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Community Knowledge and Attitudes about the Transmission of Dengue Haemorrhagic Fever and Its Relationship to Prevention Behaviour in Palembang, South Sumatra, Indonesia

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Abstract

BACKGROUND: PSN 3 M Plus is a long-running program in Indonesia for the prevention and control of dengue hemorrhagic fever (DHF).

AIM: This study aimed to determine the knowledge, behavior, attitudes, and beliefs of the community toward PSN 3 M Plus in preventing and controlling the spread of DHF.

METHODS: A cluster random sampling method was used to recruit 200 respondents in endemic areas and 100 respondents in sporadic locations of Indonesia from August 2020 to February 2021. The respondents were interviewed directly by interviewers and the relationships between demographics and characteristics with the practice of PSN 3M Plus prevention behavior on the incidence of DHF were analyzed.

RESULTS: Most respondents had good knowledge regarding the cause of DHF. Although respondents recognized and understood the dangers of and how to control DHF, most did not follow PSN 3 M Plus and believed that fogging was the most effective control measure. There was a significant relationship between the characteristics of the respondents in terms of education, occupation, and attitude on vector control practice.

CONCLUSION: Although community environmental modifications can be a cost-effective approach to reduce the incidence of DHF, there is a need to raise public awareness regarding preventive vector control measures as good knowledge does not guarantee good compliance with PSN 3M Plus recommendations.

Introduction

Dengue hemorrhagic fever (DHF) is the most common arboviral disease globally [1], affecting more than 100 countries, both tropical and subtropical [2], with an estimated 390 million dengue virus infections annually [3], of which, 96 million manifest clinically [4]. The virus is transmitted by the *Aedes aegypti* mosquito [5], [6], which rapidly breed in urban environments [7]. The World Health Organization recommends a community-based integrated vector control approach to combat *A. aegypti*. For this strategy to be effective, the authorities need to ensure that local communities have sufficient knowledge about vector control and are willing to act according to the recommendations [7]. Currently, vector control is the only available method to control DHF as there is no specific treatment or vaccine yet available for DHF [8]. An integrated vector control strategy is important [9], with DHF prevention and control achieved through environmental management and behavior change [10].

Knowledge and behavior greatly influence the dynamics of the *Aedes* mosquito population, which in turn affects dengue virus transmission [11]. Vector control is critical [12], with knowledge and behavior being fundamental aspects of DHF control and prevention [13]. Currently, the recommended control measure is the eradication of mosquito breeding nests [14], however, the local community needs to have a good understanding of the routes of DHF transmission of DHF, as their behavior plays a vital role in limiting dengue disease transmission [15].

The vector control program in Indonesia was introduced in 1992 through the 3M movement, namely drain, Bury, Cover. Since 2000, the program has been modified to 3M Plus with larvicides, raising fish in small ponds/puddles and preventing mosquito bites using mosquito repellents. This program aims to change people's behaviour [16] and eradicate mosquito nests to prevent dengue and control mosquito breeding grounds [17]. For success, the program must be accompanied by awareness-raising campaigns and

community participation [18]. Knowledge, Attitude, and Practice surveys [19] suggest that dengue control is difficult to achieve due to low community motivation, therefore, it is challenging for health campaign teams to convince the public of the importance of vector control, especially during the rainy season because there are potential breeding places for vectors inside and outside the home [20], [21].

DHF is an endemic disease throughout the tropics and parts of the subtropics [22]. The results of previous studies [23] show that dengue transmission in southern Italy has been detected in non-endemic areas. *Aedes albopictus* is considered as a vector that transmits dengue infection. The spread of DHF is influenced by the DENV-3 genotype sequence resulting in different tree phylogenetic in various worlds [23], [24] Environmental factors such as climate change are risk factors for disease incidence [25], [26]. Palembang City is an endemic area of DHF with a higher incidence and CFR when compared to other regencies/cities. The fluctuation of DHF cases during the 2015–2019 period in Palembang City, based on data from the Palembang City Health Office, in 2015 the number of DHF patients was 622 patients (IR 39.35/100,000) with a CFR of 0.16%, then in 2016 979 patients (IR 64.27/100,000) with 0.20% CFR. In 2017, there were 932 patients (IR 58.17/100,000) with a CFR of 0.22%, and in 2018 there were 693 patients (IR 44.49/100,000) with a CFR of 0.00144%.

