COMMUNITY EFFORTS ON DENGUE PREVENTION IN SUKABUMI CITY, WEST JAVA PROVINCE

Upaya Masyarakat Dalam Pencegahan Demam Berdarah di Kota Sukabumi, Provinsi Jawa Barat

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ABSTRAK

Meningkatnya insiden DBD di semua kelompok usia dan jenis kelamin memiliki dampak besar bagi pembangunan karena secara langsung menurunkan produktivitas. Tingginya insiden DBD ini dimungkinkan karena pencegahan kontak yang rendah dan kurangnya kontrol terhadap Aedes sp. Situasi ini berkontribusi terhadap keberlangsungan hidup vektor. Penelitian bertujuan untuk menemukan lokasi potensial yang menjadi tempat penularan dan menggambarkan upaya masyarakat dalam pengendalian vektor DBD di Kota Sukabumi, Provinsi Jawa Barat pada tahun 2012. Penelitian ini menggunakan metode potong lintang yang diawali dengan penemuan kasus DBD dengan penapisan menggunakan uji cepat Non Structural Protein One (NS1) yang mampu mengidentifikasi keberadaan virus dengue pada hari pertama demam. Selanjutnya dari penderita dikumpulkan informasi dugaan lokasi transmisi, dilanjutkan pemeriksaan keberadaan vektor dan upaya pengendalian vektor. Hasil penelitian menunjukkan, kontak langsung dengan fasilitas kesehatan bagi pasien demam berdarah telah dilakukan dengan baik tapi di sisi lain Aedes sp masih banyak ditemukan di tempat-tempat perumahan dan publik tanpa adanya pencegahan kontak dan pengendalian vektor. Sebuah pendekatan yang memadai dianjurkan dalam bentuk mobilisasi masyarakat untuk mengontrol kehadiran Aedes sp di lingkungan secara berkelanjutan dengan didukung oleh peraturan daerah. Perlu peraturan untuk pencegahan Aedes sp dan pemantauan rutin sebagai upaya pengendalian DBD.

Kata kunci: Dengue, pengendalian, pemberdayaan masyarakat, Sukabumi

ABSTRACT

The increasing incidence of Dengue Hemorrhagic Fever (DHF) in all age groups and sexes had a huge impact to community development because it reducesproductivity. The high incidence of DHF was possible because of inadequate prevention and control ofAedessp. These situations contributed to the sustainable existence of a vector. This research aimed to identify locationsas potential places for DHF tranmissionand to explain how community efforts in vector control had been done in Sukabumi city, West Java Province in 2012. This reserach used a cross-sectional method. DHF suspect cases in hospital were examined using Non Structural Protein One (NS1) to determined positive cases and followed by collecting informationon transmission location, vector availability and community prevention effort were obtained from the person who had positive NS1. Result of this research showed that immediate contact with healthcare facilities for dengue patients has been done well but on the other hand,Aedesspwas still commonly found in residential and public places with minimal/without contact prevention and vector control. The study reAn adequate approach is recommended in the form of mobilizing communities to prevent the presence of Aedesspin the environment in ongoing basis with support from local goverment. Stronger regulation will be needed in order to prevent Aedessp through routine monitoring and law enforcement.

Keywords: *Dengue, control, community effort, Sukabumi*

INTRODUCTION

Dengue is a global health problem. In a period of 50 years, there has been an increase of dengue cases up to 30-fold and has been spread to various countries. Dengue is not only found in urban areas but has also

spread throughout rural areas. Dengue is a vector-borne viral infection that endangers an estimated 2.5 billion people (Whitehorn & Farrar, 2010). The *Aedes aegypti* mosquito is the primary vector of dengue. The virus is transmitted to humans through the bites of infected female mosquitoes. After virus incubation for 4–10 days, an infected mosquito is capable of transmitting the virus for the rest of its life. Infected symptomatic or asymptomatic humans are the main carriers and multipliers of the virus, serving as a source of the virus for uninfected mosquitoes. Patients who are already infected with the dengue virus can transmit the infection (for 4–5 days; maximum 12) via Aedes mosquitoes after their first symptoms appear. The *Ae. aegypti* mosquito lives in urban habitats and breeds mostly in man-made containers. Unlike other mosquitoes *Ae. aegypti* is a day-time feeder; its peak biting periods are early in the morning and in the evening before dusk. Female *Ae. aegypti* bites multiple people during each feeding period (World Health Organization , 2016)

