Knowledge, Attitude and Preventive Practice of Leptospirosis among Food Handlers in Kajang, Selangor

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Abstract: Leptospirosis is one of the most widespread zoonotic diseases that put the public at risk. Lack of awareness about this disease is one of the reasons leptospirosis cases have been increasing over the years. This study aimed to determine the knowledge, attitude and practice (KAP) level among food handlers in Kajang (Selangor, Malaysia). A cross-sectional study was conducted among 112 food handlers in Kajang. Data regarding sex, age, ethnicity, education level, household income, nationality and risky activities were collected. A KAP survey concerning leptospirosis using a modified questionnaire was also carried out. The questionnaire, which was printed in the Malay language, consisted of 5 sections and 44 items. Validity and reliability tests of the questionnaire were carried out using Cronbach’s alpha (0.711). The results showed that most respondents have poor knowledge (88.4%), whereas 87.5 and 57.1% have unacceptable attitude and unsatisfactory practice, respectively. Conclusions: Evidence from this study suggests that comprehensive health education should be conducted among food handlers regarding leptospirosis and its prevention since most of them scored poorly in knowledge and had unacceptable attitude and practice.

Key words: Knowledge • Attitude • Practice • Leptospirosis

INTRODUCTION

Leptospirosis is a common re-emerging zoonotic disease transmitted from infected animals to humans. It is a bacterial infection caused by a species from the pathogenic Leptospira genus, called Spirochaetes [1]. Regression analysis showed that high-risk occupational group and history of recent recreational activities were the significant associated factors for leptospirosis [2]. The findings in previous studies revealed that people in high-risk occupations, like agricultural workers and food handlers, had an association with leptospirosis [3]. Food handlers are prone to get the infection because certain food premises are in places that attract rodents. Often, the presence of rats in food premises occurs because rodents/rats have a high breeding rate and their population increases rapidly when food is available [4]. This study aimed to determine the knowledge, attitude
and preventive practice level among food handlers regarding leptospirosis in Kajang (Selangor, Malaysia) and the association between the variables. The results from this study will provide information on the basic knowledge, attitude and preventive practice against leptospirosis amongst food handlers in Malaysia.

**MATERIALS AND METHODS**

**Study Design, Sampling Population and Sample Size:**
A cross-sectional study was conducted from 2015 until 2017 in Kajang. Eligible, respondents among food handlers in the study area were identified and invited to participate if they fulfilled the inclusion criteria. The sample of this study consisted of individuals who have worked as food handlers in the selected area for more than six months prior to the study and are aged 18 years old and above. The estimated sample size required for this study was 112 [5]. In this research, the selected food premises under Kajang Municipal Council were divided into three zones, which were Kajang & Bangi, Cheras & Hulu Langat and Semenyih & Beranang. The food premises were randomly chosen from all zones. Food premises’ list was available through the registration of business license issued by the local authorities in Selangor. Then, food handlers were chosen from the selected premises. They were informed about the research, consent to participate and instruction on how to answer the questionnaires. The respondents were assisted by trained translators.

**Instrument:** Respondents were given a questionnaire on knowledge, attitude, risk behavioral activities and preventive practice. The questionnaire was designed based on the information retrieved from focus group discussion and previous publications [6], [7], [8]. Then, the information gathered from the discussion was used to construct the questionnaire items. Content validity and reliability were evaluated by cross-referencing with documented scientific evidence and discussion with content experts, while construct validation was performed on selected items. Items with low reliability were deleted. The assessment of reliability was conducted by determining values of Cronbach’s alpha, which should be at least at 0.7. For the knowledge section, the Cronbach’s alpha was 0.71, whereas for the attitude and preventive practice sections were 0.76 and 0.70, respectively.

The questionnaire was used to obtain respondents’ background information. The questionnaire consisted of five sections, as follows:

**Section A: Socio-Demographic Information**
This section included questions on age, gender, ethnicity, education level, household income and nationality.

