Risk Factors of Malaria Events among Pregnant Women in East Sumba Regency, Indonesia

Uly Agustine

Health Polytechnics Kupang

Maria Endang

Health Polytechnics Kupang

Era Kale (✉ eradorihikale@gmail.com)

Health Polytechnics Kupang

Emilia Akoit

Health Polytechnics Kupang

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Abstract

East Nusa Tenggara (NTT) province is a malaria endemic area in Indonesia, according to API data (Annual Paracite Incidence) 2017; NTT province had highest cases of malaria at 5.76% per 1,000 populations. These morbidity rates include pregnant women. Data from the Health Service Office of East Nusa Tenggara Province (NTT) in 2014, malaria reported cases were 13.69% per 1,000 population, in 2015, it decreased to 7.06% per 1,000 population, in 2016, it decreased to 5.78‰ per 1,000 population and in 2017, it decreased to 3.77‰ per 1,000 population. Malaria cases in East Sumba Regency in 2016 were 3964 cases, in 2017, there were 7621 cases and in 2018, there were 1649 cases and 23 cases of malaria in pregnant women. East Sumba has 22 districts, 11 of which had cases of pregnant women with 1.40% positive malaria. The overall objective was to explore possibilities of preventing malaria among pregnant women by testing the correlation among eight variables that are relevant among pregnant women. Analytical research with case control design approach has been used in this study which is an analytical study concerning how risk factors are studied using a retrospective approach. It can be concluded that from 12 variables factors, there are five variables that have a correlation with the incidence of malaria in pregnant women, namely malaria medicine, insecticide-treated mosquito nets, health workers, family support and infrastructure. Between these five factors, the health worker factor is the one that simultaneously influences the incidence of malaria in pregnant women.

Introduction

Malaria is an infectious disease caused by the Plasmodium parasite that lives and multiplies in human blood cells, transmitted by female malaria mosquitoes (Anopheles), can attack all people, both men and women at all age groups from infants, children and adults (Risksdas, 2018). Malaria is still endemic in most parts of Indonesia, nearly 90% of villages in NTT Province are malaria endemic. In the context of controlling malaria, many things have been or are being done both on a global and national scale. This disease is also a public health problem that can cause death, especially in high-risk groups, namely infants, toddlers, and pregnant women (Achmadi, 2005). World Malaria Report, 2015 states that malaria has affected 106 countries in the world. The global commitment to the Millennium Development Goals (MDGs) places the effort to eradicate malaria into one of the common goals that must be achieved by 2015 through the seventh goal of eradicating HIV, AIDS, malaria and tuberculosis. With the end of the MDGs in 2015, this global commitment was made through Sustainable Development Goals (SDGs). In the SDGs, the efforts to eradicate malaria are contained in the third goal, namely ensuring a healthy life and striving for the welfare of all people, with the specific goal of ending the epidemics of AIDS, Tuberculosis, Malaria, Neglected-tropical disease until 2030 (Health Ministry of Indonesia, 2016).

The Minister of Health of the Republic of Indonesia and The Circular of the Minister of Home Affairs concerning the elimination of malaria in Indonesia. to all Governors and Regents/Mayors No. 443.41/465/SJ dated 8 February 2010 concerning Guidelines for the Implementation of the Malaria Elimination Program in Indonesia in stages starting from 2010 until all regions in Indonesia with the aim to free of malaria by 2030. The presentation of Elimination achievements varies widely among provinces

in Indonesia. Provinces whose regencies or cities have not yet achieved elimination are in the eastern part of Indonesia, namely Papua, West Papua, NTT, Maluku and North Maluku. Provinces with regencies and municipalities that achieved elimination above 80% were DKI Jakarta, Bali, East Java, West Java, West Sumatra, Central Java and DI Yogyakarta. Meanwhile, Tiaga provinces with 100% of their districts and cities have achieved malaria transmission free, namely DKI Jakarta, Bali and East Java (Risksdas, 2018).