In 2019, the number of DHF cases increased drastically in numerous countries [27], including in Palembang, the capital city of the Indonesian province of South Sumatra. As attitudes, awareness, knowledge, and community behavior are fundamental in controlling DHF [1], [28], [29], this study aimed to determine the knowledge, attitudes and compliance with PSN 3M Plus strategies of those living in Palembang. It is anticipated that the study findings will help inform policymakers to modify or develop strategies for more effective DHF control and prevention, as well as increase community participation in DHF prevention programs.

Methods

Study design and sample

This observational, cross-sectional study was conducted in Palembang, a dengue-endemic area consisting of 18 urban villages and 107 villages, with a total area of 369.22 km² and a population of 1,441,865 (Figure 1). The 7 Ulu and Gandus urban villages were selected because they are urban villages with the highest number of dengue cases in Palembang. The study included all residents living in the urban village and the sample size was calculated based on equation 1:

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

Where n and N are the minimum sample size and population size, respectively, and e is the percentage allowance for inaccuracy due to errors (10%).

The Cluster Random Sampling method was used to recruit 200 respondents from August 2020 to 2021 and was conducted in strict adherence to the COVID-19 safety protocol. The respondents were aged 18–80 years with no history of mental illness. Before the questionnaire was given to the respondents, their home address and type of dwelling were recorded and they provided written informed consent. The questionnaire

Figure 1: Map of Palembang

comprised demographic profiles and characteristics of the respondents, their knowledge, attitudes, beliefs about dengue prevention, and their compliance with PSN 3M Plus DHF control measures. All research activities have been approved by the Health Research Ethics Committee (KEPK) Poltekkes Kemenkes Palembang, Indonesia (Certificate No: 1164/KEPK/Adm2/VIII/2021).

Concept definition

Public beliefs about health influence people's knowledge, treatment methods, and disease prevention behavior. Health beliefs are general perceptions of health and disease and the influence of sociodemographic characteristics, specifically, the respondents' knowledge about DHF consists of their understanding of its clinical symptoms, the risk of contracting DHF, treatment methods, disease vector modes of virus transmission, and prevention methods. After completing the first part of the interview about the respondents' sociodemographic characteristics, the questionnaire continued with questions focusing on knowledge, attitudes, and behavior. Each interview and survey took 20–40 min.

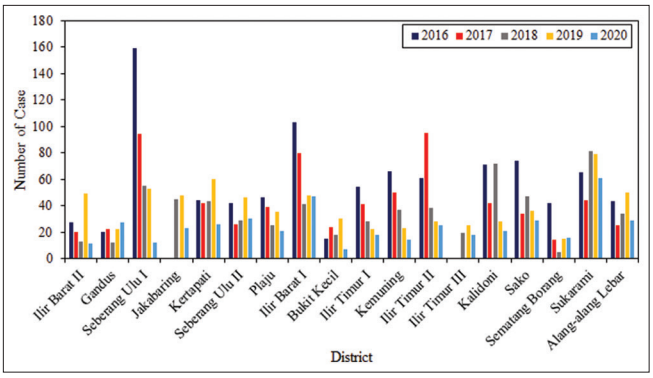

Figure 2: Number of DHF cases by district 2016–2020

Data analysis

The collected data were coded, entered into worksheets, corrected, and analyzed using SPSS (IBM SPSS 25). Descriptive statistics were applied to analyze the data and the Chi-square test was used to determine the relationships between variables. A p-value of less than 0.05 was considered statistically significant.

