

Risk Factors of Malaria Occurrence in Working Area of Wania Health Centre, Mimika 2018

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ABSTRACT

Background: Malaria is a parasitic disease transmitted by *Anopheles* sp mosquitoes and is affected by environmental conditions, host (human and vector), and agent. Malaria attacks all age groups. Papua Province which is the easternmost of Indonesia is malaria endemic area, In Mimika Regency, malaria number 2017 92.342 with API 432.6 / 1000 population. Malaria morbidity ranks first among 10 major diseases at Wania Health Center with 11,381 cases.

The purpose of this research is to know the risk factor of malaria incidence in working area of Wania District Health Center of Mimika Regency 2018.

Method of study: Analytic study with cross sectional design. Technique of sampling was consecutive sampling. Total sample was 100 respondents. Data were analyzed by univariate, bivariate and multivariate with Chi Square statistical test and logistic regression. The result of the research showed that the variables that become the risk factor are: the distance of the mosquito breeding place (p-value = 0,02; RP = 3.420; CI = 95% (1.297-9.019), use of mosquito net (p-value = 0,00 RP = 2.999 CI = 95% (2,733-27,486), activities outside the home at night (p-value = 0.03, RP = 2.984, CI = 95% (1,164-7648) use of anti-mosquito (p-value = 0,04; RP = 2600; CI = 95% (1,099-6,151) .The factor of using mosquito net is the dominant factor of malaria risk in the working area of Wania District Health Center of Mimika Regency.

Keywords: Malaria, risk factors, mosquito net, working area

1. INTRODUCTION

Malaria is a highly contagious infectious disease in the tropics and sub-tropics and can be deadly. At least 270 million people of the world suffer from malaria and more than 2 billion or 42% of the population of the earth has a risk of malaria. The mortality rate of malaria in the world in 2013 still reaches 47% and 78% of them are children under 5 years old (WHO, 2015). Malaria is a parasitic disease transmitted by *Anopheles* sp mosquitoes and is affected by environmental conditions, host (human and vector), and agent. Malaria attacks all age groups; one of the most vulnerable age groups is toddlers (Willa, 2011). Malaria is spread throughout the archipelago especially in the East. Indonesia's population is still at risk of contracting malaria as most live in the area of malaria transmission. In Indonesia reported as the largest contributor to malaria cases are Papua Province 2014 (29.57 per 1000 population), 2015 (31.93 per 1000 population) and 2016 (45.85 per 1000 population) (Ministry of Health RI, 2017).

The province of Papua, located in the easternmost part of Indonesia, is a malaria endemic area, the number of illness ranks first of 10 major diseases. The mobilization of outside residents who enter this area in large numbers has a high risk of contracting malaria. The climate change, forest burning and rapid development process cause malaria disease is increasingly widespread (Babba, 2007). Data on the top 10 diseases at the Wania Health Center shows that malaria ranks first

in 2017 with 11,381 cases. Response efforts have been carried out continuously through active or passive patient discovery and treatment (positive blood supply), but not yet significantly decreased malaria morbidity (Wania Health Center, 2018).

2. MATERIALS AND METHODS

In this study using analytical study method with cross sectional design is a study to study the dynamics of correlation between risk factors with effects, by approach, observation or data collection at one time (Natoajmodjo, 2015)

The populations in this study were all residents who visited for treatment to Wania Puskesmas with clinical malaria symptoms lived in the area of health service Wania ≥ 2 years. Number of samples 100 obtained by using Slovin formula. The sampling technique is consecutive sampling, all subjects that come and meet the criteria are included in the study until the required number of subjects is met. Consecutive sampling is the best non probability sampling type and is the easiest way. By using the technique, the population has the same opportunity to do research that has the inclusion criterion of used as sample of research (Sastroasmoro, 2007).

3. RESEARCH RESULTS

Table 1. Distribution of malaria incidence in the work area of Wania Health Center

	Number	(%)
Malaria	44	44
Not malaria	56	56
Number	100	100

Table 1 shows that the number of malaria sufferers as many as 44 people (44%) and who did not suffer malaria as many as 56 people (56%)

3.1 Univariate Analysis

Table 2. Distribution of respondents based on the distance where the mosquito breeding, the presence of livestock, the use of mosquito nets, outdoor activities at night, the use of anti-mosquito drugs against the

incidence of malaria in Wania Health Center.

