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FACTORS ASSOCIATED WITH DENGUE INCIDENCE AMONG SOCIETY IN BANTUL DISTRICT, INDONESIA: A CASE-CONTROL STUDY

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ABSTRACT

Background: Understanding the potential risk factor is vital to provide proper intervention for Dengue prevention. This study evaluated the possible risk factor of personal protection to dengue incidence. Repellent usage, hang used cloth and knowledge were assessed as the predictor for dengue incidence.

Materials and Methods: Case-control with 1:2 ratio was undertaken in Bantul, Yogyakarta Indonesia. In total, 51 participants were involved in this study, consist of 17 cases and 34 controls. Chi-square test was used to test the association among the variable and dengue incidence.

Result: Hanging used clothes inside the house was founded as the potential risk factor of dengue incidence with OR = 15.68; CI = (3.039-80.928) it was significantly associated. Repellent was found insignificant associated and not as a possible risk factor for dengue incidence with OR = 2.88; CI = (0.781-10.679). Knowledge was also discovered not a risk factor for dengue incidence with OR = 0.59; CI = (0.171-2.071) it was not significantly associated.

Conclusion: Attention about dengue potential risk factor such as to not hanging used cloth inside the house should be increased to anticipated an outbreak. In addition, proper health promotion should be provided to the community.

Keywords: Dengue, risk factor, individual protection, Bantul, Indonesia

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1.0 Introduction

Dengue is a serious public health problem, leading by the increasing number of infection and the extent of spreading. Currently, dengue occurrence is closely associated with environmental shifting such as climate change and globalisation that trigger the people mobilise in an easy way (Saker, Lee, Cannito, Gilmore, & Campbell-Lendrum, 2004)(Ebi & Nealon, 2016)(Liu-Helmersson et al., 2016)(Wu, Lu, Zhou, Chen, & Xu, 2016). The real dengue burden is unknown regarding the high dengue underreporting cases. However, there was an estimation that in Southeast Asia and the Pacific, between 50-100 million dengue happens every year (WHO, 2012)(Murray, Quam, & Wilder-Smith, 2013)(Gubler, 2012). While in Indonesia dengue case was increasing 10-fold during 2005-2016 (Indonesia Ministry of Health, 2010)(Indonesia Ministry of Health, 2017).

Female Aedes aegypti, which is the primary vector for Dengue, is responsible for carrying DEN virus and transport it to human through her biting. Aedes aegypti mostly spend their life near the human house, and when they grow to an adult, they will move around 400 meters. Biting rate of Aedes aegypti are higher in outdoor, but female Aedes aegypti breed inside the house and biting anybody during the day (WHO, 2019). However, the biting peak will occur in the morning and a couple of hours before the dusk (WHO, 2012). Aedes lays her egg in holding water container inside and nearby the house such as flower pots, tires, buckets, and water storage jars. Aedes aegypti have an excellent adaptation to dry season; therefore, her egg can service for some months (Natur, 2014).

Dengue control can be done by breakdown the interaction between human, mosquito and environment. Eliminate the contact between mosquito and human is the possible method to reduce dengue transmission. In the household and community level, an effort to eliminate Aedes aegypti should be addressed on source reduction through environmental modification and empower the community (WHO, 2017)(Sarwar, 2015). This modification aimed at giving no place for Aedes aegypti lays her egg, and while using community empowerment, this program will run sustainable. Individual protection can be focussed on reducing skin exposure to mosquito biting, for example, by wearing closed cloth, applying repellent and using mosquito net (WHO, 2017). The mosquito's behaviour will determine the choice of which protections are suitable in a particular location.

In Bantul-Yogyakarta, dengue has fluctuated every year. Between 2015-2016, dengue case in Bantul was increasing 1.5-fold (Bantul District Health Office, 2018), while in 2017 it reduced 3 -fold compared to 2016. Even though the number was reducing, Bantul, however, becomes the highest district with dengue case in Yogyakarta Province (Yogyakarta Provincial Health Office, 2018). Considering the situation, it was essential to assess the potential risk factor of dengue to provide evidence on dengue prevention action.

