Comparison of Analysis of Bivariate Factor Behavior and Environment with The Incidence of Dengue Hemorrhagic Fever (DHF) with the Topsis Method
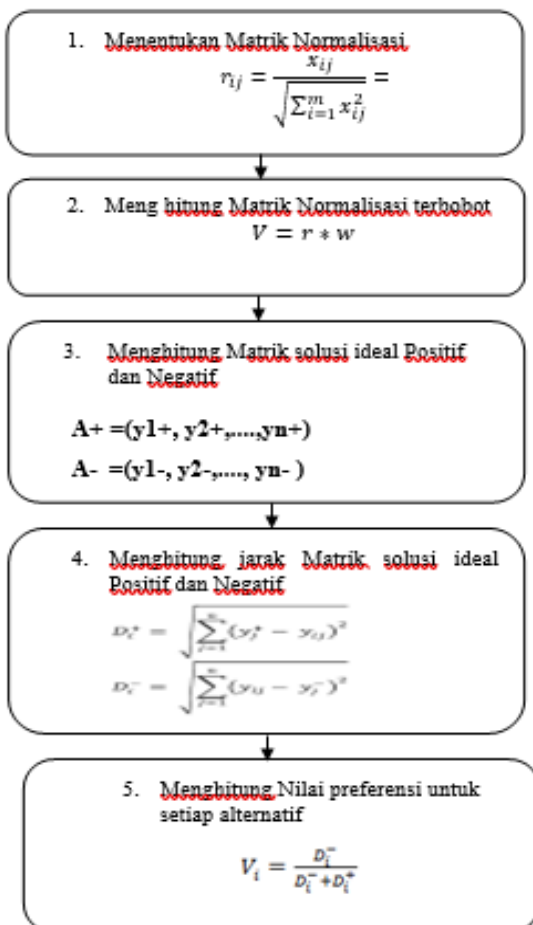
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Highlights

• Previous research on behavioral and environmental factors with the incidence of dengue hemorrhagic fever (DHF) obtained bivariate analysis results.

•.Behavioral and environmental factors with the incidence of dengue fever result in 3M, mosquito repellent, mosquito flicks, and water reservoirs.

• In this study will be compared with the results of the TOPSIS Calculation into Criteria for Behavioral and Environmental Factors with DHF events.

A graphical abstract.

Proses TOPSIS

1. Menentukan Matrik Normalisasi
$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} =$$

2. Meng hitung Matrik Normalisasi terbobot
$$V = r * w$$

3. Menghitung Matrik solusi ideal Positif dan Negatif
$$A+ = (y1+, y2+, \ldots, yn+)$$
$$A- = (y1-, y2-, \ldots, yn-)$$

4. Menghitung jarak Matrik solusi ideal Positif dan Negatif
$$D_i^+ = \sqrt{\sum_{j=1}^{n}(y_j^+ - y_{ij})^2}$$
$$D_i^- = \sqrt{\sum_{j=1}^{n}(y_{ij} - y_j^-)^2}$$

5. Menghitung Nilai preferensi untuk setiap alternatif
$$V_i = \frac{D_i^-}{D_i^- + D_i^+}$$

Abstract:- Based on research in 2020, dengue fever will continue to hit several countries, namely Bangladesh, Brazil, and India to be one of the countries that reported an increase in the number of dengue cases (WHO, 2020), and research in 2018 is the basis for this research and the data processed. to compare with the calculation of the TOPSIS method. DENGUE disease can appear throughout the year and can affect all age groups, this disease is related to environmental conditions and community behavior with Incidence Rate and Case Fatality Rate, the number of people with DENGUE reported as many as 129,650 cases with 1,071 deaths. 50.75 per 100,000 inhabitants and CFR/mortality rate = 0.83%. Based on the profile record of the Bahorok Health Center of Bahorok District of Langkat Regency, DHF is one of the endemic diseases whose existence is always present and spread in the village, according to the Head of The Bahorok Health Center of Tanjung Lenggang Village, Langkat Regency, in 2010 there were 822 Family Cards (KK) that experienced DHF cases with a total of 10 cases. This research is a descriptive-analytical study with a "cross-sectional study" design, which is to look at the relationship between behavior and the environment with DHF incidence. The population in this study was 6,039 households, while the sample in this study was the result of a temporary survey of 98 people with DENGUE. The research was conducted in Tanjung Lenggang Village Indonesia from May to August 2018. Research results every year there is a significant association between the habit of doing 3M and the incidence of DENGUE (0,000<0.05), There is a significant association between the habit of doing 3M and the incidence of DENGUE (0,000<0.05), There is a significant relationship between mosquito drug use habits and the incidence of DENGUE (0.021<0.05), There is a meaningful relationship between the presence of mosquito larvae and the incidence of DENGUE (0.000 <0.05), there is no meaningful relationship between water reservoirs and DHF incidence (0.922 < 0.05). It is recommended to the public to change their behavior, especially in terms of the application of 3 M, as well as cleaning the environment so that mosquito larvae do not nest again, and use anti-mosquito drugs such as mosquito nets and install wire mesh on windows. The potential occurrence of DHF can be done by intervening in DHF intervention programs and community empowerment, one of which is by eliminating the monitoring and maintenance of spotted fish in landfills, as well as making efforts to improve public knowledge and behavior related to DHF. Based on the