In Indonesia, dengue was first discovered in 1968 in Surabaya and Jakarta and then spread to all provi nces in Indonesia. Currently, dengue happens to be endemic in Indonesia and there is increase in cases that occurred almost every year. Almost 90% district in Indonesia is an endemic area (Indonesia Ministry of Health, 2016). Dengue transmitted by the mosquito and *Aedes aegypti* is the major vector of dengue viruses that exist in urban neighborhoods. Vector control is an effective againts dengue transmission when applied early in the season (Stoddard et al., 2013). Population growth, urbanization, lack of urban basic health infrastructure, and the exponential growth rate of the population consumerism are several factors that play a role in the creation of the environmental conditions that favor transmission (World Health Organization, 2011).

Number of patients and the incidence in West Java Province continues to increase (West Java Provincial Health Office, 2011). Until 2007 all districts/cities in West Java province (26 district) have been reported a dengue outbreak (KLB) (West Java Provincial Health Office, 2011). Dengue's Incidence Rate remained high (> 50/100.000 population) and the incidence tends to increase from year to year in all provinces including in the province of West Java (West Java Provincial Health Office, 2011). The incidence rate of dengue in Sukabumi City reached 430 per 100,000 in 2009 and 330 per 100,000 in 2010. It seems that in 2010, there was a decline in the incidence rate of dengue that occurred in most of the districts/cities in West Java. Among the districts/cities in West Java, the highest increasing trend occured in Sukabumi.

Dengue Haemorrhagic Fever (DHF) in humans is affected by dengue virus virulence factors, host and environmental conditions that allow interaction between the agent and the host (Simmons, Farrar, van Vinh Chau, & Wills, 2012). Determinants of public health are grouped into four aspects, namely lifestyle, physical environment, social environment, and also endogeneous individual attributes, either genetic or acquired during life and the environment in a spatial perspective rated as a key factor in understanding the distribution of the disease and the transmission process (Meyer S, Held L, & Höhle M, 2015). Although various attempts have been made to control dengue fever, such as fumigation (fogging) against adult mosquitoes, using larvacides, mosquito eradication involving public participation (mosquito breeding eradication) and others, increasing trend still occured in Sukabumi. The control efforts will be effective if it is done with the right method, time and location. This research aimed to identify breeding places for DHF transmission, and to explain how community efforts in vector control had been applied to prevent DHF in Sukabumi City.

MATERIAL AND METHOD

This reasearch was conducted in Sukabumi City, West Java Province for nine months in 2012. This research applied a cross-sectional design using qualitative information. Observation was done to identify building location and those who had information on preventif behavior of dengue in the selected building. Identification of building location was based on information

from DHF positive cases from dr.Syamsudin Hospital and Assyifa Hospital in Sukabumi City in 2012. DHF suspect cases in hospital were examined using *Non Structural Protein One* (NS1) to determine positive cases. Further on transmission location, vector availability and community prevention effort were obtained from the person who had positive NS1.

Number of positive cases participated in this research was 113 people from the two hospitals. This sample size was calculated by simple sampling method (WHO, sample size calculation) with P=0.5, d=0.1, N=1,549 (based on estimation of dengue cases during 2004 to 2011), and minimal sample was 98 people with additional 25% for drop out estimation (total sample was 125 people). Samples were selected by systematic random method based on registered DHF patient. The first random number was five and the next sample will be selected in every twelvefold, until reached 125 but 10 people refused to participate.

Samples for the building location were selected purposively based on information obtained from selected patients. Criteria for building was places that were visited by patients within a week before the patient got DHF symptoms. Total number of observed building was 437 building that located in Sukabumi City.

Then a survey was conducted to find mosquitoes and mosquitoes larvae. Survey locations were marked with GPS to find the coordinates. The collected data was stored as manual and electronic data base. Electronic data was processed by an electronic spread sheet which subsequently processed into mapping software to do the process of digitization and overlay. This research had been approved by ethical committee in National Institute of Health Research and Development (number KE.01.03/EC094/2012).

