Jurnal Kesehatan
Manarang

Jurnal Kesehatan Manarang, Volume 10, Number 1, April 2024, pp. 1-10
ISSN 2528-5602 (Online), ISSN 2443-3861 (Print)
doi: https://doi.org/10.33490/jkm.v10i1.1158

ENVIRONMENTAL ANALYSIS *OF THE AEDES AEGYPTI MOSQUITO* AS DHF VECTOR IN THE ENREKANG DISTRICT

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ARTICLE INFO

Article history

Submitted: 2023-11-22
Revised: 2024-03-01
Accepted: 2024-03-30

Keywords:

Physical Environment;
Dengue Haemoragic fever;
Aedes aegypti;

ABSTRACT

The physical environment of the Aedes aegypti mosquito greatly influences the ecology and development of the Aedes aegypti mosquito, which is the main factor causing Dengue Hemorrhagic Fever. In the Enrekang district area, there were 166 cases of dengue fever, in 2020 there was an increase of 209 cases and there was a decrease again in 2021 with 64 cases. Cases of Dengue Hemorrhagic Fever sufferers in Enrekang district are among the 10 highest diseases. The aim of the research is to determine the relationship between the physical environment (temperature, pH, humidity and residential density) of the Aedes aegypti mosquito and the incidence of Dengue Hemorrhagic Fever in Enrekang district. The method in this research is analytical observational using a Case Control study approach. Analytical observational research is research that tries to identify how health phenomena occur. Sampling was carried out using the total sampling method with a total sample of 124. Data was obtained directly from the Enrekang District health office. The research results showed that there was a significant relationship between room temperature, water pH, room humidity, and residential density with the incidence of Dengue Hemorrhagic Fever in Enrekang district with respective p-values of (0.007, 0.001, 0.000, and 0.000). The results of the study concluded that the physical environment of Aedes aegypti mosquitoes is a risk factor for Dengue Hemorrhagic Fever in Enrekang district. Therefore, it is recommended to the health Office and the community to actively eradicate mosquito nests (PSN) and control residential density in Enrekang Regency.

Keywords:

Physical Environment;
Dengue Haemoragic fever;
Aedes aegypti;

ABSTRAK

Lingkungan fisik nyamuk *Aedes aegypti* sangat berpengaruh terhadap ekologi dan perkembangan Nyamuk *Aedes aegypti* yang merupakan faktor utama penyebab Demam Berdarah Dengue. Di wilayah kabupaten Enrekang penderita kasus Demam Berdarah pada tahun 2020 mengalami peningkatan sebanyak 209 kasus dan mengalami kembali penurunan pada tahun 2021 sebanyak 64 kasus. Kasus penderita Demam Berdarah Dengue di kabupaten Enrekang masuk dalam 10 penyakit tertinggi. Tujuan Penelitian untuk mengetahui hubungan lingkungan fisik (Suhu, pH, Kelembaban, dan kepadatan hunian) nyamuk *Aedes aegypti* dengan kejadian penyakit Demam Berdarah Dengue di kabupaten Enrekang. Metode dalam penelitian ini adalah observasional analitik dengan menggunakan pendekatan studi Case Contol. Observasional analitik merupakan penelitian yang mencoba mengenali bagaimana fenomena kesehatan itu terjadi. Pengambilan sampel dilakukan dengan metode total sampling dengan jumlah sampel sebanyak 124. Data diperoleh langsung dari dinas kesehatan Kabupaten Enrekang. Hasil penelitian menunjukkan ada hubungan yang bermakna antara suhu ruangan, pH Air, Kelembaban ruangan, dan kepadatan hunian dengan kejadian Demam Berdarah Dengue di kabupaten enrekang dengan masing-masing *p-value* sebesar (0,007, 0,001, 0,000, dan 0,000). Hasil penelitian menyimpulkan bahwa lingkungan fisik nyamuk Aedes aegypti menjadi faktor risiko terjadinya penyakit Demam Berdarah Dengue di kabupaten Enrekang. Oleh karena itu direkomendasikan kepada dinas kesehatan dan masyarakat untuk aktif melakukan pemberantasan sarang nyamuk (PSN) serta mengontrol kepadatan hunian di Kabupaten Enrekang.

