

## RELATIONSHIPS OF THE IMPLEMENTATION OF A 3M PLUS PROGRAM AND THE EXISTENCE OF AEDES AEGYPTI LARVAE TOWARDS THE NUMBER OF DENGUE FEVER CASES IN THE PUBLIC HEALTH CENTER OF TIGO BALEH BUKITTINGGI, WEST SUMATERA, INDONESIA

Syukra Alhamda\*

Polytechnic of Health of Padang, Ministry of Health of Indonesia

**Accepted:** 1 September 2017

**\*Correspondence:**

**Syukra Alhamda**

Polytechnic of Health of Padang, Ministry of Health of Indonesia

E-mail: [syukra.alhamda@poltekkespadang.ac.id](mailto:syukra.alhamda@poltekkespadang.ac.id)

**Copyright:** © the author(s), YCAB publisher and Public Health of Indonesia. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Dengue fever in Tigo baleh Bukittinggi community is one of the infectious diseases resulting in serious health problems. Understanding the factors associated with the disease is necessity.

**Objective:** To determine the relationships of the implementation of 3M plus program and the existence of Aedes aegypti larvae towards the number of dengue fever cases in the public health center of Tigo Baleh Bukittinggi, West Sumatera, Indonesia.

**Methods:** This was a case control study conducted between January and December 2016 in the Public Health Center of Tigo Baleh Bukittinggi. There were 78 samples recruited by total sampling, with 39 were assigned in the case and control group. House index (HI) and Container index (CI) were used to measure the presence of Aedes aegypti larvae. The implementation of 3M plus program was measured using questionnaire developed by the researcher. Chi Square was performed for data analysis.

**Result:** Findings showed that house index value was 43.6% and container index was 17.9%. The presence of larvae at home contributes to 24 (61.5%) cases of DHF in the case group and 10 (25.6%) cases in the control group. Poor implementation of the program contributes to 27 (69.2%) cases in the case group and 17 (43.6%) in the control group. Chi square test showed  $p = 0.040$  ( $<0.05$ ) for the 3M plus implementation and  $p = 0.03$  ( $<0.05$ ) for the presence of Aedes aegypti.

**Conclusion:** There were significant associations between the implementation of 3m plus program and the existence of Aedes aegypti larvae towards the number of dengue fever cases in the public health center of Tigo Baleh Bukittinggi, West Sumatera, Indonesia. It is suggested that the community should do more efforts to prevent the occurrence of DHF through mosquito nest eradication, such as the implementation of 3M Plus and sanitation efforts, and pay attention to any places that potentially become a breeding ground for Aedes aegypti mosquitoes.

**Key words:** Dengue fever, Aedes aegypti, Larvae, 3M plus

## BACKGROUND

The progress of the national development in Indonesia has an impact on the health sectors despite the recent economic crisis. The future of Indonesian society to be achieved through health development include all organizations, institutions, and resources whose primary purpose is to promote, restore and/or maintain health,<sup>1</sup> as inclusive of health promotion, prevention, cure, rehabilitation, which is integrated and implemented with traditional health service efforts.<sup>2</sup>

To achieve optimal public health status, the eradication program focuses on preventing disease, reducing morbidity and mortality and reducing the adverse effects of infectious and non-communicable diseases. Infectious diseases are still a priority issue in the development of public health in Indonesia. According to Ministry of Health's Decision Letter No.145710 October 2003, a number of infectious diseases is listed as issues that must be a priority by the region. The problem of infectious diseases is still apprehensive, some types of diseases even show a tendency to increase and not successfully overcome, such as pulmonary, malaria, and dengue hemorrhagic fever.<sup>3</sup>

Dengue Hemorrhagic Fever (DHF) is a tropical infectious disease caused by dengue virus and is transmitted through the bite of *Aedes aegypti* mosquito. This disease can attack all people and lead to death.<sup>3</sup> The disease generally affects children under 15, but can also attack adults, and often cause extraordinary events or outbreaks.<sup>4</sup>

In Indonesia, DHF emerges as an outbreak for the first time found in Surabaya in 1968. Data shows that Asia ranks first in the number of patients with DHF each year. Meanwhile, from 1968 to 2009, the World Health Organization (WHO) noted Indonesia as the country with the highest dengue fever case in

Southeast Asia and the second highest in the world after Thailand.<sup>5</sup>

In the last 5 years the number of cases and infected areas has been increasing and widespread. It is estimated that every year there are 300 million cases in Indonesia, with 500,000 cases of dengue require hospitalization and at least 12,000 of them die, especially children.<sup>5</sup>

