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Pyramid Pest-Control Community-Ecosystem- Management as an Effort to Prevent Leptospirosis

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Abstract

Klaten Regency has the highest cases in Central Java during the last 3 years. Leptospirosis IR has increased 3-fold compared to 2021. In 2022, there will be 80 cases with CFR of 7.5% & IR of 6.27/100,000 population, this figure exceeds the national maximum target ($\leq 3/100,000$ population). Juwiring is one of the sub-districts with a rapid increase in leptospirosis cases. This study aims to determine differences in the level of knowledge of PKK mothers regarding leptospirosis and efforts to prevent the increase in leptospirosis cases in Bulurejo through Pyramid Pest-Control Community-Ecosystem-Management. The research was conducted in July – August 2023. This research used a pre-experimental approach with one group pretest – posttest design. The research sample consisted of PKK mothers in Bulurejo, Juwiring District, Klaten Regency. Data analysis was performed using Wilcoxon test. The results obtained are p-value < 0.001 indicating there is a difference in increasing knowledge before and after being given counseling activities. Counseling activities can have a positive effect on increasing the knowledge of PKK mothers regarding leptospirosis prevention.

INTRODUCTION

Leptospirosis is a disease caused by the bacteria *Leptospira*. Leptospirosis is a zoonotic disease that can be transmitted from animals to humans. The main source of Leptospirosis transmission in Indonesia is rats. Transmission of Leptospirosis to humans occurs through contact with water or soil contaminated with the urine of animals infected with *Leptospira bacteria* (Widjajanti, 2019).

Based on Indonesian health profile data in 2021, there were 734 cases of Leptospirosis reported in Indonesia with the number of deaths due to Leptospirosis reaching 84 cases (11.4%). The *case fatality rate* (CFR) in 2021 has increased compared to 2020 (9.1%), although the incidence of Leptospirosis has decreased, namely 1,170 cases (Indonesian Ministry of Health, 2022). Central Java Province is one of the largest contributors to leptospirosis cases in Indonesia with a percentage of 36.1%. Based on data in the 3rd Quarter Health Pocket Book of 2022, there are 18 regencies/cities in Central Java with cases of leptospirosis, one of which is Klaten Regency.

Leptospirosis cases in Klaten Regency are the highest in Central Java Province (Central Java Provincial Health Office, 2022). In 2022, it is known that there will be 80 cases of Leptospirosis in Klaten Regency with a CFR reaching 7.5%. The *incidence rate* (IR) of leptospirosis in Klaten Regency in 2022 was recorded at 6.27/100,000 population, exceeding the national maximum target of ≤ 3 per 100,000 population. IR and CFR of Leptospirosis in Klaten Regency in 2022 experienced a three-fold increase compared to 2021 which was recorded at 1.9 per 100,000 population or 22 cases and CFR 27.3% or 6 deaths due to Leptospirosis (Klaten Regency Health Office, 2022; Auliya, 2014; Indonesian Ministry of Health, 2017).

The trap-success of the Leptospirosis reservoir in Klaten Regency, especially in the working area of the Juwiring Community Health Center, especially in Bulurejo Village, has not been implemented optimally. *Trap-success* is used as an indicator of mouse abundance or

population for early detection of transmission and prevention of Leptospirosis. Rats are the main reservoir for transmission of Leptospirosis, through the urine of rats that are positive for *Leptospira* sp. Environmental factors in the form of rice fields are a potential habitat for mice. Spread of Leptospirosis can spread to other areas through water, especially areas prone to flooding. Rats are the main reservoir for transmission of Leptospirosis, through the urine of rats that are positive for *Leptospira* sp (Costa, 2015; Klaten District Health Office, 2022; Auliya, 2014) .

Socio-demogeographically, the Bulurejo village area is a densely populated residential area surrounded by rice fields or gardens. wide with diverse vegetation big. Nearly 75% of Bulurejo Village residents own rice fields. Large rice field area and surrounding the village as a potential *breeding site* or breeding habitat that is conducive to the Leptospirosis reservoir. Other factors that support the transmission of Leptospirosis are mobilization and high population density. The condition of the area with interconnected rice fields and transportation routes passing through Bulurejo village increases the high potential for Leptospirosis transmission (Klaten District Health Office, 2022; Auliya, 2014; Republic of Indonesia Ministry of Health, 2017) .

