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ORIGINAL RESEARCH

ENVIRONMENTAL AND BEHAVIORAL CONDITIONS THAT AFFECT MALARIA EVENTS IN PADANG CITY

Kondisi Lingkungan dan Perilaku yang Mempengaruhi Kejadian Malaria di Kota Padang

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ABSTRACT

Background: West Sumatra is a target area for malaria elimination in 2020; the Annual Parasite Incidence (API) in Padang City increased from 0.12 per 1000 inhabitants to 0.13 per 1000 inhabitants between 2015 and 2016. **Purpose:** This study aimed to analyze the effect of factors contributing to malaria events based on the environmental and behavioral conditions of people in Padang City. **Method:** This is a quantitative study using a case-control approach. The research was conducted in Padang from August 2017 until January 2018. The case-control study was conducted on a sample of 62 people, consisting of 31 cases and 31 controls. Cases were identified through random sampling and controls were selected by purposive sampling. Data collection was via observation and questionnaires and both univariate and bivariate analyses were conducted. **Results:** Descriptively, malaria patients were more likely to live in at-risk physical conditions at home (74.12%), had a history of visiting endemic areas (41.90%), did not use mosquito repellent equipment (58%), and had the habit of being outdoors at night (32.28%). Statistical tests showed the risk factors for the incidence of malaria were the physical condition of the house (OR = 3.43; 95% CI 1.20–9.20) and a history of visiting endemic areas (OR = 9; 95% CI 1.20–394). **Conclusion:** Environmental and behavioral factors affect the incidence of malaria. It is recommended that the Padang City Health Office provide counseling through health promotion officers about healthy homes and advise people not to go to endemic areas.

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ABSTRAK

Latar Belakang: *Sumatera Barat merupakan daerah sasaran eliminasi malaria pada tahun 2020, namun angka Annual Parasite Incidence (API) di Kota Padang mengalami peningkatan dari tahun 2015 sebesar 0,12 per 1000 menjadi 0,13 per 1000 penduduk pada*

tahun 2016. ***Tujuan:*** *Penelitian ini bertujuan untuk menguji faktor-faktor risiko kejadian malaria berdasarkan kondisi lingkungan dan perilaku masyarakat di Kota Padang.* ***Metode:*** *Studi kasus kontrol ini dilakukan dengan sampel 62 orang, yang terdiri dari 31 kasus dan 31 kontrol. Kasus diambil dengan random sampling dan kontrol dengan purposive sampling. Pengumpulan data menggunakan teknik observasi dan kuesioner serta dianalisis secara univariat dan bivariat.* ***Hasil:*** *Secara deskriptif, pasien malaria dengan kondisi fisik di rumah lebih berisiko (74,10%), memiliki riwayat mengunjungi daerah endemis (41,90%), tidak menggunakan peralatan anti nyamuk (58%) dan memiliki kebiasaan berada di luar rumah pada malam hari (32,20%). Tes statistik menunjukkan faktor risiko untuk kejadian malaria adalah kondisi fisik rumah (OR=3,40; 95% CI 1,20-9,20) dan riwayat mengunjungi daerah endemis (OR=9; 95% CI 1,20-394).* ***Kesimpulan:*** *Faktor lingkungan dan perilaku (riwayat kunjungan ke daerah endemis) mempengaruhi kejadian malaria. Peneliti menyarankan kepada Dinas Kesehatan Kota Padang melalui petugas promosi kesehatan untuk memberikan konseling tentang rumah sehat dan memberikan saran kepada orang agar tidak pergi ke daerah endemis.*

INTRODUCTION

Malaria is an infectious disease that as a public health problem has a vast impact. Malaria is generally observed in remote or difficult to reach places, including in poor and developing countries. Malaria is one of the indicators for the UN's sustainable development goals (SDGs), with an aim to end the epidemic of malaria by 2030 (Ministry of Health RI, 2016).

Malaria is an infectious disease that as a public health problem has a vast impact. Malaria is generally observed in remote or difficult to reach places, including in poor and developing countries. Malaria is one of the indicators for the UN's sustainable development goals (SDGs), with an aim to end the epidemic of malaria by 2030. In 2007, the World Health Assembly (WHA) announced a global commitment to malaria elimination for each country. However, malaria is still found in all provinces of Indonesia. In a report from the Directorate General of Communicable Disease Control and the Ministry of Health of the Republic of Indonesia in 2016, the national Annual Parasite Incidence (API) in 2015 was 0.85 per 1000 inhabitants, which was slightly lower than the previous year's rate of 0.99, in the stratification of the eastern Indonesian region. The API was categorized as a high malaria stratification in some areas of Kalimantan, Sulawesi, and Sumatra, whereas Java–Bali was classified as a lower stratification. The Strategic Plan of the Ministry of Health had a target of 400 cities/regions with an API of less than one per 1000 inhabitants by 2019. The Ministry of Health aimed to establish a community who live healthy and free of malaria transmission by 2030 (West Sumatra Provincial Health Office, 2017; Ministry of Health RI, 2016).