Pregnant women who are in malaria endemic areas have a high risk, the impact will be anemia, malaria treatment will cause the growth, and development of the fetus they contain is not good, even the worst things can cause pain and death for both mother and fetus (Achmadi, 2005). WHO estimates that 10,000 maternal deaths each year are associated with malaria infection during pregnancy. Malaria is a major cause of maternal mortality in endemic areas. More than a third of malaria-related maternal deaths occur in primigravida adolescents, mainly associated with severe anemia. A study conducted at the hospital. The main referral in Gambia found that the incidence of maternal mortality increased by 168% at the time of the malaria outbreak and the proportion of deaths due to severe anemia had increased 3 times. It is estimated that malaria contributes to 93 maternal deaths per 100,000 live births.

The government's effort to accelerate the elimination of malaria is the provision of mosquito nets, especially for high endemic areas with a minimum target of 80% of the population in these areas. Meanwhile, in endemic areas, the mosquito net is distributed only to high-risk groups, namely pregnant women and babies (Heath Ministry of Indonesia, 2016). Data on malaria cases in East Sumba Regency in 2016 were 3964 cases, in 2017 there were 7621 cases and in 2018 there were 1649 cases and 23 malaria cases in pregnant women. East Sumba has 22 sub-districts, 11 of which there are cases of pregnant women with positive malaria 1.40%. In fact, a case of malaria in pregnant women should not occur, given the very dangerous effects for both the mother and the baby she is carrying.

The people of East Nusa Tenggara, especially East Sumba, think that malaria is common in their area. One of the prevention programs implemented is the distribution of insecticide-treated bed nets. Pregnant women and children are the main targets, but pregnant women do not like to use the mosquito nets that have been distributed because they do not know the benefits of insecticide-treated bed nets. Supported again by poor healthy living habits such as not cleaning the surrounding environment, where mosquitoes live. Several previous studies have shown that families who do not use bed nets are a risk factor for malaria. According to Retdianto's (2014) research, there are still many respondents who have less knowledge of being able to influence the behavior of using insecticide-treated bed nets. The overall objective was to explore possibilities of preventing malaria among pregnant women by testing the correlation among eight variables. Therefore, it is important to prevent malaria, especially among pregnant women, so that the morbidity and even mortality of pregnant women caused by malaria can be overcome as early as possible.

Methodology

This research is an analytical research with a case control research design, which is an analytical study concerning how risk factors are studied using a retrospective approach. The sample in this study referred to as informants were pregnant women who had suffered from malaria during pregnancy and pregnant women as controls who lived around women who had suffered from malaria during pregnancy. The sampling technique used was Simple Random Sampling. The number of informants selected were 23 pregnant women who had suffered from malaria during pregnancy and 23 pregnant women as controls who lived around women who had suffered from malaria while pregnant. The inclusion criteria are a) All pregnant women in the selected Puskesmas work area, b) Pregnant women can read and write c) Pregnant women willing to be interviewed. Finally, the data collected from the interviews was coded, filtered and used for logistic regression analysis in order to determine correlation among each variable tested.

Results

From the Table 1, it can be noticed that pregnant women at a risky age were 13% and based on the number of pregnancies were 65.2%. Most of the respondents had high school education and below, and majority of the mothers were working.

Table 1
General Characteristics of Respondents in the Study in Sumba Regency in 2019

Respondent characteristics	Total (n = 46)	Percentage (%)
Age		
< 20 ≥ 35 years	6	13.0
20–35 years	40	87.0
Parity		
Primi/grande multiparous	30	65.2
Parity between 1–4	16	34.8
Pendidikan:		
Primary (Elementary-Yunior high school)	20	43.47
Moderate (Senior high school)	18	39.13
Higher (S1, S2 dan S3)	8	17.39
Occupation		
Unemployment	6	13.0
Employee	40	87.0

Source: Data Primer, 2019

The Table 2, provide the results of the analysis of the relationship between age and the incidence of malaria in pregnant women obtained a p value of 0.381 ($p > 0.05$). This means that there is no significant relationship between age and the incidence of malaria in pregnant women.

Table 2
Relationship between Age and Incidence of Malaria among Pregnant Women in East Sumba Regency in 2019

No	Age	Case		Control		Total		(p Value)
		n	%	n	%	n	%	
1	< 20 years and > 35 years	2	4,35	4	8,70	6	13,05	0,381
2	Between 20–35 years	21	45,65	19	41,30	40	86,95	
Total		23	50	23	50	46	100	

Table 3 provide results of the analysis of the relationship between parity and the implementation of Antenatal Care (ANC) obtained a p value of 0.063 ($p > 0.05$). This means that there is no significant relationship between parity and the incidence of malaria in pregnant women.