**Section B: Risk Factors**
This section consisted of questions about the respondents’ behaviour that contributed to leptospirosis infection such as occupational, recreational, behaviour and residential risks.

**Section C: Knowledge of Leptospirosis**
This section was composed of 23 questions related to knowledge, such as causative agent, mode of transmission, signs, symptoms and complications, risk factors, treatment, diagnosis and prevention. Respondents were required to choose ‘yes’ or ‘no’ answer for this section. Questions on knowledge were designed to be answered in the correct or incorrect form, whereby ‘1’ mark was given for a correct response and ‘0’ for an incorrect response. Those who scored higher than 80% were classified as having a good knowledge while the rest were classified as having a poor knowledge. The scoring system was referred to the scoring rate used by Rahim et al. [7] and Sakinah et al. [9].

**Section D: Attitude Towards Leptospirosis**
This section comprised 18 questions, which included the general attitude. The attitude section had a few questions related to the individual’s attitude towards leptospirosis prevention. The items assessed the individual’s attitude that caused the probability to get infected by leptospirosis due to occupational exposure, hobby and environment among food handlers. Next, items related to the attitude of individual behaviour initiative to seek treatment after being infected with leptospirosis were also part of this section. Some items assessed the individual’s perception of the progress of the disease if tested positive, which includes complications and death. Besides that, other items measured the individual’s behaviour on the prevention of leptospirosis from the perspectives of personal hygiene and environmental cleanliness. A five-point Likert scale was used to answer the remaining attitudinal issues listed with 5 corresponding answers, namely, ‘strongly agree’, ‘agree’, neutral, ‘disagree’ and ‘strongly disagree’. Those who scored higher than 90% were classified as having a good attitude while others were classified as having an unacceptable attitude. The scoring system was adapted from Rahim et al. [7] and Sakinah et al. [9].
Section E: Practices Related to Leptospirosis

There were 12 questions in this section. The practice items consisted of questions on personal hygiene, environmental hygiene, specific protection, isolation and elimination. Personal hygiene practices such as washing hands with water and soap either after using the toilet or before eating were stated in the questionnaire. The environmental hygiene part asked about trash disposal and cleanliness of equipment used and premises. Next, types of specific protection included wearing boots and apron and neatly covering wounds with plaster. The isolation part explained the way respondents stored their stuff to prevent rat droppings. Lastly, elimination part consisted of methods to eradicate rats by using poison, traps and cleaning programmes with the local authority. Respondents were required to choose a ‘yes’ or ‘no’ answer for this section. Those who scored higher than 95% were classified as having good practices while others were classified as having unacceptable practices. The scoring system was based on Rahim et al. [7] and Sakinah et al. [9].

Data Analysis: The data was analyzed by using IBM SPSS Statistics version 25.0. The data was analysed and presented in the respective Tables.

Study Ethics: Informed written consent was obtained from all subjects based on the approved study protocol by the Medical Research Ethics Community of Faculty of Medicine and Health Sciences, Universiti Putra Malaysia (UPM) FPSK (FR14) P005.

RESULTS

Socio - Demographic Characteristics: Respondents of this study were 112 food handlers working in food premises under the jurisdiction of Kajang Municipal Council. Based on table 1, most (56.3%) were younger than 35 years old. The mean (SD) of age for this study group was 33.91 (11.06). The number of male respondents (58.9%) was higher than female respondents (41.1%). Ethnicity consisted of Malay, Chinese, Indian and others. The others category had the highest percentage (48.2%) of respondents, compared to other ethnic groups. This category of ethnicity included those from Indonesia and Thailand. Most respondents received secondary education (66.1%). Meanwhile, most respondents were non-Malaysians (53.6%). Regarding household income, 68.8% of respondents had an income of less than RM 1500, while 31.2% had an income of more than RM 1500. The mean (SD) of household income was RM 1462.50 (985.31).

