



The Knowledge About Fogging to Prevent DHF in Urban and Rural Communities in Bantul Regency, Yogyakarta, Indonesia

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Abstract. The increased of Dengue Haemorrhagic Fever (DHF) incidences in Indonesia every year might be related to the ineffective fogging implementation due to the lack of community's knowledge about fogging. Characteristics differences between urban and rural communities can affect the knowledge level about fogging to prevent dengue between both. This study determines the differences of knowledge level about fogging between urban and rural endemic area communities in Bantul Regency. This quantitative observational research used cross sectional design. There were 355 respondents from Kasihan Subdistrict (urban) and 366 respondents from Jetis Subdistrict (rural) who aged 15–59 years, physically and mentally healthy. Data of knowledge level about fogging was taken using a questionnaire. The level of knowledge about fogging, both in urban and rural areas are low (urban 45.4%; rural 48.4%). There is no significant difference between the knowledge about fogging between urban and rural communities in Bantul Regency (p 0.372). An important question that many people still do not understand is the purpose of fogging and what to do before fogging. It is necessary to increase public understanding regarding the purpose of fogging and what should be done before fogging.

Keywords: Fogging focus · Knowledge · Urban-rural communities · Dengue hemorrhagic fever

1 Introduction

Dengue Hemorrhagic Fever (DHF) is a disease caused by the dengue virus which is transmitted through the bites of *Aedes aegypti* and *Aedes albopictus* mosquitoes [1]. The diagnosis of dengue cases is established from the history of the disease course, clinical symptoms, physical examination including vital signs and signs of bleeding, as well as supporting examinations to confirm the diagnosis. Patients suspected of DHF will undergo laboratory tests that indicate a decrease in platelets $<100,000/\text{mm}^3$, and plasma leakage which is characterized by an increase in haematocrit $>20\%$ [2].

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Until now, DHF is still a health problem in Indonesia because the incidence of DHF in Indonesia tends to increase every year [2]. Indonesia is an endemic area for DHF, and this disease is mostly found in urban and rural areas in all provinces of Indonesia. Indonesia in 2021 there were 73,518 cases of DHF with a total death of 705 cases. Geographically, there were 474 districts/cities in Indonesia infected with dengue fever in 2021. Only 9 out of 34 provinces have districts/cities with Incidence Rate (IR) $> 49/100,000$ population of $>20\%$ (not reaching the national target) [3]. Conditions this is better than the previous year, both the IR and the case fatality rate.

Yogyakarta is a province that has 100% regencies/cities with IR $< 49/100,000$ population in 2021 (meeting the national target). Bantul Regency is an endemic area of DHF which has the highest number of cases. In 2020 there were 1,222 cases of DHF in Bantul Regency from 3,625 cases in Yogyakarta Province [4].

The number of dengue cases is influenced by many factors, including the physical environment, biological environment, and social environment. Risk factors that can cause DHF are climate change, socio-economic status, community behavior, poor housing and sanitation conditions, inadequate health services, and movement of non-immune populations to endemic areas [5]. In addition, gender, education level, level of knowledge related to DHF, perceptions about DHF also contribute to influencing the incidence of DHF [6].

Several efforts to control DHF have been shown to be effective in reducing the density of Aedes larvae and pupae, so it is suspected that they are effective in preventing the incidence of DHF, although higher quality research is still needed [7]. Fogging is an effort used to prevent outbreaks, which is carried out with insecticide misting techniques (space spraying). The effectiveness of fogging is influenced by the type of insecticide, dose, method of use, implementation time, spray distance, and wind speed. Fogging that is done repeatedly in the same area can cause vector resistance so that the decrease in the number of DHF vectors is not significant [8].

From the community aspect, the effectiveness of fogging will be more optimal if it is accompanied by community participation. Behavior is influenced by predisposing factors, one of which is perception [9], perception is formed from knowledge. Thus, community participation can work if the community's knowledge related to the implementation of fogging is sufficient. The level of knowledge is influenced by the level of education, information, culture, experience, socio-economics factor, occupation, and age [10].

Urban and rural communities have different characteristic in many ways such as mindset, level of education, socio-economic status, and mastery of technology. These factors are expected to affect the level of knowledge about fogging to prevent DHF in urban and rural communities. This study aims to reveal whether there are differences in knowledge between urban and rural communities regarding the problem of fogging.

2 Method

This study is an observational quantitative study with a cross sectional design. The study was conducted in two sub-districts, namely Kasihan and Jetis, in Bantul Regency, Province of Yogyakarta, Indonesia. The location was chosen based on the high incidence

of DHF cases every year. Kasihan Sub-district represents DHF endemic areas which are included in urban areas, while Jetis Sub-district represents DHF endemic areas which are included in rural areas.

