level in addition to using insecticide-treated mosquito nets.
8	The effect of leaflet and video methods of health counseling about innecticided gambus in Mabodo Primary health care (Zanuma, zanuma, Timbul Supodo, Sanihu Munir, Anry H depu, 2018)	There is an effect (knowledge, attitude and behaviour) through leaflet and video counseling on the use of textured bed nets in the working area of the Mabodo Health Centre
9	The Effectiveness of the Lambunization Program at the Oesapa Health Center, Kelapa Lima District, Kupang City.(Bonlay et al., 2019)	The results showed 1) input: health personnel and facilities (cars and motorbikes) are limited, especially in distributing mosquito nets to pregnant women, infants, toddlers, and children. 2) Process: This program is planned by the Kupang City Health Office, while the implementation and evaluation are carried out by health workers from the Oesapa Health Center. Barriers associated with low accessibility in reaching target homes in need, an insufficient number of health workers, and the lack of special facilities required to distribute nets (3) Output: A total of 188 nets were distributed to targets according to program objectives. Based on observations from 65 households that were the sample of the study, 63 households used and treated kalaambu with insecticides until 2019. The distribution of insecticide-treated mosquito nets was considered

		ineffective. Adequate personnel and health facilities need to be provided to distribute mosquito nets, and monitoring needs to be carried out so that distribution can reach the target.
10	Utilization of mosquito nets as an effort to prevent malaria in pregnant women in 2021.(Sihite et al., 2021)	Persuasive communication strategies (home visits) and mass outreach can help increase the use of mosquito nets for pregnant women to prevent malaria.
11	Performance of village midwives in early detection of malaria cases in pregnancy in the Central Bengkulu district.(Mizawati et al., 2016)	The performance of village midwives in the early detection of malaria cases in pregnancy depends on malaria training, the availability of RDT in the field, and educational background but is not affected by age and length of work.

Several strategies are implemented by government agencies (health services) in Indonesia through health centers and educational institutions to assist government programs in efforts to prevent malaria in pregnancy, according to the 12 articles reviewed. The strategies are classified as follows:

Implementation of government programs

Three articles discuss the implementation of government programs for malaria prevention in pregnancy in high malaria endemic areas. The implementation of government programs in preventing malaria in pregnancy through integrated single screening and treatment (SST) activities in Maternal and Child Health (KIA) services carried out in the eastern part of Indonesia is still found to have inconsistency between villages in the same district and between cadres and health workers in the same health facility, according to articles nos. 1, 9, and 11. While article 10 states that the malaria prevention program planned by the local Health Office to be implemented by health workers in the area still needs to be implemented.

According to the findings of the literature review, three articles state that the implementation of malaria prevention and treatment programs in pregnancy in Indonesia is still inconsistent in every district in eastern Indonesia, which is the malaria hotspot in the country..(Webster et al., 2018) The other two articles discuss the program's implementation, which is not supported by adequate human resources (training), and the supply of RDT and mosquito nets is inadequate. This has hampered the performance of health workers, particularly midwives, in properly implementing the malaria prevention program in pregnancy. (Bonlay et al., 2019; Wahyuni et al., 2022). According to the malaria service protocol, malaria control programs and health facilities must maintain optimal conditions to support malaria services in the COVID-19 pandemic situation. In a pandemic situation, the need and availability of drugs and logistics for malaria services at all levels (nets and RDTs) must be considered, and logistics planning must be prepared to be sufficient in the next 2-3 months by taking the epidemiological situation into account.

When social restrictions and regional quarantines are imposed, provincial, district, and city health service officers are required to monitor and anticipate malaria services.(RI, 2020) The protocol did not mention malaria management in pregnancy during the COVID-19 pandemic. It only states that malaria screening for pregnant women is performed during the mother's initial visit to health facilities, along with the distribution of mosquito nets; if positive results are found, the mother will be given anti-malarial drugs. Additionally, pregnant women who are tested for COVID-19 will have their malaria status checked. According to the protocol, the monitoring of malaria service implementation is carried out by Provincial and/or Regency/City Health Office officers, so the Health Office is responsible for malaria services running consistently according to the guidelines in the region and ensuring the supply of malaria logistics (RDT and anti-malaria drugs) is available for the next 2-3 months by taking epidemiological analysis into account.

This is also consistent with the WHO recommendation for managing malaria during a pandemic, which states that pregnant women during a pandemic should be screened not only for COVID-19 but also for malaria because the symptoms of COVID-19 are similar to those of malaria.. (WHO, 2020). In Indonesia, the management of malaria in pregnancy is fully carried out in health facilities, the success of which is largely determined by health human resources. However, the findings of the two articles indicate that health human resources are still not evenly distributed in terms of malaria management in pregnancy training and have an insufficient logistical supply. As a result, the monitoring system for the implementation of adequate malaria services, the availability of guidelines for the management of malaria in pregnancy for health workers, the malaria logistics monitoring system, and the strengthening of health human resources related to malaria management, particularly malaria in pregnancy, must be improved

Health Promotion efforts using communication strategies

Article no. 3.4.5.6.8.10 is one of six that discuss health promotion/communication strategies aimed at preventing malaria in pregnancy. According to the three articles, audiovisual communication media such as videos and booklets are more effective than leaflets or mass counseling using powerpoint presentations in increasing mothers' knowledge and attitudes toward malaria prevention efforts in pregnancy (use of mosquito nets, use of repellents to prevent mosquito bites). Furthermore, assistance to pregnant women and their families is effective in ensuring that pregnant women use mosquito nets and have access to health services.

