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ANALYSIS OF TEMPERATURE, HUMIDITY AND HOUSE ENVIRONMENTAL CONDITIONS OF LEPTOSPIROSIS PATIENTS IN WORK AREA OF BANYUANYAR COMMUNITY HEALTH CENTER SAMPANG REGENCY, EAST JAVA, INDONESIA

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ABSTRACT--*Leptospirosis is a disease caused by Leptospira bacteria. This disease can be transmitted to humans due to contact with animals infected with Leptospira bacteria. Research Aims: This research aimed to analyze the temperature, humidity and house environmental conditions of leptospirosis patients in the work area of Banyuanyar Community Health Center Sampang Regency. Research Methods: This research was an observational research with cross sectional research design. The population in this research were leptospirosis patients in the area of Banyuanyar Community Health Center Sampang Regency. The method of taking a sample used total populated sampling that was all leptospirosis patients as many as 7 people. Temperature and humidity measurement used instruments called a Thermohygrometer and Stopwatch. Data collection was done by interviews, observations, and measurements. Data analysis used descriptive analysis The results of this research were that the total house temperature of leptospirosis patients (100%) did not qualify the requirements as well as the house humidity that did not qualify the requirements (85.7%). In the house environmental conditions of the patients, 100% of rats were found in the house of respondents affected by Leptospira. Rats in the respondents house were known based on signs of their presence such as sound, dirts, footprints, and direct appearance of the rat. Respondents affected by leptospirosis above 70% around their houses were affected by flood, conditions of overflowed sewers and the presence of puddles. This was in line with previous researchers, areas that have high flood vulnerability level will ease the Leptospira bacteria to enter the human body by swimming in flood water. The house environmental conditions of the respondents which there were floods (71.4%), puddles (85.7%), the conditions of overflowed ditch/sewer around the house (71.4%), poor dumpster conditions (57.1%). The house environmental conditions of patients had the potential to be a proliferation of Leptospira bacteria. The temperature and humidity at house of leptospirosis patients did not qualify the requirements, the house*

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environmental condition which there were presence of rats, had flood records, conditions of overflowed sewers and the presence of puddles. So that it will ease the Leptospira bacteria to enter the human body by swimming in flood water through wounds. Respondents should use dumpsters with waterproof materials and closed, routinely dispose the trash, set traps or rodenticides in places where it is potential for the rats.

Keywords-- *Temperature, Humidity, House Environmental Conditions, Leptospirosis*

I. BACKGROUND

Animal-borne diseases (zoonoses) that are frequently reported in Indonesia are avian influenza, rabies, and leptospirosis. Leptospirosis is a globally emerging disease with numerous outbreaks being reported worldwideover the past decades (1). One of the zoonotic diseases that is still become a public health problem in Indonesia. Leptospirosis is a disease caused by infection with pathogenic bacteria called leptospira and transmitted from animals to humans, has been characterized as an emerging zoonosis of global importance by the World Health Organization (2,3).

Leptospira can be found in pets such as cats, dogs, cows, pigs, buffalo, and wild animals such as rats, ferrets and squirrels. In the body of an animal, Leptospira lives in its kidneys and urine. Transmission of leptospirosis from human to human is very rare. Transmission that often occurs is through rats (4).

Transmission occurs directly due to direct contact between humans and the urine or tissue of infected animals for example when handling infected animal tissue or swallowing contaminated food or water. The bacteria can survive for weeks to months in urine-contaminated water and soil. Transmission can also occur indirectly, due to contact between humans and water, soil or plants which contaminated by urine of animals infected with Leptospira (5,6). More-over, the bacteria can enter through a scratch on the skin, a wound,or through mucous membranes found in the mouth, eyes, and nose (7).

Leptospirosis ranges in severity from benign in most cases to sometimes fatal with a mortality rate of around 10 percent and raises a real public health issue (8). This disease is often undiagnosed because the signs and symptoms are difficult to distinguish from other endemic diseases and less available diagnostic laboratory. Estimated by 0.1 to 1 per 100,000 people living in subtropical areas per year suffer from leptospirosis, increasing to 10 or more per 100,000 people in the tropic areas (9).

