



PRIMARY RESEARCH

# Knowledge, perception, and dengue prevention behavior in lowokwaru sub district, urban area in Malang, Indonesia

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**Abstract.** One strategy to control dengue in Indonesia is changing behavior practice using the slogan 3M plus. 3M consists of cleaning water containers, covering water containers, and burying or throwing discarded items. Plus is activity to avoid mosquito bite (using repellent or long sleeves) and reduce mosquito breeding, such as fog. This study aimed to determine the level of knowledge, perception, and prevention behavior regarding dengue in the Lowokwaru sub-district, an urban area in Malang, Indonesia. A cross-sectional study using a semi-structured questionnaire among 220 respondents was conducted by face-to-face interview. More than 43 percent (43.6%) of respondents exhibited a moderate level of knowledge. They had good knowledge regarding the cause and severity of dengue. However, they had low knowledge about prevention actions. Most of the respondents had a positive perception of dengue. The positive perception was found towards susceptibility and severity of dengue and only moderate perception towards prevention actions. Most of them (61%) were more likely to perform 3M prevention behavior than plus prevention behavior. Respondents had low knowledge and needed an improved practice level regarding prevention actions, particularly plus prevention activities. Therefore, this study suggests that the 3M plus campaign should provide more information about prevention behavior knowledge than plus activities.

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## INTRODUCTION

First dengue cases were reported in Jakarta (DKI Jakarta) and Surabaya (East Java) in 1964. At that time, there were 58 dengue patients among whom 24 persons died in Surabaya. Thereafter, the incidence and prevalence of dengue widely spread in all provinces throughout Indonesia [1, 2]. By 2010, Indonesia ranked as the highest of dengue cases in South-east Asian Nations [3]. In 2014, Ministry of Health of Indonesia reported that the highest dengue cases were found in West Java, Central Java, and East Java [4]. Dengue is health problem in Malang, the second largest city of East Java Province in Indonesia. The number of dengue cases reported was highest in 2010 in Malang. Total of 658 dengue cases were found during January to May in that year. The number of cases decreased year by

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year thereafter. However, in 2014, the number of cases began to increase. There were 160 dengue patients with one patient facing death in urban area in the year 2014. In 2015, 181 dengue patients with three mortality cases occurred during January to December [5, 6]. Data showed that dengue cases were higher in urban than in rural area. It was supported by surveillance study in Malang in the year 2010 that identified urban areas had mosquito larvae more than rural areas [7]. In 1992, the Ministry of Health launched strategies including surveillance systems, case management, control vector, and changing people's behavior. Vector control and changing people's behavior are combined through surveillance system. This program is known as 3M plus, meaning to combat mosquito nest that should be carried out periodically by the community. 3M is composed of three Ms: menutup (covering the water container), menguras (cleaning the water container), and mengubur/membuang (burying/throwing discarded items). Plus are activities to reduce mosquito breeding places such as using chemical to kill larva or fogging. Plus can also be described as activities to protect people from mosquito bite for example using repellent, mosquito coils, larvasida, or long sleeves and trouser [1, 8]. Previous studies investigated that many factors influence practice of dengue prevention such as knowledge and perception. They reported that participants with higher knowledge of dengue reported higher prevention behavior than those with low knowledge [9, 14]. In addition, studies found that individuals with higher perceived susceptibility of acquiring dengue had higher dengue prevention behavior [9, 10]. A study in Malaysia showed that the prevalence of dengue fever was higher in participants who practiced high risk behaviour as compared to those who practiced low risk behaviour [14]. Investigators in Laos revealed that persons with good knowledge were more likely to have good preventive behavior compared with those with poor knowledge [11, 15]. However, several studies revealed that good knowledge about dengue fever among community did not translate into adopting good preventive practice [16-18]. Despite evidence up to now, changing behavior may solve dengue problem in most countries. Many previous studies reported dengue prevention behavior in many places. However, there is no report on dengue prevention behavior in Malang, therefore this study aimed at investigating level of knowledge, perception, and dengue prevention behaviors in urban areas in Malang, Indonesia.