RESULT

a. Dengue Patients and Respondents

In general total number of dengue case registered in the two hospitals during March until November 2012 was 1250 people in Sukabumi City. The distribution of patients by age and sex is presented in Figure 1.

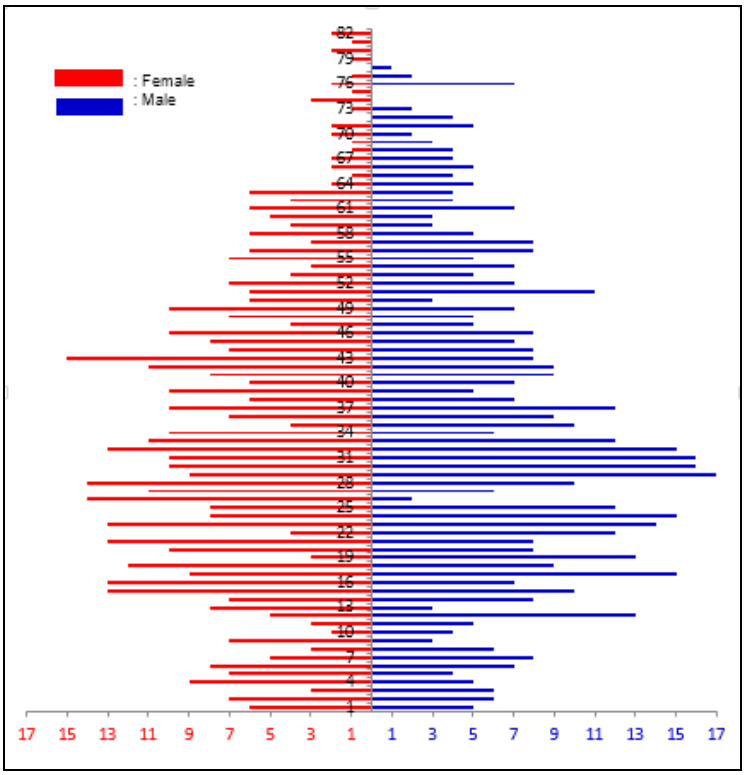

Figure 1. Total number of dengue patient in Sukabumi City by age and sex in 2012

Respondents of this research was 113 selected dengue cases from the 1250 cases. Characteristics of dengue patient respondents by age group, gender, and occupation can be seen in Table 1. Proportion of DHF in this research showed slightly higher in female (52%) than male (47.8%). This fact illustrated the DHF risk between male and female was relatively similar. The highest proportion of DHF within different occupation status was 33,6% which was among those who worked as trade or self employed.

Table 1. Distribution of dengue cases by respondents characteristics in Sukabumi City in 2012

Respondents characteristics				N	%
–	Age	–	14-24 years	30	26.5
		–	25-37 years	22	19.4
		–	38-54 years	29	25.0
		–	55-77 years	24	21.2
–	Sex	–	Male	54	47.8
		–	Female	59	52.2
–	Activity/work	–	Labor	4	3.5
		–	Trade/self employed	38	33.6
		–	Housewife	26	23.0
		–	Student	23	20.6
		–	Retired	6	5.3
		–	Goverment Employees	12	10.6
		–	Inemployed	4	3.5
		–	Total	113	100

Respondents were lived across the regions of Sukabumi City that had 3 sub-districts and contain 15 villages, mainly from central area such as Cikole Village, Citamiang Village, and Selabatu Village.

b. Existence of *Aedes* sp.

In average respondents were visited more than one places within one week periode prior to having DHF symptoms. The results of the inspection in public area were found in 57,1% recreation area, 42,9% office complex, and were totally found in 23,9% of public areas. The places visited by respondents are located in 425 to 755 meters above sea level. Existence of *Aedes* sp. were assessed by observation in the site (bulding location). The results of existence of *Aedes* sp. by site location was presented in table 2, while the spatial spread of *Aedes* sp. presence was presented in figure 2 and figure 3.