Patients with leptospirosis typically present with fever, headache, and myalgia but symptoms of any organ may be apparent. Severe forms include meningitis, pulmonary hemorrhage with respiratory failure, or Weil's disease characterized by jaundice, bleeding, and renal failure (10).

Indonesia is one of many countries in the Asia-Pacific region with a moderate annual incidence of leptospirosis (11). Indonesian Health Profile 2018 presents data on leptospirosis cases which still have a high incidence rate of 894 cases, 148 deaths, and case fatality rate (CFR) of 16.55%. The leptospirosis mortality rate in Indonesia reaches 2.5 - 16.5 percent per year. East Java occupies the top three highest provinces by number of deaths, and case fatality rate (CFR) due to leptospirosis in Indonesia on 2018, with the findings of leptospirosis as many as 128 cases, 10 deaths, and case fatality rate (CFR) of 7.81 %. The number of leptospirosis cases in East Java also increased compared to the previous year, from 106 cases to 128 cases (12,13).

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An area in East Java that still has leptospirosis problems is Sampang Regency. Based on data from the Health Office of Sampang Regency on 2018, the number of leptospirosis cases in Sampang Regency as many as 28 people in 2016, 31 people in 2017, and lastly 14 people in 2018. Sampang Regency is one of the regencies in Madura Island that has higher flood intensity than other regencies (14). Meanwhile, leptospirosis attacks many humid areas, this is in line with the results of the mapping conducted by Rejeki, et al. (2013), which shows that leptospirosis cases in Banyumas Regency are all close to rice fields and in areas that have high rainfall intensity. Areas with high rainfall intensity make it easy for rats to swim and expel Leptospira bacteria into the environment (15). Not only is leptospirosis a public health issue in developing countries, it has become an urban health problem in developed and industrialized countries, occurring in unsanitary environments in cities during periods of seasonal rainfall and flooding (16).

Leptospira can survive outside the body if environmental conditions are favorable (17). Poor environmental conditions are good area for the survival of pathogenic bacteria as to enable the environment to be a suitable place for the life and proliferation of Leptospira bacteria. (18,19). Poor environmental conditions can also be used as indicators of leptospirosis transmission such as puddles, poor sewer conditions, the presence of scattered trash, poor trash collection place conditions, the presence of rats and pets that are risk factors for leptospirosis incidence(5).

Several studies of leptospirosis show that the incidence / transmission of leptospirosis is related to components of the abiotic environment which include temperature and humidity. Temperature is a quantitative measure of heat and cold. Leptospira bacteria can grow optimally at a temperature of 28-30□ C. In addition, air humidity is the amount of water vapor mass that is in a unit of air volume and Leptospira bacteria can grow optimally in a humid environment (20).

Prevention of leptospirosis by eradicating sources of infection (infected animals) especially rats is not easy given the large number of rat populations, fast reproduction of rats and the temporary tendency of the community in eradicating rats (21).

Based on the description above, the purpose of this study is to find out more about the characteristics and house environmental conditions of leptospirosis patients in the work area of the Banyuanyar Community Health Center Sampang Regency.

II. RESEARCH METHODS

This research was an observational descriptive research in which the researcher observed directly and did not give special treatment to the object researched. This type of research was a cross sectional study. The approach when taking data was done retrospectively (looking back) to find out the cause of leptospirosis by tracing the risk factors.

This research was conducted in the work area of the Banyuanyar Community Health Center Sampang Regency, Madura in January to August 2019. The population and large sample of this study were all leptospirosis patients in the work area of the Banyuanyar Community Health Center Sampang Regency as many as 7 people. The data used in this research was the data of the Health Office of Sampang Regency and Banyuanyar Community Health Center Sampang Regency on 2018-2019.

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The variables in this research consisted of the dependent and independent variables. The dependent variable was the dependent variable in which this research was the incidence of leptospirosis in the work area of the Banyuanyar Community Health Center either directly or indirectly from animals infected with the Leptospira bacteria. The independent variables were the independent variables that can influence the dependent variable, namely the house environment including the flood records, the presence of puddles around the house, the conditions of the ditch/sewer, the spacing of the ditch/sewer to the house, the dumpster conditions in the house, the presence of rats around the house, pet ownership, as well as temperature, and humidity. Temperature and humidity measurement used an instrument called a Thermohygrometer.