## RESEARCH METHOD

### Study Design and Sample

This was a cross-sectional study. Study was conducted among respondents who lived in Lowokwaru village, Lowokwaru sub district, East Java during May – June 2016. This study enrolled Malang residents aged 18 years and above, registered, lived more than 6 months in urban areas in Malang, and were willing to participate in this study. Residents who were not at home during data collection were excluded from this study. The minimum sample size was 191 [19] and afterwards added 20% for anticipating non-response rate, therefore this study collected data from 220 respondents. Quota sampling was used to select one respondent in each house from 15 clusters.

### Data Collection and Analysis

Data collection to explore knowledge, perception, and dengue prevention behavior used semi-structured questionnaire by face-to-face interview. The total score of knowledge was 14 and respondents would be considered at need improvement level if the scores < 60% = 0-8, moderate level if scores 60%-80% = 9-11, and good level of knowledge if the scores = 12-14. Perception part consisted of 19 statements. Each positive statement was given

score 5 for strongly agree, 4 for agree, 3 for neutral, 2 for disagree, and 1 for strongly disagree. Conversely score had been given for negative statements, score 5 for strongly disagree, 4 for disagree, 3 for neutral, 2 for agree, and 1 for strongly agree. Total score was 95 and categorized into negative perception if the score ranged from 0-31, moderate perception if the score ranged from 32-63, and positive perception if the score ranged from 64-95. The total score of dengue prevention behavior was 18 and participants had been considered at need improvement level if they get the score < 60% = 0-10, moderate level if get score 60%-80% = 11-14, and good level of prevention behavior if the score = 15-18. SPSS was used to analyze and descriptive data were presented by frequency and percentage.

### Ethical Consideration

This study was approved by the Ethics Committee of the Faculty of Tropical Medicine, Mahidol University (MUTM 2016-015-01) and local Ethics Committee in Malang, Indonesia (196 / EC / KEPK / S2 / 05 / 2016).

## RESULTS

### Socio Demographic Factors

Majority of respondents were female, average age was 45 years, were housewife, had low educational background, and average income 1-3 million rupiah per month. More than 21 percent (21.4%) of respondents had been living in Malang for 31-40 years. Mostly respondents had 3-4 family members in their house (Table 1). Almost 90 percent (87.7%) of respondents mentioned that they obtained information about dengue, while 12.3 percent of them did not have. More than 32 percent (32.4%) of respondents who had dengue information said that the main resource of information was television (Table 2).

**TABLE 1 .** Participant's socio-demographic characteristics

Characteristic	N	%
<b>Gender</b>		
Male	60	27.3
Female	160	72.7
<b>Age</b>	Mean (SD) 44.94 ± 14.037	
18-30	40	18.2
31-40	48	21.8
41-50	49	22.3
51-60	52	23.6
> 60	31	14.1
<b>Duration of stay in Malang</b>	Mean (SD) 36.89 ± 18.277	
< 21 years	44	20
21-30 years	32	14.5
31-40 years	47	21.4
41-50 years	41	18.6
51-60 years	35	15.9
> 60 years	21	9.5
<b>Education</b>		
No education	2	0.9
Elementary	23	10.5
Junior high school	33	15.0
Senior high school	110	50.0
13-15 years education	7	3.2
University and higher	45	20.5
<b>Occupation</b>		
Unemployed	126	57.3
Government	6	2.7
Private (owner)	31	14.1
Private (worker)	57	25.9
<b>Income/month</b>		
< 1 million rupiah (<100 USD)	18	19.1
1 -3 million rupiah (100-300 USD)	63	67.0
>3 million rupiah (> 300 USD)	13	13.8
<b>Number of family</b>		
1-2 persons	22	10.1
3-4 persons	99	45.4
> 4 persons	97	44.5

**TABLE 2 .** Dengue information

Description	N	%
<b>Having information of dengue</b>		
Yes	193	87.7
No	27	12.3
<b>Resource</b>		
Family	31	10.6
Friend	33	11.3
Local primary health care	72	24.6
TV	95	32.4
Other	62	21.2