Results

Dengue cases

The incidence of dengue in Palembang has tended to fluctuate over the last 5 years, with the highest incidence of DHF reported in Seberang Ulu 1 urban village (414 cases) and the lowest incidence in the Gandus urban village (94 cases) (Figure 2). In the 7 Ulu urban village, which is part of the Seberang Ulu 1 urban village, there were 86 cases of dengue fever, with 37 cases in the Gandus village, part of the Gandus District, in 2015–2019 (Figure 3).

Demographic characteristics of the respondents in Palembang city

Of 163 respondents in the seven Ulu urban village, 81.5% were women, whereas, there were more male respondents (63; 63.0%) in the Gandus urban village. The average age of respondents was 126 (63.0%) and 83 (83.0%) in seven Ulu and Gandus urban villages, respectively. Furthermore, as many as 120 (60.0%) respondents in seven Ulu urban village had a low educational level in contrast to the Gandus urban village where only 31 (31.0%) of the respondents had a low educational level. In total, 173 (86.5%) respondents in seven Ulu Urban village and 93 (93%) in Gandus urban village were employed (Table 1).

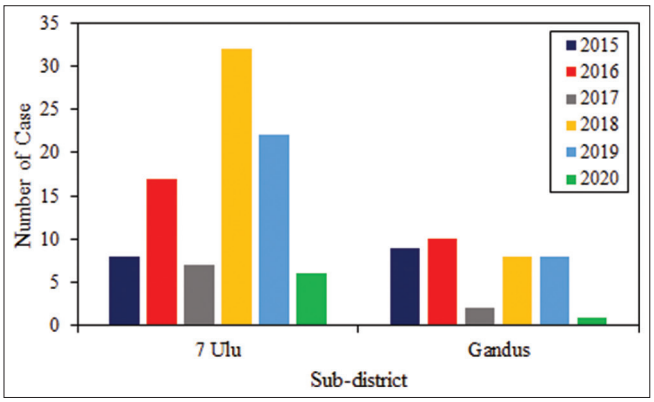

Figure 3: DHF incidence by urban village

The types of dwelling also varied between the seven Ulu and Gandus urban villages, with 118 (59.0%) of the respondents in seven Ulu urban village living in a single storey house and 58 (58.0%) of the respondents lived in such houses in Gandus. Environmental sanitation in seven Ulu urban village was categorized as dirty as poor as many as 112 houses (56.0%), while in Gandus urban village, in as many 64 houses (64.0%). Regarding population density in seven Ulu urban villages, there are 96 occupancy densities (48.0%), while in the Gandus urban village, both population density and occupancy density were categorized as not dense (Table 2).

Table 1: Characteristics of respondent

Characteristics	Seven Ulu		Gandus	
	n	%	n	%
Gender				
Woman	163	81.5	37	37.0
Man	37	18.5	63	63.0
Age				
Old	126	63.0	83	83.0
Young	74	37.0	17	17.0
Last education				
Low	120	60.0	31	31.0
Higher	80	40.0	69	69.0
Daily activities				
Work	173	86.5	93	93.0
Does not	27	13.5	7	7.0

Table 2: Environmental demographics

Environmental demographics	7 Ulu		Gandus	
	n	%	n	%
Type of house				
One floor	118	59.0	58	58.0
Graded	82	41.0	42	42.0
Environment sanitation				
Dirty	112	56.0	64	64.0
Sanitarian	88	44.0	36	36.0
Type of water reservoir is favored by mosquitoes				
Yes	123	61.5	72	72.5
No	77	38.5	28	28.0
Occupancy density				
Yes	96	48.0	26	26.0
No	104	52.0	74	74.0
Population density				
Yes	167	83.5	25	25.0
No	33	16.5	75	75.0
The existence of hanging clothes				
Yes	87	43.5	39	39.0
No	113	56.5	61	61.0
Waste management				
Right	95	47.5	64	64.0
Not exactly	105	52.5	36	36.0
Breading habit (Spot)				
≥ 3	90	45.0	62	62.0
< 3	110	55.0	38	38.0
Reasting habit (Spot)				
≥ 3	84	42.0	39	39.0
< 3	116	58.0	61	61.0
Mosquito repellent plant				
No existence	187	93.5	92	92.0
Existence	13	6.5	8	8.0

