Analysis of Factors Influencing the Incidence of Malaria in the Work Area of Public Health Centers

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Abstract

The purpose of this research is to determine what aspects of the Sidodadi Public Health Center's surrounding environment in Asahan District contribute to the high prevalence of malaria there. The survey, conducted in August and September 2022 at the Sidodadi Health Center in the Asahan Province, was quantitative in nature, taking the form of a cross-sectional study. Purposive selection was used to select a total of 88 participants for the study. Chi-square and logistic regression tests were used to evaluate the data. The bulk of the 88 respondents (35 or 39.7%) were business owners (48 or 54.5%), high school graduates (54.5%), and aged 36–45 (39.4%). The bivariate analysis revealed a significant relationship between community awareness and malaria prevalence (p=0.000). The multivariate analysis revealed that in the service region of the Sidodadi Public Health Center in the Asahan District, education was the most important factor in reducing the prevalence of malaria (p=0.000, OR=8.480). This study found that the knowledge variable was the most influential out of the six examined, which included attitudes, economic capacity, information media, living environment, and support from health workers in the catchment area of the Sidodadi Health Center in the Asahan Regency, where malaria cases were studied.

Introduction

Both chronic and pandemic forms of malaria pose a threat to public health in nearly every region of the globe, but are particularly widespread in countries with warm and sub-tropical temperatures (Solikah eta l., 2021). According to WHO projections for 2022, there will be an expected 241 million instances of malaria in the globe in 2020. In 2020, 627,000 people will lose their lives to this disease. Africa takes on a disproportionate share of the world's malaria cases. In 2020, Africa will account for 95% of all instances of malaria and 96% of all fatalities caused by the disease. The majority of fatalities from malaria in the District occur in children under the age of five. In 2020, it is predicted that 627 thousand people will lose their lives to malaria, which is a rise of 69 thousand fatalities from the previous year. For the 32 nations in sub-Saharan Africa that are responsible for roughly 93% of all malaria fatalities worldwide, the new reasons of death were implemented. More than half of the world's malaria fatalities occur in just four African countries: Nigeria (31.9%), the Democratic Republic of the Congo (13.2%), the Republic of Tanzania (4.1%), and Mozambique (3.8%) (World Health Organization, 2022).

Malaria is still an issue in several parts of Indonesia, particularly in eastern Indonesia, according to statistics from the Ministry of Health of the Republic of Indonesia for 2022. The Ministry of Health has set a goal of eliminating malaria in Indonesia by the year 2030. Malaria-

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free status has been targeted for five different areas. There will be fewer instances of malaria in Indonesia in 2021 than there were in 2009, when there were 418,439. The Yearly Paracite Incidence (API) measure of 1 case per 1000 people thus provides an estimate of the prevalence of malaria illness. This regionalization of the eradication objective is what will make it possible to realize the goal of a Malaria-Free Indonesia by 2030. Eliminating malaria is a campaign to end the spread of the disease in a specific region (Roosihermiatie & Rukmini, 2013).

Among the 12 endemic areas in North Sumatra Province, Asahan District, and more specifically Sidodadi District, is one of the worst for malaria transmission. The organism Plasmodium causes malaria in humans by thriving in our red blood cells and spreading the illness. Malaria is spread when an infected female Anopheles insect bites a healthy human, releasing the malaria pathogen into the bloodstream. The weakness and fatigue brought on by malaria's blood-stealing effects is extremely perilous (Geissler et al., 2008). Phillips & Pasvol, 1992) Plasmodium is responsible for the mortality of expectant women because it damages and destroys many red blood cells. Severe malaria from this illness can induce paralysis, multi-organ failure, and mortality (Elphinstone et al., 2015). Although health professionals at the Sidodadi Health Center in Asahan Regency have implemented a malaria control program, they have not been able to achieve their full potential because they have not engaged in extensive health promotion aimed at raising public awareness and knowledge about the disease. Asahan Regency's Sidodadi Health Center is also engaged in malaria control efforts at present, but this has not led to a decline in malaria prevalence as of yet. It is believed that the low budget allocation for malaria elimination, the lack of cross-sectoral coordination in controlling malaria cases, and the lack of capacity of medical staff due to frequent officer turnover all contribute to the large number of areas in North Sumatra province that have not yet eliminated malaria. The poor degree of general knowledge in each district's fight against malaria is directly related to this problem.

