



Effect of climate change on the incident of malaria disease in Gowa South Sulawesi Province

Wibowo^{1*}, Sahir²

¹ Center for Research and Development Resources and Health Care, Agency for Health Care Research and Development, Ministry of Health of Republic of Indonesia, Indonesia

² DHO Gowa of South Sulawesi, Indonesia

Abstract

Malaria is still a deadly disease in Gowa, South Sulawesi. This is evidenced by the increase in cases of Malaria. One of the emergence of malaria outbreaks due to weather changes. Various methods used to overcome this disease are by avoiding malaria mosquito bites is the most important way to prevent malaria transmission, such as using mosquito nets, the absence of puddles, and using repellent lotion. The purpose was to get an overview of Malaria cases regarding climate change during season transition in the Gowa District Health Office. The data obtained from the reports of Malaria cases in the Gowa DHO area in 2017. Cross sectional study design was used. Malaria incidence by 87 cases. The peak incidence occurs enhancer malaria occur in March and June, respectively 81 and 80 cases. Trend incidence of malaria in Gowa volatile. significantly increased cases per three months. There is a transition effect of the weather with increased cases of malaria in the region of Gowa district health offices, so we need a place to the breeding prevention and vector surveillance.

Keywords: malaria, falciparum, climate change, DHO, Gowa

1. Introduction

Malaria remains a public health problem, especially in tropical countries. Malaria in humans can be caused by Plasmodium malariae, Plasmodium vivax, and plasmodium falciparum and plasmodium ovale ^[1] of the four species that infect humans usual 95% are caused by plasmodium vivax and plasmodium falciparum. Plasmodium vivax infection can reach 80%, distribusinyapun most widespread in tropical and subtropical temperate. Plasmodium vivax causes high morbidity because of their stage in the liver hypnozoite that could someday grow and cause a relapse. The prevalence of Plasmodium vivax in Indonesia around 40% -70%. In Indonesia malaria remains a significant health problem, especially outside Java-Bali. Malaria in addition to lowering the level of public health also reduce the level of productivity of the population and an important obstacle in the socio-economic development of society in Indonesia ^[2].

Morbidity of the disease is still quite high, especially in the eastern part of Indonesia. In endemic areas, malaria is still common extraordinary events malaria World Health Organization estimates that the world's malaria cases recorded around 240 million per year. Cases of malaria deaths in Africa accounts for about 90% with a total of 800,000 people each year and claimed the lives of one child in Africa every 45 seconds. Areas south of the Sahara in Africa and Papua New Guinea in Oceania are the places with the highest malaria incidence ^[3]. The incidence of malaria rates is still high in several regions in Indonesia ^[4]. Approximately 80% of districts / cities in Indonesia are categorized as endemic and more than 45% of the population live in malaria endemic areas ^[5].

Indonesia is a tropical country with high levels of rainfall, so much the accumulation of water in the air and the formation of rain clouds. Rain causes increased air relative humidity and heavy rainfall resulted in many puddles that appear suddenly, waterlogging is used as a mosquito breeding sites and increase the number of breeding sites (breeding places), causing an increase in the incidence of malaria. The size of the effect depends on the rain-soaked, vector species and species breeding ground. Rain interspersed heat will increase the likelihood of breeding of Anopheles mosquitoes ^[6] increase in temperature will affect the bionomics changes or biting behavior of the mosquito population, the rate increased by an average bite (biting rate), mosquito reproduction activity change marked by increasingly rapid mosquito breeding and maturity period of the parasite in the mosquito will become shorter ^[7].