Distribution of Respondents According to Knowledge Items: Majority of respondents had poor knowledge (88.4%), while only 11.6% had good knowledge. The mean (SD) of percentage score of knowledge was 39.49 (33.67). Based on Table 2, when asked whether they know about rat urine disease, 47.3% of them knew but had limited information. Only 17.1% confidently said they know about this disease, whereas the rest (35.7%) did not.

Knowledge items were divided into causative agent, signs, symptoms and complications, risk factors, treatment and prevention. In this part, most respondents (50.9%) correctly answered the question that rat urine disease (leptospirosis) is caused by bacteria. Majority (54.5%) did not know that the mode of transmission is through a cut or open wound on the body. Nevertheless, 43.8% knew that eating contaminated food can transmit the disease.

For the signs, symptoms and complications part, jaundice had the lowest percentage (22.3%) amongst the correct answers. Most respondents were still unsure about the symptoms of leptospirosis. Nonetheless, the respondents knew that death is one of the complications, as shown by the high percentage of 49.1%, among correct answers. In addition, majority of respondents had no idea about the treatment for leptospirosis. Some (57.1%) did not know that antibiotic is used to treat leptospirosis, while 55.4% did not know about vaccine. The respondents (36.6%) have false knowledge that vaccine is a treatment for leptospirosis. They were also aware that eating food from street vendors and living in flooded area are risk factors for leptospirosis.

Distribution of Respondents According to Attitude Items: Among the respondents, only 14 (12.5%) had a good attitude towards leptospirosis infection while 98 (87.5%) had an unacceptable attitude.

Furthermore, there were 41.1% of respondents strongly disagreed that food contaminated with rat urine is not dangerous. Majority strongly agreed that house/restaurant must be free from rats. Most of them also agreed that wading in flood can pose the risk of leptospirosis infection. Besides that, most respondents agreed that all food handlers need to attend safe working method courses to avoid infection.
### Table 1: Socio-demographic Characteristics of Respondents

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35</td>
<td>63</td>
<td>56.3</td>
</tr>
<tr>
<td>≥35</td>
<td>49</td>
<td>43.8</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>66</td>
<td>58.9</td>
</tr>
<tr>
<td>Female</td>
<td>46</td>
<td>41.1</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>52</td>
<td>46.4</td>
</tr>
<tr>
<td>Chinese</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>Indian</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>Others</td>
<td>54</td>
<td>48.2</td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>Primary</td>
<td>24</td>
<td>21.4</td>
</tr>
<tr>
<td>Secondary</td>
<td>74</td>
<td>66.1</td>
</tr>
<tr>
<td>Higher education</td>
<td>11</td>
<td>9.8</td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaysian</td>
<td>52</td>
<td>46.4</td>
</tr>
<tr>
<td>Non-Malaysian</td>
<td>60</td>
<td>53.6</td>
</tr>
<tr>
<td><strong>Household income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;RM1500</td>
<td>77</td>
<td>68.8</td>
</tr>
<tr>
<td>≥RM1500</td>
<td>35</td>
<td>31.3</td>
</tr>
</tbody>
</table>

### Table 2: Distribution of respondents (%) according to correct and wrong answer on knowledge of leptospirosis among respondents