PSN 3M Plus compliance on seven Ulu and Gandus urban villages

The survey revealed that most respondents in both villages have tried to comply with the PSN 3 M Plus strategy recommendations but only a small proportion did so correctly. The most commonly used DHF control measure was the addition of larvicides to water reservoirs (Table 3).

Table 3: PSN 3 M Plus behavior

PSN 3 M Plus	7 Ulu		Gandus	
	n	%	n	%
Drain and scrub water reservoirs such as bathtubs, vases, dispose of residual water in the dispenser and back of the refrigerator once a week				
No	16	8.0	11	11.0
Yes	184	92.0	89	89.0
Close tightly all water reservoirs such as bathtubs and drums				
No	20	10.0	15	15.0
Yes	180	90.0	85	85.0
Bury used items and do not let used items scatter				
No	26	13.0	33	33.0
Yes	174	87.0	67	67.0
Keeping fish that eat mosquito larvae				
No	192	96.0	96	96.0
Yes	8	4.0	4	4.0
Installing screens on windows and ventilation				
No	149	74.5	26	26.0
Yes	51	25.5	74	74.0
Putting used clothes in a closed container				
No	101	50.5	51	51.0
Yes	99	49.5	49	49.0
Giving larvicide to water reservoirs that are difficult to drain				
No	194	97.0	96	96.0
Yes	6	3.0	4	4.0
Repairing drains and gutters that are not smooth				
No	16	8.0	90	90.0
Yes	184	92.0	10	10.0
Check the larvae in the water storage periodically				
No	118	59.0	85	85.0
Yes	82	41.0	15	15.0
Using insecticide				
No	11	5.5	5	5.0
Yes	189	94.5	95	95.0
Using mosquito repellent plants				
No	187	93.5	82	82.0
Yes	13	6.5	18	18.0

Knowledge of the Palembang city dwellers regarding dengue and its transmission

The respondents' knowledge in seven Ulu and Gandus urban villages about symptoms, transmission modes, and prevention of DHF was excellent (Table 4).

Table 4: Respondent's knowledge

Knowledge	7 Ulu		Gandus	
	n	%	n	%
High fever, suddenly 2–7 days and there are red spots on the skin is one of the clinical symptoms of dengue disease				
Not exactly	91	45.5	49	49.0
Right	109	54.5	51	51.0
Dengue is transmitted through mosquito bites				
Not exactly	20	10.0	12	12.0
Right	180	90.0	88	88.0
DHF mosquitoes bite during the day				
Not exactly	80	40.0	33	33.0
Right	120	60.0	67	67.0
Summer is the perfect time for DHF mosquitoes to hatch				
Not exactly	13	6.5	3	3.0
Right	187	93.5	97	97.0
DHF mosquitoes breed in dirty water				
Not exactly	114	57.0	57	57.0
Right	86	43.0	43	43.0
Dengue is transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes				
Not exactly	118	59.0	59	59.0
Right	82	41.0	41	41.0
Having a black body with white stripes (white stripes) all over the body is one of the characteristics of dengue-transmitting mosquitoes				
Not exactly	104	52.0	53	53.0
Right	96	48.0	47	47.0
The most effective way to eradicate DHF PSN 3M PLUS				
Not exactly	35	17.5	21	21.0
Right	165	82.5	79	79.0
Bathtubs and jars that are not covered are breeding grounds for mosquitoes.				
Not exactly	60	30.0	29	29.0
Right	140	70.0	71	71.0
Draining the bathtub is done once a week, then the eggs and mosquito larvae that exist will also be drained				
Not exactly	73	36.5	35	35.0
Right	127	63.5	65	65.0
Changing the water in the vase, removing the water dispenser and the back of the refrigerator prevent mosquito breeding grounds				
Not exactly	128	64.0	64	64.0
Right	72	36.0	36	36.0