Malaria is a disease caused by protozoa of the genus Plasmodium. Malaria in humans can be caused by P. malariae, P. vivax, P. falciparum and P. ovale. Malaria is transmitted by the female Anopheles mosquito. Anopheles mosquito is a vector of malaria which is an ecological disease, because it is influenced by environmental conditions to reproduce and potentially transmit the malaria parasite to humans. Of the approximately 67 species of Anopheles mosquitoes have been found 40 species that can transmit malaria and 24 of them are found in Indonesia (Rumbiak, 2006) ^[6]. Indonesia is a tropical country that is very great potential for the development of diseases, especially the spread of diseases mediated by mosquito vectors. The occurrence of malaria because the parasite in the mosquito's body, at a suitable temperature parasites can berkembang quickly. Adult mosquitoes and the

malaria parasites multiply very rapidly at a temperature of about 20-27 °C with a humidity of 60-80%, the optimum temperature ranges between 20–30 °C. The higher the temperature (to some extent) the shorter the extrinsic incubation period (Sporogonic cycle in the mosquito's body). The people most at risk of contracting malaria are children under five, pregnant women and non-immune populations (people who do not have immunity so that they do not have natural defenses against malaria infections) who visit malaria endemic areas such as refugees, transmigrants and tourists ^[9] (2)

The factor of increasing malaria cases is not only directly affected by the climate, but by the intensity of vector bites. High humidity affects mosquitoes to become more active and bite more often, thus increasing malaria transmission. Low humidity shortens the life of mosquitoes, although it has no effect on parasites. Humidity affects the survival and habits of mosquitoes to suck. Low humidity will shorten the life of mosquitoes, whereas high humidity prolongs the life of mosquitoes. At higher humidity, mosquitoes will become more active and bite more often (Suwito *et al.* 2010) ^[11].

2. Material and Method

This research is descriptive with cross sectional study design (cross-sectional), to get an idea of the effect of climate change on the incidence of malaria in Gowa of South Sulawesi in 2017. The research data using secondary data obtained from the monthly report data Malaria Gowa District Health Office South Sulawesi province in 2017. The data analysis using Microsoft Exell by univariate analysis. The samples in this

study was the incidence of malaria in 25 health centers and hospitals in Gowa district.

3. Result

Table 1 shows that the incidence of malaria occurred in Puskesmas Kampili with a one-year incidence rate of 87 cases. The Districts with the lowest incidence rate of the PHC Tamaona, Bontolempangan, Tonrorita, Lauwa and batuma'lonro with no cases. As based on the month, the highest malaria incidence in 2017 occurred in March with the incidence of 81 cases. Followed by June with the incidence of 80 cases. While the lowest incidence occurred in October with the incidence rate of 40 cases.

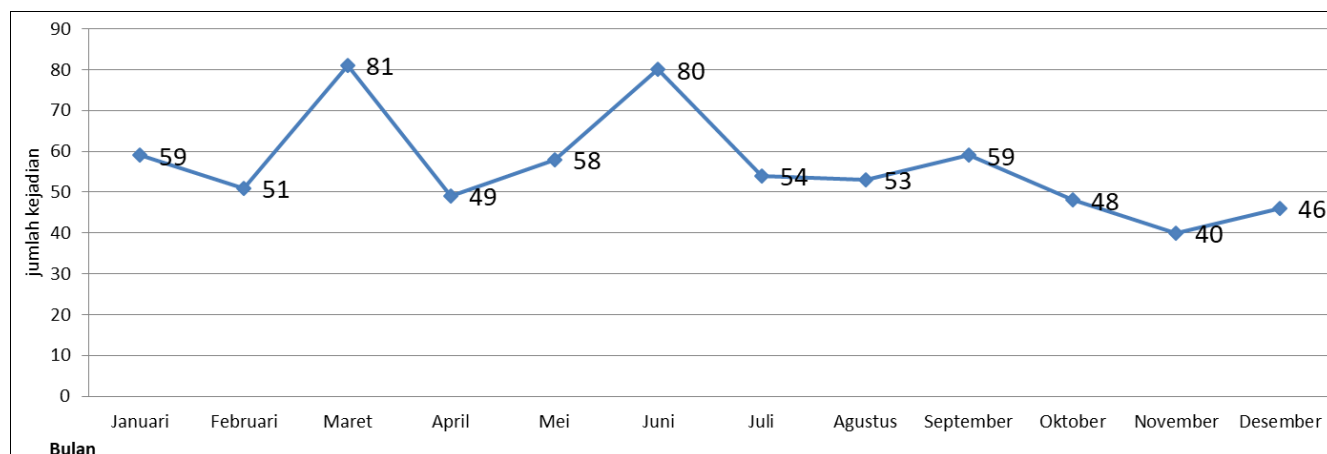
Fig 1 shows that the incidence of malaria occur sporadically changes from month to month. An increase in cases of significant every 3 months i.e. in March, June and September. Where peak malaria incidence occurred in March with the number of events 81 cases. The rainy season in 2017 occurred sporadically uncertain, but based on Sulawesi BMKG forecast peak rainy season in Gowa from October to April.