results of TOPSIS calculations, the Chi-Square Test is habitually doing 3M with DHF incidence being criterion 1, Chi-Square testing for mosquito repellent habits with DHF event being the 3rd criterion, Chi-Square test for mosquito flicks with 4th criterion DHF event and Chi-Square test for water shelters with second criterion DHF event.

Keywords:- TOPSIS, Behavior, Environment, DHF, 3M.

I. INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is one of the public health problems in Indonesia where the number of sufferers tends to increase and the spread is increasingly widespread due to the dengue virus transmitted through the bite of Aedes aegypti mosquito and Aedes albopictus mosquito.

DHF attacks mainly children aged less than 15 years, but can also attack adults. The pattern of dengue transmission is influenced by climate and air humidity. High humidity and hot milk make the Aedes aegyti mosquito last long. So the time pattern of the disease may vary from one place to another depending on the climate and humidity. In Java, dengue cases generally spread from early January to April – to May every year. The prevention of DHF depends on activities in mosquito control, namely the Mosquito Nest Eradication program, which includes the prevention of mosquito bites by using mosquito nets, mosquito repellents, repellents, and 3M implementation efforts (draining, cleaning drains, and burying). In 2017, there was a decrease in the number of cases and death rates due to dengue hemorrhagic fever (DHF) in Indonesia. This number is even reduced by more than half when compared to the same period, the Ministry of Health. The report noted that in 2015 in October there were 3,219 cases of DHF with deaths reaching 32 people, while in November there were 2,921 cases of DHF with 37 deaths, and December 1,104 cases with 31 deaths. Compared to 2014 in October there were 8,149 cases with 81 deaths, November 7,877 cases with 66 deaths, and December 7,856[1]. At the beginning of 2019, data entered until January 29, 2019, there were 13,683 patients with dengue fever, reported from 34 provinces with 132 cases who died. This figure is higher when compared to January of the previous year (2018) with 6,167 sufferers and 43 deaths. At the beginning of 2019, several regions reported dengue outbreaks, including Manado City (North Sulawesi) and 7 districts/cities in East Nusa Tenggara (NTT), namely East Sumba, West Sumba, West Manggarai, Ngada, South Central Timor, Ende, and Manggarai Timur Indonesia. Meanwhile, some other areas have seen an increase in cases but have not reported the status of extraordinary events. In anticipation of an increase in dengue cases at the end of 2018 and early 2019, the Government in this case the Ministry of Health has appealed to all levels of local government through a circular letter from the Minister of Health of the Republic of Indonesia. PV.02.01/Menkes/721/2018 number dated November 22, 2018, concerning Preparedness for Increased Dengue Cases and in 2020 DENGUE disease will continue to hit in several countries, namely Bangladesh, Brazil, and Indonesia is one of the countries that reported an increase in the number of DENGUE cases (WHO, 2020) [2].

➤ *Hypothesis Research*

The hypothesis of this study is to compare the results obtained from the calculation of the TOPSIS method with the results of bivariate factor analysis of community behavior and the environment. Wherefrom the results of the TOPSIS method will be obtained criteria that become behavior and environment with DHF events.

II. MATERIALS AND METHODS

As a data processing material and to be compared with the calculation results of the TOPSIS method, the results are RESEARCH RESULTS with Bivariate Analysis.