DHF prevention and eradication program has lasted for approximately 43 years and succeeded in reducing mortality from 41.3% to 0.87% in 2010, but has not succeeded in reducing morbidity. The number tends to increase, spread more broadly, and attack to not only children but also older age group<sup>3</sup>. In August 2011, there were 24,362 cases recorded with 196 deaths. While in 2012 the number of DHF patients in Indonesia reported as many as 90,245 cases with 816 deaths. In line with the increase in number / morbidity, the number of districts / cities affected by dengue fever in 2012 also increased from 374 (75.25%) to 417 districts / cities (83.9%).<sup>6</sup>

Ministry of Health mentioned that Indonesia is still a hotbed of dengue fever or already endemic. Until the middle of this year, dengue fever cases occurred in 31 provinces with 48,905 people, 376 of whom died. The number of dengue fever patients in the first half of this year shows an increase compared to last year.<sup>7</sup>

To overcome dengue problems in Indonesia, since 2004 the Ministry of Health has worked closely with Provincial Health Office and District Health Offices to implement a national program of dengue hemorrhagic fever prevention. The program includes epidemiological surveillance / early alert system and outbreak response, counseling, vector eradication for adult mosquitoes by spraying, focusing and periodic larva examination, larval validation and vector surveys. In addition, cross-program

cooperation through Pokjanal DHF and 3M movement period, treatment/case management including doctor training and procurement of suggestions for buffer stock.<sup>8</sup>

Based on West Sumatera Provincial Health Profile in 2012, there were several regencies / cities in West Sumatera that belong to dengue endemic areas of Padang City with 1,626 cases per 100,000 population (male 868 cases and female 758 cases), Pesisir Selatan Regency with 634 cases per 100,000 population (male 305 cases and female 329 cases), Kota Bukittinggi with 107 cases per 100,000 population (male 54 cases and female 53 cases).

Preliminary study in Bukittinggi showed that, between 2010-2013, it has been recorded that cases of dengue from year to year have increased. In 2010, there were 83 cases, decreased in 2011 to 68 cases, and in 2012 increased to 107 cases, and 142 cases in 2013. Public Health Center (PHC) that has the highest cases of DHF is PHC Tigo Baleh with 39 cases.

Bukittinggi geographically consists of 3 sub districts, with Aur Birugo Tigo Baleh is the smallest sub district, which has an area of 6.25km<sup>2</sup>, consisting of 8 sub areas as the working areas of PHC Tigo Baleh. In 2013, it was reported that dengue fever has be spread in these 8 sub areas. However, PHC Tigo Baleh supported by the local government made various efforts in overcoming the emergence of cases of dengue fever by doing a variety of counseling about the dangers, prevention and control of *Aedes aegypti* through the program of 3M plus, which is the most important effort, easy and cheap.

The 3M Plus is a basic action that consists of to drain, to cover, and to bury or reuse. The first act is to drain water reservoirs such as bathtubs, buckets of water, drinking water reservoirs, storage in refrigerators and so on. Secondly, covering

items like drums and water storage cistern. Thirdly, bury or utilize/recycle used goods that can be potentially used by the dengue mosquitoes in laying their eggs. While Plus includes all forms of prevention, such as to apply powder of larvicides in water tanks which are difficult to clean, to use mosquito repellents or utilizing mosquito nets while sleeping, keeping fish predators to consume mosquito larvae, to grow mosquito repellent plants, to adjust light and ventilation in our house, to stop hanging used clothes in the house and to maintain the environment hygiene.<sup>9</sup> In addition, regular larva monitoring activities are also routinely conducted through trained jumantik cadres, as well as spreading abate powder in schools, public places and houses with positive larva.

However, these efforts to eradicate the DHF vector have not shown the optimal results. In fact, the cases of DHF are still high and increased every year in the working area of PHC Tigo Baleh. Therefore, this study aims to determine the relationships of the implementation of 3m plus program and the existence of *Aedes aegypti* larvae towards the number of dengue fever cases in the public health center of Tigo Baleh Bukittinggi, West Sumatera, Indonesia.

## METHODS

### *Design*

This was a case control study conducted between January and December 2016 in the Public Health Center of Tigo Baleh Bukittinggi. The dependent variable was the number of dengue fever cases, and the independent variables were the existence of *Aedes aegypti* larvae and the implementation of 3M plus program.

### *Research subjects*

There were 78 samples recruited by total sampling, with 39 were assigned in the

case and control group. Those tested positive for dengue fever were included in the case group.

