

# Knowledge, Attitudes and Practices of the Community Residents Concerning the Prevention and Control of Leptospirosis in the National Capital Region (NCR), Philippines

Jonathan P. Guevarra,<sup>1</sup> Maridel P. Borja,<sup>2</sup> Nina G. Gloriani,<sup>3</sup> Roderick M. Napulan<sup>2</sup> and Shin-ichi Yoshida<sup>4</sup>

<sup>1</sup>Department of Health Promotion and Education, College of Public Health, University of the Philippines Manila

<sup>2</sup>Department of Epidemiology and Biostatistics, College of Public Health, University of the Philippines Manila

<sup>3</sup>Department of Medical Microbiology, College of Public Health, University of the Philippines Manila

<sup>4</sup>Department of Bacteriology, Faculty of Medical Sciences, Kyushu University, Japan

## ABSTRACT

**Objective.** This study assessed the knowledge, attitudes and practices of the community residents on the prevention and control of Leptospirosis in the National Capital Region, Philippines.

**Methods.** In this cross-sectional study, four-stage random cluster sampling proportional to size was used to select the 413 respondents from 30 villages in the National Capital Region. The mother or any responsible adult served as the respondent for the community survey which yielded data on the knowledge, attitudes, domestic practices, and sources of information for the prevention and control of Leptospirosis. Encoding was done using Epi Info Version 6. Descriptive statistics was generated through Microsoft Excel.

**Results.** Majority of the respondents were able to correctly identify that the causative agent of leptospirosis is bacteria (91%), that the disease is transmitted by the urine of infected rats (89%) through skin abrasions (71%) and mucous membranes (57%). Most commonly identified signs and symptoms of the disease include acute febrile illness with myalgia (87%), difficulty of breathing and decreased urine output (72%). Majority identified the prevention and control measures correctly. Wearing of boots, maintaining a clean and orderly house and maintaining good sanitation were the top answers of the respondents. In terms of attitudes, respondents had positive attitudes towards the preventive practices of wearing boots or following health advisories of authorities (99%). Majority also believed that leptospirosis is curable if detected early (99%) and that it is a serious disease (98%). Similarly, more than 90% had positive attitude when it comes to health care. Wading in flood

waters (93%), walking barefoot (85%) and conducting clearing activities after flood (63%) were the commonly believed forms of exposure to the disease. In terms of domestic practices, respondents usually clean their surroundings (40%), avoid wading in floodwaters (25%), wear boots (21%) to protect themselves from acquiring leptospirosis. Primary sources of information on leptospirosis were the mass media (46%), health workers (17%) and the health facilities (14%). The most common educational materials read by the respondents were flyers (9%), posters (8%), and leaflets (7%).

**Conclusion.** In general, majority of the respondents were knowledgeable on the causes, signs and symptoms, and modes of transmission of leptospirosis, and had favorable attitudes towards the prevention and control measures against leptospirosis. However, when it comes to domestic practices, less than 40 % actually implement measures for the prevention and control of leptospirosis. Respondents' main source of information was the mass media and very few have read educational materials containing information about the prevention and control of leptospirosis.

**Key Words:** *Leptospirosis, knowledge, attitudes and practices, prevention and control*

## Introduction

Leptospirosis is a bacterial disease affecting both humans and animals. The causative organism, pathogenic *Leptospira* species has been found in a variety of both wild and domesticated animals, including rodents, dogs, cattle, pigs and horses. Infection occurs when these bacteria are transmitted to humans through direct contact with the urine of infected animals or with a urine-contaminated environment, such as water, soil and food. It gains entry through cuts and abrasions in the skin and through mucous membranes of the eyes, nose, and mouth. The disease may present with a wide variety of clinical manifestations including high fever, headache, chills, muscle aches, vomiting, jaundice, etc. which cause some difficulties in distinguishing it from other diseases with similar symptoms.<sup>1</sup>

Leptospirosis poses occupational and/or recreational hazards. Outdoor and agricultural workers such as rice-