### Knowledge

This study revealed that 43.6 percent of respondents had moderate level of knowledge. Respondents had good knowledge regarding cause of dengue and severity of dengue. More than 80 percent of them answered the cause of dengue correctly. In addition, more than 96 percent of respondents showed good knowledge either in terms of dengue could cause death (96.4%) and be prevented (98.2%). Although almost all respondents mentioned that they could prevent dengue, 60.9 percent of them achieved moderate level of knowledge about prevention activities (Table 3). Respondents showed low level of knowledge about the highest season of dengue infection, age group of people getting sick of dengue, symptoms of dengue, and personal protection. Less than 53 percent of them (52.1%) correctly pointed out the person who would get sick of dengue. Only 56.8 percent and 31.4 percent of respondents could answer symptoms of dengue and personal protection respectively. Several respondents mentioned dry season as the highest season of dengue infection. Few respondents mentioned that only children or teenagers could get infected by dengue. For the symptoms, all respondents who knew the symptoms mentioned fever as one of three most common symptoms. Only 31.4 percent of respondents could correctly answer personal protection activity (Table 3).

**TABLE 3 .** Knowledge of dengue and dengue prevention behavior among 220 respondents in Lowokwaru sub district in Malang

Variables	Number	%
Knowledge level overall	96	43.6
the highest season of dengue infection	130	59.1]
Group age of people who can get sick of dengue	116	52.7
The cause of dengue	180	81.8
3 mostly common symptom of dengue	125	56.8
Dengue could makes patient died	212	96.4
We can prevent dengue infection	216	98.2
3 activities that can prevent dengue	134	60.9
one activity of personal protection	69	31.4

< 60% = need improvement 60-80% = moderate > 80% = good

### Perception

This study found 82.3 percent of respondents had moderate perception and 17.7 percent of them had positive perception. Respondents had positive perception regarding susceptibility and severity. More than 76 percent of them (76.4%) had positive perception con-

cerning benefit of dengue prevention behavior. However it was found that they had moderate perception toward barrier of dengue prevention behavior approximately 53.2 percent (Table 4).

**TABLE 4 .** Perception level of dengue and dengue prevention behavior among 218 respondents in Lowokwaru sub district, Malang

Issue	Mean score $\pm$ SD	Perception Level	
		Moderate (%)	Positive (%)
Susceptibility	12.14 $\pm$ 1.63	32 (14.5)	188 (85.5)
Severity	12.39 $\pm$ 1.67	33 (15)	187 (85)
Benefit of dengue prevention behavior	18.80 $\pm$ 3.19	52 (23.6)	168 (76.4)
Barrier of dengue prevention behavior	27.10 $\pm$ 4.83	117 (53.2)	103 (46.8)
Perception level overall	70.43 $\pm$ 8.85	39 (17.7)	181 (82.3)

### Dengue Prevention Behavior

About 61 percent of them practiced moderate behavior. The study revealed that 3M were the most behavior done. Around 84 percent of them (83.5%) covered water container. Almost 75 percent of them (74.8%) cleaned water container in the bathroom at least once a week and more than 1 time / week. In contrast, the percentage of respondents who practiced plus activities such as used repellent and mosquito coils properly at daytime were only 17 percent and 8.7 percent respectively. Furthermore, more than 59 percent of them (59.2%) never used repellent and 37.6% of respondents never used mosquito coils. About 165 respondents or 75.7 percent did not put abate into water container (Table 5).

**TABLE 5 .** Prevention behavior among 218 respondents in Lowokwaru sub district, Malang

Behavior	N	%
Behavior level overall		
Need improvement	78	35.8
Moderate	133	61
Good	7	3.2
Practice of behavior		
Cleaning water container in bathroom $\geq$ 1x /week	163	74.8
Have water container inside and always cover	66	83.5
Have water container outside and always cover	19	65.5
Throw discarded items $\leq$ 1 week	129	59.2
Never used mosquito coils	82	37.6
Never used repellent	129	59.2
Don't put abate	165	75.7
Sometime wear long sleeves at day time	178	81.7
Sometime wear long pants / skirts at day time	170	78.0

## DISCUSSION

### Knowledge

This study revealed that 43.6 percent of respondents had knowledge at moderate level and another 36.4 percent had good level of knowledge. This was similar to studies conducted among Myanmar migrants that revealed average of respondents had moderate level of

knowledge [20, 21]. This condition might be because majority of respondents obtained information about dengue from primary health care provider or health promotion very often due to endemic region in Indonesia. This study found that more than 90 percent of respondents had information about dengue. They received information mostly from local primary health provider and television. This was consistent with several studies that reported TV as the main source of dengue information [12, 16, 18]. The Ministry of Health had given campaign on dengue prevention behavior by advertising on social media and television. In addition, primary health care provider collaborated with health volunteer and working woman group in each cluster actively provided health promotion about dengue.