Communication in the health sector is required not only to involve all components of society in health participation but also to obtain political and policy support from stakeholders at both the local and national levels. There are three types of communication that must occur in order for the communication process to be successful: intrapersonal communication, communication within oneself, and interpersonal communication. Interpersonal communication is the most effective form of public health communication. The choice of the appropriate medium is critical in carrying out interpersonal communication so that the topics and problems presented are easily understood by the target/communicant, who is

then expected to increase their knowledge and behavior in a positive direction toward their health.

According to the findings above, health promotion via video and booklets is more effective than leaflets and presentations. This is because video media has the advantages of including all five senses in its reception, being easier to understand, more interesting, controllable, having a relatively large reach, and serving as an effective discussion tool. While booklets have advantages in that they are books that can be carried and read anywhere, they are also less expensive to produce than electronic media (visual and audiovisual). The mentoring strategy is also very appropriate in efforts to prevent malaria in pregnancy because the purpose of the assistance is to assist the initiation process of the type of health action (prevention of malaria in pregnancy) carried out by the community itself without any external intervention. Mentorship will help community groups accept and implement a health intervention introduced to them using their own resources. This activity is part of the strategy for community empowerment. (Balami et al., 2021; Escribano-Ferrer et al., 2017; Liliweri, 2009; Notoadmodjo, 2007; Supiyati; Eny Retna Ambarwati, 2012; Ulum, Mochamad Chazienul ;Anggani, 2020)

House Modification

Article no.7 states that the use of wire gauze in addition to insecticide-treated mosquito nets can be used as a supplement in preventing malaria at the household level in addition to using insecticide-treated mosquito nets because it is effective in preventing mosquitoes from entering the house. This is consistent with the recommendations on the malaria service protocol during the COVID-19 pandemic and the strategic plan for the acceleration of malaria elimination in Indonesia, which state that other innovations in malaria prevention, such as the use of wire gauze at home, are needed. (P2P, 2020; RI, 2020) Furthermore, according to research, home modification using wire netting in malaria prevention can reduce malaria transmission in people who live in the house.(Furnival-Adams et al., 2021; Odufuwa et al., 2020)

Continuity of care during Pregnancy

The midwifery care method with the continuity of care approach described in article no. 2 The method of assisting pregnant women with a continuity of care approach during the mother's pregnancy is effective in assisting pregnant women in recognizing pregnancy complications, performing early detection of malaria and other pregnancy complications, increasing pregnant women's access to health services, and assisting mothers in giving birth to healthy children. and secure. Women in the continuity of care model are cared for by the same caregiver (caseload) or a small group of midwives (team) throughout the labor and delivery process. The use of the continuity of care model has been linked to higher ANC utilization and better delivery outcomes. A model of ANC delivery known as continuity of midwife-led care has been shown to improve maternal and newborn outcomes. . In this model, the primary providers of ANC for healthy pregnant women are a known and trusted midwife or a small group of known midwives. Midwives support women during the antenatal, intrapartum, and postpartum

periods, promoting healthy pregnancy, childbirth, and parenting practices. Because this model of care necessitates a sufficient number of skilled practice midwives to ensure the sustainability and quality of ANC, policymakers must first ensure that a well-functioning midwifery program is in place before scaling it up. . (Masi, Bucagu, Lawrie, et al., 2017; Masi, Bucagu, Tunçalp, et al., 2017)

The WHO ANC guidelines recommend delegating the task of promoting maternal and newborn health-related behaviors to a broader cadre, which includes lay health workers, assistant nurses, nurses, midwives, and doctors. Birth preparation and complications readiness, use of insecticide-treated bed nets, togetherness in labor and delivery, nutritional advice, nutritional supplements, HIV testing during pregnancy, exclusive breastfeeding, postpartum care and family planning, and immunization are among the health-related behaviors covered in the recommendations. Furthermore, assistant nurses, nurses, midwives, and doctors can administer recommended nutritional supplements and intermittent treatment in pregnancy for malaria prevention. (Tunçalp et al., 2017; WHO, 2016).

Conclusion

This literature review provides information on several articles regarding strategies for preventing malaria in pregnancy during the COVID-19 pandemic in Indonesia. Several innovative malaria prevention strategies were implemented in Indonesia during the COVID-19 pandemic, including: mentoring pregnant women using a continuity of care approach; conducting health promotions using videos and booklets; providing "MISERI" packages to pregnant women; playing videos in local languages; and modifying houses to include wire gauze as an adjunct to the use of insecticide-treated mosquito nets for pregnant women. In addition to innovation, there are three articles that discuss evaluating the implementation of malaria prevention programs in pregnancy in Indonesia during the COVID-19 pandemic. Several conclusions can be drawn from the findings of this literature review, including: health promotion innovations using video media, malaria prevention information packages using booklets, and mentoring pregnant women are effective in increasing pregnant women's knowledge of malaria prevention and utilization of health services (access to health services). Meanwhile, evaluating the implementation of malaria prevention in pregnancy necessarily requires guidelines for malaria prevention in pregnancy implementation for health workers, adequate malaria in pregnancy training for health workers, and monitoring and evaluation methods for the implementation and supply of adequate malaria service logistics.

Malaria prevention and treatment are critical during pregnancy, so it is hoped that a special implementation related to malaria prevention and treatment can be actively arranged, complete with guidelines and guidelines for the implementation and evaluation of malaria prevention programs in pregnancy. Furthermore, health promotion through electronic media (video) in counseling/mass communication while paying attention to local culture is required, as is the development of media booklets containing malaria prevention in pregnancy for mothers and families as an interpersonal communication medium. It is also necessary to develop a

program to assist pregnant women and mothers in implementing the recently implemented malaria prevention program.

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