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INTRODUCTION

With an estimated 390 million cases of dengue fever worldwide each year, the World Health Organization (WHO) came to the conclusion that the prevalence of the disease is rising quite quickly. More than 3.2 million cases of dengue fever are thought to have occurred in 2018 throughout America, Southeast Asia, and the West Pacific (Bestari, 2018). WHO data shows that there was a 451,442 rise in dengue fever cases in Southeast Asia in 2015; the incidence rate (IR) was 24 per 100,000 people, with a 0.37 case fatality rate (Kurnia et al., 2021). Dengue Hemorrhagic Fever is one of the main health problems in Indonesia. Indonesia ranks first with the highest number of dengue fever sufferers in Southeast Asia. In 2020, there were 108,303 cases recorded with a total of 747 deaths (Indonesian Ministry of Health, 2020).

DHF was first discovered in Surabaya and Jakarta in 1968, causing the deaths of 24 people, then spread to several provinces in Indonesia. Dengue fever cases will affect climate change, one of which is the physical environment, changes will affect disease transmission media, because vectors will reproduce optimally if temperature, wind speed and humidity are available in optimum quantities for their survival (Fini et al., 2021).

Data from the Ministry of Health of the Republic of Indonesia in 2019-2020, stated that the number of dengue fever sufferers in Indonesia spread across 34 provinces was 246,430 cases and the number of sufferers who died was 1.66 cases (Indonesian Ministry of Health, 2020). In South Sulawesi alone there were 2,114 cases of dengue fever, of which 19 died in 2018. Then there is case as many as 683 people, of which 10 people died as well as there are 323 suspects from January 22 to 31 in 2019. Region with The largest dengue fever case is in South Sulawesi with amount case as many as 216 people and 5 people died that is Regency Pangkep (Adiatma et al., 2021).

Data from DG Prevention and Control Diseases (P2P) Ministry of Health of the Republic of Indonesia in 2017, with amount resident amounting to 261,890,872, total DHF cases in Indonesia reached 59,047 cases with an IR (*Incidence Rate)* of 22.55 per 100,000 population and 444 residents die Because dengue fever cases. In 2016 dengue cases increased high to 34.48% in districts/cities and in 2017 experienced decline to 27.59% in districts/cities. Free numbers larvae (ABJ) in 2017 experienced decline decreased by 46.7% abd enough far compared to 2016 which was 67.6 % so unmeet yet program targets (Kinansi & Pujiyanti, 2020).

Based on information from and the Epidemiological Surveillance data center of the Indonesian Ministry of Health (2010), DHF is still a health problem for the community and is one of the infectious diseases that has the potential to cause extraordinary events (KLB). Since the first dengue cases were found in Indonesia in 1968, the number of cases tends to increase and the area of spread is getting wider, causing extraordinary events (KLB) each often occurs in various regions in Indonesia. Until now there is no vaccine or antiviral drug for DHF. According to Widiyono (2008), the most effective action to suppress the dengue epidemic is to control the presence of mosquito vectors carrying the dengue virus (Purnawinadi et al., 2020).

The yearly occurrence of Dengue Fever varies across the country. The endemic pattern used to occur every five years, but over the past fifteen years, it has shifted to occur every two to five years. In the meantime, death rates are generally declining. Dengue fever cases in South Sulawesi varied from year to year; in 2018, there were 2122 cases; in 2019, there were 3745 cases; and in 2020, there was a further decrease in cases, with 2714 cases totaling across 24 Regencies and Cities (South Sulawesi Provincial Health Service, 2020).

Rapid urban population expansion, population mobilization brought on by better facilities and infrastructure, and a breakdown or weakening of population management are risk factors for the spread of dengue disease, thereby allowing Extraordinary Events (KLB) to occur. Another risk factor is poverty which can result in people not having the ability to provide adequate and healthy housing, drinking water supplies and proper waste disposal. However, on the other hand, dengue fever can also attack more affluent residents, especially those who frequently travel out of town (Setryawan et al., 2020).