This study found 80 percent of respondents had moderate and good level of knowledge, however only 3.2 percent respondents who performed good level of dengue prevention behavior. Similar to a cross-sectional study in Bali that found 95.6 percent respondents had level of good knowledge and only 51.1 percent practiced good level of behavior [22]. Regarding the knowledge, several respondents mentioned that dry season is the highest season of dengue infection. They argued that more mosquitoes lived in dry season. This opinion might be expressed due to uncertainty of the season change in Malang. Few years ago, the change of temperature was in accordance with the season. The weather was cold during dry season, however at present the weather was hot during dry season. Thus, it could increase mosquito population during dry season.

About 47.3 percent of respondents who incorrectly answered age group of getting sick of dengue mentioned that only young children, teenagers, or young adults could get dengue. They were not aware that infants and elderly people could also get dengue. It might be because mostly dengue cases were reported in young children or teenagers. However, respondents who correctly answered the question revealed that nowadays dengue could attack all age. During data collection, few respondents found dengue cases in elderly people in their neighbour. Previous study revealed that 85.6 percent of respondents had known mosquito as vector [23]. This study found around 82 percent of respondents (81.8%) mentioning the mosquito bite as route of dengue transmission, although most of them did know the name of mosquito. However, some respondents said *Aedes aegypti* is the mosquito that transmitted dengue. About 18.2 percent of them said that poor environment with much puddle could cause dengue. Around 57 percent of respondents (56.8%) correctly answered symptoms of dengue. They mentioned fever as the main symptom followed by rash on the skin. This result was similar to the study in Malaysia [24]. Although almost all respondents (98.2%) mentioned that they could prevent dengue, only 60.9 percent of them could correctly answer three dengue prevention activities. Almost 40 percent of them (39.1%) mentioned one or two dengue prevention activities. Cleaning water container in the bathroom was most often the answer. Personal activity was part of plus activities from dengue prevention actions. The average of knowledge was low for prevention. This was different from the study in Thailand which reported knowledge about dengue prevention behavior was better than others [20]. This study found only 69 persons (31.4%) correctly identifying personal activity. However, they could explain about repellent, mosquito coils, or long clothes. This might be because they were not familiar with the term protection activity, although some of them practiced it.

### Perception

Considering respondent's perception, none of them had negative perception. This study found that 17.7 percent of them achieved moderate level of perception and 82.3 percent

of them achieved positive level of perception. Compared to studies in Laos [15] and Aceh [25], respondents in this study had higher perception. However, study in Aceh found that generally practiced dengue prevention behavior was on need improvement [25, 28] while this study reported respondents practiced moderate level of dengue prevention behavior. In general, this study revealed positive perception concerning susceptibility and severity. More than 90 percent of respondents strongly agreed (32.7%) and agreed (60%) that everyone could get sick of dengue. They also had positive perception regarding children getting sick of dengue easier than adults and persons experienced with dengue could get infected again. This perception might be the reason for practicing moderate and good prevention activities. A previous study in Malaysia also found that respondents with higher susceptibility perception had a higher dengue prevention behavior [10].

More than 90 percent of respondents had positive perception regarding severity that dengue was dangerous and caused death in this study. Another study in Indonesia supported this result that individuals considered dengue as severe and deadly disease [26]. Since dengue was one of the common infectious diseases in Indonesia, it might make respondents cautious to dengue by doing the prevention actions. During data collection, some of them mentioned that dengue could cause death if the patient did not get appropriate treatment. Respondents had moderate perception concerning benefit of practicing dengue prevention behavior. However, several of them disagreed that it would be safe to put abate into water container (14.5%) and use mosquito coils (29.5%). Few respondents perceived that abates were not safe particularly in water storage for drinking and cooking. They were afraid of chemical inside abate. Furthermore, few of them hesitated to put abate into water container if they did not get from health care provider. The reason of not using mosquito coils was that they were afraid of the adverse effect. Some of them revealed that they had used it and got some respiratory problem and bad smell.

