Factors related to elimination of mosquito breeding sites

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Abstract

Background: Semarang city has the highest Dengue Haemorrhagic Fever (DHF) ende in Central Java. The characteristics of the geographical area and the community ignorance in eliminating DHF mosquito breeding sites are two main factors causing the high number of DHF. While, eliminating mosquito breeding sites is an effective way to reduce DHF. Aims: This study analyzed factors related to the elimination of mosquito breeding sites. Settings and Design: This was a quantitative study, using a cross-sectional design. Data were collected through a survey. This study involved 95 housewives as samples. Statistical analysis used: Data were processed through univariate and bivariate analysis using a chi-square test. Results: Factors correlated with the elimination of mosquito breeding sites were knowledge (p-value=0.030), accessibility to information media (p-value=0.022), support from family members (p-value=0.030), and health care support (p-value=0.006). There was no correlation of eliminating mosquito breeding sites with age (p-value=0.603), education level (p-value=0.108), job (p-value=0.390), attitude (p-value=0.669), availability of media information (p-value=0.363), and regulation (p-value=0.759). Conclusions: Regularly eliminating mosquito breeding sites should be applied in every house at least once a week.

Keywords: DHF, dengue, mosquito, breeding site, behaviour

Key Messages:
Conduct routine mosquito breeding sites eradication.

Introduction

Data reported by the World Health Organization from 1990 to 2016 on Dengue Hemorrhagic Fever (DHF) in the Asia Pacific shows Indonesia is one of the countries with more than 100,000
dengue cases in each year. Dengue cases from 2010 to 2015 reached nearly 50,000 to 150,000 cases or 40 up to 60 cases per 100,000 people each year. The DHF from 2010 to 2015 has caused about 500 to 1000 deaths per year. The highest mortality rate occurred in 2010 with more than 1000 deaths, but the lowest mortality rate was in 2011 with less than 500 deaths. Additionally, from 2012 to 2015, the trend also increased (1).

In January 2016, the Indonesian Ministry of Health, Directorate of Vector and Zoonotic Communicable Disease Control reported 3,298 DHFs with 50 deaths. Outbreaks occurred in 11 districts in 7 provinces. Within 6 consecutive years (2008-2013), Semarang city had the highest incident rate (IR) of DHF in Central Java. In 2014 and 2015, Semarang city was ranked third for the highest incidence rate (IR) in Central Java, and the number of patients remained the highest (1). At the national level, in the government has recommended DHF controlling measures as stated in the Regulation of Indonesian Ministry of Health Number 581 of 1992 concerning about the elimination of mosquito breeding sites. The national target of the larva-free index was 95% in reducing or preventing dengue transmission.

In 2008, 5,429 cases with an Incident Rate (IR) of 36.08 per 10,000 people and Case Fatality Rate (CFR) of 0.3% emerged. In 2009, it decreased to 3,883 cases with an IR of 26.21 per 10,000 people and a Case Fatality Rate (CFR) of 1.1%. Again, it reached 5,538 cases with IR of 36.75 per 10,000 population and Case Fatality Rate (CFR) of 0.8% in 2010 (2).

The Decrees of Indonesian Ministry of Health Number 581 / MENKES / SK / VII of 1992 on elimination of mosquito breeding sites and Number 92 of 1994, the amendment of Indonesian Ministry of Health Number 581 / MENKES / SK / 1992, concerning about prevention measures through elimination of mosquito breeding sites. Semarang city takes DHF control very seriously through the Regional Regulation Number 5 of 2010 concerning about dengue hemorrhagic fever control. The regulation also explains some sanctions for violating dengue fever control in Semarang city.

Pudakpayung, one of the villages in Banyumanik sub-district, Semarang city, has various population characteristics and settings. The village is far away from Semarang Central Government Office, and thus the population migration is high. In 2016, Pudakpayung had 20 people who got infected with DHF. Two main factors causing the high number of DHF are the geographical characteristics and the community ignorance about eliminating mosquito breeding sites. Another factor contributing to the community ignorance is education which affects people’s behaviour.

