

Modified Ovitrap Model and Social Community System Study to Reduce *Aedes aegypti* Density in Pematang Siantar City

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Abstract— Based on data from Health Department of Pematangsiantar, its House Index (HI) was 65.7%. This condition requires attention for the *Aedes aegypti* mosquito control with the use of egg traps (ovitrap). The ovitrap can be modified by adding abate or natural products such as chili as attractant. The research conducted in East Siantar Districts of Pematang Siantar City with two activities, namely ovitrap modification using abate, chili solution and untreated by using quasi experiment methods. The total sample of 40 houses analyzed by the McNemar test and analyzed the data collection of social studies.

Based on the results of McNemar test toward control group (untreated) showed no association the existence of larva before it is treated with the presence of larvae on week I and II. In each group that used ovitrap abate and chilli solution there was a relationship between the presence of larvae before treatment with the presence of larvae on week I and II with a significant value, $p = 0,001$. Based on data from the community social study, mostly the respondents were knowledgeable and nice attitude.

Modification ovitrap using abate and chili as attractants were effectively reduce the presence of mosquito larvae. It is necessary to continue the socialization and the development of other models ovitrap modifications.

Keywords— Modified Ovitrap Model, Social Community Study

I. INTRODUCTION

Dengue Haemorrhagic Fever (DHF) is one of several communicable disease that has been being public health problem in worldwide particularly in developing country. DHF was emerged first time at 1968 in Surabaya, Indonesia. From that time, disease caused by Dengue virus has spreaded to all provinces in Indonesia and being a significant public health problem. DHF, transmitted by *Aedes Aegypti* is spreading rapidly and potentially cause of death [8].

DHF outbreak still commonly happen in various area in Indonesia. At 1998 there was an outbreak with the number of 720133 people and it was the biggest outbreak with 1.411 deaths or 1.956% of

Case Fatality rate (CFR). An outbreak in 2004, started from January until April there were 58.861 patients and 669 deaths (CFR:1.14%). Later in 2005, there were 3.336 patients and 55 deaths *es aegypti* and associated with environment sanitation by availability of breeding place, such as container that filled up by water (bathtub, cans, and the other water reservoir). Those conditions exacerbated by the lack of understanding DHF and also society participation was minimum, seen by poor environmental conditions and facilitate the growth of mosquitos [2]. DHF mitigation have such as dengue virus, host, and affecting environment factors include breeding place. *Aedes aegypti* likes water reservoirs with clean and clear water which many around the population [7].

The existence of *Aedes aegypti* larvae in an area is a presence of indicator. In order to eradicate DHF necessary knowledge about *Aedes aegypti* biologically to control its population. Container Index (CI), House Index (HI), and Breteau Index (BI) are some of indicators measuring the eggs, larvae, pupae and mosquito that connected with DHF case in endemic area [9].

Pematang Siantar city is one of endemic places in North Sumatera Province. Based on Pematang Siantar City's health profile 2012, showed that during the last 5 years, DHF case and mortality was increasing. In 2007, IR 234 per 100.000 population with CFR 2.23%, in 2008 decreased to 195 per 100.000 population with CFR 1.44%, in 2009 increased significantly 245.8 per 100.000 population with CFR 1.13%, in 2010 increased to 254 per 100.000 population with CFR 2.27%, and in 2011

decreased to 254 per 100.000 with CFR 1.82%. Those conditions showed that there were fluctuation in the case of DHF permanently in Pematang Siantar City. Based on it, IR and CFR Pematang Siantar City has exceeded national indicator, IR must be 50 per 100.000 population and CFR <1%.

The effort have been made by Pematang Siantar City to control DHF such as precaution and mitigation DHF socialization, abate giving to society by health officer, fogging in appropriate area, and increased epidemiology surveillance (*Community Based Surveillance and Hospital Based Surveillance*) [3].

To control the larvae do disappearance of breeding place, 3M (drain, close, pile up). Based on the preliminary survey, 3M could not be done by the society because the water distribution was not enough [6].

There is a way that have been successful to control vector density in some countries are using egg traps (ovitrap). Ovitrap is a tool to attract mosquitoes to lay their eggs. When the eggs developed into adult mosquitoes, they would be trapped in ovitrap, and dead. To maximize ovitrap in vector control, then do some modifications to the ovitrap. Based on Profil Dinas Kesehatan Kota Pematang Siantar (2013) has been found of *House Index* (HI) 65,7%.