*Measure*

The existence of *Aedes aegypti* mosquito larva was measured using *House index (HI)*: percentage of houses infested with larvae and/or pupae; and *Container index (CI)*: percentage of water-holding containers infested with larvae or pupae. The implementation of 3M plus program was measured using questionnaire developed by the researcher. Good validity and reliability of the instrument was identified. The criteria of the results consist of good and bad implementation.

*Data collection*

Data were collected by semi-structured interview with the questionnaire and observation of the condition and situation

of the participants' houses by the researchers.

*Data analysis*

Chi Square was used for data analysis.

*Ethical consideration*

Study permission was obtained from the Public Health Center of Tigo Baleh Bukittinggi. The researcher has confirmed that each respondent has obtained an appropriate informed consent.

**RESULTS**

Findings of this study found that house index value was 43.6%, which indicated high-density figure; while the container index was 17.9%, indicated medium density. This result is supported by the number of cases of dengue fever amounted 39 cases and one death, with case fatality rate (CFR) of 3.1%.

**Table 1.** Relationship of the existence of *Aedes aegypti* larvae and the dengue fever cases using Chi-Square

The presence of larvae	DHF				P value	Odds Ratio (OR)	CI 95%
	Cases		Control				
	f	%	f	%			
Flicking	24	61.5	10	25.6	0.003	4.640	1.766 – 12.189
No Flicking	15	38.5	29	74.4			
<b>Total</b>	39	100	39	100			

Table 1 shows that the presence of larvae at home contributes to 24 (61.5%) cases of DHF in the case group and 10 (25.6%) cases in the control group; while the absence of larvae contributes to 15 (38.5%) cases in the case group and 29 (74.4%) cases in the control group. Chi square test showed p-value 0.003 (<0.05), which indicated that there was a statistically

significant association between the presence of larvae and the number of dengue fever cases. In addition, Odds Ratio (OR) showed value of 4.64, which indicated that the home with the presence of mosquito larvae was at risk 4.64 times suffering from DHF compared to homes having no larvae.

**Table 2.** Relationship of the implementation of 3M plus and the number of dengue fever cases

Implementation of the 3M Plus program	DHF				P value	Odds Ratio (OR)	CI 95%
	Cases		Control				
	f	%	f	%			
Poor	27	69.2	17	43.6	0.040	2.912	1.150 – 7.272
Good	12	30.8	22	56.4			
<b>Total</b>	39	100	39	100			

Table 2 shows that the good implementation of the 3M plus program contributes to 12 (30.8%) cases in the case group and 22 (56.4%) in the control group; while poor implementation of the program contributes to 27 (69.2%) cases in the case group and 17 (43.6%) in the control group. Chi square test showed p-value 0.040 (<0.05), indicated that there was a statistically significant association between the implementation of 3M plus and the number of dengue fever cases. In addition, Odds Ratio (OR) showed value of 2.912, indicated that those who had poor implementation of the 3M plus program were at risk 2.912 times at risk suffering from DHF compared to those who had good implementation of 3M Plus.

## DISCUSSION

Findings of this study showed that there were significant relationships of the implementation of 3M plus program and the existence of *Aedes aegypti* larvae towards the number of dengue fever cases in the public health center of Tigo Baleh Bukittinggi, West Sumatera, Indonesia. These results were in line with previous study revealed that the presence of larvae has a significant relationship with the occurrence of dengue disease in Binjai district.<sup>10</sup>

Fibriana also found that there is a relationship between the presences of *Aedes aegypti* larvae with the incidence of dengue hemorrhagic fever. Thus, there is a relationship between the implementation of the action close, drain and pile up with the incidence of dengue hemorrhagic fever; it is therefore recommended that people do activities such as mosquito eradication regularly.<sup>11</sup>

Whereas, geographically, Bukittinggi is predicted not to be a dengue endemic area because its altitude is more than 900 meters above sea level, where at the height

the *Aedes aegypti* mosquito cannot breed. In fact, this study found the larva existence.

On the other hand, house index is one of the indicators used to calculate the risk of the spread of disease. This index gives the percentage of positive houses and instructions for the proliferation of human populations at risk of dengue fever. Container index reveals the percentage of positive containers of *Aedes aegypti* larvae. Areas that have little positive containers larvae are epidemiologically important because they produce larvae in large quantities.<sup>11</sup> Yudhastuti<sup>12</sup> found that the density of *Aedes aegypti* mosquito larvae as measured by the parameters; HI= 58%, CI = 30,6%, BI = 82% and DF = 7, indicated faster and easier transmission of dengue hemorrhagic fever.