Attitude and beliefs of the Palembang city dwellers regarding dengue

The knowledge about DHF among respondents in both villages is high, however, their compliance with the PSN 3 M Plus recommendations was far from satisfactory. Non-compliance can be explained by the respondents' attitude and beliefs, with most respondents believing that fogging is the most effective way to eradicate DHF and that the Government should be held accountable for DHF control (Table 5).

Table 5: Respondent's attitude

Attitude	7 Ulu		Gandus	
	n	%	n	%
DHF as health problem				
No	148	74.0	74	74.0
Yes	52	26.0	26	26.0
Effective efforts in controlling DHF				
PSM 3M Plus	60	30.0	34	34.0
Fogging	140	70.0	66	66.0
Responsible for DHF control				
Government	124	62.0	62	62.0
Public	76	38.0	38	38.0
If any family member has a high fever, nosebleed, and red spots on the skin, I will take my family member directly to the health service.				
No	10	5.0	6	6.0
Yes	190	95.0	94	94.0
Report to the head sub-district if there is a family member affected by DHF to prevent transmission of DHF				
No	3	1.5	1	1.0
Yes	197	98.5	99	99.0

The relationship between 3M plus PSN behavior and the incidence of dengue fever in 7 Ulu and Gandus urban village

In the seven Ulu Urban village, there is a significant relationship between compliance with the 3M PLUS PSN and the incidence of DHF (p = 0.000), while there was no significant relationship in Gandus (p = 0.165) (Table 6). Good Aedes spp vector control and prevention behavior reduce the risk of dengue fever transmission [26] and there was a significant relationship (p = 0.010) between the incidence of DHF and compliance with the PSN 3 M Plus [27]. Khon *et al*. [28] stated that people who are less active in draining water reservoirs regularly have a higher risk of dengue There is a correlation between the using lids to cover water containers and the incidence of DHF (p = 0.000), which is in line with a previous study by Rakmani *et al*., [17] but in contrast to Lin *et al*. [29], who reported no difference in risk between mosquito breeding sites when using closed and open containers.

Wong *et al*. [30] reported that an effective method to prevent mosquito breeding is adding larvacide (Temephos) to stored water, however, communities in the study area only dispose of water and drain new water without draining and cleaning the containers, not following the Ministry of Health and 3M Plus programs. Gan *et al*. [31] reported that most respondents in a study conducted in rural North Dharmapur, Gaibandha Bangladesh replaced water container lids immediately after use, drained and clean water collection containers weekly, kept drainage systems around the house free from debris, and used house mosquito repellent plants and mosquito nets [23]. Msellemu *et al*. [32] also reported that most surveyed people living in Dar es Salaam, Tanzania believed that mosquito nets could prevent dengue fever and some thought that dengue fever could be spread from person to person.

Relationship between respondents' characteristics and PSN 3M Plus behavior in seven Ulu and Gandus subdistricts

The research has shown that there is a statistically significant correlation between compliance to PSN 3M Plus (p = 0.002) and education in seven Ulu and between compliance to PSN 3M Plus and employment status in Gandus urban village (p = 0.000) (Table 7).

Gender

There was no relationship between gender and compliance with the PSN 3 M Plus. Members of the local community, both male and female, should be taking action to eradicate DHF vector, especially around schools and hospitals, to control the dengue epidemic.

Age

There was no relationship between age and compliance with PSN 3 M Plus. Theoretically, older individuals have better compliance and adherence to the PSN 3 M Plus.