<table>
<thead>
<tr>
<th>Knowledge item</th>
<th>Correct (%)</th>
<th>Incorrect (%)</th>
<th>Don’t know (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Causative Agent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rat urine disease (leptospirosis) is caused by bacteria</td>
<td>57 (50.9)</td>
<td>10 (8.9)</td>
<td>45 (40.2)</td>
</tr>
<tr>
<td>2. Rat urine disease (leptospirosis) is a disease caused by animals</td>
<td>23 (20.5)</td>
<td>33 (29.5)</td>
<td>56 (50.0)</td>
</tr>
<tr>
<td><strong>Modes of Transmission</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Rat urine disease (leptospirosis) can infect the subject through:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Cut or open wound in body</td>
<td>31 (27.7)</td>
<td>20 (17.9)</td>
<td>61 (54.5)</td>
</tr>
<tr>
<td>b. Get bitten by mosquitoes</td>
<td>30 (26.8)</td>
<td>23 (20.5)</td>
<td>59 (52.7)</td>
</tr>
<tr>
<td>c. Eat contaminated food</td>
<td>49 (43.8)</td>
<td>12 (10.7)</td>
<td>51 (45.5)</td>
</tr>
<tr>
<td><strong>Signs, Symptoms and Complications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Infected individual will get:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Muscle pain</td>
<td>44 (39.3)</td>
<td>12 (10.7)</td>
<td>56 (50.0)</td>
</tr>
<tr>
<td>b. Demam kuning (Jaundice)</td>
<td>24 (21.4)</td>
<td>25 (22.3)</td>
<td>63 (56.3)</td>
</tr>
<tr>
<td>c. Free from symptoms</td>
<td>28 (25.0)</td>
<td>21 (18.8)</td>
<td>63 (56.3)</td>
</tr>
<tr>
<td>d. Lung and kidney failure</td>
<td>34 (30.4)</td>
<td>19 (17.0)</td>
<td>59 (52.7)</td>
</tr>
<tr>
<td>e. Death</td>
<td>55 (49.1)</td>
<td>6 (5.4)</td>
<td>51 (45.5)</td>
</tr>
<tr>
<td><strong>Risk Factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Risk to get infected by this disease is high during:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Doing recreational activities (e.g. swimming, rafting)</td>
<td>31 (21.7)</td>
<td>25 (22.3)</td>
<td>56 (50.0)</td>
</tr>
<tr>
<td>b. Cleaning drain and house area</td>
<td>46 (41.1)</td>
<td>13 (11.6)</td>
<td>53 (47.3)</td>
</tr>
<tr>
<td>c. Eat food from street vendor</td>
<td>41 (36.6)</td>
<td>19 (17.0)</td>
<td>52 (46.4)</td>
</tr>
<tr>
<td>d. Live in flooded area</td>
<td>44 (39.3)</td>
<td>15 (13.4)</td>
<td>53 (47.3)</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Rat urine disease (leptospirosis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Treated with antibiotic</td>
<td>34 (30.4)</td>
<td>14 (12.5)</td>
<td>64 (57.1)</td>
</tr>
<tr>
<td>b. Screened by blood</td>
<td>61 (54.5)</td>
<td>2 (1.8)</td>
<td>49 (43.8)</td>
</tr>
<tr>
<td>c. Treated with vaccine</td>
<td>9 (8.0)</td>
<td>41 (36.6)</td>
<td>62 (55.4)</td>
</tr>
<tr>
<td><strong>Prevention</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Rat urine disease (leptospirosis) prevented by:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Giving priority to household and workplace cleanliness</td>
<td>65 (58.0)</td>
<td>1 (0.9)</td>
<td>46 (41.1)</td>
</tr>
<tr>
<td>b. Giving priority self-cleanliness</td>
<td>61 (54.5)</td>
<td>4 (3.6)</td>
<td>47 (42.0)</td>
</tr>
<tr>
<td>c. Storing food to avoid being contaminated</td>
<td>61 (54.5)</td>
<td>4 (3.6)</td>
<td>47 (42.0)</td>
</tr>
<tr>
<td>d. Avoid walking barefooted</td>
<td>56 (50.0)</td>
<td>7 (6.3)</td>
<td>49 (43.8)</td>
</tr>
<tr>
<td>e. Install rat trap</td>
<td>62 (55.4)</td>
<td>4 (3.6)</td>
<td>46 (41.1)</td>
</tr>
</tbody>
</table>
Table 3: Distribution of respondents (%) according to attitudes towards leptospirosis infection