No	Variables	(n)	(%)
1	Distance		
	Close	71	71
	Far	29	29
2	Livestock		
	Yes	36	36
	Not	64	64
3	Net use		
	Not	70	70
	Yes	30	30
4	Outdoor activities at night		
	Yes	25	25
	Not	75	75
5	Anti mosquitoes use		
	Not	63	63
	Yes	37	37
Number		100	100

Based on table 2 shows that out of 100 respondents most of the distance of the mosquito breeding near as many as 71 people (71%), who do not have 64 livestock (64%), do not use bed nets as much as 70 people (70%), not doing activities outside the home at night as many as 75 people (75%), and who do not use anti-mosquito drugs as many as 63 people (63%).

3.2 Bivariate Analysis

Table 3. Analysis of the Relationship of Remote Place of Mosquitoes with Malaria Occurrence in the Working Area of Wania Health Center

No	Distance of breeding site	Malaria occurrence				n	%
		Malaria		Not malaria			
		n	%	n	%		
1	Close	37	52,1	34	47,9	71	100
2	Far	7	24,1	22	75,9	29	100
	Total	44	44	56	56	100	100

p-value =0,02; RP = 2.153; CI = 95% (1.091-4.273)

The result of chi square 95% ($\alpha = 0,05$) *p-value* 0,02 or $p < \alpha$ (0,05) thus there is correlation between the distance of the mosquito breeding place close to the malaria incidence in the work area of Wania Health Center. RP = 2,153 CI 95% (1,091-4,273) interpreted that people who have a house near the distance of the mosquito breeding nearby, have a chance of malaria disease 3.42 times larger than those who have homes that the distance of the remote mosquito breeding place.

Table 4. Analysis of Livestock Supply Relationship with Malaria Occurrence in Wania Puskesmas Working Area

No	Existence livestock	Malaria occurrence				n	%
		Malaria		No malaria			
		n	%	N	%		
1	Yes	21	58,3	15	41,7	36	100
2	Not	23	36	41	64	64	100
	Total	44	44,0	56	56,0	100	100

p-value = 0,05; *RP* = 1.623; *CI* = 95% (1.058-2.490)

The result of chi square 95% ($\alpha = 0,05$) *p-value* 0,05 or $p = \alpha$ (0,05) thus there is correlation between existence of livestock with malaria incidence in work area of Wania health center. The value of *RP* = 1.623 95% *CI* (1,058-2,490) interpreted that people who have livestock around the house the chance of malaria disease 1.623 times greater than those who do not have livestock around the house.

Table 5. Analysis of Usage of Bedside Nets In Respondent's Home With Malaria Occurrence In Work Area of Wania Health Center

No	Mosquito Net use	Malaria occurrence				n	%
		Malaria		Not malaria			
		n	%	n	%		
1	Not	40	57,1	30	42,9	70	100
2	Yes	4	13,3	26	87	30	100
	Total	44	44,0	56	56,0	100	100

p-value = 0,00; *RP* = 4.286; *CI* = 95% (1.683-10.912)

The result of chi square 95% ($\alpha = 0,05$) *p-value* 0,00 or $p < \alpha$ (0,05) thus there is correlation between usage of mosquito net with malaria incident in Wania Puskesmas work area. The value of *RP* = 4.286 *CI* 95% (1.683-10.912 which is interpreted that people who do not use mosquito nets have malaria 4.286 times greater than those who use mosquito nets.

Table 8. Bivariate Analysis Between Dependent and Independent Variables

No	Variables	P-value	RP	95%CI	
				Lower	Upper
1	Distance of breeding site	0,02	2.159	1,091	4,273
2	Existence of livestock	0,05	1.623	1.058	2.490
3	Mosquito Net use	0,00	4.286	1.68	10.91
4	Outdoor activity at night	0,03	1.714	1.132	2.597
5	Anti Mosquito use	0,04	1762	1.018	3.049

Table 8 shows that bivariate modeling on the distance variables where mosquito breeding, the presence of livestock, the use of mosquito nets, outdoor activities at night and the use of anti-mosquito drugs included in the category of value *P-value* < 0.25 , so included in the multivariate model using regression test binary logistics forward stepwise method, as in table 9 below.