Table 3
The Relationship between Parity and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Parity	Case		Control		Total		(p Value)
		n	%	n	%	n	%	
1	Primi & Grande multiparous	12	26,09	18	39,13	30	65,22	0,063
2	Multiparous	11	23,91	5	10,87	16	34,78	
Total		23	50	23	50	46	100	

Tabel 4 shows the results of the analysis of the relationship between education and the incidence of malaria in pregnant women obtained a p value of 0.710 ($p > 0.05$). This means that there is no significant relationship between education and the incidence of malaria in pregnant women.

Table 4
Relationship between Education and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Education	Kasus		Kontrol		Jumlah		(p Value)
		n	%	n	%	n	%	
1	Primary-secondary school	12	26,09	8	17,39	20	43,48	0,710
2	High school	10	21,74	8	17,39	18	39,13	
3	University	1	2,17	7	15,22	8	17,39	
Total		23	50	23	50	46	100	

Table 5 provide the results of the analysis of the relationship between work and the incidence of malaria in pregnant women obtained a p value of 0.381 ($p > 0.05$). This means that there is no significant relationship between work and the incidence of malaria in pregnant women.

Table 5
The Relationship between Occupation and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Occupational Status	Kasus		Kontrol		Jumlah		(p Value)
		n	%	n	%	n	%	
1	Employee	2	4,35	4	8,70	6	13,04	0,381
2	Unemployment	21	45,65	19	41,30	40	86,96	
Total		23	50	23	50	46	100	

Table 6 highlights the results of the analysis of the relationship between level of knowledge and the incidence of malaria in pregnant women obtained a p value of 0.710 ($p > 0.05$). This means that there is no significant relationship between knowledge and the implementation of Antenatal Care (ANC).

Table 6
The Relationship between Knowledge and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Level of Knowledge	Case		Control		Total		(p Value)
		n	%	N	%	n	%	
1	Low	3	6,52	2	4,35	5	3	0,710
2	Modearte	1	2,17	8	17,39	9	1	
3	Good	19	41,31	13	28,26	32	19	
Total		23	50	23	50	46	100	

The Table 7 shows the results of the analysis of the relationship between drugs and the incidence of malaria in pregnant women obtained a p value of 0.022 ($p < 0.05$). This means that there is a significant relationship between attitudes and the incidence of malaria in pregnant women.

Table 7
Relationship between malaria medicine and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Malaria Medicine	Case		Control		Total		(p Value)
		n	%	n	%	n	%	
1	Not Available	13	28,26	20	43,48	33	71,74	0,022
2	Available	10	21,74	3	6,52	13	28,26	
Total		23	50	23	50	46	100	

Table 8 show the results of the analysis of the relationship between insecticide-treated bed nets and the incidence of malaria in pregnant women obtained a p value of 0.044 ($p < 0.05$). This means that there is a significant relationship between insecticide-treated bed nets and the incidence of malaria in pregnant women.

Table 8

The relationship between insecticide-treated mosquito nets and the incidence of malaria in pregnant women in East Sumba district in 2019

No.	insecticide-treated mosquito nets	Kasus		Kontrol		Jumlah		(p Value)
		n	%	N	%	n	%	
1	Not receive	14	30,43	20	43,48	34	73,91	0,044
2	Receive	9	19,57	3	6,52	12	26,09	
Total		23	50	23	50	46	100	

Table 9 indicates the results of the analysis of the relationship between income and the incidence of malaria in pregnant women obtained p value 0.102 ($p > 0.05$). This means that there is no significant relationship between income and the incidence of malaria in pregnant women.