Table 2.1 Chi-Square test of the habit of doing 3M with the incidence of DHF

Variabel	Pvalue	OR
kebiasaan melakukan 3M dengan kejadian DBD	0,000	0,044

Based on table 2.1. The above can be seen that there is a significant relationship between the habit of doing 3M and the incidence of DHF (0,000<0.05) with an OR value of 0.044 means that respondents who have the habit of doing 3M are at risk of 0.044 times more severed than those who do not have the habit of doing 3M.

Table 2.2 Chi-Square Test Habits of mosquito repellent use with the incidence of DENGUE

Variabel	Pvalue	OR
Kebiasaan menggunakan anti nyamuk dengan kejadian DBD	0,021	0,349

Based on table 2.2. The above can be known that there is a significant relationship between the habit of using mosquito repellent and the incidence of DENGUE (0.021 < 0.05) with an OR value of 0.349 means that respondents who have a habit of using mosquito repellent are 0.349 times more likely to get DENGUE than those who do not have a habit of using mosquito repellent.

Table 2.3. Chi-Square test for the presence of mosquito flicks with dengue incidence.

Variabel	Pvalue	OR
Keberadaan jentik nyamuk dengan kejadian DBD	0,000	6,9

Based on table 2.3. From the description above, it can be known that there is a significant relationship between the presence of mosquito larvae and the incidence of DENGUE (0,000<0.05) with an OR value of 6.9 means that respondents who have mosquito flicks in their homes as many as 6.9 times. At the risk of getting DENGUE compared to those who do not have mosquito flicks in their homes Her.

Table 2.4 Chi-Square Test for water reservoirs with DHF events

Variabel	Pvalue	OR
Keberadaan jentik nyamuk dengan kejadian DBD	0,922	1,06

Based on table 2.4 above it can be known that there is no significant relationship between water reservoirs and incidence (0.922 < 0.05).

From the above data, we will do a comparison with the TOPSIS method to find out if the four variables above will go to the nearest distance variable. The theory of the TOPSIS method will be used as a comparison in this study. The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method has a concept where the best choice not only has the shortest distance from the positive ideal solution, but also has the furthest distance from the negative ideal solution, with such advantages as a simple and easy-to-understand concept, computationally efficient, and can measure the relative performance of alternative decisions in simple mathematical form. A lot of literature discusses this method, including the Method "Comparison of Certainty Factors (CF) A Suwarno With TOPSIS Method To Diagnose Personality Disorders In Adolescents" The formula used is as follows:
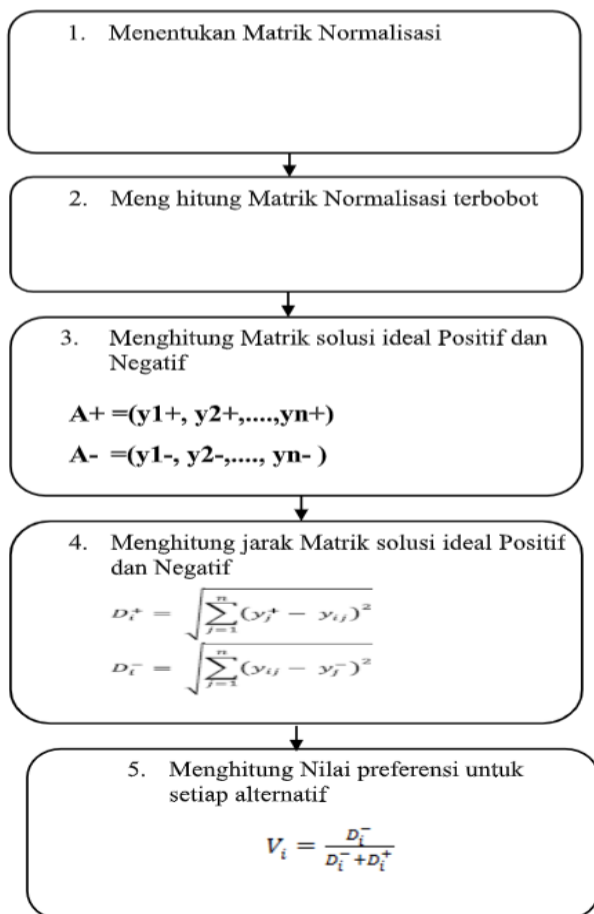

Fig 2.1 TOPSIS Process [4]

