



# Effects of Health Education Based Intervention on Community's Perception, Healthy House, and Social Capital of Dengue in Endemic Area of Sleman Regency Indonesia

Tri Wahyuni Sukesi<sup>1,2\*</sup> , Tri B. T. Satoto<sup>3</sup>, Elsa H. Murhandarwati<sup>3</sup>, Retna Siwi Padmawati<sup>4</sup>

<sup>1</sup>Doctoral Program in Medicine and Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia; <sup>2</sup>Department of Environmental Health, Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; <sup>3</sup>Center for Tropical Medicine, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia; <sup>4</sup>Department of Health Behavior, Environment, and Social Medicine, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

## Abstract

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**\*Correspondence:** Tri Wahyuni Sukesi, Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada, Yogyakarta, Indonesia.  
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**BACKGROUND:** Low community participation in the dengue hemorrhagic fever (DHF) control efforts is one of the influencing factors in the failures of some of these efforts. The community's lack of responsibility concerning the DHF issues might be caused by their low perceptions and understanding of DHF itself.

**AIM:** This study aimed to assess the effect of health education about DHF on changes in the community's perceptions, social capital, and healthy house conditions.

**METHODS:** The research method was participatory action research. The study involved 267 households in Patukan Hamlet Sleman Yogyakarta Indonesia. The intervention was health education about DHF which was presented from November 2018 to February 2019. Preliminary assessments were taken in November 2018 and evaluations were taken in August 2019. The data were analyzed with the Wilcoxon test.

**RESULTS:** The results show that in the 6<sup>th</sup> months after the intervention, there was an increase in the average score of all variables. The differences between pre- and post-intervention were statistically significant: Perceptions of dengue fever ( $p = 0.000$ ); perceptions about DHF control ( $p = 0.000$ ); the social condition for the component of concern, trust, and readiness to learn new ideas with  $p < 0.05$ ; and all component of healthy house conditions with  $p < 0.05$ .

**CONCLUSION:** Health education could contribute to changes in perceptions, social capital, and a healthy house condition. It is very important to increase the awareness and participation of the community in controlling DHF.

## Introduction

Dengue hemorrhagic fever (DHF) is one of the endemic diseases in tropical areas, including Indonesia. The high density of rainfall and low sunlight is good conditions for *Aedes aegypti* to multiply [1]. In addition to climate factors, a dirty environment can also influence the *A. aegypti* mosquitos' reproduction [2]. The non-hygienic environment is the result of the people's unhealthy behaviors, which are highly influenced by their perceptions [3]. In Indonesia, Yogyakarta Province was reported to have a high number of annual DHF case occurrences [4] (Figure 1) and Patukan has the highest incident rate (IR = 150.8) [5]. This number remains high despite several DHF controlling efforts, such as fogging, applying larvicide, and sending *Jumantik* cadres to perform monthly larvae inspection at the house of every community member [6]. The annual DHF case occurrences in Yogyakarta are

always high [7]. This pattern reveals that the efforts in controlling DHF cases have not reached a satisfying level yet [8]. The low community participation in the DHF control efforts is one of the influencing factors in the failures of some of these efforts [9]. The community's lack of responsibility concerning the DHF issues might be caused by their low perceptions and understanding of DHF itself [10].

Putnam in 2001 argued that social capital shows the characteristics of social structures, such as networks, norms, and social beliefs for mutual benefits. The existence of good social capital can facilitate the health promotion process [11]. According to a health promotion program developed by Berkman, the aim to make a community empowered is an effort to strengthen social capital [12]. Social capital in the form of customs, culture, and norms adopted by the community has a role in shaping human behavior which, in turn, has an influence on the environment [13], [14]. Low social capital and perceptions about DHF contribute

