Community Behavior in Controlling Aedes aegypti Mosquito Breeding Places before and during the Covid-19 Pandemic

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Abstract. The COVID-19 epidemic has brought more people into their homes, so it is hoped that their behavior towards dengue mosquito nests in their homes will improve. The design of this study was cross-sectional with a consecutive sampling approach in data collection, which was conducted between May 6, 2020 – May 9, 2020, in Indonesia. Data was collected using a questionnaire (google form) which was assessed with ten indicators. Data analysis was carried out by using the average difference test to determine differences in people's behavior. The analysis results showed no significant difference (p>0.005) with the community's behavior in controlling the dengue vector before and during the pandemic. Suggestions that need to be made are continuous education about DHF and efforts to prevent transmission by eradicating mosquito nests.

1. Introduction
Dengue hemorrhagic fever is still a serious public health problem. Tropical and subtropical countries are at high risk of transmission of the virus. Those countries are associated with the high-temperature rise and changes in the rainy and dry seasons, which is a risk factor for dengue virus transmission [1, 2]. The incidence rate of DHF from 1968 - 2015 tends to increase, so this should be a concern even though there is currently a pandemic of other diseases, COVID-19. This situation occurs due to climate change, behavioral factors, and community participation that is still lacking in Pemberantasan Sarang Nyamuk (Mosquito Nest Eradication, later will be written as PSN), increased population mobility, and other influencing factors. DHF Incidence Rate in Indonesia in 2015 was 49.5 per 100,000 population. At the same time, the three provinces with the highest Incidence Rate are Bali Province, 208.7 per 100,000 population, followed by East Kalimantan Province, which is 183.12 per 100,000 population, and Southeast Kalimantan Province with and incidence rate of 120.08 per 100,000 population [2].

The Government has carried out various programs to control this disease, including the PSN 3M Plus (Menguras – Mengubur – Menutup or Draining - Bury – Closing), working to establish a DHF Operational Working Group, health promotion, and others [2]. Eradication of mosquito nests by using chemicals such as larvicides can cause resistance if the dosage is not proper [3].

Dengue transmission is mediated by the Aedes aegypti, a dengue virus vector [4] [5]. During this
pandemic, the government also urges the public to be aware of Dengue Hemorrhagic Fever (DHF). By cleaning mosquito nests [6]. Lack of public knowledge about DHF is one of the causes of the many cases of DHF. Many people do not know how to deal with DHF. A person's behavior in maintaining environmental hygiene is strongly influenced by environmental and clean environmental management procedures [7]. According to Lawrence Green (1980), in Notoatmodjo S., (2010), behavior is motivated or influenced by three factors, (1) predisposing - which facilitate or predict the occurrence of a person's behavior, including knowledge, attitudes, beliefs, values, traditions, etcetera. (2) enabling - factors that enable or facilitate behavior or action. Examples are health facilities and infrastructure, (3) reinforcing - which include the attitudes and behavior of health workers, or other officers who are a reference group of community behavior[8]. According to Notoatmojo's theory, health prevention behavior is a response to prevent disease, such as sleeping using mosquito nets to prevent dengue mosquito bites, mosquito nest eradication behavior (PSN). Including the behavior to not transmit the disease to others.

Based on the data and description above, the purpose of this study is to analyze the relationship between the characteristics of respondents with the behavior of the Indonesian people in controlling the DBD vector before and during the current COVID-19 pandemic.

2. Method
The design of this study is a cross-sectional study with a consecutive sampling approach in data collection, which was carried out on May 6, 2020 - May 9, 2020. The sampling technique in this study is non-probable sampling in convenience sampling using a questionnaire as an instrument for data collection. The inclusion criteria in this study are Indonesian residents, willing to be respondents, and able to read the exclusion criteria in this study are those under 17 years old and not willing to be respondents. The type of data in this study is primary data.

Indicators of community behavior in vector control assessed in this study include ten indicators; (1) cleaning the Mosquito Breeding Place (mosquito breeding place, which will later be written as TPN) once a week and (2) the types of TPN that are cleaned are toilet tubs, bathtubs, jars, buckets, dispensers, pots, ponds/aquariums, used tires, used bottles or used cans, and others that can serve as water reservoirs and mosquito breeding grounds; (3) closure of TPN; (4) recycling or environmental cleaning of cans or used goods that can be used as water reservoirs at least once a week; (5) giving abate powder at least once every three months; (6) hang clothes for more than one week; (7) keep fish in TPN; (8) install mosquito nets on windows and doors; (9) using insect repellent before going to bed; (10) and use mosquito nets or curtains while sleeping. The level of community behavior in vector control is categorized as good behavior if the respondent performs five or more indicators and vice versa.