III. RESULTS AND DISCUSSION

Data analysis techniques in this research used descriptive analysis to determine the distribution and presentation of each variable will be seen from the frequency or percentage (%). Data will be presented in tabular form.

IV. TEMPERATURE

The temperature in this research was divided into 2 categories namely qualified and unqualified. The standard measurement of temperature and humidity in a house that qualifiy the requirements according to the Regulation of the Health Minister RI Number 1077 Year 2011 concerning Guidelines for Air Conditioning in the House Spaces iss 18-30□ C (22).

Table 1: Results of Temperature Measurement in Respondents House in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

Respondents	Temperature (^{0}C)	Temperature Standard
House 1	31,2	18-30^{0}C
House 2	32,1	
House 3	34,1	
House 4	32	
House 5	32,9	
House 6	33,5	
House 7	30,2	

Based on the table above, temperature measurements in 7 houses of respondents as leptospirosis patients were carried out using a Thermohygrometer with reference to the temperature standard of 18-30□ C. The development of Leptospira bacteria in the environment was determined by several factors including the degree of acid-base soil (soil pH), the degree of acid-base water (water pH), air humidity and temperature (23). Alive Leptospira bacteria grow optimally at a temperature of 20-25□ C (24). Pratiwi's research in Jakarta during 2007-

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2011 showed a significant relationship between average temperature and leptospirosis cases, if the average temperature was low, leptospirosis cases were high (25).

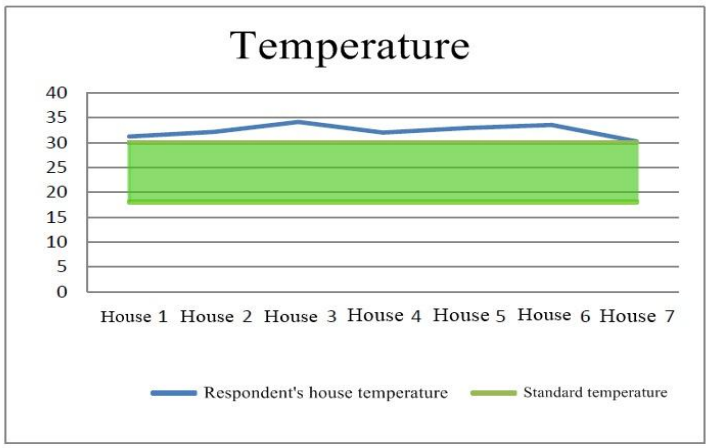

Figure 1: Temperature Measurement in House of Leptospirosis Patients

Leptospirosis was affected by rain and temperature while rain was affected by temperature. Je et al. (2011) in his research found that the amount of rainfall on two months earlier and the average temperature correlated with the number of leptospirosis cases. According to Levett (2001) the survival of pathogenic Leptospira depended on several factors including pH and temperature (26.27).

Table 2: Frequency Distribution of Respondents House Environment Based on Temperature in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

No	Temperature (^{0}C)	Frequency	Percentage
1	Unqualified	7	100%
2	Qualified	0	0%
Total		7	100%

From the table above, it was known, research conducted in the house environment of respondents as leptospirosis patients based on temperature measurements in 7 houses of respondents as leptospirosis patients, overall (100%) of the respondent's houses did not qualify the specified optimal room temperature requirements. Rooms that are in optimal air condition will make the conditions inside feel more comfortable (28).

This research found that the majority of respondents whose houses had windows tended to rarely open windows in their houses. Ventilation which tends to be closed will provide a far greater risk to humans in it to be affected by health problems (29).

Light is one of the factors that affect the growth of bacteria, one of them is Leptospira sp. This bacterium can grow to temperatures of 30 ° C. The influence of ultraviolet rays from sunlight can cause damage to compounds produced by bacteria. Its mechanism of action is absorption by nucleic acids without causing damage to the cell surface. This absorbed energy will cause bonds between adjacent thymine molecules and cause the formation of thymine dimers so that the function of nucleic acids is disrupted and can result in bacterial death (30).