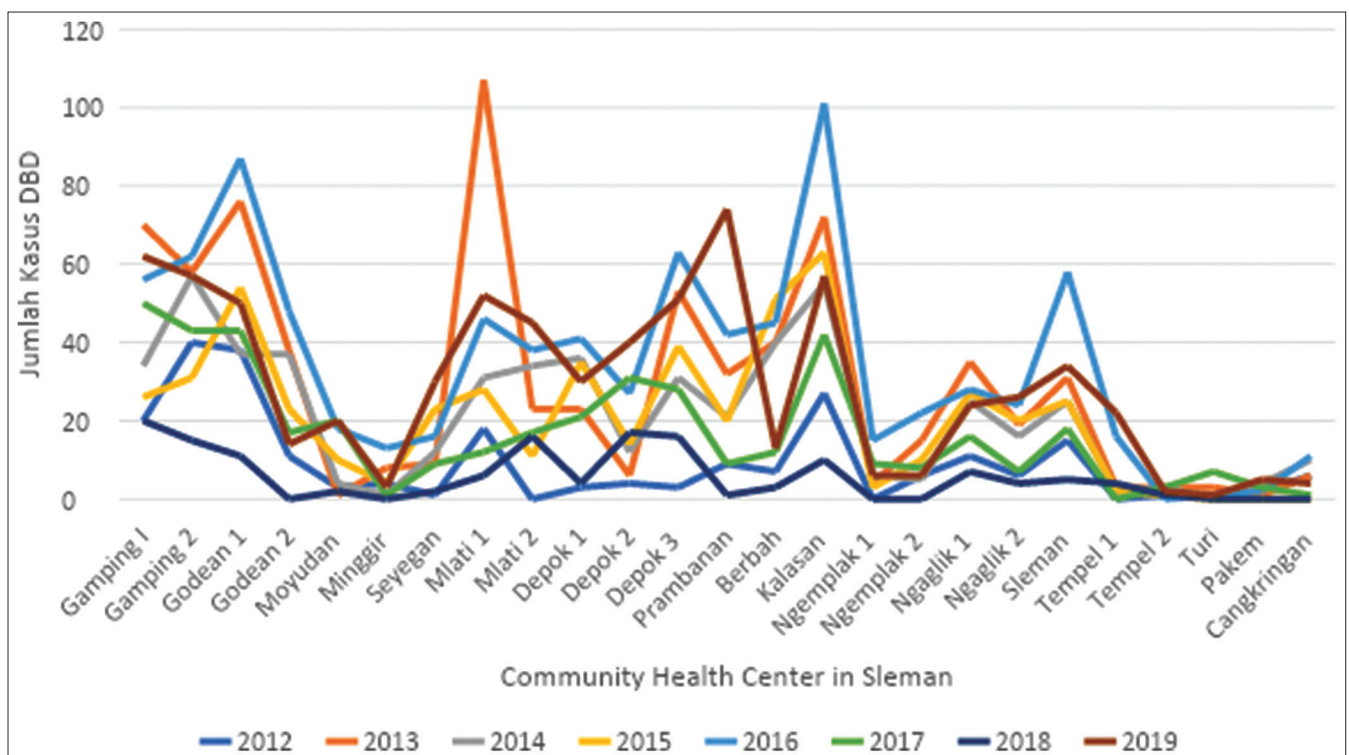


Figure 1: Data on dengue hemorrhagic fever cases in Sleman Regency, Yogyakarta Special Region Province 2012–2019 [4]

to creating a neighborhood including the condition of the house that supports DHF transmission [15]. The socialization of DHF control has been conducted to the lowest level of the community, but the perception and social conditions of the community tend to underestimate DHF which prevents all DHF control programs from running well [15], [16], [17], [18]. It needs proper attention to change perceptions, social capital, and the house environment to be better through community-based health education [3], [19], [20], [21]. Research showed that the community's perceptions can be influenced by health education [22], [23]. The fact that DHF control has always been neglected by most communities makes every community-based DHF control effort prone to failure [3]. In general, many members of a community perceive DHF as a common and less threatening disease. To change this perception, health education with accurate DHF facts is necessary [24]. This study was aimed to assess the effect of providing health education about DHF on changes in the community's perceptions, social capital, and healthy house conditions.

## Materials and Methods

### Study design and participants

Participatory action research was used in this study (Figure 2). The research subjects were the households in Patukan hamlet Sleman Yogyakarta. The

number of research subjects was 267 households by applying the total sampling technique. Patukan has the highest incident rate of DHF (IR = 150.8) [5].

Phase 1: Initial assessment before the intervention was carried out (November 2018)

Phase 2: Intervention (December 2018–February 2019)

Phase 3: Final assessment after 6 months of intervention (August 2019).