1. Define the Normalization Matrix

$$rij = \frac{xij}{\sqrt{\quad}} \qquad (1)$$

2. Calculating the Weighted Normalization Matrix

$$V = r * w \qquad (2)$$

3. Calculating Positive and Negative Ideal Solution Matrix

$$A+ = (y1+, y2+, ..., yn+)$$
$$A- = (y1-, y2-, ..., yn-) \qquad (3)$$

C1 = habitual value of 3M (draining, cleaning waterways, and burying)
C2 = Habitual value of using mosquito repellent
C3 = the value of the presence of mosquito flicks
C4 = water storage value

For the classification of symptoms of DHF events based on Tables 2.1, 2.2, 2.3, 2.4 using fuzzy for the Symptom Value attribute:

1. Very Inappropriate to 5 (STS1) = 0
2. Unsuitable to 4 (TS2) = 0.25
3. Sufficiently Fits to 3 (CS3) = 0.5
4. Match Once to 2 (SS4) = 0.75
5. Very Suitable Once to 1 (SSS5) = 1

According to Hidayat (Nurelasari & Purwaningsih, 2020), research methods are owned and carried out by researchers to collect information or data and conduct investigations of the data obtained. The method used in determining the selection of location of the establishment of this pulse wholesaler is the Order Preference Technique Based on Similarity to the Ideal Solution (TOPSIS). According to Ridaini (Kristiana, 2018) "TOPSIS uses the principle that the chosen alternative must have the closest distance from the positive ideal solution and the furthest from the negative ideal solution from a geometric point of view by using Euclidean distance to determine the relative proximity of the ideal alternative solution[5]

About the steps mentioned above, this study requires several instruments, namely: data is taken from several tables, then formed into a table so that it meets the attributes needed to create a decision matrix, the attributes of the data needed in this study are attributes of the data taken. from bivariate analysis data. In this research method, there are weights and attributes needed to determine the symptoms of DENGUE in each DHF event to be taken. The attributes are as follows:

III. RESULTS AND DISCUSSION

To compare the results obtained from the Bivariate Analysis will be calculated using the TOPSIS method so that the criteria of behavioral and environmental factors are obtained with dbd events.

If a table is created based on the results of a bivariate analysis it will look like in Table 2.5 below:

Table 2.5 Results of Bivariate Analysis of Behavioral and Environmental Factors with DHF Events

| No | Indikator | Bivariate | |
		Nilai P-Value	OR
1	Chi-Square Test of the habit of doing 3M (draining, cleaning drains, and burying) with the incidence of DHF	0,000<0,05	0,044
2	Chi-Square Test Habits of using mosquito repellent with the incidence of DENGUE	0,021<0,05	0,349
3	Chi-Square test for the presence of mosquito flicks with dengue incidence	0,000<0,05	6,9
4	Chi-Square test for water reservoirs with dengue incidence	0,922<0,05	1,06

Based on the results of bivariate analysis of behavioral and environmental factors with DBD events in table 2.5 obtained as follows: The habit of doing 3M The results of the study there is a significant relationship between the habit of doing 3M with the incidence of DENGUE (0,000 < 0.05) with a value of OR 0.044 means that respondents based on the results of the study there is a significant relationship between the behavior of 3M and the incidence of Dengue Hemorrhagic Fever in or adjusted 8.22 means that family members with an ordinal value of 0.044 mean that respondents based on the results of the study there is a significant relationship between 3M behavior and dengue hemorrhagic fever incidence in or adjusted 8.22 means that family members with Poor 3M behavior have an 8,222 times greater risk of experiencing DENGUE than a family member with good behavior. 3M behavior is related to the presence of Aedes aegypti mosquito larvae. The presence of Aedes aegypti mosquito flicks is associated with the occurrence of DENGUE disease. So the effort to prevent the occurrence of DENGUE is to eradicate the presence of Aedes aegypti mosquito flicks.

The results of the study found that there was a significant association between the habit of using mosquito repellent and the incidence of DENGUE (0.021<0.05) with an OR value of 0.349 means that respondents who have a habit of using mosquito repellent are 0.349 times more likely to get DENGUE than those who do not. Mosquito repellent, mosquito repellent is one way to avoid mosquito bites so as not to transmit DENGUE disease. the relationship of mosquito repellent with the incidence of DENGUE. The results of the study showed that there was a significant relationship between the presence of mosquito larvae and the incidence of DENGUE (0.000 < 0.05) with an OR value of 6.9 meaning that respondents who had mosquito larvae in their homes had as many as 6.9 times. The risk of dengue fever is compared to those who do not have a mosquito flick in their home. The presence of larvae is closely related to the type, location, ion, and size of the larvae. even containers at home. The presence of containers is a factor that affects the presence of flicks in the house.10 The dominant type of container is found and is the breeding ground for Ae. aegypti are tubs, buckets, and jars. The three types of containers are also the most dominant containers found dbd larvae. People's habit of storing water for daily needs provides opportunities for Ae. aegypti to breed there. From the explanation above, based on the bivariate analysis in table 2.5, we will now do a comparison using the TOPSIS method as seen in table 2.6 below.