Table 6. Relationship Analysis of Outdoor Activities at Night with Malaria Occurrence in Wania Health Center Working Area

No	Outdoor Activities at night	Malaria occurrence				n	%
		Malaria		Not malaria			
		N	%	N	%		
1	Yes	16	64	9	36	25	100
2	Not	28	37,3	47	62,7	75	100
	Total	44	44,0	56	56,0	100	100

p-value = 0,03; *RP* = 1.714; *CI* = 95% (1.132-2.598)

The result of chi square is 95% ($\alpha = 0,05$) *p-value* 0,03 or $p < \alpha$ (0,05) thus there is correlation between outdoors activity at night with malaria incidence in working area of Wania Health Center. *RP* value = 1.714; *CI* = 95% (1,132-2,597) interpreted that people who have activities outside the home at night have a chance of malaria disease 1.714 times greater than those who have activities outside the home at night.

Table 7. Analysis of Anti-mosquito Use Relationship With Malaria Incidence In Wania Puskesmas Working Area

No	Anti-mosquito Use	Malaria occurrence				n	%
		Malaria		Not malaria			
		n	%	N	%		
1	Not	33	52,3	30	47,7	63	100
2	Yes	11	30	26	70	37	100
	Total	44	44,0	56	56,0	100	100

p-value = 0,04; *RP* = 1.762; *CI* = 95% (1.099-6.151)

The result of chi square 95% ($\alpha = 0,05$) *p-value* 0,04 or $p < \alpha$ (0,05) thus there is correlation between the use of mosquito repellent with malaria incidence in Wania Puskesmas work area. *RP* value = 1.762; *CI* = 95% (1.018-3.049) interpreted that people who do not use anti-mosquito repellent have a chance of malaria disease 1.762 times greater than those who use anti-mosquito repellent.

Table 9. Analysis of Multiple Logistic Regression Variables

No	Variables	B	P=	OR	95%CI	
					Lower	Upper
1	Mosquito net use	2.220	0,00	9.207	2.829	29.964
2	Anti mosquito use	1.054	0,28	2.869	1.123	7.328

Table 9 shows that the use of mosquito nets and the use of anti-mosquito medicines is the most dominant factor in malaria occurrence in Wania Puskesmas working area.

4. DISCUSSION

4.1 The Distance of the Mosquito Misses Place

Table 3 shows that of 71 respondents whose distance from the nearby mosquito breeds were 37 people (52.1%) who suffered malaria and 34 people (47.9%) did not suffer from malaria. Whereas 29 respondents with distance from mosquito breeding place far there are 7 people (24,1%) who suffer from malaria and 22 people (75,9%) who do not suffer from malaria. The result of chi square 95% ($\alpha = 0,05$) p-value 0,02 or $p < \alpha$ (0,05) hence there is significant relation between mosquito breeding distance close to malaria incidence in work area of Wania health center. $RP = 2,153$ CI 95% (1,091-4,273) interpreted that people who have a house near the distance of the mosquito breeding nearby, have a chance of malaria disease 3.42 times larger than those who have homes that the distance of the remote mosquito breeding place. The results of this study are similar to the results of Gurendro Putro (2003) study which stated that the distance of the house from the mosquito breeding place ≤ 250 m has the risk of suffering from malaria, compared with the distance of the house from the mosquito breeding > 250 m. The result of this research is similar to Lara Nurbayani (2013) research.

The existence of shrub bush and pond as a place for mosquito breeding around the house is a risk factor of malaria incidence ($p = 0.02 > \alpha = 0.05$ CI = 95%). In the mosquito breeding place close to home, it has a greater risk of malaria. For that purpose, the mosquito nest cleaning

function with 3M method (close, drain and bury), the goods around it to avoid the breeding of mosquitoes as vectors that can transmit malaria disease and clean up the environment where the mosquito breeding nearby close to the house reduces the development vector culture.