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Corresponding author: Jonathan P. Guevarra, RN, MAN  
Department of Health Promotion and Education  
College of Public Health  
University of the Philippines Manila  
625 Pedro Gil St., Ermita, Manila 1000 Philippines  
Telephone: +632 5260811  
Email: jpguevarra2@up.edu.ph

paddy and sugarcane workers are particularly at risk of acquiring leptospirosis. The infection can also be acquired by those individuals who engage in water-related recreational activities. Leptospirosis cases often increase during rainy seasons brought about by the flooding, especially in endemic areas.<sup>2</sup> Its incidence can reach 0.1 to 1 per 100,000 in temperate climate areas to as high as 10 per 100,000 in tropical climate regions, as estimated by the World Health Organization (WHO). However, its true incidence is still unknown due to underreporting.<sup>3</sup> While it occurs in many parts of the world, it is endemic mainly in countries with humid subtropical and tropical climates. In endemic areas, the number of leptospirosis cases may peak during the rainy season and may even reach epidemic proportions in case of flooding. It has a great epidemic potential in the Southeast Asian Region including the Philippines. A leptospirosis outbreak was declared in October 2009 by the Philippines' Department of Health two weeks after the heavy rainfall brought by typhoon Ketsana (Ondoy) which happened on September 26, 2009. A total of 2,292 suspected cases of leptospirosis were recorded with 178 deaths (8%) in 15 hospitals in Metro Manila in October 2009.<sup>4</sup> On the following years, 2,471 leptospirosis cases were reported from January 1 to August 18, 2012 which is 62.35% higher compared to the same time period of the preceding year. Regions with most of the cases were Region X, Region VI and the National Capital Region. Despite of having generally low case fatality rate, the risk of death from acquiring leptospirosis is increasing, especially for people with increasing age or those suffering from jaundice and kidney damage (Weil's disease) and who have not been treated with renal dialysis.<sup>5</sup>

Large number of serovars, infection sources and differences in transmission make the Leptospirosis control complicated and dependent on the local conditions.<sup>6</sup> However, leptospirosis is considered a highly preventable disease. Measures for prevention and control of leptospirosis require the coordination of the public health, animal health and environmental authorities.<sup>7</sup> Among the common recommendations to avoid infection especially for occupationally at-risk groups, such as farmers and sewer workers, include wearing of protective gears, covering skin lesions with waterproof dressings, and preventing access to bodies of water.<sup>8</sup>

In response to this public health problem, the College of Public Health-University of the Philippines Manila (CPH-UPM) conceptualized the Project on the Prevention and Control of Leptospirosis in the Philippines (LepCon) in 2010. This 5-year project was conducted in collaboration with Kyushu University (KU), Japan International Cooperation Agency (JICA), World Health Organization (WHO), the Philippine Council for Health Research Development of the Department of Science and Technology (PCHRD-DOST) and the Department of Health (DOH). There are four working groups composing the project: the Microbiology (Group A),

Burden of Disease (Group B), Epidemiology-Environmental (Group C) and Advocacy (Group D). The Advocacy group focused on the enhancement of advocacy activities on the prevention and control of leptospirosis in the country.<sup>9</sup> The advocacy group conducted the study on the knowledge, attitudes and practices of the community concerning leptospirosis. Review of literature revealed several foreign KAP studies on the prevention and control of leptospirosis, however, there were no published studies that were conducted in the Philippines. Specifically, this study assessed the: 1) the knowledge of the community regarding the causative agent, modes of transmission, signs and symptoms, prevention, control and treatment of leptospirosis; 2) attitudes towards leptospirosis; 3) the practices of the community towards leptospirosis prevention and control and; (4) sources of information on the prevention and control of leptospirosis.

## Methods

### *Study Area, Study and Sampling Designs*

This study was conducted in the 14 cities and municipalities of National Capital Region, Philippines. This descriptive cross sectional study<sup>10</sup> employed a 4-stage random cluster sampling design<sup>11</sup> for the selection of the participants. A total of 413 respondents were included from the 30 villages that were randomly selected for the study. Inclusion criterion was also set in which, only households with at least 12 months of residence in the area were invited to join the study. Thus, the villages (barangays), zones, blocks, and households served as the primary (PSUs), secondary (SSUs), tertiary (TSUs) and quaternary sampling units (QSUs), respectively. One zone (purok) from each selected village, one block from each selected zone and twelve to fourteen households from each selected block were randomly selected.