Table 2.6 Comparison of Bivariate Analysis Results with TOPSIS Method

| No | Indikator | Bivariate | | TOPSIS | r ij | r *W | Max | Min | | Hasil TOPSIS | Kriteria |
		Nilai P Value	OR	Nilai P Value							
1	Chi-Square Test of the habit of doing 3M (draining, cleaning drains, and burying) with the incidence of DHF.	0,000<0,05	0,044	0,25	0,176	0,011	0,187	0,165	0,352	0,71023	1
2	Chi-Square Test Habits of using mosquito repellent with the incidence of DENGUE.	0,021<0,05	0,349	0,5	0,698	0,1745	0,8725	0,5235	1,396	0,35817	3
3	Chi-Square test for the presence of mosquito flicks with dengue incidence.	0,000<0,05	6,9	0,75	9,2	5,175	14,375	4,025	18,4	0,04076	4
4	Chi-Square test for water reservoirs with dengue incidence.	0,922<0,05	1,06	1	1,06	1,06	2,12	0	2,12	0,47170	2

Based on the results of TOPSIS calculations, Criterion 1 is the habit of doing 3M (draining, cleaning waterways, and burying) with DBD events, Criterion 2 is a water shelter with DBD events, Criterion 3 is the habit of using mosquito repellent with DBD events and the 4th is the presence of mosquito larvae with DBD events if sequenced it will look like in table 2.7 below:

Table 2.7 after sorting by criteria

No		Bivariat		TOPSIS	r ij	r *W	Max	min		Hasil Topsis	Kriteria
		Nilai P Value	OR	Nilai P Value							
1	Chi-Square Test of the habit of doing 3M (draining, cleaning drains, and burying) with the incidence of DHF	0,000<0,05	0,044	0,25	0,176	0,011	0,187	0,165	0,352	0,71023	1
2	Chi-Square test for water reservoirs with dengue incidence	0,922<0,05	1,06	1	1,06	1,06	2,12	0	2,12	0,47170	2
4	Chi-Square Test Habits of using mosquito repellent with the incidence of DENGUE	0,021<0,05	0,349	0,5	0,698	0,1745	0,8725	0,52535	1,396	0,35817	3
3	Chi-Square test for the presence of mosquito flicks with dengue incidence	0,000<0,05	6,9	0,75	9,2	5,175	14,375	4,025	18,4	0,04076	4

IV. CONCLUSIONS

1. In bivariate analysis there is a significant relationship between the habit of doing 3M and the incidence of DENGUE (0,000<0.05), while the results of the calculation of the TOPSIS method criterion 1 with a result of 0.71023 for the prevention of DENGUE by doing 3M (draining, cleaning waterways and burying),

2. In the Bivariate analysis there is a significant relationship between the habit of using mosquito repellent and the incidence of DENGUE (0.021<0.05), while the results of the TOPSIS method calculation are criterion 3 with a value of 0.35817 which is an anti-mosquito that can prevent dengue.

3. In bivariate analysis there is a significant relationship between the presence of mosquito larvae and the incidence of DENGUE (0.000<0.05), while the results of the calculation of the TOPSIS method are criterion 4 with a value of 0.04076

4. In the Bivariate analysis there is a significant relationship between water reservoirs and incidence (0.922 < 0.05) while the results of the calculation of the TOPSIS criterion 2 method with a value of 0.04076 which is a mosquito flick if not cleaned.

To overcome the prevention of DHF, both Bivariate analysis and using the Topsi method at point 1 have the same thing in preventing the occurrence of DHF, the main thing is to do 3M (draining, cleaning, and burying)

M to 1 Drain the bathtub and don't let any stagnant water because mosquito larvae arise.

M to 2 Clean the drainage drains.

M to 3 Burying things that can cause stagnant water such as used cans, used buckets

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