The total number of respondents was 721 people, consisting of 355 respondents in urban endemic areas (Kasihan Sub-district) and 366 respondents in rural endemic areas (Jetis Sub-district) with inclusion criteria aged 15–59 years, physically and mentally healthy. Respondents who did not return the questionnaire and did not complete the questionnaire were excluded from this study. Data on the level of fogging knowledge were taken using a questionnaire after informed consent.

The study was carried out from October 2018–February 2019. The study began with determining the location of the study based on data on the incidence of DHF in Kasihan and Jetis Sub-district in 2016–2018. After that, the questionnaire data was collected at the residents' meeting. Then tabulation and data analysis were carried out. Data was analysed using the Mann Whitney test to determine the difference in the level of knowledge about fogging between urban and rural communities in Bantul Regency.

3 Results

3.1 Respondent Characteristics

The total number of respondents were 721 people, consisting of 355 respondents in urban endemic areas (Kasihan Sub-district) and 366 respondents in rural endemic areas (Jetis Sub-district), aged 15–59 years. Data on the characteristics of the respondents were obtained from the questionnaire. Characteristics of respondents are shown in Table 1.

Women dominated respondents, both in cities (69.3%) and in villages (73.2%), with aged 26–55 years, both in cities (89%) and in villages (86.6%). In general, urban respondents have a higher level of education than rural respondents. Respondents who do not attend school and have primary school education are more in rural areas. Meanwhile, respondents with education level of Junior High School, High School, and Academy/College are more in urban areas (Table 1). As a livelihood, rural people mostly work as laborers/farmer (42.9%). Meanwhile, respondents in urban areas are more retired/unemployed (31.8%).

The results of the questionnaire show that most of the respondents have heard of the term fogging (Table 2). This indicates that the term fogging is familiar to most people in Bantul Regency.

3.2 Knowledge Score

The instrument used to determine the level of knowledge of urban and rural communities about fogging is a questionnaire containing 8 questions about fogging that have been validated. The results of scoring community knowledge about fogging are presented in Table 3. Respondents from urban and rural areas have the same pattern in answering the questionnaire. The majority of respondent in both places have correctly answered

Table 1. The Distribution of Characteristics of Respondents

No	Characteristics	Urban	Rural
		Number (%)	Number (%)
1.	Gender a. Female b. Male	246 (69.3%) 109 (30.7%)	268 (73.2%) 98 (26.8%)
2.	Age (year) a. 15–25 b. 26–35 c. 36–45 d. 46–55 e. 56–59	12 (3.4%) 88 (24.8%) 129 (36.3%) 99 (27.9%) 27 (7.6%)	28 (7.7%) 87 (23.8%) 122 (33.3%) 108 (29.5%) 21 (5.7%)
3.	Education a. Uneducated b. Elementary c. Junior High School d. High School e. Academy/College	11 (3.1%) 51 (14.4%) 87 (24.5%) 158 (44.5%) 48 (13.5%)	14 (3.8%) 104 (28.4%) 83 (22.7%) 134 (36.6%) 31 (8.5%)
4.	Occupation a. Unemployment/Retired b. Laborer/Farmer c. Entrepreneur/Trader d. Employee/Teacher e. Student	113 (31.8%) 96 (27%) 88 (24.8%) 57 (16.1%) 1 (0.3%)	118 (32.2%) 157 (42.9%) 42 (11.5%) 42 (11.5%) 7 (1.9%)

Table 2. Distribution of respondents based on ever hearing of the term ‘fogging’

No	Answer	Urban	Rural
		n = 355	n = 366
1.	Yes	330 (93.0%)	338 (92.3%)
2.	No	25 (7.0%)	28 (7.7%)

questions regarding the requirements for fogging (city 79.4%; village 76%), the need for larvae eradication (3M) movement after fogging (city 93.2%; village 91.5%), and the person in charge of fogging implementation (city 70.4%; village 75.4%). However, most of the respondents still have less knowledge about the purpose of fogging implementation (city 55.8%; village 55.5%), the right weather to carry out fogging (city 56.6%; village 56%), and other matters. Things to do before the implementation of fogging (city 54.6%; village 50.8%). Only a few correctly answered questions regarding the interval between the first and second fogging in one period (city 18.3%; village 21.9%) and the right time to do fogging (city 29%; village 19.7%). Based on the percentage of the average

Table 3. Frequency Distribution of Questionnaire Answers for Urban and Rural Communities Regarding Fogging