Data analysis was carried out quantitatively using the Statistical Package for the Social Sciences (SPSS) version 23.0 application. Univariate analysis was carried out to describe the frequency distribution of respondents. Then bivariate analysis to determine the relationship between respondent characteristics and community behavior in controlling dengue vectors before and during the pandemic, normality tests were also carried out, then a different mean was carried out. Significantly on the level of community behavior in controlling dengue vectors before and during the COVID-19 pandemic.

3. Results and discussion
In this study the collected data came from respondents of 413 households in Indonesia conducted in May 2020. The age groups or categories was based on the category from Indonesian Ministry of Health (2009) : 1. Toddler = age 0 – 5, childhood = age 6 – 11, early adolescence = age 12 – 16, late adolescence = age17 – 25, early adulthood = age 26 – 35, late adulthood = age 36 – 45, early elderly = age 46 – 55, late elderly = age 56 – 65, old age = age above 66 [9].

| Characteristics of Respondents | Total (N) | % |
|--------------------------------|----------|---|
| Age (Years)                    |          |   |
| Adolescent (17-25)             | 233      | 56.4 |
Characteristics of Respondents

|                        | Total (N) | %  |
|------------------------|-----------|----|
| Adult (26-45)          | 121       | 29.3 |
| Elderly (46-65)        | 58        | 14.0 |
| Old age (>65)          | 1         | 0.2  |

**Latest Education**

|                      | Total (N) | %  |
|----------------------|-----------|----|
| Not Educated         | 1         | 0.2  |
| Middle School        | 2         | 0.5  |
| High School          | 124       | 30.0 |
| College/university   | 286       | 69.2 |

**Gender**

|   | Total (N) | %  |
|---|-----------|----|
| Male | 135       | 32.7 |
| Female | 278       | 67.3 |

**Province**

| Province                  | Total (N) | %  |
|---------------------------|-----------|----|
| DKI Jakarta               | 154       | 37.3 |
| Jawa Barat                | 148       | 35.8 |
| Banten                    | 43        | 10.4 |
| Jawa Tengah               | 23        | 5.6  |
| Jawa Timur                | 16        | 3.9  |
| Sumatera Utara            | 2         | 0.5  |
| Sulawesi Tengah           | 1         | 0.2  |
| Bangka Belitung           | 2         | 0.5  |
| Sumatera Selatan          | 2         | 0.5  |
| DI Yogyakarta             | 6         | 1.5  |
| Riau                      | 2         | 0.5  |
| Kalimantan Timur          | 2         | 0.5  |
| Sulawesi Selatan          | 1         | 0.2  |
| Sumatera Barat            | 5         | 1.2  |
| Jambi                     | 1         | 0.2  |
| Bali                      | 5         | 1.2  |
| Riau                      | 4         | 1.4  |

Table 1 shows the majority of respondents are adolescents with a range of ages 17-25 by 56.4% and was mostly female by 67.3%. The majority of respondents' latest education is college/university which is 69.2% of 413 subjects and also students with 45.8% of respondents being the most occupation of this study. The majority of respondents also have incomes above UMR by 51.8%. Most of the respondents were from DKI Jakarta Province.