### Intervention

Based on the initial data, the intervention applied in this research was health education about DHF. In delivering the DHF education, the researcher was assisted by ten fresh graduates from the Faculty of Public Health who had undergone a 1-week training to synchronize their perceptions on DHF and improve their understanding of DHF. The pre-post-test showed that the training of the trainer could improve the trainers' understanding of DHF ( $p$ -value  $0.000 < 0.005$ ). Interventions were delivered naturally by collaborating with the routine activities carried out by the target community. The researchers explained the material and the participants were invited to discuss dengue issues. In this forum, the participants received accurate education about dengue. The community health center (*Puskesmas*) as the closest health service facility to the community and village government was involved in the implementation of this health education intervention. Health education about dengue was provided regularly

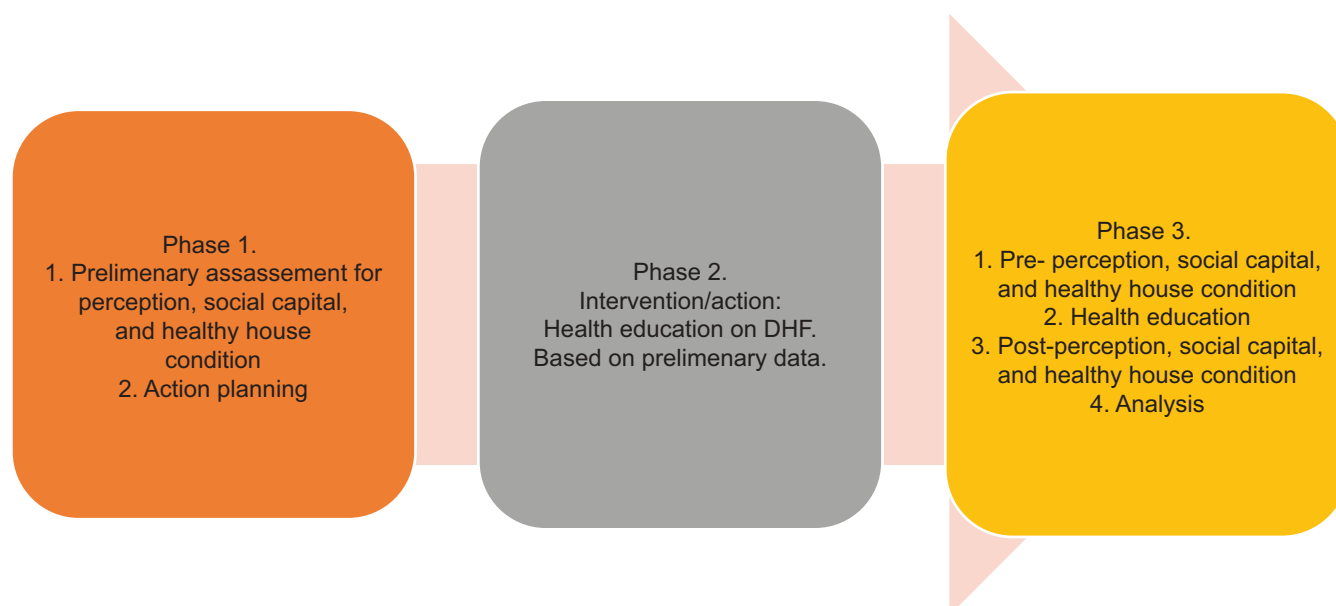


Figure 2: The research flow [25]

according to the community meeting schedule for 3 months (December 2018–February 2019).

### Research instrument

The data collection instrument in this research was a questionnaire that had passed the validity and reliability tests. The applied validity test in this research was construct validity by calculating the correlation between the research data and the existing measurement. The minimum standard for the validity measurement was based on the Pearson correlation  $\geq$  of 0.30 [25], [26]. The validity test was conducted by testing the questionnaire to minimally 10% of the total respondents. In this research, the questionnaire was tested on 80 respondents (30%) [27]. The results of the validity and reliability tests are presented in Table 1.

The questionnaire consisted of three sections: Perceptions of DHF, perceptions of DHF control, and social capital. Every item in the questionnaire had passed the validity test as the score of Pearson correlation  $> 0.30$  and  $p < 0.05$ . Similarly, all items of the questionnaire were valid according to the Spearman reliability test. The reliability test showed that the Alpha Cronbach's score was  $> 0.60$ , which means that the questionnaire was considered valid and reliable [26]. To measure the healthy house condition, a checklist based on the Ministry of Health of the Republic of Indonesia in 2002 was used.