Table 2. Types of places and the presence of *Aedes* sp. in Sukabumi City in 2012

Land use	Details	*Aedes sp.*			
		Presence		absent	
		N	%	n	%
Residential home		91	24.7	277	75.3
Public area	trade area	3	10.0	27	90.0
	recreation area	8	57.1	6	42.9
	office complex	3	42.9	4	57.1
	hospital	1	25.0	3	75.0
	places of worship	1	11.1	8	88.9
	school	5	20.8	19	79.2
Total Public area		21	23.9	67	76.1

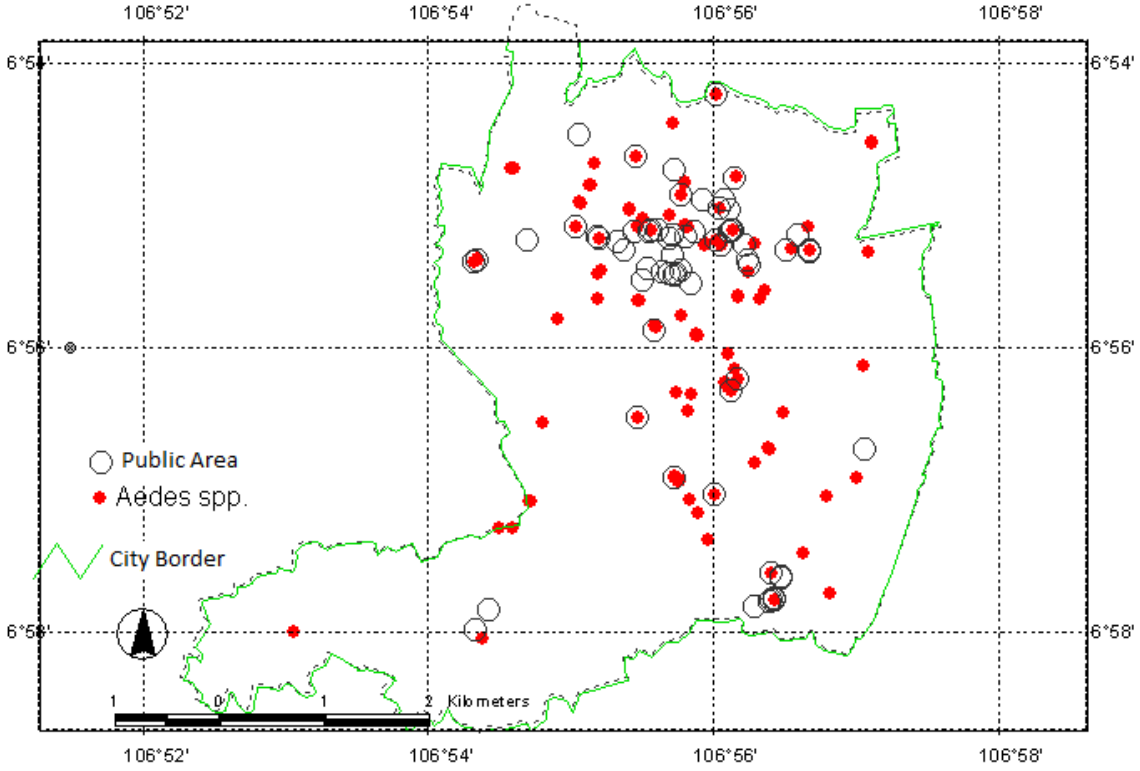

Figure 2. Distribution of examined public places and the presence of *Aedes* sp. in Sukabumi City in 2012