Methods

A quantitative approach model was used to analyze the factors that influence the incidence of malaria, and the research design that was used in this study was an analytic survey with a cross-sectional study design. The aim of this study was to determine the factors that influence the incidence of malaria. In this study, the population consisted of all of the heads of families that resided in malaria endemic areas in the working area of the Sidodadi Public Health Center, which is located in the Asahan Regency. More specifically, these families were from the following sub-districts: Tegal Sari Sub-District, Tebing Kisaran, Kisaran Kota, Kisaran Baru, and Kisaran Barat, and a total of 7. The method of selecting consisted of taking a proportionate random sample from 88 leaders of household.

Result and Discussion

Univariate Data Analysis

Univariate data analysis in this study was conducted to determine the distribution of factors that influence the incidence of Malaria in the Work Area of the Sidodadi Health Center, Asahan District. Frequency distribution in this study includes: age, education, occupation, knowledge, attitude, economic capacity, information media, living environment, support from health workers, and incidence of malaria.

Distribution of Age, Education, and Occupation in the Work Area of the Sidodadi Health Center, Asahan District

The frequency distribution of age, education, and employment in the working area of the Sidodadi Public Health Center, Asahan Regency can be seen in the table below:

Table 1. Distribution of Age, Education, and Employment in the Working Area of the Sidodadi Health Center, Asahan Regency

Age	N	%
17-25 Years	2	2,3
26-35 Years	21	23,9
36-45 Years	35	39,7
> 45 Years	30	34,1
Education	**N**	**%**
Junior School	24	27,3
High School	48	54,5
Higher Education	16	18,2
Work	**N**	**%**
Not Working	37	42,0
Self employed	39	44,3
Civil servants	12	13,7
Total	**88**	**100**

With reference to the data in chart 1. From what has been stated above, we can infer that 35 (39.7%) of the 88 individuals examined fell into the age range of 36-45 years, that 2 (2.3%) fell into the age range of 17-25 years, that 21 (23%) fell into the age range of 26-35 years, and that 30 (34%) fell into the age range of 45 and up. It was found that 48 (54.5%) of the 88 interviewees with documented educational backgrounds had completed high school, 24 (27.3%) had completed junior high school, and 16 (18.2%) had completed some form of PT. Most (39 of 88) of the respondents who were working were those who were self-employed; the remaining respondents (37 of 88) were either unemployed or had employment in the public sector; and 12 of the respondents (13%) were members of the military.

Distribution of Knowledge in the Working Area of the Sidodadi Health Center, Asahan Regency

The distribution of knowledge in the Working Area of the Sidodadi Health Center, Asahan Regency, can be seen in the table below:

Table 2. Distribution of Knowledge in the Working Area of the Sidodadi Health Center, Asahan Regency

Knowledge	n	%
Less	50	56,8
Good	38	43,2
Total	**88**	**100**

Based on table 2.   Above, it is known that out of 88 respondents, most of the respondents have less knowledge, namely 50 (56.8%) respondents, while other respondents have good knowledge, namely 38 (43.2%).

Distribution of Attitudes in the Working Area of the Sidodadi Health Center, Asahan Regency

The distribution of attitudes in the Sidodadi Puskesmas Working Area, Asahan Regency, can be seen in the table below:

Table 3. Distribution of Attitudes in the Working Area of the Sidodadi Health Center, Asahan Regency

Attitude	n	%
Negative	46	52,3
Positive	42	47,7
Total	**88**	**100**

Based on table 3. Above, it is known that of the 88 respondents, most of the respondents had a negative attitude, namely 46 (52.3%) respondents, while the other respondents had a positive attitude, namely 42 (47.7%) respondents.