<table>
<thead>
<tr>
<th>Attitude items</th>
<th>Strongly agree n (%)</th>
<th>Agree n (%)</th>
<th>Undecided n (%)</th>
<th>Disagree n (%)</th>
<th>Strongly disagree n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Food contaminated with rat feces is not dangerous.</td>
<td>7 (6.3)</td>
<td>7 (6.3)</td>
<td>14 (12.5)</td>
<td>38 (33.9)</td>
<td>46 (41.1)</td>
</tr>
<tr>
<td>2. House/restaurant must be free from rats.</td>
<td>50 (44.6)</td>
<td>28 (25.0)</td>
<td>18 (16.1)</td>
<td>10 (8.9)</td>
<td>6 (5.4)</td>
</tr>
<tr>
<td>3. Trash in the house/premises that is uncovered foods does not pose a risk.</td>
<td>10 (8.9)</td>
<td>6 (5.4)</td>
<td>22 (19.6)</td>
<td>52 (46.4)</td>
<td>22 (19.6)</td>
</tr>
<tr>
<td>4. Wading in the flood does not pose a risk of infection.</td>
<td>5 (4.5)</td>
<td>10 (8.9)</td>
<td>30 (26.8)</td>
<td>48 (42.9)</td>
<td>19 (17.0)</td>
</tr>
<tr>
<td>5. Safe working methods courses for food handler like me are necessary to avoid infection.</td>
<td>43 (38.4)</td>
<td>35 (31.3)</td>
<td>29 (25.9)</td>
<td>3 (2.7)</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>6. Individually, your job may make you exposed to this disease.</td>
<td>13 (11.6)</td>
<td>27 (24.1)</td>
<td>39 (34.8)</td>
<td>28 (25.0)</td>
<td>5 (4.5)</td>
</tr>
<tr>
<td>7. Individually, hobby / outdoor activities that you do make you vulnerable to get infection.</td>
<td>12 (10.7)</td>
<td>27 (24.1)</td>
<td>49 (43.8)</td>
<td>17 (15.2)</td>
<td>7 (6.3)</td>
</tr>
<tr>
<td>8. Individually, your poor health status may make you vulnerable to infection especially if the environment is not clean.</td>
<td>24 (21.4)</td>
<td>40 (35.7)</td>
<td>35 (31.3)</td>
<td>11 (9.8)</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>9. A person who lived / worked in the area that there was a rat is at risk for this disease.</td>
<td>34 (30.4)</td>
<td>35 (31.3)</td>
<td>35 (31.3)</td>
<td>5 (4.5)</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>10. Early treatment may prevent me from getting serious complications if infected with the disease.</td>
<td>36 (32.1)</td>
<td>37 (33.0)</td>
<td>30 (26.8)</td>
<td>7 (6.3)</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>11. Do you agree that the disease can be fatal if left untreated?</td>
<td>41 (36.6)</td>
<td>41 (36.6)</td>
<td>24 (21.4)</td>
<td>4 (3.6)</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>12. Do you agree the disease can give complication of organs?</td>
<td>38 (35.9)</td>
<td>33 (29.5)</td>
<td>32 (28.6)</td>
<td>6 (5.4)</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>13. Knowledge about the disease can help in the prevention of this disease.</td>
<td>39 (34.8)</td>
<td>37 (33.0)</td>
<td>32 (28.6)</td>
<td>4 (3.6)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>14. Using personal protective equipment during cleaning activities is one of the preventive measures.</td>
<td>36 (32.1)</td>
<td>38 (33.9)</td>
<td>33 (29.5)</td>
<td>5 (4.5)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>15. Cleaning program carried out by the local authorities can help to prevent this disease.</td>
<td>48 (42.9)</td>
<td>29 (25.9)</td>
<td>33 (29.5)</td>
<td>1 (0.9)</td>
<td>1 (0.9)</td>
</tr>
<tr>
<td>16. Working in food premises is a risk for this disease.</td>
<td>23 (20.5)</td>
<td>32 (28.6)</td>
<td>41 (36.6)</td>
<td>14 (12.5)</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>17. Less clean environment inviting disease-carrying rats.</td>
<td>43 (38.4)</td>
<td>32 (28.6)</td>
<td>30 (26.8)</td>
<td>7 (6.3)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>18. Reduce recreational activities can help you to prevent from getting infected by this disease.</td>
<td>29 (25.9)</td>
<td>25 (22.3)</td>
<td>42 (37.5)</td>
<td>15 (13.4)</td>
<td>1 (0.9)</td>
</tr>
</tbody>
</table>

There were 34.8% had an undecided perception regarding whether their job will expose them to this disease or not. 31.3% of them also agreed that living or working in an area that has a large rat population entails the risk of infection.