4.2 The Presence of Livestock

Table 4 shows that from 36 respondents who have livestock around the house there are 21 people (58.3%) who suffer from malaria and 15 people (41,7%) do not suffer from malaria. While 64 respondents who do not have cattle around the house there are 23 people (36%) who suffer from malaria and 41 people (64%) who do not suffer from malaria. The result of chi square 95% ($\alpha = 0,05$) p-value 0,05 or $p = \alpha$ (0,05) thus there is correlation between existence of livestock with malaria incidence in work area of Wania health center. The value of $RP = 1.623$ 95% CI (1,058-2,490) interpreted that people who have livestock around the house the chance of malaria disease 1.623 times greater than those who do not have livestock around the house.

The existence of livestock is very supportive in the breeding habitat of mosquitoes. Based on the theory that mosquitoes have two properties in the likes of blood that is antrophofilik (like human blood and Zoofilik (like animal blood) With the presence of livestock around the house is also a habitat or resting place for a comfortable mosquito (Resting place) ready to look for blood and at the same time can transmit malaria disease. The results of this study are not in line with research conducted by Arif Mulyono et al (2013) stating that there is no significant relationship between livestock ownership and malaria incidence in East Nusa Tenggara.

4.3 Use of mosquito net

Table 5 shows that out of 70 respondents who did not use mosquito nets there were 40 people (57.1%) suffering from malaria and 30 people (42.9%) who did not suffer from malaria. While 30 respondents did not use mosquito net 4 people (13.3%) suffering from malaria and 26 people (87%) who did not suffer from malaria. The result of chi square 95% ($\alpha = 0,05$) p-value 0,00 or $p < \alpha$ (0,05) thus there is correlation between usage of mosquito net with malaria incident in Wania Puskesmas work area. The value of RP = 4.286 CI 95% (1.683-10.912) interpreted that people who do not use mosquito nets have malaria 4.286 times greater than those who use mosquito net.

The result of this research is same with Lara Nurbayani (2013) research that habit of not using mosquito net during sleep is a risk factor of malaria incidence ($p = 0.028 < \alpha = 0.05$ CI = 95%). The results of this study are also in line with research conducted by Babba (2014) states there is a relationship between the habits of using mosquito nets with the incidence of malaria disease. ($p = 0.04$). This research is in line with Ria N (2013) research that the habit of using mosquito net is a risk factor for malaria incidence. The habit of using mosquito nets is an effective effort to prevent and avoid contact between Anopheles Sp mosquitoes and healthy people while sleeping at night. Mosquito nets are one of the efforts in prevention activities of transmission of malaria, in addition to the use of wire netting and also the use of anti-mosquito repellent. Based on the results of interviews observation have mosquito nets, but not used at the time of sleep at night with a very disturbing reason for their comfort while sleeping at night.

4.4 Outdoor Activities At Night

Table 6 shows that out of 25 respondents who did not have outdoor activities at night, 16 (64%) suffered malaria and 9 people (36%) did not suffer from malaria. While 75 respondents who do

not have outdoor activities at night are 28 people (37,3%) who suffer from malaria and 47 people (62,7%) who do not suffer from malaria. The result of chi square is 95% ($\alpha = 0,05$) p-value 0,03 or $p < \alpha$ (0,05) thus there is correlation between outdoors activity at night with malaria incidence in working area of Wania Health Center. RP value = 1.714; CI = 95% (1,132-2,597) interpreted that people who have activities outside the home at night have a chance of malaria disease 1.714 times greater than those who have activities outside the home at night.

The results of this study are in line with Gurendro Putro's (2003) research that people have activities > of 2 hours have great potential for contact with the bite of Anopheles Sp mosquitoes which is a malaria disease vector. The results of this study are not in line with the research of Sujari (2007) which states that there is no relationship between outdoor activities at night with the incidence of malaria ($p = 0,428$). This means that people who have outdoor activities at night have a risk of getting malaria from people who do not have activities outside the house at night. The results of interviews with the community found that activities / work outside the house at night such as selling at the night market, keeping the garden without using a protector such as long-sleeved shirts and trousers or anti-mosquito repellent.