Data from the Enrekang District Health Service in 2019 saw a total of 166 cases of dengue fever and 1 person died, in 2020 the number of cases was 209 cases and 4 people died, and in 2021 it decreased with the number of cases being 64 cases and 1 person died. spread across 12 sub-districts. The results of previous research show that there is a significant relationship between the physical environmental factors of the *Aedes aegypti mosquito* and the incidence of dengue fever in the Bengkuring health center area, Samarinda city with the variable residential density obtained by *p-value* of 0.002 and for the air humidity variable, *a p-value was obtained* of 0.000 (Affandy et al., 2018).

METHOD

Types of research

This kind of research employs a case-control study methodology and is analytical observational research. Analyzing environmental risk variables for Aedes aegypti in case and control samples in Enrekang Regency and measuring pH, water temperature, humidity, and residential density with the incidence of dengue hemorrhagic fever (DHF) are the goals of this case control technique.

Research Location and Time

This research was conducted in Enrekang Regency, South Sulawesi Province. The research was carried out in September-October 2022.

Population and Sample

The population in this study were all houses that had not or had ever suffered from dengue fever cases in villages/subdistricts in Enrekang Regency in 2021, totaling 64 cases. The samples in this study were all selected sub-districts in Enrekang Regency. Sampling was carried out using the *Total Sampling method*, where the samples in this study were all houses that had suffered from dengue fever cases in 2021 in Enrekang Regency, totaling 6 2 cases and 6 2 control samples or 1:1. The control sample taken in this research is a *matching case control study* or case control study by matching age and gender variables between the case and control groups to see differences in exposure to risk factors for the same respondent characteristics.

Data collection

Interviews and direct measurements of study objects were used to gather data. The case sample and control samples were matched based on age and gender, and the case samples were visited at the residences of those who had contracted dengue fever.

Processing and analysis of data

Data processing and analysis was carried out using univariate and bivariate analysis with IBM *Statistical Package for Social Science (SPSS) data processing software*. Univariate analysis was carried out to see the frequency distribution of each variable studied (respondent characteristics, pH, water temperature, humidity, and residential density with the incidence of dengue hemorrhagic fever (DHF) in Enrekang Regency. Meanwhile, bivariate analysis was carried out to see the relationship between pH, water temperature, humidity, as well as residential density with the incidence of dengue hemorrhagic fever (DHF) in Enrekang Regency. The statistical test used was *chi-square with an alpha* error rate of 5% with results declared significant if *the p-value* <0.05 and significant if *the p-value* >0.05 with an OR value and confidence interval of 95%.

RESEARCH RESULT
Analysis Univariate

Table 1. Characteristics Respondents in the District Enrekang (n=124)

Variable	Respondent		%
	Case	Control	
Age			
0 – 5	2	2	3,2
6 - 10	4	4	6.5
11 - 1 5	29	29	46.8
1 6 - 20	26	26	41.9
>20	1	1	1.6
Gender			
Man	32	32	51.6
Woman	30	30	48.4
Total	**62**	**62**	**100**

Source: Primary data

Based on table 1. known that majority the respondents studied were in the teenage category 58 (46.8 %), then age mature as many as 52 respondents (41.9%), age children as many as 8 respondents (6.5%), age toddler as many as 4 people (3.2%), and at least 2 people aged >20 years (1.6%). There are two categories of respondent gender, namely male and female. There were 64 (51.6%) male respondents and 60 (48.4%) female respondents.

Table 2. Environmental Frequency Distribution Physically Based DHF incidence in Enrekang Regency (n=124)

Variable	Dengue fever incidence			
	Case		Control	
	n	%	n	%
Water pH				
Optimal	58	93.5	43	69.4
Not optimal	4	6.5	19	30.6
Temperature Room				
Optimal	35	56.5	20	32.3
Not optimal	27	43.5	42	67.7
Humidity Room				
No Qualify	55	88.7	29	46.8
Qualify	7	11.3	33	53.2
Density Residential				
Not eligible	40	64.5	19	30.6
Qualify	22	35.5	43	69.4
Total	**62**	**100**	**62**	**100**

Source: Primary data

Table 2 shows that of the 62 case respondents, the pH of the water was measured as optimal (≥6.5 - ≤ 7.5) as many as 58 respondents (93.5%), and the pH of the water was measured as not optimal (<6, 5 or > 7.5) as many as 4 respondents (6.5 %). Meanwhile, there were 62 control respondents, there were 43 respondents (69.4 %) whose water pH was measured as optimal and 19 respondents (30.6 %) whose water pH was measured as not optimal.