Next, most respondents (32.1% strongly agreed and 33.0% agreed) gave positive responses to the statement concerning early treatment may prevent them from getting serious complications if infected by the disease. 36.6% strongly agreed that the disease can be fatal if left untreated and cause death if ignored. Most of them also perceived that the disease can cause complications to the organs.

There were 34.8% respondents agreed with the statement that knowing about the disease can help in its prevention. Hence, they should have knowledge about the disease before knowing how to prevent it. There were 33.9% of them agreed that using personal protective equipment during cleaning activities is one of the preventive measures. For the statement on cleaning programme carried out by the local authorities can prevent the disease, there were 42.9% of the respondents strongly agreed (Table 3).

Distribution of Respondents According to Practice Items: Among 112 respondents, the majority of the respondents had unsatisfactory practice (57.1%) than good practices (42.9%). However, the majority of the respondents had good practices to each of the practice item.

For personal hygiene, all of the respondents practised washing hands with soap and water before and after using the toilet and before and after food...
preparation. For workplace hygiene, the majority of the respondents (96.4%) washed utensils (knives, plates) and also used the bins provided. In the personal protective equipment part, the majority of the respondents wore enclosed shoes, an apron and headgear (76.8, 83.9 and 76.8%, respectively).

For the safe operating procedure part, the majority of respondents (75.9%) attended a safe work practice course for food handlers and majority of them (92.0%) also covered any wounds with a plaster neatly. For the elimination of source reduction (prevention) in food premises, the majority of respondents 69 (61.0%) used rat poison, while 79 (70.5%) of them used rat traps (Table 4).

## DISCUSSION

**Knowledge of Leptospirosis:** Majority of respondents had poor knowledge (88.4%), while only 11.6% had good knowledge. This result is quite similar to the study conducted among town service workers in Kota Bharu, whereby the findings showed that majority of workers had a poor knowledge (87.2%). In addition, a low percentage of respondents (12.8%) had never heard of leptospirosis [7]. Another recent local study, Nozmi et al. [10] also reported poor knowledge of leptospirosis than good knowledge (57.0% vs. 43.0%), with a mean knowledge score of 52.1 (SD 26.4).

For knowledge of causative agent, most respondents (50.9%) knew rat urine disease (leptospirosis) is caused by bacteria. This is consistent with the KAP study in the Philippines, in which majority of respondents, who were health workers and residents, agreed that leptospirosis is caused by bacteria [8].

Next, most respondents (54.5%) did not know that the mode of transmission is through a cut or open wound on the body and only 27.7% of them answered correctly. This is a big concern as the respondents of this current study were food handlers who are prone to get cut when working. Other than food and water, microbial contamination is via transmission of enteric pathogens and other microbial hazards through air, contaminated utensils and food contact [11]. Moreover, food premises can easily become infested with rats. The presence of rats in food premises often occurs because rodents/rats have a high breeding rate, resulting in a rapid population increase, especially when there is availability of food [4]. It is important for the food handlers to be aware of the mode of transmission. However, among the respondents, 43.8% knew that eating contaminated food can transmit the disease. As reported by Nozmi et al. [10], 61.9% of the respondents recognised that contaminated water/drinks are a medium for leptospirosis to enter the human body.

