

KNOWLEDGE LEVEL ON LEPTOSPIROSIS DISEASE AMONG PRE-UNIVERSITY STUDENTS

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Abstract: Leptospirosis, also known as rat-urine disease, is a type of zoonotic disease that has a high prevalence in tropical countries, including Malaysia. Current knowledge about the spread of this disease is limited to urban and suburban areas. Recreational forest areas consistently contribute to the spread of the disease among humans. Understanding of this disease and its transmission is still lacking among various segments of society, especially among youths. A cross-sectional study was conducted to assess the level of knowledge regarding leptospirosis among 57 pre-university students at Universiti Malaysia Terengganu and to compare knowledge levels based on gender. Data collection was carried out using a validated questionnaire in Google Form, which was distributed randomly through WhatsApp groups between 1 December 2023 and 31 January 2024. All respondents were 18 years old, with 51% identifying as female and 49% as male. The results indicated that there was no significant difference in knowledge levels based on gender among the students ($p > 0.05$). However, there were notable gaps in their knowledge, particularly regarding the causes, symptoms, transmission routes, and prevention of leptospirosis. Therefore, it is crucial to enhance their understanding through comprehensive strategies aimed at younger generations to prevent potential outbreaks and ensure effective management and control of leptospirosis.

Keywords: Leptospirosis, knowledge, awareness, public health, zoonotic disease.

Introduction

Leptospirosis is a serious zoonotic disease caused by a spirochete bacterium known as *Leptospira* sp. These bacteria are approximately 0.1 μm in diameter and are classified into pathogenic, intermediate, and saprophytic species (Ghosh *et al.*, 2018; Di Azevedo & Lilenbaum, 2021). In Malaysia, it is referred to as “*penyakit kencing tikus*” or rat urine disease. The bacteria are spread directly through the urine or body fluids of infected animals or indirectly through contaminated environments such as water, sediment, and soil (Ko *et al.*, 2009). They can survive in contaminated water and soil for several weeks or months under favourable conditions, depending on the species, serovars, and environmental characteristics (Thibeaux *et al.*, 2017; Alasharaf *et al.*, 2020).

According to the United States Centers for Disease Control, leptospirosis is more prevalent in tropical and subtropical regions, where environmental conditions such as high humidity, heavy rainfall, and dense vegetation favour the persistence of the bacteria (CDC, 2024). Leptospirosis is typically associated with flooding, recreational activities, interactions with wildlife, and occupational hazards for those working in environments, where they might be exposed to infected animals or contaminated water. Its status as a Neglected Tropical Disease (NTD) highlights its disproportionate impact on vulnerable populations, including those living in areas with poor sanitation and infrastructure. This disease presents symptoms ranging from flu-like febrile illness to severe conditions such as jaundice, renal failure, and bleeding (Haake

& Levett, 2015). However, leptospirosis can be challenging to diagnose and treat, leading to delayed interventions and severe health complications in some cases.

Recreational areas, which attract individuals engaged in various outdoor activities such as picnicking, swimming, and jungle trekking create environments that can inadvertently support wildlife and potentially foster the spread of zoonotic diseases like leptospirosis. As people enjoy these activities, rubbish and food waste can attract many species of small mammals, particularly rodents, which act as the major reservoir host in leptospirosis transmission (Costa *et al.*, 2014). These animals can contribute to environmental contamination through their droppings, urine, and other waste, creating an environment, where harmful pathogens, such as the bacteria *Leptospira*, can thrive.

As recreational areas continue to grow in number and popularity, the chances of humans coming into contact with these contaminated environments increase. This is particularly concerning because leptospirosis is a disease that can be transmitted from animals to humans, often through contact with water or soil contaminated with the urine of infected animals. In the case of outdoor recreational activities, the likelihood of exposure is higher, especially in areas, where people may swim, wade, or walk in muddy or waterlogged environments, where infected animal urine is more likely to be present.

The disease poses a growing threat to both public health and the environment, underscoring the need for better management practices at these sites, such as improving waste disposal, monitoring wildlife populations, and educating visitors about the risks associated with contaminated environments. Proper sanitation, wildlife control, and public awareness campaigns are key to mitigating the spread of leptospirosis in these increasingly popular outdoor areas (Soo *et al.*, 2020; Sykes *et al.*, 2022).

Known for its high biodiversity, Terengganu boasts many natural resources suitable for ecotourism development. The region offers a variety of natural attractions, including beautiful beaches, islands, rivers, mangroves, and lagoons, as well as its rich heritage and cultural sites. The main activities associated with ecotourism in Terengganu include boating, jungle trekking, nature observation, camping, fishing, canoeing, and water sports (Bhuiyan *et al.*, 2014). Despite its significance in ecotourism, there is still a lack of awareness, and basic knowledge regarding how recreational areas can be hotspots for leptospirosis outbreaks.