### Data collection and analysis

Data were collected using the same questionnaire and checklist for pre- and post-tests. The pre-data were taken in November 2018 and the

post-data were taken in August 2019. The interval between the implementation of the intervention and the post-data collection was 6 months to see the consistency of changes [28]. The data obtained were analyzed by employing SPSS 24 using the Wilcoxon test because the data were not normally distributed [29].

## Results

### Participants' socio-demographic

Table 2 lists the socio-demographics of the respondents in the research setting. The respondents were dominated by women (77.54%). The predominant occupation was housewife (49.8%) with the most common age range being more than 45 years (58.88%). The majority of the participants' education was in senior high school (40.45%).

### Perception of DHF pre- and post-intervention

Perception of DHF is what the community thought about DHF. The data from the perception about DHF measurement show 100% improvement on how the community perceived DHF as a disease that has to be eradicated (Table 3).

Wilcoxon test shows that the average perception of DHF before and after health education had a significant difference with  $p = 0.000$  (Table 4). It was found that there was an improvement in the mean of the perception of DHF before and the 6<sup>th</sup> month after the health education.

**Table 1: The results of validity and reliability tests**

Variable	Item	Pearson correlation (Validity test)	Alpha Cronbach (Reliability test)
Perception of DHF	1	0.35 (valid)	0.724/reliable
	2	0.34 (valid)	
	3	0.31 (valid)	
	4	0.48 (valid)	
	5	0.44 (valid)	
	6	0.59 (valid)	
	7	0.55 (valid)	
	8	0.57 (valid)	
	9	0.51 (valid)	
	10	0.48 (valid)	
Perception of DHF control	1	0.35 (valid)	0.796/reliable
	2	0.37 (valid)	
	3	0.48 (valid)	
	4	0.45 (valid)	
	5	0.33 (valid)	
	6	0.55 (valid)	
	7	0.70 (valid)	
	8	0.36 (valid)	
	9	0.44 (valid)	
	10	0.34 (valid)	
Social capital A. Participation	1	0.46 (valid)	0.683/reliable
	2	0.33 (valid)	
	3	0.35 (valid)	
	4	0.56 (valid)	
	5	0.38 (valid)	
	6	0.45 (valid)	
	7	0.56 (valid)	
	8	0.31 (valid)	
	9	A.38 valid)	
	10	0.78 (valid)	
B. Concern	1	0.61 (valid)	0.793/reliable
	2	0.61 (valid)	
	3	0.55 (valid)	
	4	0.67 (valid)	
	5	0.57 (valid)	
	6	0.63 (valid)	
	7	0.63 (valid)	
	8	0.40 (valid)	
	9	A.31 valid)	
	10	0.71 (valid)	
C. Trust	1	0.71 (valid)	0.636/reliable
	2	0.35 (valid)	
	3	0.64 (valid)	
	4	0.42 (valid)	
D. Social norm	1	0.69 (valid)	0.813/reliable
	2	0.60 (valid)	
	3	0.64 (valid)	
	4	0.77 (valid)	
E. Readiness to learn new ideas	1	A.79 (valid)	0.633/reliable
	2	0.47 (valid)	
	3	0.61 (valid)	
	4	0.34 (valid)	
	5	0.68 (valid)	

DHF: Dengue hemorrhagic fever.

**Perception of DHF control pre- and post-intervention**

Perception of DHF control emphasizes the community's view of DHF control efforts [17], [28]. The results show that after the health education delivery, the community's view on DHF was a disease that had to be controlled together increased to 100% (Table 5).

The mean score of the perceptions of DHF control before the intervention showed a consistent increase 6 months after intervention. The Wilcoxon test shows that the average score of the perception of DHF control before and after health education had a significant difference with  $p = 0.000$  (Table 6).

**Table 2: Socio-demographic of research respondents (n = 267)**

	Frequency	Percentage
Gender		
Male	60	22.47
Female	207	77.54
Occupation		
Not working	3	1.12
Housewife	133	49.8
Self-employed	91	34.08
Others	40	14.98
Ages		
17-25	13	4.48
26-35	34	12.73
36-45	63	23.59
>45	157	58.88
Education		
No School	5	1.87
Elementary School	51	19.10
Junior High School	48	17.98
Senior High School	108	40.45
Diploma	17	6.37
≥.37omaHi	38	14.23

**Social capital pre and post-intervention**

Social capital holds five components, namely, participation, concern, trust, social norms, and readiness in learning new ideas [11]. Of the five components, there are changes after the intervention (Table 7). This difference is statistically significant with  $p = 0.003$  for participation,  $p = 0.000$  for trust, and  $p = 0.000$  for readiness to learn new ideas. Participation and social norms did not show any significant difference with  $p > 0.005$  (Table 7).