The peak incidence of malaria in Gowa that occurred in March still in the peak rainy season in the Gowa. The significant reduction of malaria cases occur in April, July and November. In April start entering the dry season and July is the dry season, anopheles breeding Nyamuk began to decline. While in November the rains early in the season, so the new mosquito breeding puddles started because not many. In April into May as well as the incidence of malaria has remained relatively constant in July to August. The results can be seen in the table and Fig below.

Table 1: Event numbers of malaria in the work area district health department Gowa per month in 2017

No.	PHC	Incidents per month												Total
		January	February	March	April	May	June	July	August	September	October	November	December	
1	Sombaopu	2	2	0	2	3	3	3	5	1	3	1	2	27
2	Samata	2	1	4	1	2	4	2	2	1	4	2	2	27
3	Palangga	2	1	2	0	2	5	5	2	4	0	3	1	27
4	Kampili	13	16	12	9	5	6	5	5	5	5	3	3	87
5	Mancobalang	0	0	0	0	0	0	0	0	1	0	0	0	1
6	Kanjilo	1	2	3	0	1	3	2	2	2	2	1	2	21
7	Bajeng	7	5	5	0	2	11	5	6	7	13	7	11	79
8	Pabbentengan	2	2	3	3	1	2	3	1	4	2	2	3	28
9	Gentungan	3	0	3	3	2	5	1	3	5	3	2	2	32
10	I Bontonompo	7	5	4	0	7	4	3	4	5	0	4	4	47
11	Bontonompo II	8	6	14	0	4	9	3	3	7	7	2	5	68
12	Bontomarannu	2	1	2	2	3	6	4	5	4	1	2	2	34
13	Pattallassang	0	2	2	2	2	2	1	1	0	0	1	1	14
Districts														
14	Paccellekang	1	1	2	2	0	0	0	0	0	0	0	0	6
15	Parangloe	0	2	5	5	5	2	2	3	1	1	0	0	26
16	Manuju	0	0	0	0	2	2	3	0	0	0	0	0	7
17	Tinggimoncong	2	1	3	3	6	4	5	2	3	3	2	1	35
18	Parigi	2	2	1	1	2	0	0	0	0	1	2	1	12
19	Tamaona	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Sapaya	0	0	0	0	0	3	1	4	2	2	2	2	16
21	Bontolempangan	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Tompobulu	5	2	8	8	6	4	3	4	4	1	2	1	48
23	Tonrorita	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Lauwa	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Batuma'lonro	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Hospital	0	0	8	8	3	5	3	1	3	0	2	3	36
amount		59	51	81	49	58	80	54	53	59	48	40	46	678

Source: Secondary Data (Monthly report Kab. Gowa Malaria Health Office, 2017)



Source: Secondary Data (Monthly report Kab. Gowa Malaria Health Office, 2017)

Fig 1: Malaria trend in Gowa during 2017

4. Discussion

In this study, it was found the highest incidence of malaria occur in Puskesmas Kampili (Table 1) with a number of events 87 cases. The working area of this clinic is adalah Kampili Village, District Palangga, and. In Puskesmas Kampili the dam are irrigation facilities by the community. These dams can be a breeding ground for anopheles mosquito, which can affect the incidence of malaria in Puskesmas Kampili. Alethea results of research conducted in 2016 in the city of Bandar Lampung show that there is a relationship between land use and land irrigated river sengai malaria incidence.