From the data gathered in the signs, symptoms and complications part, jaundice had the lowest percentage (22.3%) among correct answers. Majority of respondents were still unsure about the symptoms of leptospirosis. This is supported by Nozmi et al. [10], whereby rural communities in their study were not aware of jaundice as the clinical sign of leptospirosis (66.4%). Awareness regarding the disease is very important in its prevention and control. Knowledge of clinical features and complications also plays a crucial role to decrease morbidity and mortality. Due to the lack of risk perception, people ignore the fever caused by leptospirosis and thus delay treatment. Late referral to medical centre is one of the main reasons leading to majority of deaths [12]. Nevertheless, there were 49.1% of respondents knew that death is one of the complications. Other studies have also reported that most respondents were aware that death is a complication of leptospirosis. Local studies by Sakinah et al. [9] and Nozmi et al. [10] reported that 82.1 and 80.4%, respectively, knew leptospirosis can cause death, while Mohan and Chadee [13] reported that 89.5% knew leptospirosis could kill. This implies that the respondents recognised leptospirosis as a serious disease.

Most respondents had no idea about the treatment for leptospirosis. There were 57.1% who did not know that antibiotic is used to treat leptospirosis and 55.4% did not know about vaccine. Some had false knowledge that vaccine is the treatment for leptospirosis (36.6%). Antibiotics must be administered during the early stages of the onset of the disease so that the treatment can be effective. Correction of fluid and electrolyte imbalance is important from the start of the illness and antibiotics must be given to seriously ill patients. The use of antibiotic will alleviate fever and other symptoms [1].

There were respondents who also aware that eating food from street vendors and living in flooded area are the risk factors. Lau et al. [14] reported that leptospirosis is associated with flood. Similarly, flood and heavy rainfall have been linked with numerous outbreaks of leptospirosis around the world [15], [16]. Based on Prabhu et al. [17], if the community does not know about the risk factors, it will be tough to raise awareness about leptospirosis and to expect the workers to be aware of the disease. It will be impossible for them to be motivated to adopt preventive work practices.
Attitude: Majority of respondents (87.5%) had an unacceptable attitude towards leptospirosis infection. Similar data were reported by Sakinah et al. [9], where by 94.0% had an unacceptable attitude. In addition, Nozmi et al. [10] determined that 90.3% of respondents from the studied rural communities had an unacceptable attitude. Nonetheless, this is in contrast with the study by Rahim et al. [7], in which majority of respondents had a positive attitude while only 35% had an unsatisfactory attitude.

Although majority of respondents showed unacceptable attitude score for overall items however for certain items, they showed positive responses. There were 30.4% of the respondents strongly agreed that living or working in an area that has a rat population brings the risk of infection. Nonetheless, in the study by Allwood et al. [18], majority of respondents had some knowledge of leptospirosis, but there was a large proportion who did not think that they or their families were at risk to contract the disease. The way individuals choose to mitigate the risk is critical in risk perception. If individuals estimate that the risk from a hazard is minimal, they are less likely to act to reduce their exposure to this hazard and vice versa [19].

Besides that, the respondents gave positive responses to the statement that early treatment may prevent them from getting serious complications if infected by the disease. They were aware that early treatment is crucial. The chance of an early diagnosis will increase if people recognise the importance of visiting the doctor when the early signs of the disease are present [13]. The respondents positively perceived that the disease can be fatal if left untreated and cause death if they ignore the disease. Furthermore, there were 33.9% also strongly perceived that the disease can cause complications to the organs. In Araujo et al. [20], respondents assessed perception related to leptospirosis severity by comparing leptospirosis with other diseases that are well recognised in the community. There were 50% of respondents who felt that leptospirosis was the most serious disease that requires prevention and control in their community.

The respondents agreed with the statement that to know about the disease can help in the prevention of it. They should have knowledge about the disease before they know how to prevent it. They also agreed that using personal protective equipment during cleaning activities is one of the preventive measures. For the statement on cleaning programme carried out by the local authorities can prevent the disease, there were 40.3% of the respondents strongly agreed. The motivation to take actions to change a behaviour requires the belief that the precautionary behaviour effectively prevents the condition [21].