**Table 3: Perception of DHF (n = 267)**

Perception of DHF	Pre		Post	
	n (%)	n (%)	n (%)	n (%)
Dengue hemorrhagic fever is a disease transmitted by the <i>Aedes aegypti</i>	263 (98.5)	4 (1.5)	264 (98.9)	3 (1.1)
DHF is a fatal disease	261 (97.8)	6 (2.2)	262 (98.1)	5 (1.9)
DHF is a disease that must be eradicated	265 (99.2)	2 (0.8)	267 (100)	0 (0)
Eradicating dengue fever is an obligation of health officers only	213 (79.8)	54 (20.2)	214 (80.2)	53 (19.8)
People do not need to participate in the dengue eradication effort	233 (87.3)	34 (12.7)	235 (88)	32 (22)
I would be partially responsible for any neighbor who suffered from dengue fever	216 (80.9)	51 (19.1)	217 (81.3)	50 (18.7)
Having a family member who suffers from dengue fever would cost expensive treatment	257 (96.3)	10 (3.7)	259 (97)	8 (3)
Everyone is possible to suffer DHF	262 (98.1)	5 (1.9)	264 (98.9)	3 (3.3)
DHF transmission can occur in every place and at any time	248 (92.9)	19 (7.1)	249 (93.3)	18 (6.7)
We must always be aware of the transmission of dengue disease	263 (98.5)	4 (1.5)	264 (98.9)	3 (3.3)

DHF: Dengue hemorrhagic fever.

**Healthy house pre- and post-intervention**

A healthy house as one of the risk factors for dengue transmission holds three components, namely, the parts of the house, sanitation facilities,

**Table 4: The effectiveness of health education for the perception of DHF**

Variables	Average Pre ± SD	Average Post ± SD	Difference (p-value)
Perception of DHF	92.99 ± 10.48	96.14 ± 6.69	0.000*
	Negative rank = 46		
	Positive rank = 93		
	Ties = 128		

\*Significant, SD: Standard deviation, DHF: Dengue hemorrhagic fever.

and occupant behaviors. Table 8 shows that after the health education intervention, the average score of the

parts of a healthy house improved. This difference was statistically significant with  $p = 0.000$  for physical parts of the house,  $p = 0.017$  for sanitation facilities, and  $p = 0.000$  for occupant behavior (Table 8).

**Table 5: Perceptions of DHF control (n = 267)**

Perception of dengue fever control	Pre		Post	
	n (%) Agree	n (%) Disagree	n (%) Agree	n (%) Disagree
Dengue is a disease that must be controlled together	265 (99.2)	2 (2.2)	267 (100)	0 (0)
Eradicating dengue is the task of health workers only	212 (79.4)	55 (20.6)	213 (79.8)	54 (20.2)
The community plays an important role in the DHF eradication	255 (95.5)	12 (4.5)	256 (95.8)	11 (4.2)
I will allow the <i>Jumantik</i> to observe the larvae at my house	260 (97.4)	7 (2.6)	262 (98.1)	5 (1.9)
I feel embarrassed if there were any larvae at my house	156 (58.4)	111 (41.6)	158 (59.2)	109 (40.9)
I feel uncomfortable if a <i>Jumantik</i> officer checks my house	227 (85)	40 (15)	229 (85.8)	38 (14.2)
I don't like when my house is inspected by <i>Jumantik</i> officer	242 (90.6)	25 (9.4)	244 (91.4)	23 (8.6)
I am worried if my water tank is sprinkled with abate	209 (78.3)	58 (21.7)	211 (79)	56 (21)
Abate is poisonous	218 (81.6)	49 (18.4)	220 (82.4)	47 (17.6)
Fogging or spraying is the most effective way to eradicate DHF	177 (66.9)	90 (33.7)	178 (66.7)	89 (33.3)
I support the eradication of dengue by fogging because it is easy and practical	163 (61.0)	104 (39.0)	164 (61.4)	103 (38.6)
Efforts to eradicate dengue with 3M (draining, closing, and managing used goods) is troublesome	207 (77.5)	60 (22.5)	209 (78.3)	58 (21.7)
I don't like the activity of mosquito nest eradication	229 (85.8)	38 (14.2)	231 (86.5)	36 (13.5)
I don't have any spare time to eradicate mosquito nests (PSN)	224 (83.9)	43 (16.1)	225 (84.3)	42 (15.7)
I can pay someone else to eradicate the mosquito nests when I'm busy	61 (22.8)	206 (77.2)	61 (22.8)	206 (77.2)
I will not sprinkle larvicide powder (abate) from the officer into my wells or other clean water tanks	185 (69.3)	82 (30.7)	186 (69.7)	81 (30.3)
I make sure that my house is free from any mosquito nest	259 (95.9)	8 (4.1)	261 (97.8)	6 (2.2)
Eradication of DHF is my responsibility	232 (86.9)	35 (13.1)	234 (87.6)	33 (12.4)
Cooperation in the DHF eradication is very important	263 (98.5)	4 (1.5)	265 (99.2)	2 (0.8)