On temperature of the 62 case respondents there were rooms in the optimal temperature category (≥25-30) ° C as many as 35 respondents (56.3%), and in the non-optimal temperature category (< 25° or > 30°) as many as 27 respondents (43.5%). Meanwhile, in the control category of 62 respondents, there were 20 respondents (32.3%) whose room temperature was optimal, and 42 respondents (67.7%) whose room temperature was not optimal.

On variables dampness room Shows that of the 62 case respondents, the room humidity measured did not meet the requirements (≥ 60%) as many as 55 respondents (88.7%), and the room humidity measured met the requirements (<60%) as many as 7 respondents (11.3%). Meanwhile, of the 62 control respondents, 29 respondents (46.8%) whose room humidity was measured did not meet the requirements, and 33 respondents (53.2%) whose room humidity was measured met the requirements.

On variables density residence showed that of the 62 case respondents, the residential density of respondents who did not meet the requirements (≤8 m²) was 40 respondents' houses (64.5%), and the residential density of respondents who met the requirements (>8 m²) was 22 respondents' houses (35.5 %). Meanwhile, in the 62 control respondents, it was found that the residential density of respondents who did not meet the requirements was 19 respondents' houses (30.6%), and those who met the requirements were 43 respondents' houses (69.4%).

Analysis Bivariate

Table 3. Environmental Relationships Physique With the incidence of dengue fever in Enrekang Regency (n=124)

Variable	Dengue fever incidence				*p - v alue*	OR (95%CI)
	Case		Control			
	n	%	n	%		
Water pH						
Optimal	58	93.5	43	69.4	0.001	6,407
Not optimal	4	6.5	19	30.6		(2033-20196)
Temperature Room						
Optimal	35	56.5	20	32.3	0.007	2,722
Not optimal	27	43.5	42	67.7		(1,309-5,659)
Humidity Room						
No Qualify	55	88.7	29	46.8	0,000	0.112
Qualify	7	11.3	33	53.2		(0.044-0.284)
Density Residential						
No Qualify	40	64.5	19	30.6	0,000	4,115
Qualify	22	35.5	43	69.4		(1,944-8,709)
Total	**62**	**100**	**62**	**100**		

Source: Primary data

Based on Table 3 shows that among dengue fever case respondents with optimal water pH there were 58 respondents (93.5%) greater than the control respondents, namely 43 respondents (69.4%). Then, the pH of the water was not optimal for case respondents as many as 4 respondents (6.5%) which was smaller than for control respondents as many as 19 respondents (30.6%).

Research results in table 3. showed that among dengue fever case respondents with optimal room temperature there were 35 respondent houses (56.5%) which was greater than that of dengue control respondents, namely 20 respondent houses (32.3%). Then the non-optimal room temperature in 27 dengue case respondents' houses (43.5%) was smaller than the non-optimal room temperature in control respondents' 42 houses (67.7%).

Based on table 3. showed that the room humidity that did not meet the requirements for dengue case respondents was 55 respondents (88.7%) greater than the room humidity for dengue control respondents, namely 29 respondents (46.8%). Meanwhile, the room humidity that meets the requirements for dengue case respondents is 7 respondents (11.3%) which is smaller than the room humidity for dengue control respondents, namely 33 respondents (53.2%). Table 3 shows that the residential density of the respondents is did not meet the requirements (≤8 m²) as many as 40 respondents' houses (64.5%), and the residential density of respondents who met the requirements (>8 m²) was 22 respondents' houses (35.5%). Meanwhile, among control respondents, it was found that the residential density of respondents who did not meet the requirements was 19 respondents' houses (30.6%), and those who met the requirements were 43 respondents' houses (69.4%).