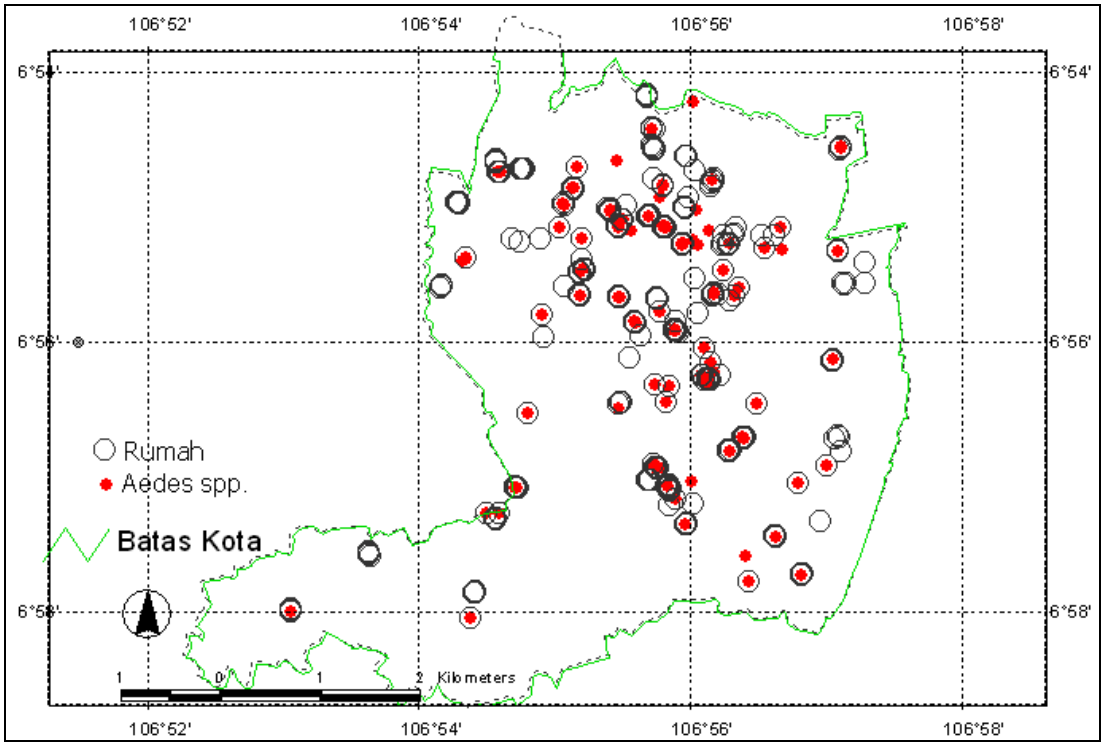

Figure 3. Distribution of inspected house/building and the presence of *Aedes* sp. in Sukabumi City in 2012

Existence of *Aedes* sp. in public places and housing area was mostly higher in the city central area although it was also found in other area across Sukabumi City (Figure 2 and Figure 3).

Observation from total 717 containers found that breeding places of *Aedes* sp. were commonly in used tires, *bak mandi* and used plastic/furniture. Existences of *Aedes* sp. in various breeding sites are presented in Table 3. It was shown that the highest percentage of *Aedes* sp. existence was in used tires (60.0%), follow by used plastic/furniture with water inside (41.7%) and *bak mandi* (40.8%).

Table 3.Existence of *Aedes* sp. in various containers in Sukabumi City in 2012

Breeding type	*Aedes* sp.		Total	% +
	+	-		
Bak mandi	64	93	157	40.76
Used tires	3	2	5	60.00
Basin	0	1	1	0.00
Dispenser	33	94	127	25.98
Drum	0	9	9	0.00
Padasan	21	212	233	9.01
Puddle on the floor	3	5	8	37.50
Pond/aquarium	7	13	20	35.00
Refrigerator	11	63	74	14.86
Used Plastic/Furniture	10	14	24	41.67
Pot/vase	5	11	16	31.25
Bird bath container	1	8	9	11.11
Cooking utensils	1	13	14	7.14
water reservoirs	5	15	20	25.00
Total	164	553	717	22.8

c. Efforts in Vvector Control and Prevention.

Vector control efforts were obtained from several informants who were using the selected sites such as dengue patients, their family and persons in charge of buildings/places visited by patients. In total 746 answers of vector control effort types had been identify by 437 informants. Whereas one respondent could gave more than one answer. The following table showed the variation of vector control efforts done by respondents (Table 4). The table shows that the most widely used vector control effort for mosquito adults was the use of repellent (38.5%) and insecticides (31,8%).

Table 4. Vector control and prevention types by A*edes* sp. existence in Sukabumi City in 2012

Vector Control and Prevention	*Aedes* sp.		Total
	Presence	Absent	
Closing, drain, and bury	65(24.3%)	202(75.7%)	267
Biology	6(40.0%)	9(60.0%)	15
Physical	11(24.4%)	34(75.6%)	45
Insecticide	75(31.8%)	161(68.2%)	236
Larvicides	3(17.6%)	14(82.4%)	17
Repellent	10(38.5%)	16(61.5%)	26
Sanitation	32(25.4%)	94(74.6%)	126
Nothing	3(21.4%)	11(78.6%)	14
Total	205(27.5%)	541(72.5%)	746