One of the ways to control *Aedes aegypti* which is able to decrease density of vectors in several countries by using egg traps (ovitrap). Ovitrap is an equipment to attract mosquitos to spawn in the ovitrap. When the egg grow up to be a mosquito, it will trapped in the ovitrap and causing of death. Ovitrap can be maximalize to control *Aedes aegypti* in order to do some modification of ovitrap. Based on research [5], using the ovitrap that has been modification by using abate (temephos) can decrease the number of *Container Index* (CI) 5,33% and *House Index* (HI) 7,74%. Ovitrap modification can be lethal by adding sort of insecticides on ovitrap, efectivity 45-100 percent.

Ovitrap installation by adding abate has several drawbacks such as society concerns against the negative impacts of chemical constituents, hardly found the abate, and prices are less affordable. Therefore, required replacement of abate with a natural substance and easy-to-get by the society. Attractant is something that can attract mosquitoes to

approach breeding place. Attractant can be used to influence behavior, monitoring or decreasing mosquitoes population directly without causing injury to other animals and human does not leave residues on food.

Various types of plants can be used as attractants such as rice straw, red chili, garlic, etc. Red chili is a basic seasoning that always available in every house and can be used as ovitrap attractant because it produces ammonia, CO₂, lactic acid, octanol, and fatty acid after going through soaking process for 7 days [10].

The effort to reduce DHF by decreasing mosquitoes density will not work without society participation and health officer. Therefore, commitment and participation of government are very important and needed to be motivation in applying a new inovation to decrease DHF case.

II. METHODS

This study implemented in Merdeka Subdistrict, Siantar Timur District Pematang Siantar City with 2 actions, modificating ovitrap by using abate, chili solution and untreated by using *quasi* experiment methods. Observations were made by the larva survey at houses before treated, 1 week and 2 weeks after treated. Then collecting data of social studies.

Data will be analyzed quantitatively and qualitatively. Quantitative data used Mc Nemar test to know significant average difference (μ) between each samples with degrees of confidence 95%.

III. RESULT AND DISCUSSION

Merdeka subdistrict is one of subdistrict in Siantar Timur District, with a total area 0.2300 Km² and had population of 11.849 people. Merdeka Subdistrict have boundaries, north bordered with Asahan Subdistrict, South bordered with Pahlawan Subdistrict, East bordered with Siopat Suhu Subdistrict and West bordered with Pardamuan Subdistrict.

Based on health profile of Merdeka Subdistrict 2013, the number of residents in the area are 4.335 people, 2.034 men and 2.301 women. The number of households by 625 families.

Based on observation, the existance of larvae in house's containers.

TABLE I
LARVA SURVEY RESULTS BEFORE OVITRAP MODIFICATION AND SOCIAL
COMMUNITY SYSTEM STUDY TO REDUCE *Aedes Aegypti* DENSITY IN
PEMATANG SIANTAR CITY

Question		Total	
		n	%
The existence of Larva	Present	92	76.6
	No	28	23.3
Total		120	100

Table I shows HI 76.6% and Larva Free Index (LFI) 23.3%. It shows mosquitoes density in Merdeka Subdistrict still high above HI average number, 95% to each subdistricts.

TABLE II
FREQUENCY DISTRIBUTION OF RESPONDENTS CHARACTERISTICS IN OVITRAP
MODIFIED MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE
Aedes Aegypti DENSITY IN PEMATANG SIANTAR CITY

No	Characteristics of Respondents		Total	
			n	%
1	Age	19-30	14	11.7
		31-40	29	24.1
		41-50	33	27.5
		51-60	21	17.5
		≥ 60	23	19.2
		Total	120	100
2	Education	Primary School	7	5.8
		Junior High School	17	14.2
		Senior High School	62	51.7
		Diploma	11	9.2
		Bachelor	23	19.2
		Total	120	100.0
3	Occupation	Government employees	21	17.5
		Private Employees	7	5.8
		Entrepreneur	48	40.0
		Unemployee	8	6.7
		Retired	14	11.7
		Housewife	15	12.5
		Student	3	2.5
		Etc	4	3.3
		Total	120	100.0
4	Income	1.000.000-2.000.000	41	34.1
		2.000.000-3.000.000	53	44.2
		≥ 3.000.000	26	21.7
		Total	120	100.0

Table II shows respondents characteristics by age, 41-50 years old (27.5%); by education level, Senior High School (51.7%); by occupation (40%); and average respondent income, Rp.2.000.000 – Rp.3.000.000/ month.