Distribution of Economic Capabilities in the Working Area of the Sidodadi Health Center, Asahan Regency

The distribution of economic capabilities in the Sidodadi Puskesmas Working Area, Asahan Regency, can be seen in the table below:

Table 4. Distribution of Economic Capabilities in the Working Area of the Sidodadi Health Center, Asahan Regency

Economic Capability	n	%
Low	49	55,7
Tall	39	44,3
Total	**88**	**100**

Based on table 4. Above, it is known that out of 88 respondents, most respondents have low economic capabilities, namely 49 (55.7%) respondents, while other respondents have high economic capabilities, namely 39 (44.3%) respondents.

Distribution of Information Media in the Working Area of the Sidodadi Health Center, Asahan Regency

The distribution of information media in the Sidodadi Puskesmas Working Area, Asahan Regency, can be seen in the table below:

Table 5. Distribution Media Information di Wilayah Kerja Puskesmas Sidodadi, Asahan Regency

Information Media	N	%
Not available	47	53,4
Available	41	46,6
Total	**88**	**100**

Based on table 5 above, it is known that out of 88 respondents, most respondents stated that information media was not available, namely 47 (53.4%) respondents, while other respondents

stated that information media was available as many as 41 (46.6%) respondents.

Distribution of Living Environment in the Working Area of Sidodadi Health Center, Asahan Regency

The distribution of the influence of the residential environment in the Sidodadi Puskesmas Working Area of Asahan Regency can be seen in the table below:

Table 6. Distribution of Living Environment in the Working Area of Sidodadi Health Center, Asahan Regency

Neighborhood	n	%
Don't care	48	54,5
Care	40	45,5
Total	**88**	**100**

Based on table 6. Above, it is known that of the 88 respondents, most respondents do not care about the living environment, namely 48 (54.5%) respondents, while other respondents care about the living environment, namely 40 (45.5%) respondents.

Distribution of Health Officer Support in the Sidodadi Puskesmas Working Area, Asahan Regency

The distribution of health worker support in the Sidodadi Puskesmas Working Area, Asahan Regency, can be seen in the table below:

Table 7. Distribution of Health Officer Support in the Sidodadi Puskesmas Working Area, Asahan Regency

Healthcare Officer Support	n	%
Less	48	54,5
Good	40	45,5
Total	**88**	**100**

Based on table 7 above, it is known that out of 88 respondents, most respondents stated that the support of health workers was lacking, namely 48 (54.5%) respondents, while other respondents stated that the support of health workers was good, namely 40 (45.5%) respondents.

Distribution of Malaria Incidence in the Working Area of PuskesmasSidodadi, Asahan Regency

The distribution of malaria incidence in the Sidodadi Health Center Working Area, Asahan Regency, can be seen in the table below:

Table 8. Distribution of Malaria Incidence in the Working Area of the Sidodadi Health Center, Asahan Regency

Incidence of Malaria	n	%
Yes	43	48,9
Not	45	51,1

Total	88	100

Based on table 8. Above, it is known that out of 88 respondents, respondents who experienced malaria events were 43 (48.9%) respondents and respondents who did not experience malaria events, namely 45 (51.1%) respondents.

Bivariate Data Analysis

Relationship of Public Knowledge with Malaria Incidence in the Working Area of the Sidodadi Health Center, Asahan Regency

For the relationship between public knowledge and malaria incidence in the Sidodadi Health Center Working Area, Asahan Regency, it can be seen in the table below:

Table 9. Relationship of Public Knowledge with Malaria Incidence in the Working Area of the Sidodadi Health Center, Asahan Regency

Incidence of Malaria							
Knowledge	**Yes**		**Not**		**Total**		
	n	**%**	**n**	**%**	**n**	**%**	**p** *value*
Less	36	40,9	14	15,9	50	56,8	
Good	7	8,0	31	35,2	38	43,2	0,000
Total	**43**	**48,9**	**45**	**51,1**	**88**	**100**	

Based on the results of the calculations above, it is known that the results of statistical tests obtained p *significancy* values of 0.000 < 0.05. So, it can be concluded that there is a relationship between public knowledge and the incidence of malaria in the Sidodadi Health Center Working Area, Asahan Regency.