**Table 2.** Behavioral indicators for cleaning and checking the existence of larvae in each TPN.

| Community Behavior in Controlling DHF Vector | Before Pandemic | During Pandemic |
|---------------------------------------------|-----------------|-----------------|
| Behavior of Cleaning the Bathtub            |                 |                 |
| Good                                        | 241 (58.4%)     | 250 (60.5%)     |
| Bad                                         | 22 (5.3%)       | 13 (3.1%)       |
| Behavior of Cleaning the Lavatory Tub       |                 |                 |
| Good                                        | 208 (50.4%)     | 218 (52.8%)     |
| Community Behavior in Controlling DHF Vector | Before Pandemic | During Pandemic |
|---------------------------------------------|----------------|----------------|
| Bad                                         | 28 (6.8%)      | 18 (4.4%)      |
| Behavior of Cleaning the Crock              |                |                |
| Good                                        | 87 (21.1%)     | 86 (20.8%)     |
| Bad                                         | 10 (2.4%)      | 11 (2.7%)      |
| Behavior of Cleaning the Bucket             |                |                |
| Good                                        | 281 (68.0%)    | 280 (67.6%)    |
| Bad                                         | 33 (8.0%)      | 34 (8.2%)      |
| Behavior of Cleaning the Dispenser          |                |                |
| Good                                        | 225 (54.5%)    | 234 (56.7%)    |
| Bad                                         | 66 (16.0%)     | 57 (13.8%)     |
| Behavior of Cleaning the Pot                |                |                |
| Good                                        | 163 (39.5%)    | 174 (42.1%)    |
| Bad                                         | 74 (17.9%)     | 63 (15.3%)     |
| Behavior of Cleaning the Pool/Aquarium      |                |                |
| Good                                        | 127 (30.8%)    | 128 (31.0%)    |
| Bad                                         | 29 (7.0%)      | 28 (6.8%)      |
| Behavior of Cleaning the Used Tires         |                |                |
| Good                                        | 28 (6.8%)      | 28 (6.8%)      |
| Bad                                         | 9 (2.2%)       | 9 (2.2%)       |
| Behavior of Cleaning the Used Bottles/Cans  |                |                |
| Good                                        | 70 (16.9%)     | 67 (16.2%)     |
| Bad                                         | 18 (4.4%)      | 21 (5.1%)      |
| Behavior of Cleaning other Mosquito Breeding Site |            |                |
| Good                                        | 90 (21.8%)     | 92 (22.3%)     |
| Bad                                         | 14 (3.4%)      | 12 (2.9%)      |
| Behavior of Checking the Larvae in Bathtub  |                |                |
| Good                                        | 195 (47.2%)    | 206 (49.9%)    |
| Bad                                         | 68 (16.5%)     | 57 (13.8%)     |
| Behavior of Checking the Larvae in Lavatory Tub |            |                |
| Good                                        | 166 (40.2%)    | 180 (43.6%)    |
| Bad                                         | 70 (16.9%)     | 56 (13.6%)     |
| Behavior of Checking the Larvae in Crock    |                |                |
| Good                                        | 67 (16.2%)     | 71 (17.2%)     |
| Bad                                         | 30 (7.3%)      | 26 (6.3%)      |
| Behavior of Checking the Larvae in Bucket   |                |                |
| Good                                        | 202 (48.9%)    | 214 (51.8%)    |
| Bad                                         | 112 (27.1%)    | 100 (24.2%)    |
| Behavior of Checking the Larvae in Dispenser|                |                |
| Good                                        | 171 (41.4%)    | 187 (45.3%)    |
| Bad                                         | 120 (29.1%)    | 104 (25.2%)    |
| Behavior of Checking the Larvae in Pot      |                |                |
| Good                                        | 135 (32.7%)    | 143 (34.6%)    |
| Bad                                         | 102 (24.7%)    | 94 (22.8%)     |
Table 2 shows the community’s behavior in cleaning the TPN once a week and checking the existence of larvae in the TPN. Note that not all respondents had a similar TPN. Table 3 shows the difference on the change of people’s behaviour before and during the pandemic ranging from -0.5% to 5.1%, with the lowest -0.5% is hanging clothes in the house for a long time, while the highest difference in behavior changes is checking the presence of mosquito larvae in TPN by 5.1%. In the normality test, it was found that the data distribution was not normal (<0.005), so Wilcoxon rank sign test was used as an alternative test to measure people's behavior in controlling the DHF vector.

Table 3. Changes in the level of community behavior in controlling dhf vectors before and during the pandemic.

| Behavior of Checking the Larvae in | Before Pandemic | During Pandemic | Total | $P$-Value |
|-----------------------------------|----------------|----------------|-------|-----------|
| Pool/Aquarium                     | Good          | Bad            |       |           |
| Good                              | 170 (89.5%)   | 20 (10.5%)     | 190   | 0.768     |
| Bad                               | 26 (11.7%)    | 197 (88.33%)   | 223   |           |

Table 3 shows the results of the analysis of the mean difference test with the Wilcoxon rank sign test with a $P$ value of 0.768, indicating that there are no significant changes in the level of community behavior in controlling DHF vectors before or during the pandemic. In this study, it was found that almost half of the respondents were teenagers with educational status as students (Table 1). The last respondent's education was in college/college as many as 286 respondents (69.2%). This research was conducted by collecting data through questionnaires distributed through the Google form application so that respondents who can access the questionnaire on average may have higher education [7].