A previous study claims a person with a low education level does not always have low knowledge(3). It is not in line with other studies stating education level is related to actions. The higher the education level, the better the knowledge about dengue fever. The longer people study, the more...
knowledge they gain (4). Relying upon the facts, this study aimed to analyze factors related to elimination of mosquito breeding sites.

Subjects and Methods

This quantitative study used a cross-sectional design and invited 95 mothers as samples in Pudakpayung village, Banyumanik sub-district, Semarang city. The samples were calculated with the Lemeshow formula in which the population proportion was 0.5 with a 95% of Confidence Level and a 0.1 degree of deviation (5). This study employed a random sampling technique to select the samples. It was conducted in January 2018.

The data processing stages consisted of editing, coding, entry, cleaning, and tabulation. Data analysis was carried out quantitatively through univariate analysis, bivariate analysis, and multivariate analysis. The univariate analysis was performed on each variable, and the bivariate analysis would determine the relationship between the independent variables and the dependent variable. To test the hypothesis, this study used a chi-square (X2) test. While the multivariate analysis could find out which of the independent variables had the greatest effect on the dependent variable.

Results

The results show 95 mothers as the respondents live in Pudakpayung Village. Most of them were late adults (36-45 years) (41.1%), and only 2.1% of them were adolescents (17-25 years). Based on the level of education, some respondents did not attend formal education (4.2%), and most of them had completed primary school or equivalent (30.5%). They mostly were housewives (68.5%).

<table>
<thead>
<tr>
<th>Table 1. Respondents characteristic</th>
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<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Late adolescent</td>
</tr>
<tr>
<td>Early adult</td>
</tr>
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<td>Late adult</td>
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<td>Early elderly</td>
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<td>Late elderly</td>
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<tr>
<td>Education</td>
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<tr>
<td>Did not go to school</td>
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<tr>
<td>Elementary school</td>
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<td>Middle school</td>
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<tr>
<td>High school</td>
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<tr>
<td>Bachelor degree</td>
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<tr>
<td>Occupation</td>
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<tr>
<td>Not working/housewife</td>
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<tr>
<td>Public servant</td>
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<tr>
<td>Private employee</td>
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<tr>
<td>Businessman</td>
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<tr>
<td>Labourer</td>
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<tr>
<td>Teacher</td>
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<td>Household assistant</td>
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Table 2. Summary of bivariate analysis results

<table>
<thead>
<tr>
<th>Variables</th>
<th>95% CI</th>
<th>POR</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.603</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.108**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job</td>
<td>0.390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>1.082-5.652</td>
<td>2.47</td>
<td>0.030*</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.505-2.899</td>
<td>1.21</td>
<td>0.669</td>
</tr>
<tr>
<td>Media Information Accessibility</td>
<td>1.144-7.890</td>
<td>3.00</td>
<td>0.022*</td>
</tr>
<tr>
<td>Media Information Availability</td>
<td>0.648-3.267</td>
<td>1.46</td>
<td>0.363</td>
</tr>
<tr>
<td>Regulation</td>
<td>0.619-3.469</td>
<td>1.47</td>
<td>0.759</td>
</tr>
<tr>
<td>Family support</td>
<td>1.083-6.195</td>
<td>2.59</td>
<td>0.030*</td>
</tr>
<tr>
<td>Health workers’ support</td>
<td>1.387-7.433</td>
<td>3.21</td>
<td>0.006*</td>
</tr>
</tbody>
</table>

Note:
* Variables are dependent variables (p <0.05) in the logistic regression test
** Variables in the logistic regression test because p-value is less than 0.25

Other findings show the relationship between knowledge and elimination of mosquito breeding sites (p-value=0.030). Elimination of mosquito breeding sites was correlated to knowledge (p-value=0.030), accessibility to information media (p-value=0.022), support from family members (p-value=0.030), and health care support (p-value=0.006).