Practice: Looking at practice, most respondents had an unsatisfactory practice (57.1%). In contrast, Rahim et al. [7] showed that 35.5% of the respondents had good practices while 64.5% had unsatisfactory practices. A study by Sakinah et al. [9] showed that only 21% of their respondents had good practices, which is lower than this study.

For personal hygiene, all respondents practised washing hands with soap and water before and after using the toilet and before and after food preparation. Similarly, in Nozmi et al. [10], majority of their respondents (63.5%) washed hands with soap after managing waste/rubbish and 60.6% washed utensils before cooking. Apart from that, for workplace hygiene, most respondents washed utensils (knives and plates) and used the bins provided. It is important to practise preventive actions such as practising a good personal and workplace hygiene by workers. Some actions that can be taken include wearing footwear to prevent transmission of leptospirosis bacteria through feet [1].

In the personal protective equipment part, majority of respondents wore enclosed shoes, an apron and headgear. Most of the infections are preventable through use of appropriate personal protective equipment [22]. In a study by Araujo et al. [20], 17% reported of cleaning an open sewer. Among them, 35% reported using gloves and 33% were wearing boots while cleaning. A study by Rahim et al. [7] showed that the use of PPE amongst respondents while working was relatively poor. Wearing protective equipment is important for workers working in an exposed condition. This is because the mode of transmission of the leptospires is through cuts or abrasions in the skin or mucosal surfaces. Besides that, it also enters through the conjunctiva or by inhalation of droplets or aerosol of fluids containing leptospires. People or animals can be infected by leptospires by ingestion of contaminated food or water [1].

For the safe operating procedure part, majority of respondents attended a safe work practice course for food handlers and most also neatly covered any wounds with a plaster. The workers must know the safe operating procedure for food handlers so that they will not harm themselves and other people. Previous studies have
revealed that food safety training increases knowledge regarding food safety issues. Food safety knowledge and awareness of hygiene among food handlers can be increased through training and education, thus, improving food safety practices [23]. Nonetheless, the level of consciousness on food handling might decrease due to wrong knowledge. This can lead to food handlers practising a false idea of safety [24]. Therefore, transferring knowledge regarding food handling practices is a priority and there is more to be discovered about food handlers’ attitude towards food safety issues, as well as their potential to influence practices [25].

For the elimination of source (prevention) in food premises, majority of respondents (61.6%) used rat poison, while (70.5%) of them used rat traps. The most common route of infection is exposure through water contaminated by urine of infected animals and rodents, which are recognised as the major reservoir for the transmission of leptospirosis. This is consistent with Araujo et al. [20], which reported that the methods used to control rats in homes included poison (121; 47%), closing entries that rodents could use to enter houses (116; 45%), filling the rat burrows in or around the house (64; 25%) and setting rat traps (62; 24%). It is important to establish rodent control programmes as components in the prevention and control of the disease. The use of rodenticides is also successful in minimising the risk of disease transmission [26].

CONCLUSIONS

The results showed that majority of respondents have poor knowledge, unacceptable attitude and unsatisfactory preventive practice against leptospirosis. This information is useful in developing health promotion because the element of knowledge about the disease can be further improved. Appropriate and adequate knowledge of leptospirosis may help those with a poor knowledge to reduce the risk of infection. Besides that, a proper intervention should be done promptly for the food handlers to adopt a good attitude towards the prevention of leptospirosis. Their perception, belief and habits should be changed. Knowledge was also an indicator for practice, which provided evidence that a good knowledge will lead to a good practice. Intervention programmes should be conducted to spread knowledge and subsequently improve the prevention practices. Although leptospirosis education programmes should be designed for a broad audience, more efforts should be given to target those who are younger with a lower income, males, low educated and non-Malaysians, especially those who are engaged in high-risk occupations or area of working. Health education efforts should address the issue of poor knowledge and attitude, especially for knowledge of signs and symptoms. Ignoring the signs and symptoms can cause serious complications for an individual’s health-seeking behaviour because they will delay early detection and treatment of the disease.

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