Table 9

The Relationship between Income and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Income	Case		Control		Total		(p Value)
		n	%	n	%	n	%	
1	< Rp. 905.000	14	30,43	19	41,30	33	71,74	0,102
2	> Rp. 905.000	9	19,57	4	8,70	13	28,26	
Total		23	50	23	50	46	100	

Table 10 presents the results of the analysis of the relationship between health workers and the incidence of malaria in pregnant women obtained p value 0.010 ($p < 0.05$). This means that there is a significant relationship between income and the incidence of malaria in pregnant women

Table 10

Relationship between Health Workers and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Petugas Kesehatan	Kasus		Kontrol		Jumlah		(p Value)
		n	%	N	%	n	%	
1	Tidak Memberi Informasi	12	26,09	20	43,48	32	69,57	0,010
2	Memberi Informasi	11	23,91	3	6,52	14	30,43	
Total		23	50	23	50	46	100	

Table 11 provide the results of the analysis of the relationship between family support and the incidence of malaria in pregnant women obtained p value 0.020 ($p < 0.05$). This means that there is a significant relationship between family support and the incidence of malaria in pregnant women.

Table 11
Relationship between Family Support and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Dukungan Keluarga	Case		Control		Total		(p Value)
		n	%	n	%	N	%	
1	Less Family Support	12	26,09	19	41,30	31	67,39	0,028
2	Good family support	11	23,91	4	8,70	15	32,61	
Total		23	50	23	50	46	100	

Table 12 present the results of the analysis of the relationship between family support and the incidence of malaria in pregnant women obtained a p value of 0.227 ($p > 0.05$). This means that there is no significant relationship between community support and the incidence of malaria in pregnant women.

Table 12
Relationship between Community Support and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Community Support	Case		Control		Total		(p Value)
		n	%	n	%	n	%	
1	Less community support	12	26,09	16	34,78	28	60,87	0,227
2	Good Community Support	11	23,91	7	15,22	18	39,13	
Total		23	50	23	50	46	100	

Table 13 show the results of the analysis of the relationship between infrastructure and the incidence of malaria in pregnant women obtained p value 0.016 ($p < 0.05$). This means that there is a significant relationship between community support and the incidence of malaria in pregnant women.

Table 13
Relationship between Infrastructure and the Incidence of Malaria in Pregnant Women in East Sumba Regency in 2019

No.	Infrastructure	Case		Control		Total		(p Value)
		n	%	n	%	n	%	
1	Not complete	10	21,74	18	39,13	28	60,87	0,016
2	Complete	13	28,26	5	10,87	18	39,13	
Total		23	50	23	50	46	100	

Discussion

1. Age

The results of this study indicate that there is no significant relationship between age and the incidence of malaria in pregnant women. The results are in line with the opinion of Rehana and Mutiara (2017) states that malaria incidences can take place irrespective of age.

2. Parity

The results of this study indicate that there is no significant relationship between parity and the incidence of malaria in pregnant women. The results are in line with the opinions expressed in the literature that parity is a childbirth experience and experienced during life, the difference in parity is very different from one person to another, and mothers have their respective experiences in giving birth, both natural processes and difficult or risky processes. This situation affects the mother's attitude in facing subsequent parity.

3. Education

The results of this study indicate that there is no significant relationship between education and the incidence of malaria in pregnant women. The results of this study are in line with the opinion that education has no effect on the incidence of malaria in pregnant women, a source of information and counseling that is very influential on one's actions to prevent malaria. Pregnant women with high or basic education, even those who are illiterate, have received information about the prevention of malaria from health personnel both at the health center and in the community.

4. Work

The results of this study shown that there is no significant relationship between work and the incidence of malaria in pregnant women. The results are in line with the opinion of Bangsu et al (1995) and Sumiati et al (2012) that working mothers will have a lot of activity with their daily routine while the time to check their health is quite limited.

5. Knowledge

The results of this study indicate that there is no significant relationship between knowledge and the incidence of malaria in pregnant women. The results are in line with the opinion of Notoatmodjo (2003) that various things including education, experience, information, age, occupation, interests and local culture influence a person's knowledge. These factors influence each other.

6. Malaria medicines

The results of this study indicate that there is a significant relationship between availability of malaria medicine and the incidence of malaria in pregnant women. The results are in line with the opinion of Rehana and Mutiara (2017) that prophylactic treatment in malaria endemic areas is a prevention that can reduce the incidence of malaria in pregnant women. According to researchers, drugs are very influential on the incidence of malaria in pregnant women, seen from a person's geography and environment.