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V. Humidity

Humidity in this research was divided into 2 categories, namely qualified and unqualified. The standard measurement of humidity in a house that qualify the requirements according to the Regulation of the Health Minister RI Number 1077 Year 2011 concerning the Guidelines for Air Conditioning in the House Spaces is 40-60%.

Table 3: Results of Humidity Measurement in Respondents House in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

Respondents	Humidity (%)	Humidity Standard
House 1	55	40-60%
House 2	62	
House 3	69	
House 4	61	
House 5	72	
House 6	61	
House 7	67	

Based on the above table, the humidity measurement was carried out in 7 houses of respondents as leptospirosis patients carried out using a Thermohygrometer with reference to the standard temperature of 18-30□C. Survival of pathogenic leptospires in the environment is dependent on several factors, including pH, temperature, and the presence of inhibitory compounds. The relationship of humidity to the case of leptospirosis is more influential on the life span of the disease agent, namely Leptospira. Leptospira can live longer in humid environments. Research conducted at Marocco showed that one of the main environmental risk factors for leptospirosis is a humid environment. Optimum humidity for proliferation of Leptospira sp. in wet / humid conditions more than 31.4%. Pratiwi's research in Jakarta during 2007-2011 showed a direct pattern between leptospirosis cases with humidity according to annual and monthly patterns, if humidity is high then cases are high and vice versa. This is consistent with the results of research conducted in Brazil also stated that the incidence of leptospirosis is affected by humidity (25,27,30).

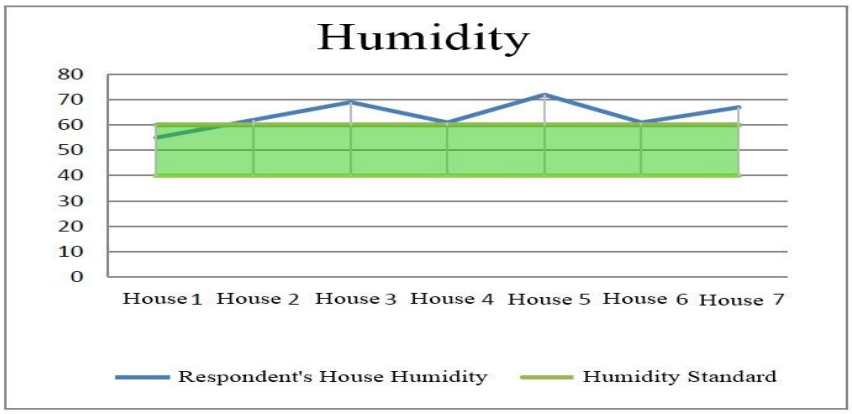

Figure 2: Humidity Measurement in House of Leptospirosis Patients

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The high incidence of leptospirosis in tropical areas can be associated to environmental conditions that have high humidity and rainfall as to enable the environment to be a good place for Leptospira bacteria to live and breed (31).

Table 4 : Frequency Distribution of Respondents House Environment Based on Humidity in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

No	Kelembaban (%)	Frekuensi	Persentase
1	Unqualified	6	85,7%
2	Qualified	1	14,3%
Total		7	100%

From the table above it was known, research conducted in the house environment of respondents as leptospirosis patients based on humidity measurements in 7 houses of respondents as leptospirosis patients, there was only 1 (14.3%) of respondent house that qualified the optimal room humidity requirements, 6 (85.7%) other respondents houses had room humidity that did not qualify specified requirements.

Rooms that are in optimal air condition will make the conditions inside feel more comfortable (28). The growth rate of bacteria, fungi or microorganisms in the room will be faster if the room has humidity above 60% (32). In addition, leptospirosis bacteria can easily grow in humid areas (33).This research found that the majority of respondents whose houses had windows tended to rarely open windows in their houses. Ventilation which tends to be closed will provide a far greater risk to humans in it to be affected by health problems (29).