The number of cases with a clinical diagnosis leading to Leptospirosis in Juwiring Village has been found to be around 5 people since the beginning of the rainy season in 2023. This situation puts Bulurejo Hamlet at high risk and needs to be followed up immediately so that the IR and CFR can be reduced and an outbreak does not occur (World Health Organization, 2011) . The dense population, average temperature, regional *altitude* , and average annual rainfall in Bulurejo Village, Juwiring District are also potential environmental factors for the proliferation of Leptospirosis reservoirs (Costa, 2015; Klaten District Health Office, 2022) . Apart from that, the variety of vegetation in Bulurejo Village in the form of fruit gardens/rice fields is very large, there are open dump bins and water channels and there are two the public burial area is a habitat potential for mice. Moon Program Leptospirosis prevention is also not being implemented optimally in the Juwiring Community Health Center area, especially in Bulurejo Village. Then around residence Bulurejo Village house too found Lots mouse wandering around. Although attempts to catch live rats have been made, they have been unsuccessful. This is also supported by the low level of knowledge about bioecology or the potential habitat of mice and Leptospirosis disease, the low level of public awareness regarding the implementation of Leptospirosis Prevention Month, and the absence of Leptospirosis cadres making Bulurejo Village very prone to outbreaks and at high risk of an increase in IR Leptospirosis (Klaten District Health Office, 2022; Auliya, 2014; Republic of Indonesia Ministry of Health, 2017b) .

One strategy that can be used to overcome the problem of Leptospirosis is through the *Pyramid Pest-Control Community-Ecosystem-Management program*. This program seeks to prevent Leptospirosis by controlling the rat population through multilevel and comprehensive *pest control stages*. *The pest or pest control program* is gradual like the levels of a pyramid. The first stage of *Pyramid Pest-Control Management* is social-cultural control, biological-physical control, and the final step is chemical control. This *Pyramid Pest-Control Management* manages a sustainable ecosystem so that it focuses on the activities of citizens who are innovative, active and get ideas and solutions, oriented towards *science* , education, the latest information, and *co-working* between citizens in carrying out preventive measures which can later reduce the IR of Leptospirosis .

The targets are PKK cadres who live in Bulurejo Village. The selected PKK cadres are cadres with high enthusiasm for learning and can convey knowledge/information to families/residents in other hamlets. Criteria for selected cadres, based on discussions with the Hamlet Head, RT/RW Head, and chairman of the PKK.

The difference between this research and previous research is that there are active and sustainable community empowerment activities through the activation of Leptospirosis Prevention Month, environmental sanitation working groups, and Leptospirosis cadre formation which focuses on rat depopulation through the application of biopesticides and *eco-rodent-live traps* . Based on this explanation, this research aims to reduce the IR of leptospirosis through *Pyramid Pest-Control Management* in Bulurejo Village, Juwiring District, Klaten Regency.

METHOD

The research was conducted in Bulurejo Village, Juwiring District, Klaten Regency. This research was carried out from July to August 2023. This type of research uses a quantitative approach. The research design used was a quasi-experimental design with a *one group pre test–post test design approach*. The research area was determined based on dengue fever data from the Klaten District Health Service in 2022. The research sample consisted of PKK women from Bulurejo Village, Juwiring District, Klaten Regency. The samples were selected according to the criteria determined by researchers in areas that have a high incidence of leptospirosis in Klaten Regency, namely Bulurejo Village, Juwiring District, Klaten Regency.

The measuring instrument used to collect data was a questionnaire created by researchers. The variable studied was the level of knowledge about leptospirosis. Data collection was carried out by distributing pretest and post-test questionnaires with a total of 10 questions about leptospirosis. The data source comes from primary data obtained from the results of the pre-test and post-test for respondents, namely PKK women in Bulurejo Village, Juwiring District, Klaten Regency.

Primary data consists of data on respondent characteristics and the respondent's level of knowledge. Each statement is given a value of 10 if it is true and 0 if it is false. Apart from that, secondary data was also used in this research, including data on leptospirosis cases, data on morbidity and mortality rates due to leptospirosis and the results of field observations.

The research was carried out through several processes sequentially, namely pre-test, providing counseling material, and post-test. The education material consists of understanding, causes, symptoms, introduction to types of mice, and ways to prevent leptospirosis. The media used are slide images and props.