The results of this study also revealed that HI and CI with high density, which is therefore recommended that people need to perform sustainable activities such as action close, drain and pile up activities regularly for mosquito eradication.<sup>11</sup>

Besides, the good implementation of 3M plus program seems to be effective in reducing the DHF cases. Therefore, it is necessary to increase the motivation to make the community more effective in implementing 3M plus through providing mutual assistance to clean up the environment given by local government officials, such as the Head of Sub district. In addition to increased motivation, coaching also needs to be done on community groups, such as youth, adolescent and youth mosques in order to increase preventive measures in the form of regular implementation of 3M Plus.

## CONCLUSION

It can be concluded that there were significant associations between the

implementation of 3m plus program and the existence of *Aedes aegypti* larvae towards the number of dengue fever cases in the public health center of Tigo Baleh Bukittinggi, West Sumatera, Indonesia. It is suggested that the community should do more efforts to prevent the occurrence of DHF through mosquito nest eradication, such as the implementation of 3M Plus and to carry out environmental sanitation efforts and pay attention to any places that potentially become a breeding ground for *Aedes aegypti* mosquitoes. In addition, PHC is expected to conduct more intensive and continuous extension activities and health promotion on dengue fever both individually and groups as an effort to increase the behavior and increase periodic larva monitoring activity.

## REFERENCES

1. Departemen Kesehatan RI. Indonesia sehat 2010. *Visi Baru, Misi, Kebijakan dan Strategi Pembangunan Kesehatan*. Jakarta. 1999.
2. World Health O. Health systems strengthening glossary. *Geneva: World Health Organization*. 2013.
3. Sukowati S. Masalah vektor demam berdarah dengue (DBD) dan pengendaliannya di Indonesia. *Buletin Jendela Epidemiologi*. 2010;2(1):26-30.
4. Timmreck T. *Epidemiologi suatu pengantar*2004.
5. Sumarmo PS. Masalah demam berdarah dengue di Indonesia. *Dalam: Sri Rezeki HH, Hindra IS. Demam berdarah dengue. Naskah lengkap. Pelatihan bagi pelatih dokter spesialis anak & dokter spesialis penyakit dalam dalam tatalaksana kasus DBD*. Balai Penerbit Fakultas Kedokteran Universitas Indonesia. Hal. 1999:1-12.
6. Indonesia KKR. *Profil Kesehatan Indonesia tahun 2013* Jakarta: Depkes RI. 2014.
7. Kurniati D. *Kemenkes: Indonesia Masih Endemis Demam Berdarah 2013*; <https://nasional.tempo.co/read/news/2013/07/26/173500085/kemenkes-indonesia-masih-endemis-demam-berdarah>. Accessed August 15th, 2017.
8. Presiden RI. *Undang-Undang Republik Indonesia No. 36 Tahun 2009 Tentang Kesehatan*. *Presiden Republik Indonesia, Jakarta*. 2009.
9. Vale. *3M Plus campaign to eradicate Dengue Fever 2014*; [http://www.vale.com/indonesia/EN/aboutvale/news/id/Pages/3m\\_plus\\_campaign\\_to\\_eradicate\\_dengue\\_fever.aspx](http://www.vale.com/indonesia/EN/aboutvale/news/id/Pages/3m_plus_campaign_to_eradicate_dengue_fever.aspx). Accessed September 15th, 2017.
10. Parida S, Dharma S, Hasan W. Hubungan Keberadaan Jentik *Aedes aegypti* dan Pelaksanaan 3M Plus dengan Kejadian Penyakit DBD di Lingkungan XVIII Kelurahan Binjai Kota Medan Tahun 2012. *Lingkungan dan Kesehatan Kerja*. 2013;2(2).
11. Aji R, Totong M, Kamaluddin S. Environmental factors and indices related to dengue vector larva in Rejang Lebong District. 2016.
12. Yudhastuti R, Vidiyani A. Hubungan kondisi lingkungan, kontainer, dan perilaku masyarakat dengan keberadaan jentik nyamuk *Aedes aegypti* di daerah endemis demam berdarah dengue Surabaya. *Jurnal Kesehatan Lingkungan*. 2005;1(2).

**Cite this article as:** Alhamda S.  
Relationships of the Implementation of a  
3M Plus Program and the Existence of  
Aedes Aegypti Larvae towards the  
Number of Dengue Fever Cases in the  
Public Health Center of Tigo Baleh  
Bukittinggi, West Sumatera, Indonesia.  
Public Health of Indonesia  
2017;3(3):131-137