Percentage of Aedes sp. existence was found higher among those who prevent with biology control (40%) such as using fish as larvae predation. Meanwhile the lowest presence *Aedes* sp. was found in Larvicides control (17.6%)

Table 5. Person who initiate the vector control in the environment in Sukabumi City in 2012

Person	n	%
Nobody	134	30.66
Housewives	80	18.31
Officers/cadre	79	18.08
Any family member /relative	67	15.33
Father	27	6.18
All members of the family	18	4.12
House workers	17	3.89
Mother and father	9	2.06
Neighborhood Community	6	1.37
Total	437	100.00

Table 5 indicated that mostly nobody initiated the vector control (30.7%). Most respondents stated that the main actors of vector control efforts were housewives (18.31%) and Officers/cadre (18.1%). Thus only 1,37% respondents stated that whole Neighborhood Community plays important role as vector control.

In addition to the efforts mentioned by respondents, Sukabumi City's Health Department also made various efforts, including fogging at least throughout 74 local

residence groups. They also distributed free larvicides through health centers and health volunteer in the whole region of Sukabumi City. Other efforts were community health education and counseling as well as government program called "*Gebrak sarang nyamuk*".

d. Map of Dengue Control Efforts by Community

Figure 4 presents the distribution of effort or a combination of efforts types in vector control and prevention by the presence of *Aedes* sp. There is only a small proportion of respondents who did a single attempt. In general the respondents use more than one way of controlling the dengue vector.

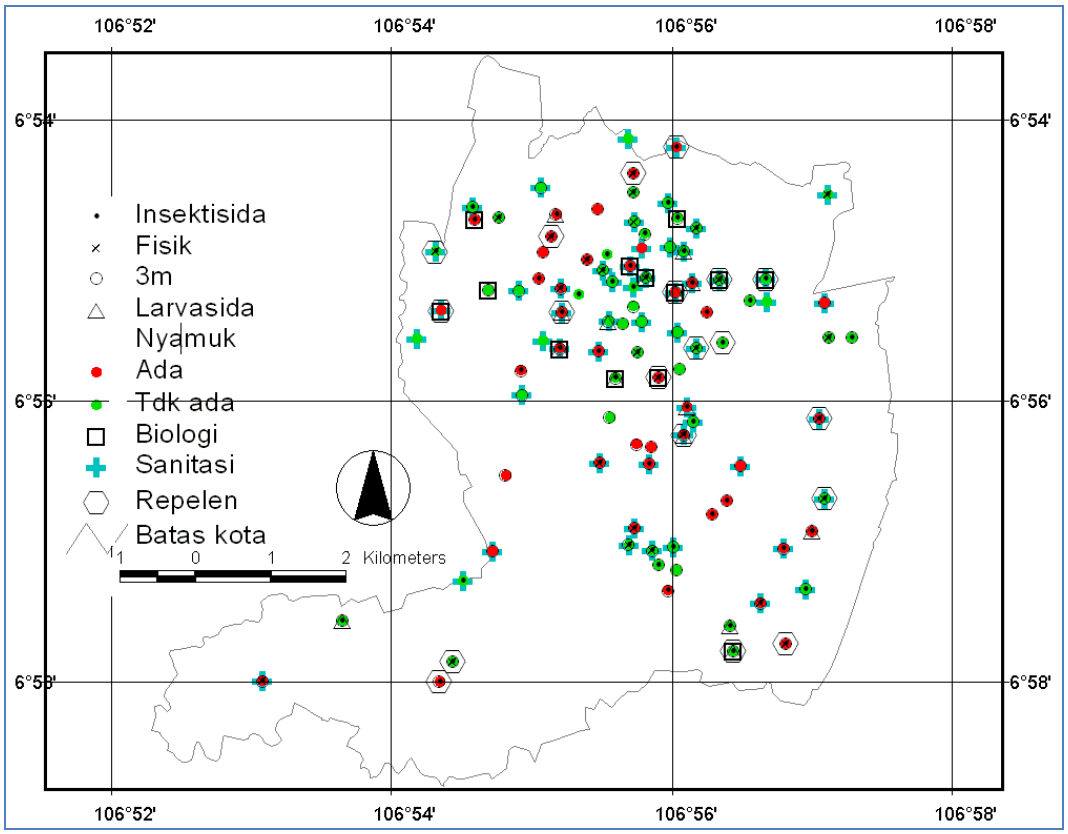

Figure 4. The presence of *Aedes* sp. and vector control efforts distribution in Sukabumi City in 2012

There are 20 respondents who did not make any effort to control and prevent contact with *Aedes* sp. Most respondents use more than one attempt. The effort that most commonly done is the use of insecticides to adult mosquito. The use of insecticide spread on the entire study area but mostly in nothern side of Sukabumi City's central part.

e. Potential Dengue Transmission Locations in Sukabumi City.