In preparing this research, several stages were carried out, including: a) FGD with Bulurejo Village residents to identify and filter supporting factors and obstacles from Bulurejo Village residents; b) lecture method, facilitated with multimedia tools, namely the use of pictures and videos to convey material about the etiology of leptospirosis, identification of types of mice, and practices for preventing leptospirosis; c) demonstration method, to show directly *live* rat traps that can be used in the environment around residents' homes.

Data analysis included univariate analysis to describe sample frequencies and bivariate analysis with the Wilcoxon test to determine differences in knowledge before and after being given health education.

RESULTS AND DISCUSSION

In this research, the respondents involved came from PKK mothers in Bulurejo Juwiring Village. The role of respondents as part of the PKK is one of the strategic targets because they have the ability to disseminate high levels of information both to the residents of Bulurejo Village and to people from other villages within the Juwiring District area. In table 1, it can be seen that 15 of the respondents involved were female. Most of the respondents came from the 40-49 year age group with a total of 7 people (46.7%). Based on their occupation, the majority of respondents are housewives with a total of 12 people (80%). The presence of PKK cadre mothers will encourage residents to participate actively and be a determinant of the program's sustainability.

Table 1. Characteristics of Respondents from PKK Women in Bulurejo Juwiring Village

Respondent Characteristics	f	%
Age		
20-29 years old	4	26.7
30-39 years old	2	13.3
40-49 years old	7	46.7
50-58 years old	2	13.3
Work		

IRT	12	80
Midwife	1	6.67
Self-employed	2	13.33

People who have a higher level of knowledge will better understand and understand the importance of health both for themselves and their family members. Ignorance and unwillingness about the importance of preventive measures and control of leptospirosis are major obstacles. As age increases, a person's ability to perceive and think about an object will also increase. Increasing information related to an object is one of the things that can shape a person's attitude.

A person's level of knowledge can be influenced by how much information a person receives, whether from the family, neighbors, print and electronic media, or from health workers. Table 2 shows the level of understanding of respondents regarding leptospirosis, starting from the definition, causes, symptoms, as well as ways to prevent and control it. In this table, it is known that 8 respondents (53.3%) had good knowledge and 7 respondents (46.67%) had sufficient knowledge during the *pretest* or before counseling was carried out. Meanwhile, at the *posttest* or after the counseling was carried out, it was discovered that all respondents had good knowledge (100%).

Table 2. Respondent's Knowledge Level

Knowledge	<i>Pretest</i>		<i>Posttest</i>	
	f	%	f	%
Good	8	53.33	15	100
Enough	7	46.67	-	-
Not enough	-	-	-	-

PKK mothers' knowledge regarding Leptospirosis is what the mothers know and understand regarding the etiology, habitat, reservoir, symptoms, transmission, and prevention and control of Leptospirosis. In table 3 you can see the distribution of respondents' answers to the questionnaire given. Respondents' knowledge before being given the counseling showed that all respondents (100%) already knew about preventing leptospirosis outside the home and through improving sanitation. However, most respondents had the wrong answer to the question about the etiology of leptospirosis.

Table 3. Distribution of Respondents' Answers

Statement	<i>Pretest</i>		<i>Posttest</i>	
	Correct (%)	Wrong (%)	Correct (%)	Wrong (%)
Leptospirosis is a disease caused by a virus.	13.33	86.67	80	20
Red spots appearing on the skin that do not disappear when pressed and red eyes are symptoms of leptospirosis	100	0	100	0
Night sweats and swelling in the wound area are symptoms of leptospirosis	0	100	60	40
The way to prevent leptospirosis is to always keep the environment clean	100	0	100	0
Using food containers made of glass/plastic that are tightly closed is one way to control mice at home	80	20	100	0
Closing the holes where the drain pipes and gutters are can prevent the transmission of leptospirosis	73.33	26.67	93.33	6.67
Maintain rodent predators, such as cats, to prevent the presence of mice in the house	93.33	6.67	100	0
Using rat poison is better and more effective than using natural rat traps	73.33	26.67	93.33	6.67
Prevention of leptospirosis outside the home can be done by covering wounds with waterproof dressings and wearing footwear when doing activities in dirty/muddy environments.	100	0	100	0

Reducing tree branches and cleaning up mouse havens such as grass areas, embankments, river banks and embankments full of grass are efforts to improve sanitation to prevent mice.	100	0	100	0
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Bivariate analysis was carried out using the *Wilcoxon Signed Rank Test*, because the data used was not normally distributed so an alternative test from the Paired to T-Test was used. The results of the bivariate test are shown in table 4, where the *p-value* <0.001 is smaller than significance (<0.05), so H_a is accepted. So it can be concluded that there is a significant difference in the knowledge of PKK women in Bulurejo Juwiring Village before and after being given education about Leptospirosis and its control.