DHF: Dengue hemorrhagic fever.

## Discussion

The majority of participants in this study were housewives with high school education backgrounds and age over 45 years (Table 2). The dominance of women in the effort of DHF control is notably high in Indonesia. In Indonesia, gender division of labor is common. Women are assigned to do domestic work while men do non-domestic work such as earning money [30], [31]. Efforts to control DHF at the house, such as draining water containers, cleaning the house, and preserving the house free of mosquito larvae, are considered domestic work that is performed by women [30], [31], [32].

**Table 6: The effectiveness of health education for the perception of DHF control**

Variables	Average Pre $\pm$ SD	Average Post $\pm$ SD	Difference (p-value)
Perception of DHF control	80.43 $\pm$ 11.16	84.66 $\pm$ 9.53	0.000*
	Negative rank = 79 Positive rank = 143 Ties = 45		

\*Significant, SD: Standard deviation, DHF: Dengue hemorrhagic fever.

This study was aimed to assess the effect of providing health education about DHF on changes

in the community's perceptions, social capital, and healthy house conditions. The wrong perception about DHF could influence the knowledge, attitudes, and practices of DHF control [17], [33], [34].

**Table 7: The effectiveness of health education for social capital (n = 267)**

Social Capital	Pre Average $\pm$ SD	Post Average $\pm$ SD	Difference (p-value)
Participation	81.9 $\pm$ 38.1	83.5 $\pm$ 15.0	0.247
Concern	86.5 $\pm$ 11.1	89.3 $\pm$ 9.6	0.003*
Trust	74.5 $\pm$ 20.4	80.2 $\pm$ 18.3	0.000*
Social norm	37.5 $\pm$ 30.1	39.6 $\pm$ 31.3	0.462
Readiness to learn new ideas	83.7 $\pm$ 17.5	89.1 $\pm$ 14.3	0.000*

\*Significant, SD: Standard deviation.

Perception is obtained from stimuli that enter through the five senses and then are processed in the brain to give rise to an assessment. Accordingly, if the received stimulus is translated incorrectly because of the lack of information conveyed, it can affect a person's view of DHF [15], [35]. So far, what has developed in the community is the reluctance to carry out DHF control because there are health workers who are responsible for this and if there are cases of DHF, they can ask for fogging. According to most people, fogging is the best and quickest way to control DHF so that many community-based DHF control programs often fail in their other efforts [36], [37]. Informative health education about DHF can improve public perceptions of DHF, demonstrating that DHF is a dangerous disease that can be contagious and cause death, and besides that, the task of controlling dengue is the task of all components of society and cannot only be done by health workers (Table 3) [9], [15], [38], [39].

**Table 8: The effectiveness of health education for healthy house (n = 267)**

Healthy house	Pre Average $\pm$ SD	Post Average $\pm$ SD	Difference (p-value)
Physical parts of the house (Roofs, windows, walls, floors, ventilation, kitchen chimneys, and lighting)	212.9	223.3	0.000*
Sanitation facilities (Clean water facilities, Source of clean water, Toilet, Type of latrine, Wastewater disposal facilities, Garbage disposal facility, Type of trash can, and Waste management)	294.7	304.9	0.017*
Occupant behavior (Open the window, Clean house, and yard, and the habit of Taking out the trash)	254.4	273.0	0.000*

\*Significant, SD: Standard deviation.