The Relationship between Community Attitudes and the Incidence of Malaria in the Sidodadi Health Center Working Area, Asahan Regency

For the relationship between community attitudes and the incidence of malaria in the Sidodadi Puskesmas Working Area, Asahan Regency, it can be seen in the table below:

Table 10. The Relationship between Community Attitudes and the Incidence of Malaria in the Sidodadi Health Center Working Area, Asahan Regency

Incidence of Malaria							
Attitude	**Yes**		**Not**		**Total**		
	n	**%**	**n**	**%**	**n**	**%**	**p** *value*
Negative	33	37,5	13	14,8	46	52,3	
Positive	10	11,4	32	36,3	42	47,7	0,000
Total	**43**	**48,9**	**45**	**51,1**	**88**	**100**	

Based on the results of the calculations above, it is known that the results of statistical tests obtained p *significancy* values of 0.000 < 0.05. So, it can be concluded that there is a relationship between community attitudes and the incidence of malaria in the Sidodadi Health Center Working Area, Asahan Regency.

Relationship of Community Economic Capability with Malaria Incidence in the Sidodadi Health Center Working Area, Asahan Regency

For the relationship between the economic ability of the community and the incidence of

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malaria in the Sidodadi Health Center Working Area, Asahan Regency, it can be seen in the table below:

Table 11. Relationship of Community Economic Capability with Malaria Incidence in the Sidodadi Health Center Working Area, Asahan Regency

Incidence of Malaria							
Economic Capability	Yes		Not		Total		p *value*
	n	%	n	%	n	%	
Low	33	37,5	16	18,2	49	55,7	
Tall	10	11,4	29	32,9	39	44,3	0,000
Total	43	48,9	45	51,1	88	100	

Based on the results of the calculations above, it is known that the results of statistical tests obtained p *significancy* values of $0.000 < 0.05$. So, it can be concluded that there is a relationship between the economic ability of the community and the incidence of malaria in the Sidodadi Health Center Working Area, Asahan Regency.

Public Information Media Relations with the Incidence of Malaria in the Sidodadi Health Center Working Area, Asahan Regency

For the relationship of public information media to the incidence of malaria in the Sidodadi Puskesmas Working Area, Asahan Regency, can be seen in the table below:

Table 12. Public Information Media Relations with the Incidence of Malaria in the Sidodadi Health Center Working Area, Asahan Regency

Incidence of Malaria							
Information Media	Yes		Not		Total		p *value*
	n	%	n	%	n	%	
Not Available	28	31,8	19	21,6	47	53,4	
Available	15	17,0	26	29,6	41	46,6	0,035
Total	43	48,8	45	51,2	88	100	

Based on the results of the calculations above, it is known that the results of statistical tests obtained p *significancy* values of $0.035 < 0.05$. So, it can be concluded that there is a relationship between the public information media and the incidence of malaria in the Sidodadi Health Center Working Area, Asahan Regency.

The Relationship between the Community Living Environment and the Incidence of Malaria in the Working Area of the Sidodadi Health Center, Asahan Regency

For the relationship of the community's residential environment to the incidence of malaria in the Sidodadi Puskesmas Working Area, Asahan Regency, it can be seen in the table below:

Table 13. The Relationship between the Community Living Environment and the Incidence of Malaria in the Working Area of the Sidodadi Health Center, Asahan Regency

Incidence of Malaria							
Neighborhood	Yes		Not		Total		p *value*
	n	%	n	%	n	%	
Don't Care	29	32,9	19	21,6	48	54,5	
Care	14	16,0	26	29,5	40	45,5	0,020
Total	43	48,9	45	51,1	88	100	

Based on the calculation results above, it is known that the results of statistical tests obtained p *significancy* values of 0.020 < 0.05. So it can be concluded that there is a relationship between the community's living environment and the incidence of malaria in the Sidodadi Health Center Working Area, Asahan Regency.