Additionally, previous studies in Malaysia have shown that most positive cases of leptospirosis were reported among younger individuals, as they are typically involved in outdoor activities (El-Jalii, 2000; Thayaparan *et al.*, 2013; Benacer *et al.*, 2016). Furthermore, research on the knowledge level of younger generations such as university students is still lacking (Bakar & Rahman, 2018). To ensure proper control of leptospirosis, it is crucial to improve public knowledge, especially among students, about this disease. Thus, this study aimed to determine the knowledge level regarding leptospirosis and to compare knowledge levels based on gender among pre-university students at Universiti Malaysia Terengganu (UMT).

Materials and Methods

Study Design

This study employed a cross-sectional design involving pre-university students from Universiti Malaysia Terengganu who consented to participate. A random sample of 155 respondents (60% of 257) was selected from the STEM Foundation Centre database using IBM SPSS Statistics for Windows version 21 (IBM Corp., Armonk, NY). The sample size was determined based on a 95% confidence interval, a 5% margin of error, and an anticipated positive response rate of 50%.

A Google Forms link was randomly distributed to the students through their WhatsApp groups. The survey included a brief introduction and consent form detailing the research background, the purpose of the survey, and instructions for completing it. All respondents were assured that their data and personal information would remain confidential and be used solely for research purposes. The survey was conducted from 1 December 2023 to 31 January 2024. Approval to carry out this study was obtained from the Ethical Review Committee Board at Universiti Malaysia Terengganu (UMT/JKEPHT/2019/30).

Questionnaire

A validated questionnaire was developed using a previous study survey on leptospirosis (Shafie *et al.*, 2021). The questionnaire was conducted in two phases: The pilot study and the main questionnaire. The pilot study took place prior to the distribution of the questionnaire, involving five respondents to determine its reliability. The reliability of the developed questionnaire was tested using Cronbach's alpha, with a coefficient value of 0.78, which was considered acceptable

(Cronbach, 1951; Tavakol & Dennick, 2011). The questionnaire consists of two sections: (1) demographic data (age and gender), experiences of being in recreational areas, and sources of information about leptospirosis and (2) 13 closed-ended questions regarding their knowledge of leptospirosis (Table 1). Respondents were given an overview of the types of recreational areas (with examples such as Sekayu Recreational Area, Chemerong Recreational Area, etc.) when asked about their experiences. For the 13 closed-ended questions, respondents were provided with three answer options: "yes", "no", and "not sure". Total scores for each respondent were calculated, with 1 point awarded for each correct answer and 0 for incorrect answers. The "not sure" option was included to minimise the guessing effect and was scored as incorrect.

Data Analysis

All the responses from Google Forms were extracted and exported to Microsoft Excel for further data analysis. The total score for each respondent was categorised into three levels: High (85-100%), moderate (60-84%), and low (0-59%) based on Bloom's cutoff

Table 1: Knowledge assessment questions on leptospirosis

Item	Questions
1	Are you aware of leptospirosis?
2	Leptospirosis is caused by pathogens (bacteria that can cause infections).
3	Leptospirosis is caused by parasitic worm infection.
4	Leptospirosis is a serious illness.
5	An infected person may not show any symptoms.
6	Patients with leptospirosis may develop symptoms such as fever, headache, jaundice, and muscular or joint pain.
7	Leptospirosis can cause death.
8	Leptospirosis can be transmitted directly to humans through cuts and wounds.
9	Leptospirosis can be transmitted from human to human.
10	Leptospirosis can be transmitted indirectly through food, water, or the environment contaminated by rodent faeces or urine.
11	Stagnant water can harbour the pathogens that cause leptospirosis.
12	Maintaining the cleanliness of recreational forests is the only way to prevent leptospirosis infection.
13	The disease can be prevented by covering wounds or scars with medical plasters.

(Bloom, 1968). The Chi-square test was used to determine if there was a significant difference in the level of knowledge (high, moderate, and low) between genders. Data analysis was performed using IBM’s Statistical Package for the Social Sciences (SPSS) for Microsoft v26. All *p* values were considered statistically significant at *p* < 0.05.

Results and Discussion

Out of 155 randomly selected respondents, only 57 (37%) agreed to participate, resulting in a nonresponse rate of 63% in this study. All 57 respondents were aged 18 years, comprising 30 females (53%) and 27 males (47%). Only 36.8% of them had experience in any recreational area in Malaysia. Most respondents identified social media (23%) as their main source of information about leptospirosis, followed by school/work (15%), and radio/television and newspapers, each at 14% (Figure 1). Health professionals were recorded as the lowest source, with only 3%.