2.0 Materials and Methods

Bantul is a district located in the southern part of Yogyakarta province, where mostly their area is plain. This district spreads over 506.85 Km^2, divided into 17 subdistricts with 75 villages inside. 919.440 people reside Bantul; they are experiencing with a tropical two seasons-wet and dry (Bantul Government, 2018).

2.1 Study design

A case-control study with 1:2 ratio was conducted in Caturharjo and Triharjo villages, Pandak subdistrict, Bantul - during March-August 2018. These two villages were randomly chosen. The population on these two villages were 24,585 people by the second semester of 2017 (Yogyakarta Province Government, 2018). A preliminary study was conducted in the local Public Health Centre (PHC) to identify the positive dengue patient during 2017. Accordingly, we listed 17 (n = 17) individual who was identified as dengue positive. Healthy controls (n = 34) were elected from the same population and had dengue negative. In total, 51 people participated in this study.

A case was defined as a person who diagnosed with dengue fever by the PHCs physical and recorded in PHC record system during January-December 2017 and was living in associated villages. Control was an individual who did not diagnose with dengue fever with the same method and not recorded during the same time and residing in the associated place.

2.2 Research instrument

A survey using a Yes-No question was conducted to collect demographic characteristic, personal protection and respondent knowledge regarding dengue. Questioner was adopted from Bantul District government. It was divided into three sections: using repellent or not, have a habit of hanging used cloth or not and 20 knowledge questions about definition, symptoms and transmission, mosquito breeding place, patient treatment, dengue prevention and Aedes aegypti.

2.3 Data collection

All listed respondents chose to participate in this study. We visited one by one of the participants on their house to collect the survey. A survey was asked per question item by the first author for all respondent. If the selected individual did not present in the first visit, we returned on the other occasions. Informed consent was obtained prior to the study.

2.4 Analysis

Questionnaires from the survey were entered and cleaning. An appropriate answer was scored as 1, and a non-appropriate response was scored as 0. A total score was calculated for knowledge and categorised as poor and good according to the mean. Descriptive and bivariate statistics were directed on this study. Descriptive was used to calculate the percentage for each variable Chi-square analysis was done to assess the association between dengue and exposure with a significance level of $p<0.05$.

3.0 Result

3.1 Participant characteristics

More than half of the case participant were male, and 70% of control participants were female. Both for case and control, the majority of participants, were in (20-40) and >40 years of age (Table 1)

Table 1. Characteristics of the participants of the Dengue Study in Pandak, Bantul, Indonesia

Characteristic	Case	Control
	n (%)	
Sex		
Male	10 (58.8)	10 (29.4)
Female	7 (41.2)	24 (70.6)
Age group (y)		
<20	3 (17.6)	2 (5.8)
20-40	7 (41.2)	16 (47.1)
>40	7 (41.2)	16 47.1)

3.2 Potential Risk Factor of Dengue According to Bivariate Analysis

The odd getting dengue infection for people who not applied the repellent in the morning and evening were 2.88-fold higher compared to people who applied the repellent in the morning and evening. However, this result was not significantly associated. Significantly association was found between people who habited of hanging used cloth inside their house (p-value = 0.01). People who were hanging a used cloth inside their home was increasing their risk to have dengue with odds 15.68-fold compared to people who did not. Lastly, even though not significant, the odds to get dengue infection was increasing 0.59-fold for people who had poor dengue knowledge compared to people who obtained good knowledge. Table 2.

Table 2. Bivariate analysis of the possible factors associated with the increased risk of dengue infection.

Characteristic	Case (n=17)	Control (n=34)	Crude OR (95% CI)	p-value
Using repellent in the morning and evening				
No	13 (76.5)	18 (52.9)	2.88 (0.781-10.679)	0.18
Yes	4 (23.5)	16 (47.1)		
Hanging used clothes				

Yes	15 (88.2)	11 (32.4)	15.68 (3.039-80.928)	0.01
No	2 (11.8)	23 (67.6)		
Knowledge about dengue				
Poor	5 (29.4)	14 (41.2)	0.59 (0.171-2.071)	0.60
Good	12 (70.6)	20 (58.8)		

Values are presented as number (%).
OR, odds ratio; CI, confidence interval.