In this study, it was found that almost half of the respondents were teenagers whose also a student. The latest education of respondents college or university as many as 286 respondents (69.2%) go together with an increase in DHF vector control behavior before and during the COVID-19 pandemic. The previous study relates to the results of a study conducted by Rakhmani in which adult respondents have better preventive behavior than younger respondents. The results may occur because adults have more experience with dengue than younger people [12]. The results of this study are not following with research conducted by Anthi in 2012 who found that respondents' knowledge level in Dalung Village, North Kuta District, only 39.8% had good knowledge. The remaining 60.2% of respondents had inadequate knowledge. This impacts the eradication of mosquito nests (PSN). The study results
showed that the respondents’ behavior in doing PSN in Dalung Village, North Kuta Subdistrict was only 48.9%, and the remaining 51.1% did not practice PSN [13]. Based on a study conducted by Tika in 2019, the level of parental knowledge can be influenced by with age. Based on the study results, note the characteristics of respondents aged between 36-45 years, as many as 12 respondents (73.3%). This is supported by the opinion of Notoatmodjo, who revealed that the more he gets older, the more his comprehension and mindset would develop so that the knowledge he gets is getting better [7].

A study conducted by Sulistyawati in Yogyakarta shows that people of reproductive age know pretty well, but older and retired people are considered to have better behavior [14]. Likewise, studies conducted by Arora in India, where higher educated people have better knowledge of dengue, but in terms of doing preventive measures, the community still has not entirely done it [10]. A study conducted by Kumaran et al. that higher education does not fully mean they have a role in practicing vector control in their environment because there are still some educated people who do not know the symptoms of dengue and do not immediately look for health facilities to be treated [15, 16]. In contrast to research conducted by Said et al. in Malaysia, where there is no relationship between age, sex, and education on dengue prevention behaviors [17]. Lack of knowledge can affect a person, including health behavior, thus becoming a cause of the high rate of spread of disease, including dengue fever which has a high risk of transmission and spread [7]. The role of the community itself is still considered not optimal in dealing with dengue cases. It requires multidisciplinary from government units, health practitioners, and community leaders to comprehensive preventive action [18].

In this study results, the community behavior before and during the pandemic increased from 46% to 47.5%. The results showed that there was an increase in cleaning the bathtub during the pandemic from 58.4% to 60.8%. This also happened in cleaning the lavatory tub from 50.4% to 52.8%, cleaning dispensers, pots, and aquariums. However, some indicators did not experience an increase during the pandemic, such as cleaning jars, buckets, used tires, used bottles. Although in another study by Rather et al., doing preventive measures such as PSN has a role in Aedes aegypti vector control [19, 20].

On the other hand, the behavior of checking the presence of mosquito larvae in TPN shows an increase almost in all TPN. The most larvae inspections as much as 48.9%, an increase of up to 51.8% which was carried out by 314 people or 75% of respondents, this following by a larvae check on the dispenser that has been done by 291 people or 70.5% of respondents, where the data shows an increase from 41.4% to 45.3%. Likewise, examining larvae in the bathtub and toilet showed an improvement during the pandemic.

Based on the community level of behavior before and during the pandemic, the results of this study respondents with good behavior were only 190 people (46%) before the pandemic. However, during the pandemic, this good behavior increases to 196 people (47.5%). This is in contrast to a study conducted by Mahalul in 2016, which stated that as many as 59 families (46.8%) had not practice PSN properly. This is indicated by the community’s rarely cleans water reservoirs, such as bathtubs/toilets, once a week. People prefer fogging as a way to eradicate mosquitoes [21].

The limitations of this study were that the respondents were not random. The sampling was only done by filling out the google form with consecutive sampling, did not observe behavior directly due to pandemic conditions, and the research design was cross-sectional. It could not determine the causal factors and their effects with certainty.

4. Conclusion
The conclusion of this study indicates there are no differences in community behavior before and during the pandemic. However, the study results illustrate that community behavior is already good in controlling vectors in groups of respondents with high education and income.

Suggestions from this study are to involve a broader scope so that the characteristics of respondents are more varied, with the expectation that the data become more significant. The government can improve the prevention or control of DHF vectors in the current COVID-19 pandemic. The community is expected to continue to carry out government programs in vector control by
implementing PSN or Mosquito Nest Eradication while maintaining or preventing the spread of COVID-19.

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