Education

Employment status dramatically influenced compliance and adherence to the PSN 3 M Plus. Our study found that employed respondents (civil servants, private sector employees, and laborers) were too tired to strictly follow the recommended prevention measures, using insecticide spray, electric repellers, or burning mosquito breeding nets to avoid mosquito bites. Similar results were reported by Wong *et al*. [30] according to Lin *et al*. [29], [31], [32] workers tend to have better prevention practices compared to office workers (p < 0.05). The results of previous studies [31], [32], [33], [34], [35] were similar to the PSN 3M Plus control study which stated a relationship between adherence to the program and education. People with a university degree show better compliance than those who lack higher education, thus, education is an essential aspect of dengue infection control. In contrast, a study by Sukesi *et al*. [32] showed that individuals with higher education status show lower compliance with DHF prevention practices.

Occupation

Employment status can be a predisposing factor to inhibit or encourage a person's actions to eradicate mosquito nests. In general, people who have a job do not have time to carry out PSN. The study revealed that respondents who work show lower compliance with DHF prevention practices than those who do not work or are housewives, in line with the previous study, which stated that DHF prevention practices were mainly conducted by unemployed respondents [12], [36].

Table 6: The relationship between behavior and the incidence of DHF

DHF	Prilaku PSN 3 M Plus n (%)													
	7 Ulu							Gandus						
	Not good		Good		Total	p-value	OR	Not good		Good		Total	p-value	OR
	n	%	n	%	n			n	%	n	%			
Yes	22	84.6	4	15.4	26	0.000**	9.000	7	9.3	68	90.7	75	0.165*	0.412
No	66	37.9	108	62.1	174		2.971–27.268	5	20.0	20	80.0	25		0.118–1.439

*No relationship. **There is relationship.

Table 7: Relationship between respondent characteristics and PSN 3M Plus behavior

Variable	DHF incident n (%)												
	7 Ulu							Gandus					OR
	Not good		Good		Total	p-value	OR	Not good		Good		Total	p-value	
	n	%	n	%	n			n	%	n	%			
Gender						0.116*	1.820							
Woman	76	46.6	87	53.4	163		0.856-3.868	36	37.9	59	62.1	95	0.649*	2.441
Man	12	32.4	25	67.6	37			1	20.0	4	80.0	5		0.262-22.702
Age														
Old	54	42.9	72	57.1	126	0.782*	0.882	60	72.3	23	27.7	83	0.226*	0.348
young	34	45.9	40	45.1	74		0.495-1.572	15	88.2	2	11.8	17		0.074-1.642
Last education														
Low	66	55.0	54	45.0	120	0.000**	3.222	19	61.3	12	38.7	31	0.061*	0.368
Higher	22	27.5	58	72.5	80		1.754-5.921	56	81.2	13	18.8	69		0.143-0.942
Daily activities														
Work	84	48.6	89	51.4	173	0.002**	5.427	92	98.9	1	1.1	93	0.000**	112.667
Does not work	4	14.8	23	85.2	27		1.801-16.350	3	42.9	4	57.1	7		10.327-1457.030

*No relationship. **There is relationship.

Relationship between knowledge and compliance with PSN 3 M Plus in seven Ulu and Gandus urban villages

In the Urban village of 7 Ulu, there was no relationship between the respondent's knowledge and compliance with PSN 3 M Plus (p = 0.635), while in Gandus urban village, there was such a relationship (p = 0.000). DHF prevention practices are shown in Table 8. A more personal and practical approach to health education programs may be needed to influence behavior change. People need to have good knowledge about the signs and symptoms of the disease, its transmission modes, and transmission vectors to prevent disease transmission. The expected behavior is defined in the Mosquito Nest Eradication (PSN) effort, however, knowledge does not always result in good practice.