No	Questions	Urban		Rural	
		Right (%)	False (%)	Right (%)	False (%)
1.	What is the purpose of Fogging?	198 (55.8%)	157 (44.2%)	203 (55.5%)	163 (44.5%)
2.	What are the conditions for fogging?	282 (79.4%)	73 (20.6%)	278 (76.0%)	88 (24.0%)
3.	What is the best weather for fogging?	201 (56.6%)	154 (43.4%)	205 (56.0%)	161 (44.0%)
4.	How long is the distance between the first and second fogging in 1 period?	65 (18.3%)	290 (81.7%)	80 (21.9%)	286 (78.1%)
5.	Is it still necessary to do the 3M movement after fogging?	331 (93.2%)	24 (6.8%)	335 (91.5%)	31 (8.5%)
6.	Who is responsible for implementing the fogging?	250 (70.4%)	105 (29.6%)	276 (75.4%)	90 (24.6%)
7.	When is the right time to do fogging?	104 (29.0%)	252 (70.0%)	72 (19.7%)	294 (80.3%)
8.	What needs to be done before fogging for optimal results?	194 (54.6%)	161 (45.4%)	186 (50.8%)	180 (49.2%)

frequency of respondents' answers, the correct answer in urban communities is slightly higher than in rural communities (city 57.2%; village 55.7%).

The knowledge score on fogging was then classified into three levels, namely good, sufficient, and poor. The distribution of the community's level of knowledge about fogging based on the knowledge score is shown in Table 4. The level of knowledge about fogging of urban communities is slightly better than that of rural, but both have the least category (city 45.4%; village 48.4%), followed by the moderate category (city 44.5%; village 42.3%), and the least category was good (city 10.1%; village 9.3%).

3.3 Differences in Knowledge Between Urban and Rural Communities

The Mann Whitney test showed a $p = 0.372$ ($p > 0.05$) so it was concluded that there was no difference in the level of fogging knowledge between urban and rural communities in Bantul Regency, Yogyakarta.

Table 4. Distribution of Knowledge Levels of Urban and Rural Communities

No	Score Interval	Category	Urban	Rural
			n (%)	n (%)
1	≥ 76	Poor	161 (45.4%)	177 (48.4%)
2	56–75%	Moderate	158 (44.5%)	155 (42.3%)
3	≤ 55			

4 Discussion

4.1 Gender

In Table 1 it is stated that the number of female respondents is higher than that of men, both in urban and rural areas. This shows that Indonesian women are caretakers [11], also because women's ability to remember in terms of knowledge is better than men [12]. If it is related to the results of the study that there is no difference in knowledge about fogging between urban and rural communities, it may be due to gender. The dominant respondents in the two areas being compared (urban and rural) are female.

The results of this study also prove that the level of public knowledge about fogging is low, both in urban and rural areas. This may be due to the lack of sources of information regarding fogging, either through counseling or mass media. This needs to be further proven.

4.2 Age

From Table 1, information is obtained that majority respondents are aged 26–55 years, both in urban and rural areas. The age of 25–65 years is a full adult age category [13]. If it is associated with a low level of knowledge about fogging, then this shows that knowledge is not directly proportional to age. A person's level of knowledge is influenced by education level, type of work, and proficiency of the use of information technology [14]. However, different results were reported by Suwarno and Yuwono [15] which stated that with increasing age, the ability to grasp and mindset also increased, so knowledge was getting better.

The results of this study indicate that there is no significant difference in the level of knowledge about fogging between urban and rural communities, where the level of knowledge of both is equally lacking. This shows that in the same age group, the level of knowledge about fogging is the same between urban and rural communities. It is necessary to reveal further, sources of knowledge about fogging that can be accessed by the public.

4.3 Level of Education

Urban respondents have a slightly higher level of education than rural respondents (Table 1). Research related to the relationship between the level of education with a person's level of knowledge of something is still inconsistent. Research by Gladys et al. [16] showed that there was no relationship between the level of education and the level of community knowledge about first aid for DHF because the community had never received this information at school. In addition, the formation of knowledge is more dominated by local culture, the environment, and the influence of others [17]. Diaz-Quijano et al. [18] stated that respondents with higher education levels have higher knowledge of DHF than those with lower levels of education. The higher a person's level of education, the easier it is to accept and develop knowledge and technology [19]. The above differences may be due to differences in the objects studied. This needs further research.

The results of this study indicate that there is no difference in the level of knowledge about fogging between urban and rural communities, where the level of knowledge of both is categorized as less. Thus, it is interpreted that the difference in education level between respondents in the two places may not affect the level of knowledge about fogging. Further research is needed to prove whether there is a relationship between the level of fogging knowledge and the level of education.

4.4 Occupation

Table 1 shows that most respondents in urban areas are retired/unemployed (31.8%), while respondents in rural areas work as laborer/farmer (42.9%). Several studies have shown that one's type of work will affect one's knowledge and experience. When the job uses the brain more often than uses muscles, the performance and ability of a person's brain to store (memory) will increase [15]. If it is related to the results of this study, that there is no difference in the level of knowledge about fogging between urban and rural communities where the level of knowledge of both is in the poor category, it is likely because the job status of the respondents are retirees and housewives (urban) and laborer/farmer (rural) were equally less exposed to information about fogging. Further research is still needed regarding the relationship between type of work and knowledge of fogging.