Once mothers contributed to eliminate mosquito breeding sites, it indicates family supports. While, mothers with no support from family members had 2.59 times possibilities for not eliminating mosquito breeding sites compared to those with family support (95% CI = 1.083-6.195). Additionally, support from health workers is significant too (p = 0.006). Mothers with less health worker support were 3.21 times more likely to not eliminate mosquito breeding sites compared to those with adequate support (95% CI = 1.387-7.433). Based on the probability of events, mothers with less access had a 68.7% possibility of not eliminating mosquito breeding sites. Besides, mothers with less family support had 67.4% likelihood to not practice the prevention measure.

Less health worker support could contribute to a 66.9% possibility of not eliminating the mosquito breeding sites among mothers. This study also proves mothers with higher education levels got a 9.4% possibility of not eliminating mosquito breeding sites.

Discussion

The Lawrence Green Theory mentions four factors reinforcing individual's health behaviour. First, knowledge about dengue could encourage people to practice prevention measures that would reduce the transmission of dengue fever in the community (6). The results of this study are consistent with research conducted in Tanah Kali Kedinding village in Surabaya. Both show no relationship between knowledge and elimination of mosquito breeding sites(25). However, another study has found no correlation between knowledge and elimination of mosquito breeding sites(18). In Malaysia, a study conducted by Wong (2015) found that exposure to information and awareness of disease prevention affected knowledge. Therefore, someone might not act if they have no knowledge about the issues(18).

Second, family behaviour is vital because family members are aware of how to keep their house and surroundings free from t dengue larvae. Hence, every family member would be motivated to practice eliminating the mosquito breeding sites(7). The probability event shows that mothers with other family support had more probability (67.4%) of not eliminating mosquito breeding sites. Family
members’ knowledge and information levels about DHF, therefore, affected their actions (8). With adequate knowledge, family can share information about dengue from many sources (9) since knowledge could make someone have awareness and willingness to act removing the breeding sites (24).

Family support can obviously be observed when family members participated in counselling sessions on elimination of mosquito breeding sites. Another study explains that health information sharing could explain 33% of the variance in behavioural intentions, indicating that the communicative information sharing can positively impact health outcomes (10).

Health worker support was realized into some promoting and monitoring activities, such as eliminating mosquito breeding sites, checking larvae periodically, providing information about elimination of mosquito breeding sites, and handing over abate powder to households.

In Nepal, Dhimal, the majority of people had good behaviour towards dengue fever prevention due to decent access to information and enough health worker support. In order to perform optimally, health workers need good health facilities and sustainable programs from the government. Before delivering information, health workers could access information about DHF through newspapers, leaflets, posters, television, and the internet (11), while television gave the impactful result in raising the community awareness (6).

Elimination of mosquito breeding sites can be done if health workers give convincing stimuli (12). A study in Tembalang sub-district has discovered that the health surveillance officers lacked knowledge and reporting accuracy but had good responsiveness, high innovation, and a high workload. As a result, their targets were hardly achieved. Furthermore, they were not disciplined in carrying out work and collecting reports. However, the community received support from the government in collaboration with private sectors (11).

If not improving their commitment, the health surveillance offices could discourage the community to practice the prevention measure. Besides, routine larval surveillance should be conducted for an effective mosquito control program to reduce the mosquito population (13).

Regarding education, mothers with high school education eliminated mosquito breeding sites better. Some mothers with higher education levels seldom eliminated mosquito breeding sites due to poor awareness and concern about the environment. The fact of the matter might be concerning about the effect of cultural factors on people’s behaviour. For example, low educated individuals who lived in healthy lifestyles would eliminate mosquito breeding sites (14).

Moreover, age can also affect physical and mental condition, will, responsibility, and awareness of health. Older people had a better way of thinking and receiving information, but they did not always have good knowledge (15). Age could determine the right dengue fever prevention and increase maturity in making decisions (16). Actions and decisions individuals take can determine health status and thoughts about elimination of mosquito breeding sites. Also, age may lead to a process that confirms whether the information obtained is correct or not. Consequently, good perceptions shaped good attitudes that manifested good behaviour as well (17).