Respondents had moderate perception regarding barrier of dengue prevention behavior. Few respondents had negative perception such as using mosquito coils caused bad smell (35%), and was expensive (24.1%). Some of them disliked the smell of mosquito coils because the smell would stay for whole day and make clothes smell. Few respondents with less income said that some of the mosquito coils were expensive. They also mentioned that cleaning water container regularly was time consuming (16.3%) and wearing long sleeves at daytime limited movement for doing activities. Several respondents had big water container and it might need effort to clean it. Since the temperature at daytime was high in Malang, some of the respondents preferred to wear short clothes for doing daily activities.

### **Dengue Prevention Behavior**

Only 3.2 percent of respondents had good level of dengue prevention behavior. In general, this study found that respondents practiced moderate level of dengue prevention behavior. Previous studies in Thailand [21, 26] revealed that respondents practiced moderate level of dengue prevention behavior. Another study in Aceh found 70.35 percent individuals practiced need improvement level of dengue prevention behavior [25]. Another study in Malang revealed that 52 percent of households had good prevention behavior [6]. The possible reason for difference might depend on the criteria to categorize towards good, moderate, or need improvement level. The criteria for categorizing respondent's behavior in this study used Benjamin Bloom taxonomy. Around 61 percent of respondents practiced moderate level of dengue prevention behavior. This might be because the majority of respondents were familiar with the prevention actions particularly 3M activities. Few

respondents mentioned that they were doing such behavior because of their habit. Although they did not know certain reason for doing it, they had done the prevention actions. Moreover, every house had water container in the bathroom, may lead respondents to clean it regularly. This study found that 3M activities was the most common behavior done. Approximate 83 percent of respondents (83.5%) covered water container indoors. The most second was personal protection activity such as wearing long sleeves at daytime (81.7%). Previous study found that participants are likely to practice personal protection activity for example putting abate in the water container [16] or using mosquito nets [27, 29]. However, a study in Laos revealed that they perform both personal protection such as use mosquito nets and 3M behavior such as covering water container [11]. This study showed that respondents also performed both personal protection and 3M activity such as covering water container and wearing long sleeves at daytime. Majority of respondents knew 3M and practiced it in daily life regularly such as cleaning water container in the bathroom, covering water container, or throwing discarded items. However, some of them might not do as recommended. For example, few respondents clean water container once a month or never clean it. For those who never clean containers, they expected that other family members would do. During data collection, some respondents mentioned they would not clean it by themselves because other family member always did. For plus activity of dengue prevention behavior, 15.9 percent of respondents used mosquito coils properly and 7.7 percent of them used repellent at daytime. Around 18 percent of them put abate in the water container. It was found that 15 percent of respondents wore long sleeves and 18.6 percent of respondents wore long pants or skirts. The rest of the participants practiced less properly, for example some respondents used mosquito coils and repellent at the night time. Several respondents mentioned they disliked to use mosquito coils or repellent because they worried about adverse effect and no need to use because there were rare mosquitoes flying around their house. Few respondents suggested that mosquito racket was better than mosquito coils. They also mentioned that abate was not effective in killing mosquito larva. Some of the respondents mentioned several activities that could prevent dengue besides 3M and plus activities such as cleaning house, garden, and environment around house, maintaining healthy life and consuming healthy or herbal food. Using mosquito racket was part of plus activities that they suggest to do because it was easy and safer. In addition, few of them said avoiding hanging clothes may be another prevention practice. This finding showed that several respondents practiced some prevention actions besides 3M and plus activities.

## CONCLUSION

In general, respondents had moderate level of knowledge. However, they had low knowledge and need improvement level of practice regarding prevention actions particularly plus prevention activities. Therefore, this study suggests that 3M plus campaign should provide more information about prevention behaviour knowledge in terms of plus activities.

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— This article does not have any appendix. —