Relationship between attitude and compliance with PSN 3 M Plus in 7 Ulu and Gandus urban villages

There is a relationship between the attitude of the respondent (p = 0.027) and compliance with PSN 3M Plus (p = 0.000) in both villages (Table 9). Ghani *et al*. [39] showed that attitude does not influence DHF prevention practices (p = 0.101), however, the results from previous research showed that there is a significant relationship between the two variables [39], [40], [41], [42]. Attitude can influence people's behavior. Rahman *et al*. [37] describe attitude as evaluation of a psychological object, either positive or negative, which can be classified into at least three terms of thought. First, a frame of mind where an attitude is a form of evaluation or reaction to the feelings one has, be it a favorable or unfavorable attitude. Second, the attitude framework is a kind of readiness to react to an object in a certain way. Third, oriented to the triadic scheme. According to this framework, an attitude is a combination of cognitive, affective, and conative components that interact with each other in understanding, feeling, and behaving toward an object. Based on the health behavior theory put forward by Guad *et al*. [1], [38], a person's actions or practices are formed from someone's knowledge and the tendency to act in a person is one of the main components of a person's attitude [39].

Discussion

The global incidence of DHF has increased dramatically in the last few decades and coupled with the Covid-19 pandemic, can cause death. DHF is a viral infection transmitted via arthropods to humans that attacks the immune system. The DHF outbreaks in Palembang are not spontaneous but closely related to the season. Furthermore, DHF prevention is not only the responsibility of the government or healthcare workers, it requires broad community participation in the 3M movement to effectively eradicate mosquito nests, closing chambers, burying, and draining.

PSN 3M Plus was introduced a relatively long time ago but is often considered a slogan and the knowledge is not put into practice. Local communities may have excellent knowledge regarding the dangers of DHF but activities to eradicate mosquito breeding grounds are still lacking. Research by Guan *et al*. [40] and Xu *et al.,* [1], Alwan *et al.,* [41] show that the level of knowledge does not correlate with actual vector control practices. Knowledge about the transmission of dengue fever is high but the control of *A. aegypti* mosquitoes is still low. Kumaran *et al*., [42] showed that negative habits were challenging to break even though health promotion campaigns have been conducted.

Table 8: Relationship between knowledge and compliance with PSN 3 M Plus

Knowledge	PSN 3M Plus behavior (%)												
	7 Ulu							Gandus					OR
	Not good		Good		Total	p-value	OR	Not good		Good		Total	p-value	
	n	%	n	%	n			n	%	n	%			
Not good	36	46.8	41	53.3	77	0.635*	1.199	51	91.1	5	8.9	56	0.000**	8.500
Good	52	42.3	71	57.7	123		0.676–2.126	24	54.5	20	45.5	44		2.848–25.370

*No relationship. **There is relationship.

Public knowledge about the dengue virus and its transmission process can be increased by developing, modifying, and intervening in the community controlling DHF. Slum settlements and poor sanitation in Palembang were risk factors for the incidence of dengue disease. In line with previous studies [43], population density, residential density, and environmental sanitation were closely associated with the incidence of DHF and effective prevention methods, especially during the rainy season [19].

DHF prevention is a shared responsibility, for example, fogging is routinely performed by the Health Office but this only kills the adult mosquitoes, therefore does not eliminate the risk of DHF transmission. Fogging cannot kill the larvae in stagnant water, so 3M prevention must still be conducted by the community such as closing or covering water containers, draining stagnant water reservoirs, and burying all objects that have the potential to be used as water reservoirs, for example, used cans or used tyres, that could potentially be a mosquito breeding site.

Respondents believed that DHF was a global health threat in all countries but that fogging is the most effective method to prevent DHF, with most respondents believing that the Government is the most responsible for DHF management. When exposed to dengue infection, the people of Palembang city sought immediate treatment at a private hospital to get the best service, which is consistent with other studies [19], [44], [45], [46]. Respondents were not applying larvicides to water reservoirs that are difficult to drain in contrast to a report by Kumosani *et al*., [46] whereby larvacide (Temephos) or chemicals were added to water storage containers to prevent mosquito breeding.