VI. House Environmental Conditions

Flood Records

The flood records in this research meant floods that occurred before the respondents suffered leptospirosis. The flood records were divided into 2 categories namely have flood records and no flood records.

Table 5: Frequency Distribution of Respondents House Environment Based on Flood Records in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

No	Flood Records	Frequency	Percentage
1	Have Flood Records	5	71,4%
2	No Flood Records	2	28,6%
Total		7	100%

From the table above showed from 7 (100%) of respondents whose house environment were researched, there were 5 (71.4%) respondents whose house environment had flood records before they were sick and 2 (28.6%) others did not have flood records in their house environment before they were sick. This meant that floods hit most of the house environment of leptospirosis patients before they were sick. Floods that hit the house environment of respondents occurred because the flood vulnerability level in the Sampang Regency was classified as very vulnerable, the floods period that occurred were between 1-2 days (34).

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Climatic changes (warming) and extreme weather events such as floods are potential risk factors of leptospirosis.*Leptospira* can continue to survive for long periods in environments. An interesting finding was that *Leptospira* were able to survive for up to 43 days in soil flooded with rainwater (35,36). Three studies, two of them on islands, reported ORs above 6 indicating that the flood was the direct cause of an epidemic rather than a risk factor. Also in this case the study from Jamaica surprisingly found a reduced risk in persons living in previously flooded homes (37).

Leptospirosis cases have been reported in a variety of settings, from large urban centers after floods to remote rural areas(38). Floods hit an area due to high rainfall which caused the river to overflow (39). Areas with rainfall above 177.6 mm (height) have many cases of leptospirosis (40). In addition, areas that have high flood vulnerability level will ease Leptospira bacteria to enter the human body by swimming in flood water (41). Flood is a medium for spreading of Leptospira bacteria in contaminated water around the houses or rice fields, so that bacteria can enter the human body through wounds (42).

VII. The presence of puddles

The presence of puddle in this study was divided into 2 categories presented in table. The categories are there are puddles and no puddles.

Table 6: Frequency Distribution of Respondents' House Environment Based on the Presence of Puddles in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

No	The presence of puddles	Frequency	Percentage
1	Found puddles	6	85.7 %
2	No puddles	1	14.3 %
Total		7	100%

From the table above was known that puddles presence around the house of people with leptospirosis namely based on house environment 7 (100%) of patients studied, there were 6 respondents who had puddles around the house with a percentage of 85.7% and only 1 respondents who did not have puddles their house with a percentage of 14.3%. This means that the house environment of leptospirosis patients in the working area of Banyuanyar Community Health Center has a lot of puddles. The same thing happened with research in Pati, Central Java, from the cases, there were puddles in their house environment by 93.3%, the risk for leptospirosis cases in respondents with puddles around their house was 5.8 times greater than respondents with no puddles around their house.

Leptospir bacteria that can swim make it easier for *Leptospir* bacteria to contaminate and breed themselves in puddles around the house until there is an animal or human passing the puddles (5). In theory, the presence of puddles is one of the leptospirosis transmission media due to the presence of *Leptospira* bacteria through rat urine to contaminate water and soil which will then enter the body through injured skin (43). This puddles are very potential as a medium for transmission of leptospirosis. This is consistent with the statement that leptospirosis is at risk for individuals exposed to water contaminated with *Leptospira sp*. The incidence of leptospirosis in humans is mostly found in sewer cleaners who are always exposed to puddles (41).

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VIII. Ditch Condition

The condition of ditches or gutters around the respondents' house was divided into two categories namely overflowed and not overflowed.

Table 7: Frequency Distribution of Respondents' Home Environment Based on Ditch Condition in Work Area of Banyuanyar Health Center Sampang Regency on 2019

No	Ditch Condition	Frequency	Percentage
1	Overflowed	5	71.4 %
2	Not Overflowed	2	28.6 %
Total		7	100%

From the table above, it was known that research conducted around the house environment of leptospirosis respondents shows that out of 7 (100%) respondents, there were 5 (71.4%) respondents who had overflowed ditches or gutters. Meanwhile, 2 (28.6%) of the other respondents did not have overflowed ditches or gutters. This means that respondents who live in houses with ditches or gutters have poor ditch conditions. Research conducted in the city of Semarang from the results of the study found that the conditions around 100% of respondents were included in the overflowed category due to clogged ditches conditions (21).