DISCUSSION

Univariate Analysis

Dengue Hemorrhagic Fever is one of the main health problems in Indonesia. The number of dengue fever sufferers increases from year to year along with increasing mobility and population density in Indonesia. From 1968 to 2009, Indonesia ranked first with the highest number of dengue fever sufferers in Southeast Asia. Dengue fever first occurred in Indonesia in 1968 in the city of Surabaya, where 58 people were infected with the dengue virus, of which 24 people died with a mortality rate of 41.3%. Since then, dengue fever has begun to spread throughout Indonesia. In 2020, there were 108,303 cases recorded with a total of 747 deaths (Indonesian Ministry of Health, 2020).

The physical environment that greatly influences the ecology of the *Aedes aegypti mosquito* is the pH level and water temperature, humidity and residential density. The research results in table 2 show that the water pH was measured optimally (≥6.5 - ≤ 7.5) by 58 respondents (93.5%), and the water pH was measured not optimally (<6.5 or > 7.5) as many as 4 respondents (6.5 **%)**. In table 3, the optimal temperature (≥25-30) º C was 35 respondents (56.3%), and in the non-optimal temperature category (<25º or > 30º) there were 27 respondents (43.5%). In table 4. the room humidity measured did not meet the requirements (≥60%) as many as 55 respondents (88.7%), and the room humidity measured met the requirements (<60%) as many as 7 respondents (11.3%). And in table 5. the residential density of respondents who do not meet the requirements (≤8 m²) is 40 respondent houses (64.5%), and the residential density of respondents who meet the requirements (>8 m²) is 22 respondent houses (35.5%).

In line with research by Izza (2022) which states that the physical conditions of the environment are very supportive of the existence of the Aedes aegypti mosquito vector because it is caused by a damp living environment, used cans that collect rainwater can become a breeding ground for the Aedes aegypti mosquito. The Aedes aegypti mosquito can be a risk factor for dengue fever in this area. In Indonesia itself, dengue fever is still very high due to the lack of awareness among the public to behave in a clean and healthy lifestyle, health behavior related to the presence of the Aedes aegypti mosquito vector which causes dengue fever, including the habit of hanging clothes, poor lighting and rarely draining and closing shelters water.

Analysis Bivariate

Relationship between pH Water and the incidence of dengue fever in Enrekang Regency

Water pH is one of them factors that have role important for reproduction of mosquito larvae *Aedes aegypti.* Mosquito larvae *Aedes aegypti* during its growth period *breeding site* can live at low pH namely pH below 7. Increasingly high pH exceeds the optimum pH for breeding mosquitoes, then the larvae will dead. The pH of water is greatly influenced by the season, where matter this impact on life Aedes aegypti mosquito. Where the *Aedes aegypti* larvae have tolerance life to a pH between 6.5-7.5 (Ishak, 2018).

Based on the results of the study, statistical test results using the Chi-Square correction test (Continuity Correction) obtained a p-value of 0.001 ($p < 0.05$), which means that the pH of the water has a significant relationship with the incidence of Dengue Bleeding Fever in Enrekang Regency. Meanwhile, the calculation of Odd Ratio obtained the value of OR=6,407 (95% CI=2,033-20,196), which means that case respondents who have an optimal water pH (≥6.5 - ≤7.5) are 6,407 times more likely to support the growth of Aedes Aegypti mosquitoes and are at risk of dengue than control respondents with non-optimal water pH.

This research is supported by previous research at the Dinoyo Community Health Center, Malang City RW 1 RT 1, RT 2, RT 3, RT 5 and RT 10 which concluded that there was a significant relationship between water pH and the occurrence of larvae and the occurrence of *Dengue Hemorrhagic Fever* with a value of *p -value* is 0.000 (Astuti, 2017). This research is also in line with previous research which concluded that there was a significant relationship between water pH and the incidence of *Dengue* Hemorrhagic Fever in Mangunjiwan Village, Demak District with *a p-value* of 0.036 (Maftukhah et al., 2017).