The Indonesian Health Ministry Decree Number 293 of 2009, on the elimination of malaria in Indonesia and Sumatra Island (except for Aceh and Riau Island provinces), identified the target of eliminating malaria by 2020. Data from communicable disease prevention and control section in Ministry of Health RI 2016 shows that the API of West Sumatra fluctuated from 2010 to 2015. The API in West Sumatra was 0.11 per 1000 inhabitants in 2010, 0.09 per 1000 inhabitants in 2011, 0.25 per 1000 inhabitants in 2012, 0.26 per 1000 inhabitants in 2013, 0.18 per 1000 inhabitants in 2014, and 0.14 per 1000 inhabitants in 2015 (West Sumatera Provincial Health Office, 2017).

The API in the province of West Sumatra is still more than one per 1000 inhabitants in the Mentawai Islands. However, based on data from the Directorate General of communicable disease prevention and control, in the West Sumatran province, the malaria morbidity rate (API) increased from 2015 to 2016, from 0.12 per 1000

inhabitants in 2015, to 0.13 per 1000 inhabitants in 2016. The API in regencies and cities has decreased and some reached a zero API rate in 2016, including Sijunjung, Tanah Datar, and Dhamasraya District (West Sumatera Provincial Health Office, 2016, 2017).

The process of reducing and eradicating malaria in the city of Padang has long been a focus, but there are still people who suffer from malaria. This is most likely due to the simultaneous mobility of people outside the entrance to Padang City in large numbers. Data from the West Sumatra Health Profile (2014) show that the house which categorized as a healthy house in Padang is 33%. Home is a physical environment that, in a healthy state, can reduce the occurrence of contact with mosquitoes and minimize the occurrence of diseases transmitted by them. The home provides many breeding places for mosquitos due to the topography and ecology of Padang, which leads to the progression of malaria (West Sumatera Provincial Health Office, 2016, 2017).

The Padang topography consists of coastal areas, lowlands, and highlands, surrounded by the Bukit Barisan Mountains. The south section of the city is still largely an agricultural area, while the eastern section is a hilly area. Padang also has many rivers. An increasingly crowded population makes the transmission of malaria easier.

The behavior of the local community is also alleged to contribute to the occurrence of malaria. One example of behavior linked to the incidence of malaria is the habit of being outdoors at night. As shown in research conducted by Mangguang (2015) on risk factors for malaria incidence showed that the people of Padang have a habit of going out at night. This leads to more people being bitten by the Anopheles mosquito. The purpose of this research is to analyze the effects of environmental and behavioral conditions on the incidence of malaria in Padang in 2017.

The purpose of this research has analysis the effect of environmental and behavioral condition for the incidence of malaria in the city of Padang Year 2017.

METHOD

This study was an observational study using a case-control research design. The research was conducted in Padang from August 2017 until January 2018. The case-control was conducted using a sample of 62 people, consisting of 31 cases and 31 controls. Cases were selected by random sampling and controls were selected by purposive sampling. The sample selection in the control group was matched with the case group based on characteristics.

This study compared the distribution of risk factors for malaria incidence between the two groups. Variables in this study included malaria incidence, the physical condition of the home, a history of visiting endemic areas, use of anti-mosquito drugs/tools, and habits outside the home at night (Timah,2019)

The physical condition of the house is the condition of the respondent's home, which includes the use of wire netting and the type of walls and ceiling in the house. A history of visiting endemic areas tracks the respondents traveling to or visiting malaria-endemic areas (Mentawai, Pesisir Selatan, and Sawahlunto) one month prior to the start of the study. The behavioral variable, use of anti-mosquito repellent or equipment, measures the respondents' use of mosquito nets or anti-mosquito repellent (burn/repellent/spray) at night. Outdoor night activity measures whether the respondents went outside the home at night, for more than one hour, between 6 pm and 4 am, at least once every three days, without using protective gear.

The inclusion criteria required respondents who were willing to participate in the research, who could communicate smoothly, and who lived in the city of Padang (± three months). The exclusion criteria for this study were that they were not present during the study after three consecutive visits and had a history of suffering from malaria before residing in the city of Padang.

The population in this study included malaria cases recorded in a register report malaria from communicable disease prevention and control of Padang City Health Department before September 2017 and who had been diagnosed with malaria by health workers based on laboratory examination. The control population were people who had not been diagnosed with malaria and did not live with the case population. A sample is a population whose characteristics are investigated. The case-control study was conducted on a sample of 62 people, consisting of 31 cases and 31 controls.