The presence of ditches around the house will make it easier for mice to breed in it and become a pathway for rats to enter people's houses. The presence of ditches or gutters around the house will facilitate the transmission of *Leptospira* bacteria into the human body (41).

The result of this study is in line with research from Auliya (2014) which shows that respondents with poor ditch conditions have a higher risk for suffering from leptospirosis. Overflowed ditch conditions are also found around the houses of leptospirosis patients found in hospitals (Anies, et al., 2009).

IX. Ditch Spacing

The ditch spacing in this study is the spacing between the dicth and the respondent's house. The ditch spacing is divided into 2 categories namely <2 meters and ≥2 meters.

Table 8: Frequency Distribution of Respondents' House Environment Based on Ditch Spacing in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

No	Ditch Spacing	Frequency	Percentage
1	<2 meters	2	28.6 %
2	≥2 meters	5	71.4 %
Total		7	100%

From the table above was known that the research conducted in the house environment of patients with leptospirosis based on ditch spacing and respondents' house, there are 2 (28.6%) respondents who have a ditch

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spacing between houses of <2 meters. Meanwhile, 5 (71.4%) other respondents had a ditch spacing between houses of ≥2 meters.

The results of this study are in line with research from Rejeki, *et al*. (2013), where most of leptospirosis patients in Banyumas Regency had a ditch spacing between houses of 2 meters.

Ditch proximity is not likely to be a cause of leptospirosis because it depends on the condition of the ditch itself. If the ditch spacing of <2 flows smoothly and clean, then rats tend to choose another habitat. On the contrary, if the ditch spacing is ≥ 2 m but the condition is dirty and clogged with a lot of garbage, this may be a preferred habitat for rats (44). Look again the sanitary conditions of the ditches, is it at risk of becoming rats habitat or not.

X. Dumpster Conditions

Dumpster condition in this study was divided into 2 categories: poor and well condition.

Table 9: Frequency Distribution of Respondents' House Environment Based on Dumpster in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

No	Dumpster Conditions	Frequency	Percentage
1	Poor	4	57.1 %
2	Well	3	42.8 %
Total		7	100%

From the table above was known that results of environmental research of patients with leptospirosis respondents' house based on dumpster inside the house which is from 7 (100%) respondents who placed dumpster inside the house inspected, there were 4 (57.1%) respondents who have a poor dumpster condition and the other 3 (42.8%) respondents have a well dumpster condition. In this research, the dumpster at the respondents' house is said to have a poor condition if there are scattered trash, open dumpster and not from waterproof materials (19). Respondents with a poor condition of dumpster are more dominated by the open dumpster condition and scattered trash around the dumspter.

The lack of adequate sewage systems, trash deposits, and poor housing favor high rodent densities which in turn leads to environmental contamination with pathogenic (45). Improper means trash disposal will increase the risk factor in the spread of leptospirosis because rats get their main food from the dumpster in the house (39). The presence of dumpster in the house coupled with house characteristics that are easy for rats to enter will ease transmission of leptospirosis (46).

This study is in accordance with the theory put forward by Rusmini (2011) which stated that poor trash collection is a risk factor for the occurrence of leptospirosis because the intermediate vectors of *Leptospira* bacteria, especially rats, are very fond of places where trash piles are present (47). In addition, the research of Dwi Sarwani (2005) also stated that poor trash disposal facilities can cause trash around the house to be associated with leptospirosis. For this reason, trash disposal facilities should be made well enough to be useful without causing negative effects that cause disease (48).

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The presence of rats

Rats are said to be inside someone's house if the person has seen the rat directly or seen signs of the presence. The presence of rats in this research was divided into 2 parts, there are rats and no rats.