Aedes sp as dengue's vector are found while the inspection and survey were conducted in the residences and public places visited by patients before the symptoms occured. This suggests that these places are potential location of dengue transmission.

DISCUSSION

DHF is an infectious disease caused by the dengue virus and it is transmitted through *Aedes* sp mosquito. It could affect everyone and may lead to death, especially in children and often cause an outbreak (World Health Organization, 2016).

Factors that influence the increase and spread of DHF include high population growth and rapid, unplanned and

uncontrolled urbanization. Thus high access of transportation between cities may accelerate the risk of DHF, which create non-endemic area become endemic (Gubler, 2011).

The results showed that the DHF proportion in Sukabumi City in 2012 were similar in all age groups (Table 1). This indicated that all of the age groups in the population at the same risk of dengue in Sukabumi. Unfortunately, there was a change in the pattern of dengue disease, which formerly found in children under 15 years old but now could attack different age levels, even at productive age. Children admitted at pediatric ward in the age group of 0-16 years of both gender presenting with febrile illness 0f 2 to 7 days along with clinical features (Ahmad et al., 2015).

This research showed that proportion of DHF varied among different occupation status. A study by Wibisono informed the highest morbidity rate according to the type of work in patients with DHF are the students, followed by labor (Wibisono & Oktober, 1995). These differences arised because there were differences in the characteristics of the population with a variety of conditions. Dengue transmission can be occured in house, school, workplace and other public places. This research also indicated that mosquito larvae found in places visited by dengue patients. Various types of public facilities can be a potencial places for dengue transmission. Vector control should not only be done in housing but also in public places.

Neighbourhood area could also be a high-risk place of Aedes sp virus transmission cycle. The virus could be found in the form of egg, larva, pupa and adult mosquito. Existence of a source of virus in individuals with viremia and availability of adult *Aedes* sp who is able to act as vectors at the same time will increase the potential for transmission of dengue virus. The impact of this transmission does not necessary make infected individuals as patients with DHF. Santya research results (2008) in West Java indicated that 30% of individuals infected with dengue virus, but without obvious symptoms and also had identified presence dengue (Santya RNR, 2008).

Three main factors of DHF endemic were host immune response and resistance, *Aedes* sp. as a vector and dengue as an agent of virus (Indonesia Ministry of Health, 2016). Vector borne diseases will increase when the number of vectors increases. Therefore infection by dengue virus incidence will increase when the number of vectors arise. Population density of *Aedes* sp. will increase during the rainy season, which creates wet patch as a mosquito-breeding place. Mosquito eggs in a dry wall reservoir will hatch after waterlogged which will increase the number of mosquitoes especially during the rainy season.

Indonesia's tropical natural conditions was suitable for breeding of *Aedes* sp as the main vector of DHF that generally occurs in the rainy season(World Health Organization (WHO), 2016). The altitude below 1000 meters above sea level affects the distribution of the presence of *Ae. Aegypti*. This condition facilitates the spread of disease through the mobility of population from an area to another. Thus it trigerred more endemic areas. One of the most important transmitting factors of dengue were transportation and population migration (Gubler, 2011).

Aedes aegypti is anthropophilic. It prefers human blood than animal and has a biting habit repeatedly (multiple bitters) (Farjana & Tuno, 2013). It bites in the morning and evening (day biting mosquito) with two peak times (diurnal/day bitter), after sunrise and before sunset (Ali et al., 2012). The nature of anthropophilic and repeatedly biting habit were very important in its capacity as a vector of dengue. Urban mosquitoes mostly bite during the day (90%) and less during the night time (10%). Meanwhile, mosquitoes in rural areas only bite during certain time. Biting happened regularly in certain hours, especially at 7:00-11:00 am and 17:00 pm. Urban lights likely influenced the incident and it caused behavior of mosquitoes biting. Female mosquitoes usually spread dengue virus in densely populated area. The *Aedes* sp mosquitoes usually stay in dark places, perched on hanging objects, mosquito nets and clothes/clothing, bushes/plants and grass. Additionally, bright light, clothing and

human existence usually attracted mosquitoes.