RESULTS

Table 1 shows that the respondents' ages in the case and control groups were mostly between 25 and 44 (61.20%). There were more women in the case group (58.80%) and in the control group (70.90%). In the case group, 41.90% of

respondents had an educational level of diploma/bachelor/magister, with the same amount having a high school level of education or equivalent. In the control group, 35.40% of respondents had a high school level of education. The respondents were more often self-employed in both the case group (32.20%) and in the control group (41.90%).

Table 2 shows that at-risk physical conditions in the home were more common in the case group (23 respondents, 74.10%) than the control group (11 respondents, 35.40%). The case group of respondents were more likely to have visited an endemic area (13 respondents, 41.90%) than the control group (five respondents, 16.10%). More of the control group (20 respondents, 64.50%) used insect repellent than in the case group (18 respondents, 58%). Outdoor night activity was more common in the case group (ten respondents, 32.20%) than in the control group (eight respondents, 25.80%).

Table 3 demonstrates that the variables associated with the incidence of malaria (with p values < 0.05) are the physical condition of the home and a history of visiting endemic areas. The variables of using mosquito repellent and outdoor night activity were not related to the incidence of malaria (p values > 0.05).

The physical condition of the home had a p value of less than 0.05 (p = 0.01) and an OR of 3.43 (95% CI 1.20 to 9.20), which means there is a significant relationship between the physical condition of the home and the incidence of malaria. Respondents who had an at-risk home were 3.43 times more likely to contract malaria than respondents with a home that was not at-risk.

A history of visiting endemic areas had a p value of less than 0.05 (p = 0.01) and an OR of 9 (95% CI 1.20 to 394), which means there is a significant correlation between visiting endemic areas and the incidence of malaria. Respondents who had visited endemic areas were 9.00 times more likely to contract malaria than respondents who did not visit endemic areas.

DISCUSSION

Physical condition house

The current research showed that there is a significant relationship between the physical conditions of the home and malaria incidence.

Table 1
Frequency Distribution of Respondents in Padang at 2017

Variable	Case		Control	
	n	%	n	%
Age (Years)				
5-14	0	0.00	0	0,00
15-24	7	22.50	7	22.50
25-44	19	61.20	19	61.20
45-64	6	19.30	6	19.30
≥ 65	0	0.00	0	0.00
Sex				
Man	14	45.10	9	29.00
Woman	17	54.80	22	70.90
Education				
Junior High School	5	16.10	10	32.20
Senior High School	13	41.90	11	35.40
Diploma/Bachelor/Magister	13	41.90	10	32.20
Type Of Work				
Does Not Work / Student	5	16.30	2	6.40
Government Employee	6	19.30	3	9.60
Private Employees	5	16.10	0	0.00
Entrepreneur	10	32.20	13	41.90
Farmer / Fisherman / Labor	0	0.00	1	3.20
Housewife	4	12.90	11	35.40
Other	1	3.20	1	3.20
Total	31	100.00	31	100.00

Table 2
Distribution of Environment and Respondent Behavior

Variable	Case		Control	
	n	%	n	%
Physical condition of the home				
At risk	23	74.10	11	35.40
Not at risk	8	25.80	20	64.50
History of visiting endemic areas				
Yes	13	41.90	5	16.10
No	18	58.00	26	83.80
Use of mosquito repellent				
Yes	18	58.00	20	64.50
No	13	41.90	11	35.40
Outdoor night activity				
Yes	10	32.20	8	25.80
No	21	67.70	23	74.10
Total	31	100.00	31	100.00

Table 3
Chi-Square Test

Variables	OR	95% CI	*p*
Physical condition house	3.43	1.20–9.20	0.01
History of Visit Endemic Areas	9.00	1.20–394	0.01
Use Mosquito Repellent	0.70	0.20–2.40	0.60
Outdoor Night Activity	1.30	0.40–4.60	0.60

These results are consistent with research conducted by Tulangow, Kandou, & Kaseke (2018) who also found a significant correlation between home environment and the incidence of malaria (p = 0.00; OR = 8.1). The results of this study are also consistent with prior research that found a significant relationship (p = 0.01) between the condition of the home and the incidence of malaria, with the risk for contracting malaria being eight times greater in at-risk homes compared to homes in good physical condition (Mayasari, Andriayani, & Sitorus, 2016; Rahmadani, Anwar, & Rudijanto, 2016).

The WHO report in Media Center stated that the incompleteness of the houses will cause the mosquitoes to come, relax, and bite humans in the house. House with good construction can reduce mosquito contact with humans to minimize the risk of disease transmitted by mosquitoes, even around the house are mosquito breeding (Pratamawati & Widiarti, 2015). The environmental risk of malaria transmission was highest for houses near mosquito breeding habitats and houses near the cocoa and coffee plantations (Trapsilowati, Pujiyanti, & Negari, 2016).