Table 10: Frequency Distribution of Respondents' House Environment Based on the Presence of Rats in Work Area of Banyuanyar Community Health Center Sampang Regency on 2019

No	The presence of rats	Frequency	Percentage
1	Found rats	7	100 %
2	No rats	0	0 %
Total		7	100%

From the table above, it was known that the research was based on the presence of rats, from 7 (100%) leptospirosis patients in Banyuanyar Community Health Center area, all respondents (100%) have rats in their house environment. The presence of rats in respondents' house was known based on the signs of its presence which include sound, dirt, footprints, and direct appearance of rats. The same thing with research conducted by Sofiyani in Sleman Regency, distribution results of the presence of rats in respondent's house environment showed 93.5% of respondents claimed there were rats around their house (49). Asia-Pacific countries have reported a significant association between the existence of rats near human habitation and the occurrence of human leptospirosis infection or disease (45).

Rats are known as animals that like dirty places, if people's behavior in an area is bad so that it makes the environment dirty, rats will be easy to breed in the area (Fadzilah, 2012). Houses in which there are rats have a higher chance for residents to suffer from leptospirosis because rats are the main reservoir in transmission of this disease (Rejeki, et al., 2013). Respondents with rats in their house have 22.6 times greater risk of leptospirosis compared to those who don't have rats in their house (50). A healthy house will make it difficult for rats to breed (Ramadhani and Yunianto, 2010). The existence of these rats needs to be of more concern given the results of previous studies that showed rats that were caught positive for leptsospira bacteria.

Pet Ownership

Pet ownership in this study was divided into 2 categories, have pet pet and no pet.

Table 11: Frequency Distribution of Respondents' Home Environment Based on Pet Ownership in the Work Area of Banyuanyar Health Center in Sampang Regency in 2019

No	**Pet Ownership**	**Frequency**	**Percentage**
1	No pet	5	71.4 %
2	Have pet	2	28.6 %
Total		7	100%

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From the above table, it was known, research conducted on leptospirosis patients in Banyuanyar Community Health Center area based on pet ownership, namely only 2 (28.7%) respondents who had pets, while 5 (71.4%) other respondents did not have pet. The pets owned by respondents were cows and chickens. The same was true with research in Demak and Pati regency on the variable presence of pets for number of cases by 49 respondents (81.7%) and the results of a biavariate analysis were not significant (5).The results of this study are in line with the research of Rejeki (2013) which showed that the presence of other animals as intermediate host leptospirosis does not affect the incidence of leptospirosis. The absence of this relationship is possible because the transmission of leptospirosis mostly occurs through rodent group reservoirs (rats) not through pet groups. Pets that can transmit leptospirosis to humans are such as dogs, goats, cats, cows, pigs or birds. This is not enough to be a determinant stating that there is a relationship between the presence of pets and the incidence of leptospirosis. This result may be due to the leptospirosis incidence influenced by the cleanliness factor of the pet cage. So even though the community has pets, but cleanliness of the cage is maintained, it will not be a risk factor for leptospirosis.

Table 12: Frequency Distribution of Respondents' House Environmental Conditions in Work Area of Banyuanyar Health Center Sampang Regency on 2019

No	House Environmental Conditions	Frequency	Percentage
1	Floods Records	5	71.4 %
2	Puddles Presence	6	85.7 %
3	Overflowed Ditch	5	71.4 %
4	Poor Dumpster Conditions	4	57.1 %
5	Rats Presence	7	100 %

From the table above were known house environmental condition of leptospirosis patients, this research's respondents in work area of Banyuanyar community health center, there were 5 (71.4 %) out of total 7 respondents who have flood records, 6 (85.7 %) out of total 7 respondents with puddles presence, 5 (71.4%) respondents with overflowed ditch, 4 (57.1%) respondents with poor dumpster conditions, and all respondents or 7 (100%) had rats presence in their house.

Transmission of leptospirosis occurs due to poor environmental conditions in residential areas. Poor environment can increase the availability of food, shelter, nesting and breeding rats as a reservoir of leptospirosis. In addition, a bad environment can cause flooding which can increase the risk of leptospirosis (5).