Social media has become a primary source for receiving information, as it is a fast and affordable way to access content due to its accessibility (Rogala, 2017). Furthermore,

university students today prefer modern communication channels such as Facebook, YouTube, and Instagram, as these platforms are more engaging compared to conventional communication channels (Meyliana *et al.*, 2015). However, it is recommended that the public, especially students use social media responsibly and ethically to ensure the reliability of the information shared with others.

Out of 57 respondents, 73.7% were aware of leptospirosis and 66.7% knew that it is caused by pathogens (Table 2). Most respondents also recognised that leptospirosis is a serious illness (94.7%) that can lead to death (82.5%) and that patients may develop symptoms such as fever, headache, jaundice, muscular, and joint pain. (70.2%). The majority (80.1%) understood that the disease can be transmitted indirectly through the consumption of contaminated food and water, as well as via contaminated environments (soil, water).

Additionally, at least 68.4% of respondents acknowledged that stagnant water can sustain the pathogens. However, there was significant uncertainty among respondents, particularly regarding the causes, symptoms, transmission routes, and prevention of leptospirosis.

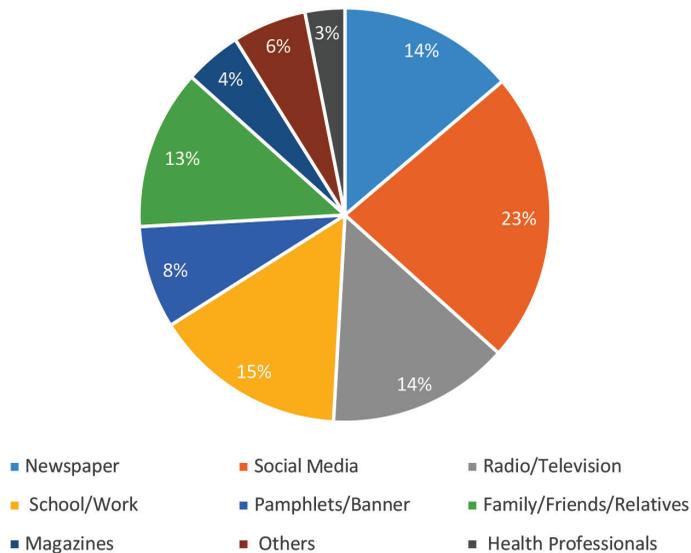


Figure 1: The percentage of information sources on leptospirosis

Table 2: Summary of responses regarding leptospirosis ($n = 57$)

Item	Questions	Yes (%)	No (%)	Not Sure (%)
1	Are you aware of leptospirosis?	73.7	8.8	17.5
2	Leptospirosis is caused by pathogens (bacteria that can cause infections).	66.7	5.3	28.1
3	Leptospirosis is caused by parasitic worm infection.	29.8	22.8	47.4
4	Leptospirosis is a serious illness.	94.7	1.8	3.5
5	An infected person may not show any symptoms.	24.6	35.1	40.4
6	Patients with leptospirosis may develop symptoms such as fever, headache, jaundice, and muscular or joint pain.	70.2	3.5	26.3
7	Leptospirosis can cause death.	82.5	1.8	15.8
8	Leptospirosis can be transmitted directly to humans through cuts and wounds.	36.8	12.3	50.9
9	Leptospirosis can be transmitted from human to human.	12.3	38.6	49.1
10	Leptospirosis can be transmitted indirectly through food, water, or the environment contaminated by rodent faeces or urine.	80.1	3.5	15.8
11	Stagnant water can harbour the pathogens that cause leptospirosis.	68.4	1.8	29.8
12	Maintaining the cleanliness of recreational forests is the only way to prevent leptospirosis infection.	63.2	15.8	21.1
13	The disease can be prevented by covering wounds or scars with medical plasters.	35.1	15.8	49.1

Respondents were unsure if the disease could also be caused by parasitic worms (47.4%) and whether an infected person may be free from any symptoms (40.4%). Typically, symptoms do not manifest until the second week of exposure, but individuals exposed to the infection will develop symptoms if their immune system cannot tolerate it (Md-Lasim *et al.*, 2021). Furthermore, many were uncertain about whether leptospirosis can be transmitted directly to humans through cuts and wounds (50.9%) and from human to human (49.1%).