TABLE III
FREQUENCY DISTRIBUTION OF RESPONDENT QUESTION IN OVITRAP
MODIFIED MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE
Aedes Aegypti DENSITY IN PEMATANG SIANTAR CITY

No	Question		Total	
			n	%
1	Have family members suffered by DHF	Ever	29	24.2
		Never	91	75.8
Total			120	100
2	Have you ever heard of DHF prevention?	Ever	90	75.0
		Never	30	25.0
Total			120	100
3	If counseling is done in your area, are you willing to attend	I will	93	77.5
		I will not	27	22.5
Total			120	100
4	Who is the most actively inform about DHF prevention	Officer	88	73.3
		Public Health	11	9.2
		Centre	0	0
		Cadre	13	10.8
		Non-governmental organization		
		Subdistrict Head	0	0
		Public Figure	2	1.7
		Family	6	5.0
Total			120	100

Table III shows respondents recognition who had suffered DHF 24.2%. 75% to respondents who ever heard DHF prevention. 77.5% respondents are willing to attend counseling and the most actively inform about DHF prevention is Health Officer, 73.3%.

TABLE IV
FREQUENCY DISTRIBUTION OF DHF PREVENTION INFORMATION RESOURCES
IN OVITRAP MODIFIED MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO
REDUCE *Aedes Aegypti* DENSITY IN PEMATANG SIANTAR CITY

No	Question		Total	
			n	%
1	If ever, where did you get the information	HealthOfficer	49	54.4
		E-Media	35	38.9
		Cadre	6	6.7
Total			90	100

Table IV shows frequency distribution of information resources of DHF prevention are health officer 54.4%, e-media 38.9%, and cadre 6.7%.

TABLE V
DISTRIBUTION OF KNOWLEDGE QUESTION RESPONDENT IN OVITRAP
MODIFIED MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE
Aedes Aegypti DENSITY IN PEMATANG SIANTAR CITY

No	Question		Total	
			n	%
1	Do you know about DHF	I do I do not	96 24	80 20
Total			120	100
2	Do you know what the cause of DHF	I do I do not	89 31	74.2 25.8
Total			120	100
3.	Do you know that DHF can be contagious	I do I do not	86 34	71.7 28.3
Total			120	100
4	Do you know where mosquitoes lay their eggs	I do I do not	81 39	76.5 32.5
Total			120	100
5	Do you know how to control <i>Aedes aegypti</i>	I do I do not	87 33	72.5 27.5
Total			120	100

Table V shows for the second question of knowledge about cause of DHF 74.2%. Many people believe DHF is not contagious disease 28.3%. From conducted interviews, 76.5% respondents have known the breeding place of *Aedes aegypti* and 72.5% do know how to control *Aedes aegypti*.

TABLE VI
GROUPING RESPONDENT'S KNOWLEDGE DISTRIBUTION IN OVITRAP
MODIFIED MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE
Aedes Aegypti DENSITY IN PEMATANG SIANTAR CITY

No	Knowledge	Total	
		n	%
1	Good	70	58.3
2	Bad	50	41.7
Total		120	100

After grouping respondent's knowledge, 70 respondents with good knowledge (58.3%) and 50 respondents with bad knowledge (41.7%).