The pH of water in Enrekang Regency tends to be normal, this can be seen in the results of research that shows the pH measurement of water is more dominantly normal. This plays an important role in the growth of Aedes aegypti mosquitoes in Enrekang Regency. The pH of water that tends to be normal in Enrekang Regency is influenced by the season at the time of the study.

Relationship between room temperature and dengue fever incidence in Enrekang Regency

Air temperature is one of the physical environmental factors that influences the growth of the *Aedes aegypti* mosquito. Changes in temperature will affect the survival process of mosquitoes. Temperatures that are too high can increase virus replication and shorten the vector incubation period (Lahdji & Putra, 2019). The optimum average temperature for mosquito development is 25-17ºC. Mosquito growth will stop completely if the temperature is less than 10ºC or more than 40ºC. Rising temperatures can shorten the life expectancy of mosquitoes and can interfere with the development of pathogens. *Aedes aegypti* mosquito eggs that stick to the surface of damp water reservoir walls can undergo a complete embryonization process at a temperature of 25-30ºC for 72 hours (Sucipto CD, 2011).

Based on the research results, statistical test results using the *Chi-Square* correction test (*Continuity Correction*) obtained *p-Value of* 0.007 ($p < 0.05$), which means that room temperature has a significant relationship with the incidence of *Dengue Hemorrhagic Fever* in Enrekang Regency. Meanwhile, *the Odd Ratio calculation* obtained a value of OR= 2.722 (95% CI=1.309-5.659), meaning that case respondents who had suboptimal room temperatures (<25ºC or >30ºC) in their homes were 2,722 times more likely to support the growth of *Aedes aegypti mosquitoes* and risk of experiencing dengue fever than control respondents with suboptimal room temperature.

Room temperature has a significant relationship with the incidence of dengue fever. This research is in line with previous research which concluded that room air temperature is related to the incidence of dengue fever. with *p-value of* 0.003 and *an Odds Ratio* = 2.9, which means that the risk of contracting dengue fever in respondents who have an optimal room air temperature is 2.9 times greater than the risk of contracting Dengue Hemorrhagic Fever than a room air temperature that is not optimal (Salempang, 2020).

This research is also supported by research conducted by Hafnidar which concluded that room temperature is also related to the incidence of Dengue Hemorrhagic Fever with a p-value of 0.003 and OR=22.1, which means that room temperature that is not optimal carries a 22.1 times greater risk for exposed to Dengue Hemorrhagic Fever at optimal room temperature (Hafnidar, 2019). Temperature in the Regency's room According to study results, enrekang is generally best for mosquito development (Aedes aegypti). The sample case indicates that the ideal temperature predominates. The season has an impact on this ideal temperature because the study was conducted between September and October, when the season was experiencing a drought.

Connection Room Humidity with Dengue Fever Incidence in Enrekang Regency

Air humidity is one of the factors that can cause *Dengue Hemorrhagic Fever*. Room air humidity greatly affects the respiratory system of the *Aedes aegypti mosquito*, where mosquitoes use tracheas with holes in the mosquito's body wall (spirakes). If the humidity in the room is low, there will be excessive evaporation of water in the body, causing a lack of fluid in the mosquito's body which will interfere with mosquito activities such as flight distance, age, breeding period, biting habits and the mosquito's resting period. If the room humidity does not meet the requirements of above 60%, it really supports the reproduction of embryos in mosquitoes. Meanwhile, humidity that meets the requirements of <60% causes the lifespan of mosquitoes to be shorter and the Dengue virus in the mosquito's body cannot survive for a long period of time (Affandy, et al. 2018).

Based on the research results, statistical test results using the *Chi-Square* correction (Continuity *Correction)* test obtained *a p-value* of 0.000 ($p < 0.05$), which means that there is a significant relationship between room humidity and the incidence of *Dengue Hemorrhagic Fever* in Enrekang Regency. Meanwhile, the results of the Odds Ratio calculation obtained a value of OR=0.112 (95% CI=0.044-0.284), which means that respondents whose room humidity does not meet the requirements (≥60%) are 0.112 times more likely to contract *Dengue Hemorrhagic Fever* than respondents who have adequate room humidity.