The bivariate analysis shows no relationship between age and elimination of mosquito breeding sites (p=0.603). It supports other studies that have found respondents aged <40 years were 1.1 times
more likely to follow instructions on eliminating mosquito breeding sites than those aged ≥40 years (p=0.86). Similarly, a study conducted in Manado also has discovered the same finding (p = 0.005) where younger respondents had a 3.95 times greater possibility of not eliminating mosquito breeding sites than older respondents (95% CI = 1.52-10.27)(18).

It indicates that age is not a determinant for someone’s decision in eliminating mosquito breeding sites. It is supported by another study which has found no relationship between age and elimination of mosquito breeding sites in Mulyoharjo village, Jepara regency(19).

Another variable that this study examined is employment which has a vital role in shaping behaviour towards dengue prevention measures. Employment could determine income level or economic status. If someone has a high income and good facilities, the opportunity for implementing a health care program will be even greater (20).

On the contrary, another study does not find any relationship between work and community-based dengue-free programs in Malalayang village, Manado. Civil servants and private employees had more knowledge, high education, and career experience than entrepreneurs, traders, and labourers (21).

Previous study stated that work and behaviour towards dengue prevention measures were related. However, in Jamaica, a study has pointed out that individual characteristics could be a forceful factor on DHF prevention. Concerning these ideas, a workplace could transmit DHF if the inhabitants did not know well how to prevent DHF (22).

This present study also reveals employed or unemployed respondents had equal opportunities to prevent DHF. Other studies also show similar finding that employment status could not be a determinant on eliminating mosquito breeding sites in the community (23). For example, unemployed respondents had more free time to eliminate mosquito breeding sites than those employed.

Additionally, this study discusses about the community attitude. Attitude is a reaction or response to a stimulus or object. Attitude is not an action, but a predisposition to action in both positive and negative. A positive attitude shows acceptance, recognition, and a tendency to accept something, leading to the right action. While a negative attitude is a refusal or disapproval of something, leading to wrong actions (15).

A previous study in Bandung has found supportive attitude was the most powerful factor in preventing DHF. However, a study in Tanah Kali Kedinding village, Surabaya shows no relationship between attitudes and elimination of mosquito breeding sites. Attitude is formed through personal experience with DHF that later could make people more aware of DHF prevention. Due to security reason, people tend to react positively to prevention measures and health care (26).

Other factors also might affect elimination of mosquito breeding sites. A positive attitude is not enough, supports might be still required. For example, formulating regulations may affect the community to be more aware of eliminating mosquito breeding sites. For example, Semarang city has formulated the Regional Regulation Number 5 of 2010 concerning DHF control. The results of this present study are not in line with the previous study which say government policy was one of the hindering factors to eliminate mosquito breeding sites in Jambon village, Grobogan district. Due to poor communication about the regulation and accessibility to information, the community would have
different perception of the information (27). If health workers do not understand the regulation, they
cannot provide counselling and support to the community(28).

More importantly, government support is one of the key factors in preventing DHF throughout
Indonesia. Delayed prevention will harm various sectors(29). For example, government support had a
strong relation to prevent DHF in Brazil (30). The Brazil Government made improvements in healthcare
system and facilities and established a new regulatory system for DHF prevention supported by several
other programs (30).

**Conclusion**

Eliminating mosquito breeding sites is affected by education, health worker support, and family support.
However, age, occupation, knowledge, attitude, and regulation do not affect mothers’ action to
eliminate mosquito breeding sites. This study recommends that the community conduct routine
elimination of mosquito breeding sites independently, at least once a week. This practice should be
done continuously as mosquitoes breed rapidly and move up to 100 meters. The community
acceptance is required in every larvae monitoring by health workers so that houses with larva breeding
sites can be detected to receive further interventions.

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