The Relationship between Health Worker Support and Malaria Incidence in the Sidodadi Health Center Working Area, Asahan Regency

For the relationship between health worker support and malaria incidence in the Sidodadi Puskesmas Working Area, Asahan Regency, can be seen in the table below:

Table 14. The Relationship between Health Worker Support and Malaria Incidence in the Sidodadi Health Center Working Area, Asahan Regency

Healthcare Officer Support	Incidence of Malaria						p value
	Yes		Not		Total		
	n	%	n	%	n	%	
Less	34	38,6	14	15,9	48	54,5	
Good	9	10,3	31	35,2	40	45,5	0,000
Total	**43**	**48,9**	**45**	**51,1**	**88**	**100**	

Based on the results of the calculations above, it is known that the results of statistical tests obtained p *significancy* values of 0.000 < 0.05. So it can be concluded that there is a relationship between the support of health workers and the incidence of malaria in the Sidodadi Health Center Working Area, Asahan Regency.

Multivariate Analysis

To see the most influential factors with the incidence of malaria in the working area of the Sidodadi health center in Asahan Regency are as follows:

Table 15. Selection of Variables that Become Model Candidates in Multiple Logistic Regression Tests based on Bivariate Analysis

Variable	p value	Information
Knowledge	0,000	Candidate
Attitude	0,000	Candidate
Economic Capability	0,000	Candidate
Information media	0,035	Candidate
Neighborhood	0,020	Candidate
Healthcare worker support	0,000	Candidate

Based on the table above, it can be seen that all variables, namely, are candidates for models in logistic regression tests where the p *value* < 0.25. The results of the logistic regression analysis can be seen in the following table:

Table 16. Results of the First Stage of Logistic Regression Analysis

Variable	B	p value	Exp(B) OR	95% CI For Exp (B)
Knowledge	2,443	0,001	11,512	2,779-47,692
Attitude	1,463	0,054	4,319	0,974-19,151
Economy-enabled capabilities	1,935	0,004	6,927	1,834-26,157
Information media	0,102	0,877	1,107	0,304-4,032

| Neighborhood | 1,372 | 0,041 | 3,945 | 1,061-14,669 |
| Healthcare worker support | 0,750 | 0,677 | 1,367 | 0,315-5,939 |

Table 17. Results of the Second Stage of Logistic Regression Analysis

Variable	B	p value	Exp(B) OR	95% CI For Exp (B)
Knowledge	2,459	0,001	11,691	2,848-47,994
Attitude	1,501	0,036	4,487	1,009-18,320
Economy-enabled capabilities	1,945	0,004	6,992	1,859-26,306
Neighborhood	1,373	0,041	3,946	1,058-14,718
Healthcare worker support	0,316	0,672	1,372	0,317-5,934

Table 18. Results of the Third Stage of Logistic Regression Analysis

Variable	B	p value	Exp(B) OR	95% CI For Exp (B)
Knowledge	2,547	0,000	12,765	3,277-49,722
Attitude	1,661	0,007	5,263	1,584-17,486
Economy-enabled capabilities	1,991	0,003	7,323	1,980-27,083
Neighborhood	1,430	0,030	4,178	1,148-15,198

Table 19. Results of the Fourth Stage of Logistic Regression Analysis

Variable	B	p value	Exp(B) OR	95% CI For Exp (B)
Knowledge	2,284	0,000	9,816	2,897-33,256
Attitude	1,666	0,005	5,292	1,674-16,725
Economy-enabled capabilities	1,823	0,003	6,193	1,868-20,525

Table .20. Results of the Final Stage of Logistic Regression Analysis

Variable	B	p value	Exp(B) OR	95% CI For Exp (B)
Knowledge	2,138	0,000	8,480	2,828-25,433
Economy-enabled capabilities	1,755	0,001	5,786	1,995-16,778

Based on table 4.20 above, it can be seen that the last stage of the logistic regression analysis produced a variable that affected the incidence of malaria in the Working Area of the Sidodadi Health Center, Asahan Regency, namely the knowledge variable with a p value of 0.000, OR = 8.480 (95% CI = 2.828-25.433) meaning that the respondent Those who have less knowledge have a 8,480 chance of experiencing malaria events compared to respondents who have good knowledge with a positive coefficient B of 2,138. The more respondents who have less knowledge, the more they experience malaria incidents in the Work Area of the Sidodadi Health Center, Asahan District.