4.0 Discussion

Dengue has occurred because there is an interaction between human, environment and DEN Virus that mostly be transmitted by Aedes aegypti mosquito. Accordingly, to stop dengue transmission could be executed by breaking the chain of dengue transmission among the involved item such as changing the human behaviour, modifying the environment to reduce the susceptibility and last by eliminating contact between human and the mosquito. This research aimed to investigate the potential human behaviour risk factor for dengue transmission in Bantul District, Yogyakarta, Indonesia.

The repellent is one method to avoid mosquito biting. In Indonesia, we recognise several types of repellent such as lotion, liquid, spray, electrical and fuel (Wahyono & W, 2016). Applying repellent, it does not mean this substantive kill the mosquito, but it only makes the mosquito hard to find the human who applied it. In this study, the risk of people who did not use repellent (spray or lotion or spay) was increasing. Even though it had not significantly associated, we need paying attention to repellent as a potential tool for reducing dengue transmission while look at the odds ratio. The insignificant result probably caused by the inconsistent repellent usage, may respondent have said they applied repellent but not frequently. Consequently, respondent still possible to get mosquito biting. Our result was in contrast with previous research in India, who found that not using repellent was significantly had higher odds 6-fold compared to who was using (Mamoona et al., 2015).

In Indonesia, repellent usage does not been employed as official prevention practice. Mostly in every endemic city emphasising their effort on vector control, particularly in larvae stage such as 3M (Kusriastuti & Sutomo, 2005). Probably, it influences the repellent is not popular as dengue prevention in society. As shown by the previous study in Yogyakarta that society knowledge about Aedes aegypti biting behaviour and repellent usage was considered as low (Sulistyawati et al., 2019). However, another research in another part of Indonesia found differently; it discovered using repellent was potential as a risk factor for dengue infection with 4.2 odds (Ayun & Pawenang, 2017). The differences may imply that repellent as individual protection remains relevant to apply; however, it will be determined by the community knowledge and intention to use repellent.

Our result shows that hanging cloth that had been used inside the house was a potential risk factor for dengue. This finding was consistent with the previous research that confirmed a similar result (Ayun & Pawenang, 2017)(Mariappan, 2009). Dirty cloth meaning after used is attracting the mosquito to be a resting place due to the presence of lactic acid, amino acids,

body sweat, body heat, and other substance (Mubarok, Wahyuningsih, Riani, Putri, & Budiharjo, 2018). In our research, respondent hanged their used cloth behind the door of their bedroom or hang it in the wall. That cloth provides resting place for female Aedes aegypti after she fed the blood from human and since then waiting for her egg maturation. Therefore, hanging used cloth inside the house, potentially increase the chance for Aedes aegypti to reproduce.

It is undoubtedly that knowledge is an essential component in determining individual health behaviour. However, knowledge alone does not suffice to get proper behaviour (Happell, Stanton, Hoey, & Scott, 2014). In our research may suitable with those states, since we found had poor knowledge about dengue, and the prevention did not increase the dengue risk. Our study may indicate the challenge of translating people knowledge in their practice. Meaning that even though people have a good understanding of dengue prevention, nonetheless they did not do the practice in reality. Accordingly, people remain possible to get dengue infection even though they had good knowledge. Another possibility, people neglect dengue as severe disease and assumes it as a common preventable disease because they believe having good and modern health services to care them when needed. This opinion may influence their prevention behaviour.

This research may have a limitation when interprets the result regarding the study design that was retrospective, meaning that possible to have bias memory from the participants.

5.0 Conclusion and recommendation

Dengue remains to become a public health concern. Our study concludes repellent usage may be recommended, however, needs to be completed with suitable health promotion to the community on how and when it should be applied. Finding organic/natural repellent is a future challenge to reduce the cost of purchasing manufacturer repellent. Regarding dengue prevention, Health Belief Model (HBM) assessment is required to see the community belief on dengue to propose a proper intervention or dengue program.

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Declaration

Author(s) declare that they have no conflict of interest.

Authors contribution

Author 1: Developed the research protocol, conducted the data collection, analysed the data, and wrote the report

Author 2: Developed the methodology, reviewed the data analysis, writing the publication

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