4.5 Level of Knowledge

Knowledge is part of health behavior. Public understanding of knowledge in the health sector varies widely [20]. In this study, respondents' level of knowledge about fogging was measured using a questionnaire sheet containing questions about the objectives, requirements, and preparation for fogging implementation.

This study aims to measure the understanding of urban and rural communities regarding fogging as an effort to prevent dengue outbreaks. From Table 3, it can be seen that most of the respondents in both places already have good knowledge about the requirements for fogging, the need for 3M movement after fogging, and the person in charge of fogging implementation. However, most of the respondents still have less knowledge about the purpose of fogging implementation, the right weather to conduct fogging, and things that must be done before the implementation of fogging. Only a few know the interval between the first and second fogging in one period and the right time to do fogging.

Judging from the percentage of correct answers to each question (Table 3), urban respondents have higher knowledge on almost all questions, especially questions regarding the requirements for fogging implementation, the right time to carry out fogging, the need for 3M movement after fogging, and preparation before fogging implementation. This is probably since more urban people access information through mass media and social media. City people get a lot of information about DHF from radio, television, and print media [21].

What is interesting from the results of the questionnaire is that knowledge about the person in charge of fogging implementation and the interval between the first and second fogging in one period is higher in rural respondents. This is probably since the attention of rural communities during fogging is slightly higher than that of urban communities. Knowledge is not only obtained from formal education but can also be obtained from daily life experiences [22].

Based on the percentage of the average frequency of respondents' answers (Table 3), it can be concluded that knowledge about fogging in urban communities is slightly higher than in rural communities. After the knowledge scores are classified as in Table 4, it can be concluded that the level of knowledge about fogging in urban and rural communities is included in the poor category. The level of public knowledge about dengue prevention affects attitudes in behavior because someone who has insight and experience about dengue will have confidence and take preventive action [23].

4.6 Knowledge Differences Between Urban and Rural Communities

Based on Table 4, most respondents in urban and rural areas have a low level of knowledge about fogging, then the category is sufficient, and at least good category. The results of the Mann Whitney comparison test obtained a p value of 0.372 (>0.05) so it can be concluded that there is no difference in the level of fogging knowledge between urban and rural communities. The results of this study are inversely proportional to the results of the research of Kesetyaningsih et al. [24] and Hafeez et al. [21] which stated that there is a significant difference between the level of knowledge about DHF in urban and rural communities.

The absence of differences in the level of knowledge about fogging between urban and rural communities in this study can be caused by several things as follows: (1). Characteristics similarity. The similarity of respondents' characteristics in terms of gender, age, and level of education can lead to similarities in the level of knowledge. This

is supported by Farhan's research [25] that the similarity in aspects of age, gender percentage, education level, and history of having DHF can lead to the same level of knowledge about DHF in high endemic and low endemic areas. (2). Occupation. Most of the respondents in urban areas are unemployed (housewives) or retired, and most of the respondents in rural areas are laborers/farmers where people with these jobs tend to have the same level of knowledge. This is evidenced by the results of research Benthem et al. [26] that farmers, housewives, and people who do not work have a lower level of DHF knowledge than students and traders. They tend to stay at home more so there is a possibility that they are not exposed to information about fogging or other dengue prevention. Lack of information regarding fogging. Information is a principal factor related to the level of knowledge. According to Wawan and Dewi [27], the factors that affect a person's level of knowledge include education, occupation, age, environment/experience, socioeconomic, and information. Based on Piaget's theory (1947), people tend to build their knowledge from the information they get. Someone combines their experiences and observations to form their knowledge and incorporates current ideas they get from information sources because additional information will develop their understanding of a knowledge [27]. Based on information from respondents both in urban and rural areas, most respondents often receive counseling about DHF, but very few get information about fogging. This is likely to cause the level of knowledge of urban and rural communities about fogging is still poor.

4.7 Lack of Participation on the Implementation of Fogging

Knowledge is not only obtained from formal education but can also be obtained from daily life experiences [22]. A person's experience of various things is usually obtained from the environment of daily life [28]. The more experience a person has about a thing, the more knowledge will increase things about it [29]. The results of interviews with respondents in urban and rural areas obtained information that most respondents rarely participate in the implementation of fogging in their environment because the implementation of fogging is only carried out by health workers. Thus, for fogging to be more effective in preventing the incidence of DHF, it is necessary to increase public understanding regarding the purpose of fogging and what should be done before fogging.

5 Conclusion

It is concluded that the level of knowledge of most urban and rural communities regarding fogging is poor. In addition, there is no significant difference regarding knowledge of fogging between urban and rural communities in Bantul Regency.

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