TABLE VII
DISTRIBUTION OF RESPONDENT BEHAVIOR IN OVITRAP MODIFIED MODEL
AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE *Aedes Aegypti*
DENSITY IN PEMATANG SIANTAR CITY

No	Question		Total	
			N	%
1	Do you agree, it's necessary to control DHF mosquitos population	I do I do not	116 4	96.7 3.3
Total			120	100
2	Do you agree to drain the tub once a week	I do I do not	111 9	92.5 7.5
Total			120	100

3.	Do you agree to close the water reservoir	I do I do not	90 30	75 25
Total			120	100
4	Do you agree to clean the place that enable to hold water	I do I do not	113 7	94.2 5.8
Total			120	100
5	Do you agree to put abate on bath tub to reduce DHF mosquitos	I do I do not	101 19	84.2 15.8
Total			120	100
6	Do you agree to use chili as abate replacement	I do I do not	104 16	86.7 13.3
Total			120	100
7	Do you agree to survey the larvae once a week	I do I do not	102 18	85 15
Total			120	100

Table VII shows 4 respondents (3.3%) disagree to control mosquitos population and 116 respondents (96.7%) agree to do. 92.5% agree to drain the tub once a week and 75% agree to close the water reservoir. 84.2% of repondents agree to put abate in bath tub to reduce DHF mosquitoes.

TABLE VIII
DISTRIBUTION OF GROUPING REPODENT'S BEHAVIOR IN OVITRAP MODIFIED
MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE *Aedes Aegypti*
DENSITY IN PEMATANG SIANTAR CITY

No	Behavior	Total	
		n	%
1	Good	99	82.5
2	Bad	21	17.5
Total		120	100

After grouping respondent's behavior, 99 respondent (75%) have good behavior and 21 respondent (17.5%) have a bad behavior.

TABLE IX
DISTRIBUTION OF TREATMENT GROUPING AT 1ST WEEK OF OVITRAP
MODIFIED MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE
Aedes Aegypti DENSITY IN PEMATANG SIANTAR CITY

No	Existence of Larva in Initial Condition	Existence of Larva at 1st week		Total	p
		Present	No		
Without treatment					
1	Present	9	6	15	0.508
	No	3	22	25	
Total		12	28	40	
Ovitrap with Abate Attractant					
2	Present	5	11	16	0.001
	No	0	24	24	
Total		5	35	40	
Ovitrap with Chili Attractant					
3	Present	11	27	38	0.001
	No	1	1	2	
Total		12	28	40	

Table IX shows that there is no significant association between the existence of larva in initial condition with existence of larva in 1st week, $p = 0.0508$. Ovitrap with abate attractant shows a significant association between the existence of larva in initial condition with existence of larva at 1st week, $p = 0.001$, so does the ovitrap with chili attractant, $p = 0.001$.

TABLE X
DISTRIBUTION OF TREATMENT GROUPING AT 2ND WEEK OF OVITRAP
MODIFIED MODEL AND SOCIAL COMMUNITY SYSTEM STUDY TO REDUCE
Aedes Aegypti DENSITY IN PEMATANG SIANTAR CITY

No	Existence of Larva in Initial Condition	Existence of Larva at 2nd week		Total	p
		Present	No		
Without treatment					
1	Present	7	8	15	0.227
	No	3	22	25	
Total		10	30	40	
Ovitrap with Abate Attractant					
2	Present	2	14	16	0.001
	No	0	24	24	
Total		2	38	40	
Ovitrap with Chili Attractant					
3	Present	5	33	38	0.001
	No	0	2	2	
Total		5	35	40	

Table X shows that there is no difference between the existence of larva in initial condition with existence of larva in 2nd week, $p = 0.227$. It assumed for this without treatment group. There is a significant association between the existence of larva in initial condition with existence of larva at 1st week, $p = 0.001$ and so does the ovitrap with chili attractant, $p = 0.001$.

From conducted interviews with community shows the participation of health officer, cadre, subdistrict officer and community which still low in preventing DHF transmission. It is based on without treatment data with House Index (HI) 76.6%. based on McNemar test, the effective use of ovitrap by increasing Larva Free Index (LFI) to be 85.5%. This is indicated by each significant value, $p = 0.001$ for using abate and chili as attractant in ovitrap.

IV. CONCLUSION

Interviews result showed that the participation of health officer, cadre, subdistrict officer and community were still low in preventing DHF

transmission. It is based on data of untreated group with House Index (HI) 76.6%. Based on McNemar test, the effective use of ovitrap is by increasing Larva Free Index (LFI) to be 85.5%. This is indicated by each significant value, $p = 0.001$ for using abate and chili as attractant in ovitrap.

Suggestion for this program is an approach to community, religious leaders, and public figure to decrease the number of DHF case through reduction of mosquito density and the next research about the using of attractant to increase the Larva Free Index.

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