This research is supported by previous research conducted in Mangunjiwan Village, Demak District which concluded that there was a significant relationship between room humidity and the incidence of *Dengue Hemorrhagic Fever* with *a p-value* of 0.036 (Maftukhah et al., 2017). This research is also in line with Siti Rahma's research in Majene Regency in 2022 which concluded that there was a significant relationship between room humidity and the incidence of *Dengue Hemorrhagic Fever* with a *p-value* of 0.03 (Rahma, 2022).

Room humidity in Enrekang district is predominantly unqualified (>60%) in the case sample, this can be seen from the results of the study. If the humidity of the room does not meet the requirements above 60%, it is very supportive of the breeding of embryonic periods in mosquitoes. The high humidity of the room in Enrekang Regency is influenced by high air temperatures which cause a lot of water vapor and high ambient air pressure.

Relationship Density Residential with Dengue fever incidence in the district Enrekang

Residential density is indirectly impacted by population density in an area because larger families tend to engage in more activities that serve as mosquito breeding grounds for Aedes aegypti (Wahyuningsi et al, 2017). Occupancy density is calculated by knowing the area of a house and the number of occupants. According to Law Number 1 of 2011 concerning residential and residential areas, it is said to be dense if the occupancy is ≤8 m² / person. Occupancy density is a factor in the frequency of mosquitoes biting more often, so that if in a house there are family members affected by Dengue Hemorrhagic Fever, the frequency of other family members affected by DHF is higher if the occupancy occupied is dense.

Based on the results of the study, statistical test results using the Chi-Square correction test (Continuity Correction) obtained a p-value of 0.000 ($p < 0.05$), which means that there is a significant relationship between residential density and the incidence of Dengue Hemorrhagic Fever in Enrekang Regency. Meanwhile, the calculation of the Odds Ratio obtained a value of OR=4,115 (95% CI=1,944-8,709) which means that respondents who have occupancy density do not qualify (≤8²/person) 4,115 times.

This study supported by research in Minahasa that concludes that There is meaningful relationship between density residence with incident Fever Dengue blood in the work area of Public Health Center Tompaso Minahasa with a p-value of 0.031 (Kaeng et al., 2020). In line with That Research results Ita Maria in 2013 in Makassar showed that group case more many have residence crowded house (risk high) was 37 people (71.2%), while in the control group it was more many have residence a house that doesn't dense (isk low) amounted to 33 people (63.5%). Dense house occupancy is a risk factor for Dengue Hemorrhagic Fever (DHF) with an OR value = 4.28 (95% CI 1.88-9.76). The risk of respondents who live in houses that have dense occupancy to get Dengue Hemorrhagic Fever is 4.28 times greater than respondents who live in houses that have not dense occupancy (Maria et al., 2013).

Study this is also in line with research in Kupang concluded that there is meaningful relationship between density something residence with incident Fever Dengue Blood in Kupang City with the p-value is 0.002 (Singga, 2019). However, in Semarang, there is no relationship between residential density and the incidence of Dengue Hemorrhagic Fever with a p value = 0.175 (OR 2.634) and Banyumas with density occupancy (p=0.605 OR=1.495) (Maharani, 2017 and Kanigia, 2017).

The occupancy density in Enrekang district tends to be unqualified, which is ≤8 m²/person in the case sample. This is planned in a dwelling lived by 2-3 heads of families. This is what really supports the spread of Dengue Hemorrhagic Fever in Enrekang Regency, if in a dense dwelling there is one family member suffering from DHF, it will be easily transmitted to other family members.

CONCLUSIONS AND RECOMMENDATIONS

There is a significant relationship between room temperature, water pH, room humidity, and occupancy density with the incidence of Dengue Fever in Enrekang Regency with p-values of 0.007, 0.001, 0.000, 0.000 and OR values of 2.722, 6.407, 0.112, 4.115, respectively. It is expected that the Enrekang Regency Health Office will supervise and provide guidance to the community to focus more on eradicating mosquito nests (PSN) in each village/kelurahan or hamlet and forming jumantik cadres in each village/kelurahan or hamlet in order to monitor or control mosquito larva populations in each village/kelurahan or hamlet and control residential density in Enrekang Regency.

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