Table 4. Wilcoxon Test Results

Knowledge	Average	<i>p-value</i>	Conclusion
<i>Pretest</i>	76	<0.001	Significant
<i>Posttest</i>	92.7		

Counseling about Leptospirosis is included in health education. Health education can be provided using various methods that are as interesting as possible. The use of various audio-visual media and teaching aids will also make it easier to gain understanding. Providing counseling can improve respondents' knowledge and attitudes (Sudaryanto, 2018). This is in accordance with the results in this study which showed an increase in the level of knowledge of respondents after the outreach activities were carried out.

This research is in line with research by (Pujiyanti, Negari and Trapsilowati, 2018) which also used a *one group pre-post design* in Sedayu Village and Wukirsari Village, Bantul Regency. The results of the study showed that there was a difference in the average knowledge of respondents before and after the intervention, with a *p* value <0.05, which means there was an increase in knowledge after being given the intervention.

Differences in knowledge before and after counseling were also found in research by (Kurniawati, 2014) which used audiovisual media. The use of information media through the eyes which reaches 75% and the ears 13% can provide better stimulation so that the results obtained will be optimal.

Research by (Yadi, 2022) conducted outreach using the health lecture method and educational videos about Leptospirosis. The target respondents who were given counseling were farmers in Sendangsari Pajangan Village, Bantul. The results also showed an increase in the level of knowledge of respondents after the counseling was carried out with a *p* value <0.001.

The increase in knowledge after outreach can be caused by several factors, one of which is the outreach method and media. Choosing methods and media that can stimulate more senses in receiving information, the better the knowledge obtained (Yadi, Muryani and Anida, 2022). In this research, material regarding leptospirosis and its control was presented using a lecture method using *powerpoint as a medium* equipped with attractive writing and image designs. Apart from that, it was also supported by the distribution of *leaflets* about rat control after the delivery of the outreach material was complete. This is in line with research by (Wijayanti, 2016) which was conducted in Tembalang District, Semarang City. The results of the research show that the lecture method using power point and LCD media can increase knowledge about leptospirosis. The subjects in this study included the final adult group who were given intervention using the lecture method for 1 hour. Based on the *Wilcoxon Signed Rank Test* statistical test, it shows a *p* value = 0.000, which means there is a positive change between the *pretest* and *posttest* scores in the intervention group.

Basically all age groups can be affected by leptospirosis. The risk of leptospirosis infection will increase due to several factors, such as work, lifestyle and living environment (Ratnaningsih, 2023). The Bulurejo village area has extensive rice fields and is adjacent to residential areas (Supriyadi, 2019). According to Dian in (Zukhruf, 2020), agricultural areas such as rice fields, rivers and bushes, have the potential to become habitat for mice which play a role in the transmission of leptospirosis. In endemic areas, poor environmental factors around the house can increase the availability of food, shelter, and breed rats as a reservoir for leptospirosis (Andriani, 2020). So apart from age, environmental factors where living close to rice fields can increase the risk of contact with mice.

CONCLUSION

The level of knowledge about Leptospirosis in Bulurejo Village, Juwiring District, Klaten Regency before and after the counseling was carried out has increased and most of it is in the good category. This is especially in the aspects of understanding, causes and signs of leptospirosis. There was a difference in knowledge after and before counseling about leptospirosis control (p -value <0.001).

Suggestions for village officials and Community Health Centers are that there is a more comprehensive outreach to all levels of society regarding the dangers of Leptospirosis and the need to maintain environmental conditions and behavior to prevent and anticipate the occurrence of Leptospirosis. This research has not studied in more depth the factors that influence knowledge about leptospirosis, so the suggestion for future researchers is to study in more depth the factors that influence PKK mothers' knowledge about leptospirosis, such as occupation, age, history of leptospirosis, and so on .

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