Results of research conducted in Ethiopia by Yewhalaw *et al.*, in 2013 found that climate change / season effect on the incidence of malaria in an area. The results of this study also found that an increase in cases of malaria in the rainy season (March and June). In March the peak incidence of malaria in Gowa which is still in the peak months of the rainy season. This indicates that the rainy season affects an increase in cases of malaria. It was also found by Sulasmi, *et al.* on research conducted in Borneo in 2016. Sulasmi *et al.* found that rainfall optimum support increased incidence of malaria seen from the number of cases and the need to increase awareness on wet month (the month of February to May). Another study also found that the effect of the change of seasons with the malaria incidence study conducted by Midekisa *et al.* in Ethiopia in 2015. However, this result is not consistent with the results of research conducted by Mohammadkhani, Minoo, *et al.* in 2016 in Iran. They found that precipitation had no effect on the incidence of malaria, but the effect on the incidence of malaria is the temperature. Research conducted by Gunda, *et al.* 2016 in rural Zimbabwe shows that there is much influence malaria incidence occurred in urban areas with temperature. Mohammadkhani research results are also similar to the results of research Alethea, in London in 2016. Alethea found that there is a relationship between rain falls to the incidence of malaria.

In May-June, according BMKG Moon had entered the dry season but in the still rain although not routine in Gowa, so that in June an increase in the incidence of malaria by 80 cases (Fig, 1). Many puddles disebabkan by rain into Anopheles Mosquito breeding sites, with an average breeding period 7-14

days, it is very possible for mosquitoes multiply quickly. The incubation period of plasmodium falciparum and vivax which is between 9-17 days has led to the discovery of cases of malaria even though not in the rainy season. The results of this study, shown that the fluctuations in the rainy season effect to the increase in cases of malaria due to changes in humidity and rainfall. This is in line with research Suwito, *et al.* 2017 that humidity and rainfall has a significant relationship with the density of Anopheles mosquitoes, and will be positively correlated with the incidence of malaria. According Munif, *et al.*, temperatures will affect the development of the parasite in the mosquito's body, the optimum temperature range between 200C - 300C, the higher temperatures will result in extrinsic incubation period is getting shorter, and vice versa. The same thing dikemukakan by Arson AA, i.e., low air humidity will shorten the lifespan of mosquitoes, although the effect on the parasite. At humidity tingg lead more active nyamuk bite so that correlates with an increase in malaria transmission. While the level of humidity of at least 60% allow mosquitoes to survive. and will be positively correlated with the incidence of malaria. According Munif, *et al.*, temperatures will affect the development of the parasite in the mosquito's body, the optimum temperature range between 200C - 300C, the higher temperatures will result in extrinsic incubation period is getting shorter, and vice versa. The same thing dikemukakan by Arson AA, i.e., low air humidity will shorten the lifespan of mosquitoes, although the effect on the parasite. At humidity tingg lead more active nyamuk bite so that correlates with an increase in malaria transmission. While the level of humidity of at least 60% allow mosquitoes to survive and will be positively correlated with the incidence of malaria. According Munif, *et al.*, temperatures will affect the development of the parasite in the mosquito's body, the optimum temperature range between 200C - 300C, the higher temperatures will result in extrinsic incubation period is getting shorter, and vice versa. The same thing dikemukakan by Arson AA, i.e., low air humidity will shorten the lifespan of mosquitoes, although the effect on the parasite. At humidity tingg lead more active nyamuk bite so that correlates with an increase in malaria transmission. While the level of humidity of at least 60% allow mosquitoes to survive. The higher temperatures will result in extrinsic incubation period is getting shorter, and vice

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5. Conclusion

Conclusion of this research is that climate change has an influence on the incidence of malaria. Thus, needs to be done to prevent and control malaria by P2PL particular section of mosquito breeding sites / environment and vector surveillance. This study was a descriptive study therefore it is necessary to do a deeper analysis to determine the cause of the rising incidence of malaria dropped in Gowa. Also needs to be studied on human activities outside the home and the effect of temperature on the anopheles mosquito breeding.

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