Based on the research results, the average community does not know what causes the large number of mosquitoes that spread malaria, namely mosquitoes nesting in stagnant water, in tall grass, hanging clothes and untidy houses. During data collection, the researchers noticed that there were many puddles of water around the respondent's yard, even the weeds in the yard were allowed to grow lengthwise because they admitted that they did not have time to cut the

grass because they were busy taking care of their children, working and even their homes tended to be messy and they were often found. untidy house.

People do not know what causes the large number of mosquitoes that spread malaria, namely mosquitoes that nest in stagnant water, in tall grass, hanging clothes and untidy houses. Community knowledge that is not accompanied by actions to avoid contact with mosquito vectors will still be at risk of contracting malaria. Community attitudes are a part of life which is certainly difficult to leave, because this has been going on for a long time and has been passed down for generations. Such as a negative attitude in eradicating mosquitoes that trigger the incidence of malaria.

A negative attitude shows a lack of knowledge and awareness of the community regarding the prevention and control of malaria, which has a more important meaning than just the need for daily necessities. The existence of obstacles causes this attitude to not support efforts to prevent malaria incidents. Based on the researchers' assumptions, even though a family has low economic capacity, malaria prevention can still be carried out, if the community can maintain the cleanliness of their yard and home environment, and use mosquito nets that have been provided by the government.

Based on the information service sources are government agencies engaged in health services and education, which contain information about the world of health. One source of information that is inexpensive, yet reliable and always new that must be utilized can be obtained from newspapers, magazines and the internet as well as other forms of mass media (Fang, 1997). Information services can be provided directly and openly by health workers to the whole community. A variety of techniques and media that are varied and flexible can be used through classical and group formats (Dufrêne & Legendre, 1997). The format used of course depends on the type of information and the characteristics of service participants. Providing information can be done using a number of techniques including lectures followed by questions and answers, discussions, interviews, field trips with teaching aids and other tools, guidebooks, career center activities and sociodrama. In general, it is divided into four forms, namely oral, written, audio-visual and computer diskettes.

Environmental factors that have sufficient influence include the physical environment such as air temperature, humidity, rain, wind, sunlight, water currents, chemical environment, biological environment (flora and fauna) and socio-cultural environment (Upadhyay, 2020). Mosses, algae, and other plants like mangroves can all play a role in stifling mosquito populations by preventing the eggs from getting enough sunshine to develop. The mosquito population in a region will be influenced by the presence of fish that feed on mosquito eggs, such as the tinhead fish (panchaxspp), gambusia, tilapia, and others. Also, if the cows or buffaloes are kept in enclosures outside the home but not too far away, the human population will experience fewer insect attacks. Even in non-endemic regions, there is still a tiny chance of malaria infection for residents. Mobility of the people is a key consideration here.

The findings are consistent with those of Gilang's studies (2015). The study shows that the likelihood of preventing malaria is low (60.6%), if the family's breadwinner has never been subjected to the disease and works in a high-risk occupation. People in the Rajabasa Subdistrict need constant education and guidance from health officials about the biology and habits of Anopheles mosquitoes, as well as effective methods of mosquito control, malaria treatment, and malaria prevention. Findings from studies conducted in the Sidodadi Health Center's Working Area, Asahan Province, suggest that health employees play a critical role in disrupting the mosquitoes' ability to breed and spread malaria.

Conclusion

Based on the research results it is known that there is an influence of community knowledge, attitudes, economy, information media, living environment, support of health workers on the incidence of malaria, so the conclusions drawn certainly have implications in the field of education.

Suggestion

Carry out educational activities for the community on a scheduled basis from house to house. Actively carry out health promotion activities, especially those related to information about malaria and how to prevent it. As well as providing economic improvement training for families and communities.

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