Aedes sp were able to fly as far as two kilometres and the flying distance ranges between 40-100 m from the breeding. Other species of *Aedes* sp, which could also transmit dengue, is *Ae. Albopictus* but it has less transmission spread because *Ae. albopictus* live and breed in the garden or bush, so more rarely contact with human than *Ae. Aegypti*, which is lived inside and around the house (Chadee, 2013).

The eradication DHF done by breaking the chain of transmission between *Ae.aegypti*, viruses and humans. There was no effective vaccine to prevent or eradicate the virus, so most preventing effort was vector control in areas with potentially high transmission. The most effective effort in vector control was management of environment (World Health Organization, 2011), eradication of mosquitoes breeding places, solid waste management, the use of insecticide-treated nets and repellent (Dirjen P2M dan PL, 2002). Biological control efforts could use those larvae-eating fish (Gambusia and Poeciliareticulataaffanis). The use of *Bacillus thuringiensis* serotype H-14 and B. sphaericus. 16.18 as larvicida need to be done at the water reservoir (Widodo, 2007). These efforts needs to be done regularly and continuously (Central Java Health office, 2004). Fogging (fumigation) will be insufficient because the process will only affect on adult mosquito (Bonebolango health office, 2009).

Vector control efforts need to be integrated and sustainable involving individual, family, community and health services. Every individual should be able to protect themselves from contact with *Aedes* sp. On the other hand, Sukabumi city did not undergo this condition.

Community participation is a long process and requires persistence, patience and effort in providing an understanding and motivation to individuals, groups, communities, and even officials on an ongoing basis. This programe was aimed to increase the motivation of community in order to give positive effect on *Aedes* sp control (Prasetyowati, Nusa, & Wahyu NR, 2015). The program involved the community to prevent mosquito breeding. Data from reporting system showed 89% of building without larvae in Sukabumi (11% larva positive), which was relatively different from this reasearch (24.7% in housing area and 23.9% in public places). This difference related to different measuring method.

Various programs to control the rate of dengue incidence has been widely applied in Sukabumi City. Intensive activity such as simultaneous movement mosquito eradication were done by community transmission of dengue virus. Other efforts such as monitoring of mosquito breeding, larval control, counseling, and individual/ families effort were implemented by the majority of community in Sukabumi City and local governments. In November 2012 could be identified common models DHF control in Sukabumi City. However, this model has not been generally applied in the response to DHF in Sukabumi City.

Mosquito-borne diseases (vectors) including dengue were based on environments and it could not be solved only by health sciences. The DHF control in Sukabumi City need to focus more on controlling the environment. This includes mosquito nest eradication/control of mosquito breeding sites, fogging, counseling for positive behavior change in order to control the breeding sites and other risk factors. This process were done in order to reduce the number of events required complete integrated effort with a relatively fast response time between the source case management and control of dengue transmission risk factors in one region covering neighborhood areas.

CONCLUSION AND SUGGESTION

Conclusion

Incidence of dengue (symptomatic) in Sukabumi City related with past infection, serotypes circulation of dengue virus and presence of vectors in the environment. Prevention from contact with mosquitoes and its inadequate management will enlarge the potential of dengue cases. Sukabumi City communities still rely on the efforts to control *Aedes* sp. with insecticides and only a

few community who admitted the mosquito eradication. On the other hand, vector control in public places did not achieve maximum results (only 76.1% building free from larvae). Approach needs to be developed in *Aedes* sp. population control efforts. This activity began with early search source of transmission, prevention of contact with a source of transmission of *Aedes* sp., cleaning mosquito breeding, and community mobilization for sustainable mosquito breeding eradication in the environment as a whole.

Suggestion

The DHF events rooted in the ecosystem, the limits of administrative regions relatively less suitable, because it did not recognize boundaries DHF transmission administrative area. Thus there would be necessary cooperation in the border region between regions.

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