7. Insecticide-treated mosquito nets

The results of this study indicate that there is a significant relationship between insecticide-treated bed nets and the incidence of malaria in pregnant women. The results are in line with the opinion of previous studies that prevention of vector and mosquito bites. Simple prevention and can be done by most people, among others: a) Avoiding or reducing malaria mosquito bites, by sleeping with a mosquito net, at night not. Being outside the house, smearing the body with anti-mosquito bites, using mosquito coils, putting gauze on the windows and keeping the cattle pens away from the house (Depkes RI, 2003).

8. Income

The results of this study indicate that there is no significant relationship between income and the incidence of malaria in pregnant women. This is because the government has prepared funds for the community with the Indonesian Health Card so that people can enjoy basic health insurance. In addition, to be healthy does not have to be with money but understanding and healthy behavior of each individual.

9. Health Officer

The results of this study indicate that there is a significant relationship between income and the incidence of malaria in pregnant women. The results are in line with the opinion of Rehana and Mutiara (2017) that information about health is important to be conveyed by health workers. An especially important role for health workers to educate about health in this particular case concerning the incidence of malaria in pregnant women.

10. Family Support

The results of this study indicate that there is a significant relationship between family support and the incidence of malaria in pregnant women. The results are in line with the opinion of Musbikin (2008) that husband's support in pregnancy is quite a difficult period for a mother, therefore pregnant women need support from various parties, especially husbands, so that they can go through the process of pregnancy to giving birth safely and comfortably. One of the supports that can be given to pregnant women is social

support; this can be manifested in the form of materials such as financial readiness, information support by finding information about pregnancy, as well as psychological support such as accompanying them when they go to check their pregnancies, and reminding their wives to do pregnancy checks.

11. Community Support

The results of this study indicate that there is no significant relationship between community support and the incidence of malaria in pregnant women. The results showed that community support was statistically not related to the incidence of malaria in pregnant women, but the results of interviews with respondents were very clear about the active role of cadres in providing health education related to pregnant women with malaria.

12. Infrastructure

The results of this study indicate that there is a significant relationship between community support and the incidence of malaria in pregnant women. In the world of health, infrastructure is very much needed because without the existing infrastructure, health workers cannot work. Infrastructure is also a place or means for the community to come and use, so that the public health service needs can be met. The results of the study statistically stated that there was no relationship between health infrastructure and the incidence of malaria in pregnant women. However, in the field this is very necessary because both the community receiving health services and health workers as health services cannot do anything about it.

Conclusion

Malaria is still endemic in most parts of Indonesia, nearly 90% of villages in NTT Province are malaria endemic. In the context of controlling malaria, many things have been done both on a global and national scale. Based on the recent cases reported there is a decline trend but also need to advance interventions to prevent it. The overall objective of this study was to explore possibilities of preventing malaria among pregnant women by testing the correlation among twelve variables that are relevant among pregnant women. Among studied 12 variables, only five independent variables that influence the incidence of malaria in pregnant women, namely availability of medicines, insecticide-treated bed nets, health workers, family support and infrastructure. Between these five variables, the health worker factor is the one that simultaneously influences the incidence of malaria in pregnant women.

Recommendations

- Efforts need to increase outreach or information through various media either directly: (counseling either individually or in groups or at meetings both formal and non-formal). Indirectly: providing information through mass and electronic media, putting up posters in public places, distributing leaflets, broadcasting on radio, showing films related to the incidence of malaria in pregnant women.

- Efforts required to increase knowledge and motivate health workers by providing community-based training so that community services are prioritized so that they can provide information, share experiences, simulations about malaria in pregnant women.
- Increase efforts to approach and collaborate well with community leaders or traditional leaders by forming groups of traditional leaders or community leaders to care for the health of pregnant women suffering from malaria.

Declarations

Ethics approval and consent to participate

For this research, the ethical approval and participants' consents have been collected and it was approved by the ethical and participants.

Consent for publication

We have received consent from the ethical committee and the participants for the publication of this research. There are no objections to the publication.

Availability of data and material

We have documented the participant's data and preserved the questionnaires and other details. If there is a need, we can provide details and the questionnaires for reference.

Competing interests

We declare that there are no conflicting interests in the publication of this research among authors or anyone involved in the research including the institution,

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Authors' contributions

All authors listed in this manuscript have equally contributed to the research, data analysis, and interpretations.

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Authors Information

All authors listed in this manuscript are presently working at the Polytechnics of Health, Kupang, Indonesia.

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