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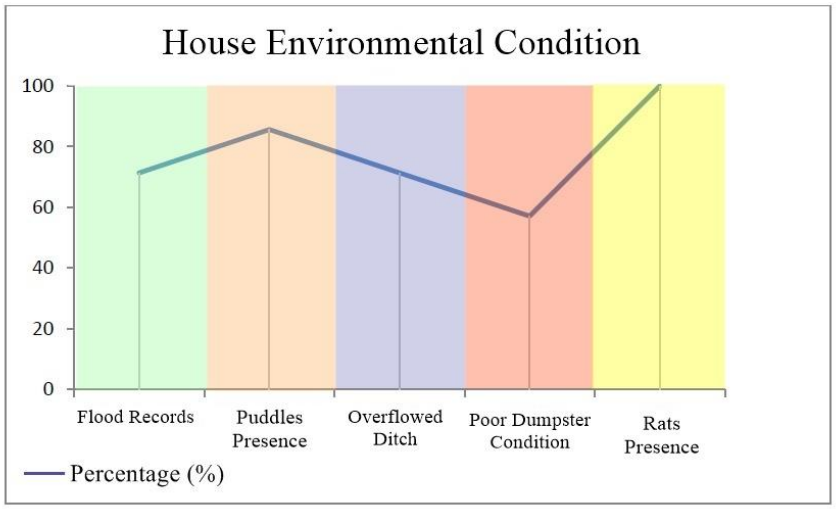

Figure 3 : Environmental Conditions in Homes for Leptospirosis Patients

Transmission of leptospirosis to humans through rats is more likely related to several types of mice whose habitat is in the vicinity of human habitation. From the results of the research showed that the presence of rats has a high proportion in the condition of house environment in the incidence of leptospirosis. In line with research in Semarang, distribution of patients based on the presence of rats is divided into the presence of rats and the absence of rats. The results of the distribution of the presence of rats in the respondent's environment showed 100% of respondents claimed there were rats in the vicinity (21).

The next highest proportion of house environmental condition are puddles presence and flood records. The majority of the disease burden occurs in tropical regions where large epidemics can occur after heavy rainfall and flooding (51). In Indonesia , the main infectious animal is rat through feces and urine. In the rainy season when there is a puddle of water, especially floods, rats that live in the clefts of the land will go out to save themselves. Rats will roam around humans where the dirt and urine will be mixed with the flood water. Someone who is injured, then submerged in flood water that has been mixed with dirt or rat urine containing bacteria lepstopira, then that person can be infected and potentially will fall sick (52).

XI. CONCLUSIONS AND SUGGESTIONS

The results of the research of the respondent's house environment in work area of Banyuanyar Community Health Center in Sampang Regency indicate that, it was possible that the transmission of leptospirosis mostly occurs through reservoirs of rodent groups (rats). From most respondents in their house environment, the temperature and humidity was genereally ranged between 32 ^{0} C and 64%. That range of temperature is not a condition that is most appropriate or optimal for the development of Leptospira bacteria, but in that temperature range the bacteria can still live with reduced virulence. The relationship of humidity and temperature to leptospirosis cases has more influence on the life span of the disease agent. *Leptospira* bacteria can live longer in humid environments and low temperatures.

The presence of rats, 100% was found in the houses of respondents affected by *Leptopspira*. The presence of rats in respondent's house is known based on signs of its presence which include sound, dirt, footprints, and

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direct appearance of rats. Above 70% of respondents with leptospirosis had flood records, puddles presence, and overflowed ditch around their house. This is in line with predecessor researchers, areas that have high levels of flood vulnerability will make it easier for *Leptospira* bacteria to enter the human body by swimming in flood water. Flooding is a medium for spreading *Leptospira* bacteria in contaminated water around the house or rice fields, so that bacteria can enter the human body through wounds.

Suggestions that can be given are to replace dumpster at home with watertight or plastic and closed material, to throw garbage regularly so that it does not accumulate at night, open the window of the house routinely in the morning and afternoon so that circulation in the house is flowing freely, to set rat traps or rodenticide in places where there is potential for rats presence. Suggestions for further research should use a sampling technique in the form of *cluster random sampling in* order to get a larger population so that it can describe the incidence of leptospirosis in Sampang Regency as a whole.

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