Social capital consists of components of participation, concern, trust, social norms, and readiness to learn new ideas, and all of these components support each other in efforts to control DHF [28], [29], [30]. The implementation of health promotion depends on the social capital of a community but health promotion can strengthen the social capital of the community. The existence of the same goals that are conducted in controlling DHF, the interaction between individuals, community leaders, and health workers to increase participation, cooperation, mutual trust, and the desire to learn new things in DHF control can strengthen the social capital component [40], [41], [42], [43]. Health education is always followed by other community activities which are more easily accepted and provide a good relationship between participants and researchers. Good social relations and health education that are well

received by the research participants can change their participation, concern, trust, social norms, and readiness to learn new information about DHF control for the better. This good change has also occurred due to the participation of the local village government and *Puskesmas* during the implementation of health education. They support the participants to take part in health education concerning prevention of DHF [9], [20], [44], [45].

A healthy house is one of the environmental factors that influence the transmission of DHF since the *A. aegypti* mosquito is an anthropophilic mosquito. The *A. aegypti* breeding occurs in settlements. The condition of the house can be a supporting habitat for the *A. aegypti* mosquitoes. The physical condition of the house, sanitation facilities, and the behavior of the occupants of the house determine the condition of the house [44], [45], [46]. The poor physical conditions of the house, such as low lighting and high humidity, are supportive of the breeding of the *A. aegypti*, which like dark and humid places, so these conditions should be minimized in the house [44], [47], [48], [49]. Sanitation facilities such as the availability of sufficiently clean water, so that people do not need to collect water, would reduce the mosquito's breeding places [50], [51], [52], [53]. The availability of waste processing facilities at the house could reduce the disposable site of *A. aegypti* [22], [54]. Occupant behavior greatly affects the condition of the house. The habit of maintaining cleanliness, avoiding hanging clothes, and other habits could be supportive and preventive for mosquito breeding [21], [55]. This must be known by the community so that they could maintain the condition of their houses from being the breeding spots to the *A. aegypti* mosquitoes, through health education, information, and knowledge about DHF are provided so that public awareness increases [3], [24], [56], [57].

Health education about DHF affects perceptions, capital, and healthy house conditions. Post-intervention data were taken 6 months after the health education was done and the results still showed positive changes in all variables [58]. These changes are consistent. Health education that is given repeatedly over a long enough period influences the community's understanding of DHF and its transmission risk factors [3], [59], [60]. DHF is a disease that is often neglected [18], especially at this time when most people are focused on efforts of COVID-19 control, including in Indonesia. DHF cases remain high and become the second most significant threat after COVID-19 [61], [62]. DHF control in Indonesia is still very dependent on larva investigators, health workers, and fogging officers. Since the role of the community has not been maximal in DHF controlling efforts, more community-based DHF control is needed [7], [42], [52], [63]. Continuous health education is important to remind the community about the dengue problem and the shared responsibility in DHF controlling efforts. Regular health education can increase public awareness to participate in controlling DHF. The health education also can involve the *Puskesmas* as the closest health service facility

to the community and involve the village government for monitoring and evaluating the implementation and results of the interventions. Besides, the *Puskesmas* and the village government would be responsible for the sustainability of health education to the community after the research concludes. This is essential because health education must be presented continuously to maintain the community's consistency in controlling DHF. The limitation of this study is that the assessment process after the intervention was not done every month so that the changes that occurred every month could not be known, but the assessment conducted at the 6<sup>th</sup> month still showed that the changes that occurred after health education were consistently good.

## Conclusion

Health education can increase good perceptions about DHF and its control, social capital, and healthy housing conditions. It is very important to increase the active participation of the community in implementing DHF control. The implementation of this health education needs to be done continuously to maintain the consistency of changes that occur in the community. It is feasible by involving the community health centers (*Puskesmas*) and the village government as managers of the health education program about dengue after the research is conducted.

## Data Availability

All the data analyzed for this study are included within the article.

## Ethical Approval

This research had received approval from the Medical and Health Research Ethics Committee of FKMK UGM number: KE/FK/1233/EC/2018 accepted on November 22, 2018.

## Authors Contributions

Idea owner of this study: (TWS), (TBTS), (MAW), (EHM), and (RSP).

Study design: TWS, TBTS, MAW, EHM, and RSP.  
 Data gathering: TWS.  
 Writing and submitting manuscript: TWS and RSP.

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