4.5 Use of Anti Mosquito Drugs

Table 7 shows that out of 63 respondents who did not use anti-mosquito drugs there were 33 people (52.3%) who suffered malaria and 30 people (47.7%) who did not suffer from malaria. While 70 respondents who use anti-mosquito drugs there are 11 people (30%) who suffer from malaria and 26 people (70%) who do not suffer from malaria. The result of chi square 95% ($\alpha = 0,05$) p-value 0,04 or $p < \alpha$ (0,05) hence there is significant correlation between the use of mosquito repellent with malaria incidence in Wania Puskesmas work area. RP value = 1.762; CI = 95%

(1.018-3.049) interpreted that people who do not use anti-mosquito repellent have a chance of malaria disease 1.762 times greater than those who use anti-mosquito repellent. The results of this study are in line with Gurendro Putro's (2003) research which states that people who always use anti-mosquito repellent do not have the risk of malaria incidence, because repellent mosquito repellent cause mosquito repellent so mosquito contact to human body does not happen so transmission of mosquito-borne diseases does not occur as malaria ($p = 0.00$). This study is also in line with Babba (2014) study indicating that there is a significant relationship between people taking anti-mosquito drugs and malaria incidence ($p = 0.01$).

5. CONCLUSION

5.1. There is a correlation of the distance of the mosquito breeding place with the incidence of malaria disease in the working area of Wania District Health Center of Mimika Year 2018

5.2 There is a relationship of the presence of livestock with the incidence of malaria disease in the work area of Wania District Health Center Mimika Year 2018

5.3 There is a relationship between the use of mosquito nets with the incidence of malaria disease in the work area of Wania District Health Center of Mimika Year 2018

5.4 There is an activity relationship outside the house at night with the incidence of malaria disease in the working area of Wania District Health Center Mimika Year 2018

5.5 There is a relationship between the use of anti-mosquito drugs with the incidence of malaria disease in the work area of Wania District Health Center Mimika Year 2018

5.6 The use of mosquito net is the dominant factor of malaria incidence in the working area of Wania Health Center of Mimika Regency Year 2018

REFERENCES

- Arsin, 2012, *Malaria di Indonesia*.<http://repository.unhas.ac.id/hardl>

e /123456789/2744. Diakses pada jam dan tanggal (10.12 wit 17 Maret 2018)

- Aipasa, 2015 *Kepatuhan Penggunaan Kelambu Anti Malaria Di Kelurahan Inauga Kabupaten Mimika* KTI Prodi kesling, Timika 2015.
- Atikoh, I.K, 2014 *Faktor yang berhubungan dengan kejadian malaria di desa Selakambang Kecamatan Kaligondang Kabupaten Purbalingga*, Tesis Program Studi kesehatan Lingkungan Universitas Negeri Syarif Hidayatulla Tahun 2014
- Babba I, 2007 *Faktor yang mempengaruhi kejadian malaria* Studi Kasus Di Wilayah Kerja Puskesmas Hamadi Kota Jayapura, Tesis program Studi Magister Epidemiologi, Undip 2007.
- Bagasrasid, 2012, *Makalah Nyamuk Anopheles Sp* <http://bagasrasid89.co.id> 2012/12 Diakses pada jam dan tanggal (01.18 wit 31 Februari 2018).
- Damar T, 2008 *Mata Kuliah Pengendalian Vektor Nomenklatur, klasifikasi dan Toksonomi Nyamuk*, tesis Pasca Sarjana Undip, Semarang 2008
-Depkes RI 2009, perencanaan dan pembiayaan pelayanan kesehatan bagi Penduduk miskin.
- Gandahusada S, *Parasitologi kedokteran*, fakultas Kedokteran Universitas Indonesia, Jakarta 2006
- Hadisaputro, Suharyo, 2013, *Studi Diagnostik Malaria*, Yogyakarta: Politeknik Kesehatan Pramata Indonesia
- Harmendo 2008, *Faktor Resiko Kejadian Malaria* di wilayah kerja Puskesmas Kenanga Kecamatan Sungailiat Kabupaten bangka, Tesis Undip, 2008
- Harijanto 2000, *Malaria : dari molekuler ke klinis*, Jakarta: EGC
-Kemenkes RI, 2017 <http://www.psychologymania.com/2018/3/siklus-hidu-nyamuk.html>.
- Harijanto P.N, 2000, *Malaria, epidemiologi, patogenesis, manifestasi klinis dan penanganan*, EGC, Jakarta 2000
- Hasmi, 2016 *metode penelitian kesehatan*, penerbit in media 2016
- Martono N, 2011, *Metode Penelitian Kuantitatif Analisis Isi dan Analisis data sekunder*, Cetakan ke tiga, PT. Raja Grafindo persada : Jakarta 2011
- Masra F, 2002, *Hubungan Tempat Perindukan Nyamuk Dengan Kejadian*