A WHO report has stated that the incompleteness of a home can encourage mosquitoes to enter and bite humans. Homes with good construction can reduce mosquito contact with humans and minimize the risk of diseases transmitted by mosquitoes, even when mosquitoes are breeding around the house (Pratamawati & Widiarti, 2015).

This study found that the hot temperature in Padang City is indirect factor of malaria incidence. Hot temperature makes people reluctant to install wire netting on their home, on the grounds of ventilating hot air. Ventilation without wire netting allows greater airflow into the house. The heat and humidity in Padang has made air conditioning a necessity. Usually, air conditioning is installed in bedrooms for sleep, meaning ventilation in the bedroom is sealed so that the air conditioning is more effective.

History of Visit Endemic Areas

This result showed that there is a significant relationship between a history of visiting endemic areas and malaria incidence. This result is not consistent with research conducted by Isnaeni, Saraswati, Wuryanto, & Udiyono (2019) which states that there is no significant relationship between visiting endemic areas and malaria incidence (p = 0.21; OR = 1.80). In epidemiology and immunology, people from non-endemic areas, where there are no malaria cases, are more vulnerable to contracting malaria when visiting endemic areas. The longer a person stays in an endemic area, the greater the risk of exposure to

the bites of mosquitoes carrying the malaria parasite (Lubis & Boy, 2017; Manumpa, 2016).

A history of visiting endemic areas is related to the incidence of malaria due to endemic malaria in West Sumatra, which is not far from Padang and can be reached in a few hours of driving. Therefore, people can easily access the area for work, personal recreation, or other needs. Of the respondents, 64.2% visited endemic areas more than once per year and 18.74% visited an endemic area once per year (Damayanti, 2018).

Malaria elimination programs in endemic areas require an evaluation of the socialization system, both for the prevention and control of malaria, as well as the policies that govern it. Outreach efforts can lead to behavior change. Malaria prevention will more successful if there is a strong commitment in the form of supportive policies from the local government and a good information system that can reach all walks of life (Pratamawati & Widiarti, 2015).

The Use of Anti-Mosquito Repellent

Research shows that more than half of the patients with malaria in this study used anti-mosquito tools or repellant. This result is not in line with research conducted by Mangguang (2015) which stated that 82.84% of malaria case respondents do not use mosquito nets and 69% do not use anti-mosquito drugs (Arsyad, 2015). The habit of using anti-mosquito drugs can reduce contact between humans and mosquitoes. The results of the bivariate analysis showed that there was a significant relationship between the use of anti-mosquito drugs and the incidence of malaria. Respondents who did not use anti-mosquito drugs every day were 2.719 times more at risk of developing malaria than those who used anti-mosquito drugs every day (Rangkuti, Sulistyani, & Endah, 2017).

Outdoor Night Activity

The research showed that a small percentage of malaria cases in Padang spent time outdoors at night. The analyses resulted in a p value of more than 0.05 (p = 0.60) and an OR of 1.30 (95% CI 0.42 to 4.69), which means there is no significant relationship between spending time outside the house at night and the incidence of malaria. These results are consistent with other research, which also found no significant relationship between being outdoors at night and malaria (p = 0.18; Adnyana, 2015; Papilaya et al., 2015).

However, this study is not in line with research conducted by Munawar (2005) which found that respondents who spend time outdoors at night are less likely to be in the case group than in the control group. Outdoor night activity is very risky for contracting malaria (Haqi & Astuti, 2016). and people are more at risk if they leave the house without wearing protective clothing, such as long-sleeved shirts and long pants. Being out of the house at night increases the risk of contact between healthy people and an Anopheles mosquito, which needs blood to complete the gonotrophic cycle (Rangkuti, Sulistyani, & Endah, 2017). If mosquitoes have sporozoids in the salivary glands, then the chances of people contracting malaria will increase (Keptiyah, Martini, & Saraswati, 2017). Research by Wardah, Nurjazuli, & Dangiran (2017) also stated that there is a significant relationship between activity outside the house at night and the incidence of malaria (p = 0.04; OR = 2.34). Research conducted by Wahyudi & Cahyati (2015) found that respondents who spend time outside the house at night are 10.7 times more likely to contract malaria than respondents who do not. In this study, outdoor night activity did not prove to be a risk factor for malaria incidence. This is because, out of the respondents who spent time outside the home at night, 70.91% wore long clothing, which reduced the chances of being bitten by mosquitoes.

CONCLUSION

Most people with malaria live in physical conditions that increase their risk of contracting the disease, less likely have a history of visiting endemic areas, likely do not use mosquito repellent, and less likely do not use mosquito repellent. Physical conditions and a history of visiting malaria-endemic areas affected the number of malaria cases in Padang at 2017.

CONFLICT OF INTEREST

The authors declare that no conflict of interest in this study.

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