Leptospirosis can spread to humans in several ways: Directly, indirectly, and through droplets. Direct transmission occurs, when contaminated urine comes into contact with broken skin, mucous membranes, or infected tissues (Bharti *et al.*, 2003). Indirect transmission

happens, when wounds or mucous membranes are exposed to contaminated environments like water, soil, or mud (Ricaldi & Vinetz, 2006). The infection can also spread through the consumption of contaminated food and water (Victoriano *et al.*, 2009). Additionally, droplets in the air from evaporated contaminated urine can lead to infection, when inhaled (Adnan, 2010). Previous studies have reported that human-to-human transmission of leptospirosis is extremely rare, although it may occur through sexual intercourse and breastfeeding (Al-Orry *et al.*, 2016). Many respondents believed that maintaining cleanliness in recreational areas is the only way to prevent leptospirosis (63.2%) and only 35.1% knew that this disease can be prevented by protecting any wounds or scars with medical plaster.

Many people may not be aware of the specific methods to prevent this disease or how a simple protective measure, like covering a wound with medical plaster could potentially reduce exposure to the bacteria. Although the use of medical plaster is a temporary solution, it can help block contaminated water from entering and protect the exposed area (Thayyil *et al.*, 2021). However, it is crucial to choose the right type of medical plaster, which should be waterproof to prevent leptospirosis infection.

Based on the knowledge level, 29 respondents (50.9%) scored high knowledge, 24 (42.1%) scored moderate knowledge, and 4 (7%) scored low knowledge. The level of knowledge based on gender showed that male respondents had a higher percentage (26.3%) of high knowledge, compared to females (24.6%) (Figure 2). Conversely, female respondents had a higher percentage (24.6%) of moderate knowledge, compared to males (17.5%), both genders had the same percentage (3.5%) for low knowledge. However, our Chi-square test revealed no significant difference in the level of knowledge (high, medium, and low) between genders ($p > 0.05$). This result agrees with a previous study that showed no significant difference between students' levels of knowledge on leptospirosis and gender (Bakar & Rahman, 2018).

The lack of significance in knowledge levels between genders among pre-university students could be attributed to the STEM programme curriculum, when all science subjects, including biology are compulsory. This study has limitations in terms of sample collection; the small sample size may affect the generalisability of our findings, thereby limiting our ability to generalise the results to the youth population of Terengganu. Additionally, the use of convenience sampling through WhatsApp groups could potentially introduce sampling bias. However, we believe that our initial findings provide reliable insights into the level of knowledge among pre-university students at UMT.

Conclusions

In conclusion, this study demonstrated that social media is the primary source of information about leptospirosis among pre-university students. The majority of female and male students exhibited high to moderate levels of knowledge regarding leptospirosis. Most respondents had basic knowledge of the disease; however, there were still gaps in their understanding, particularly concerning the causes, symptoms, transmission routes, and prevention of leptospirosis.

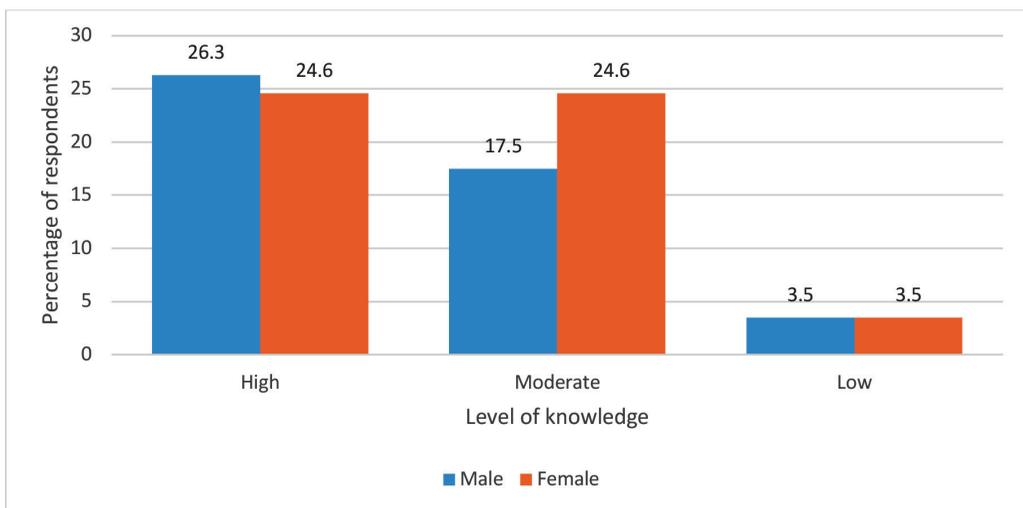


Figure 2: Respondents' level of knowledge on leptospirosis by gender

Overall, this study suggests a need to enhance their knowledge through a variety of communication channels beyond social media. Health professionals must take proactive measures to disseminate information about leptospirosis to the public. Collaboration between health professionals, policymakers, researchers, and the local community is crucial for the effective management and control of leptospirosis. Additionally, further studies should be conducted with a larger sample size to accurately represent the youth demographic in a university setting.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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