- Malaria Kecamatan teluk Betung barat Kota Bandar Lampung Tahun 2002; Tesis FKM UMI
-Menkes 2009, KEPMENKES no. 293 tentang eliminasi malaria, Tahun 2009
 -Puskesmas Wania, 2008, data penyakit malaria, Timika 2017
 - Nurbayani Lara, 2013, Faktor resiko kejadian malaria di wilayah kerja puskesmas Mayong I Kabupaten Jepara; Tesis UNDIP 2013.
 - Putro Gurendro, Rahman Saiful, 2003, *Faktor resiko kejadian malaria di Puskesmas selad III kabupaten Kapuas*, buletin penelitian sistim kesehatan vol.7 No.2 Desember 2004 : 151-165.
 - Rahman, S.A., Rahim, A., Mallongi, A. 2018. Risk analysis of dengue fever occurrence in bone province sulawesi south using temporal spatial geostatistical model. *Indian Journal of Public Health Research & Development*, April-June 2018, Vol.9, No. 4
 - Rika Mayasari Diana Andriyani, Hotnida Sitorus, 2015 *risk factors associated with malaria incidence in indonesia Advanced analysis* (Riskesdes 2013)
 - Ria Nurfitriana AS, Hasanuddin Ishak, Ruslan La Ane, 2013 *Analisis Faktor Resiko Terhadap Kejadian Malaria Di Wilayah kerja Puskesmas Durikamba Kecamatan karossa kabupaten mamuju*; Bagian Kesehatan Lingkungan Fakultas Kesehatan Masyarakat, UNHAS, Makassar.
 - Sand Ibrahim, Ishak Hasanuddin, 2013, *Faktor Resiko Kejadian Malaria di Wlayah kerja Puskesmas Baraka kecamatan baraka Regency Enrekang Tahun 2013*, Tesis UNHAS 2013.
 - Stang Abdul Rahman, Amran Rahim and Anwar Mallongi, 2017. Forecasting of dengue disease incident risks using non-stationary spatial of geostatistics model in Bone Regency Indonesia. *J. Entomol.*, 14: 49-57.
 - Sucipto C 2015, *manual lengkap malaria*, cetakan Pertama Gosyen Publishing, Yokyakarta 2015
 - Sujati, Setiani onny, Sulistiyani, 2007 *Risk Factor related to the Inciden of Malaria in Tin Mining Region of Central Bangka Regency, Bangka Belitung Province*, *Journal Of Envirimental Health* Vol.6 No. 2 October, 2007
 - Natoadmodjo, 2015, *metodologi penelitian kesehatan*, Rineke Cipta 2015
 - Nurbayani Lara, 2013, *Faktor Resiko Kejadian Malaria di Wilayah Kerja Puskesmas Mayong I kabupaten Jepara*, *Jurnal kesehatan masyarakat* 2013, Volume 2 No. 1 Januari 2013. *Online di [http://ejournals I.Undip.ac.id/index.php/jkm](http://ejournals.I.Undip.ac.id/index.php/jkm)*
 - Sandjaja Bernard, 2014, *Dynamic Simulation Model on Malaria Incidence based on Risk Factors in Keerom, Papua*, CDK-221/ vol. 41 no. 10, th. 2014
 - Sorontou Y, 2014, *Ilmu Malaria Klinik*, Penerbit buku kedokteran, Jakarta 2014
 - Soedarto, 2011, *Epidemiologi Global- Plasmodium-Anopheles penatalaksanaan Penderita malaria*, CV Sagung Seto, Jakarta 2011
 - Wibowo A, 2014, *metodologi penelitian praktis Bidang kesehatan*, PT Raja gravindo persada, jakarta 2014
 - Willa W Ruben, Adyana D.W Ni, *Risk Factors in The Incidence of Malaria in Children Laura Sub District West Sumba Power* *Jurnal Ekologi Kesehatan* Vol. 10 No 4, Desember 2011 : 219 – 228

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