Even though the respondents were aware of the 3M plus strategy, they did not put this into practice. Those who should have drained and cleaned the water containers just threw away the old water and filled the container [1], [46], most people used lids to cover water containers, drained and cleaned water containers weekly, kept drainage systems around the house clear of debris, and used house mosquito repellent plants and mosquito nets [46], [47]. A study conducted in Dar es Salaam, Tanzania, [48] reported that most respondents considered that mosquito nets could prevent dengue fever, while some thought that dengue was spread from person to person.

Chandren *et al*. [13] reported that people in Hong Kong stated that DHF is not a threat. believing that DHF is not dangerous if a person has initial treatment. Most respondents demonstrated good attitudes and beliefs about dengue outbreaks, taking action to protect against dengue and mosquito bites. Television, radio, and newspapers are the most crucial information channels regarding dengue [13]. In Pakistan, most respondents claimed that they are knowledgeable about dengue infection [1], [49], that this disease is spread by mosquitoes and dengue fever is more common in the rainy season. However, in contrast to Shan Timur Special Region IV, Myanmar, their knowledge of DHF is not sufficient. However, dengue prevention practices have been put in place and they believe that knowledge is not from the educational background but experience [50].

The present study showed that most families surveyed had experienced DHF. Clean water is a place for mosquitoes to breed. The correct PSN 3M Plus of DHF control measures have been discussed on television and by health department promotion teams. However, the results obtained are inversely proportional to the gap between knowledge and practice of preventing dengue. Most people of Palembang city believe that dengue prevention is the full responsibility of the health department and that the most effective prevention is fogging. Education is not related to dengue prevention practices but the respondent's employment status is very influential.

Good knowledge is not associated with the adoption of dengue prevention measures [1], [12]. In response to each incidence of DHF, the respondent takes action to drain and clean the water reservoir of mosquito eggs that might stick to the container. Lack of knowledge and poor adherence to DHF prevention guidelines in the community will increase the morbidity due to DHF [9]. The present study revealed that the practice of controlling PSN 3M Plus is associated with education. A person with a bachelor's degree has a better practice attitude than other educational groups. Education shows a higher probability of dengue control practices and attitudes. Furthermore, education is an essential aspect of dengue infection control [36], however, according to Makrufardi *et al*. [38], respondents with higher education did not show better behaviour to prevent mosquito breeding. Also, employment in the present study dramatically affected compliance with PSN 3M Plus. Employees such as civil servants, private supervisors, and workers were too tired to implement vector control measures, instead of relying on avoiding mosquito bites by using insecticide spray, electric repellers or burn.

A limitation of this study is that all information obtained through interviews and reported practices

Table 9: The relationship between attitudes and compliance with PSN 3M Plus

Attitude	DHF incident n (%)													
	7 Ulu							Gandus						OR
	Not good		Good		Total	p-value	OR	Kurang baik		Baik		Total	p-value	
	n	%	n	%	n			n	%	n	%			
Not good	3	50.4	62	49.6	125	0.027**	2.032	55	91.7	5	88.3	60	0.000**	11.000
Good	25	33.3	50	66.7	75		1.121–3.683	20	50.0	20	50.0	40		3.641–33.230

*No relationship. **There is relationship.

cannot be verified, as can responses to questions in attitude and practice. However, an important strength of this study is that respondents were recruited based on criteria across endemic areas. Results can be applied to general community settings. The eligibility criteria further strengthen the quality of the findings.

Conclusion

Vector control practices are essential for the prevention and control of DHF. Household-level environmental modifications can be a cost-effective approach to reduce the incidence of DHF, however, there is a need to raise public awareness via preventive campaigns as good knowledge does not guarantee good compliance with PSN 3M Plus recommendations. Health promotion activities should increase public awareness about the importance of eradicating breeding grounds around households. It is also recommended that regular dengue health education programmes target all age groups and promote the planting of mosquito repellent plants as safe and environmentally friendly vector control.

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