### *Data Collection*

From each household, the mother or any responsible adult served as a respondent for the study. The data collection instrument was developed by the researchers, pre-tested, made culturally-sensitive, translated to Filipino and back-translated from Filipino to English. If the household respondent was not at home during the data collection, at least two callbacks were made before recruiting the substitute household. Informed consent forms were signed by the respondents prior to the actual interview.

All interviewers were trained and provided with a field manual during the face-to-face interview for their reference. The knowledge of the respondents on leptospirosis was determined by reading statements to them which may indicate as either "TRUE" or "FALSE". They were allowed to indicate "Don't know" if such was the case. For their attitudes towards leptospirosis, they were asked whether

they “STRONGLY AGREE”, “AGREE”, “DISAGREE” or “STRONGLY DISAGREE” to statements read to them. Their responses were later dichotomized because most respondents responded either “AGREE” and “DISAGREE”. The practices of the respondents were determined through answering “YES” or “NO” on the statements regarding their practices to prevent and control leptospirosis. They were also asked about their health-seeking behavior and the materials that they have read to obtain general health information, as well as the specific information on leptospirosis.

#### Data Processing and Analysis

At least two persons edited the accomplished data collection forms and a coding manual was provided to the coders to serve as a guide. Data processing entailed editing of the accomplished data collection forms, coding, encoding and machine editing. These processes were closely monitored by the data manager. The data structure for encoding the data featured a consistency and range check program that could detect inconsistent and/or out of range entries. Encoding was done using Epi Info Version 6. Descriptive statistics such as the mean and the proportion with the attribute of interest were derived with the use of Stata 10 data analyzer software. Tabulations and graphs were generated through Microsoft Excel.

#### Ethical Considerations

The respondents signed the informed consent form prior to data collection. The objectives, risks and benefits were explained to the study participants. They were also informed about the anonymity and confidentiality of the information to be gathered from them. A code number was used for each accomplished questionnaire.

## Results

#### Study Site

The study sites included in the study were 30 villages from 14 cities and municipalities in the National Capital Region (also called Metro Manila) namely, Caloocan, Las Pinas, Makati, Malabon, Manila, Marikina, Muntinlupa, Paranaque, Pasay, Pasig, Pateros, Quezon City, Taguig and Valenzuela (Figure 1).

The National Capital Region is considered the political, social and cultural center of the Philippines being the country’s premium urban region among others. It is the smallest region but has the second largest population among other regions of the country. It has a total of 17 local government units with 16 cities and 1 municipality.<sup>12</sup>

#### Socio-demographic Profile

There were 413 respondents included in the survey and mothers comprised the majority (88%) of these respondents.



**Figure 1.** The Study Site.

The respondents other than the mothers were grandparents (5%) and fathers (7%). The mean age of the respondents was approximately 41 years, with more than half of the respondents having obtained some high school education (56%). Majority of the respondents (71%) had no income and only one fifth (19%) of the employed respondents earned less than PhP 6,500 per month. Ten percent (10%) of these employed respondents were involved in sales-related occupations.

#### Knowledge on Causes, Mode of Transmission, and Signs and Symptoms of Leptospirosis

The majority of the respondents gave the correct answer when asked about the cause of leptospirosis, i.e. that it is caused by bacteria (91%), that it can be caused by exposure to the urine of infected rats (89%) and that rat bite cannot cause leptospirosis (84%). In terms of the modes of transmission of the disease, respondents answered that leptospirosis can be transmitted through contact with the urine from infected rat particularly through skin abrasions (71%) or through the mucous membranes (57%). In terms of the knowledge on the signs and symptoms of leptospirosis, the majority knew that acute febrile illness with myalgia (87%) and difficulty of breathing and poor urine output (72%) were the clinical manifestations of leptospirosis. In contrast, less than half were knowledgeable that the leptospirosis cases do not scream like a rat, have gum bleeding after tooth brushing and have elevated blood sugar or hypertension (Table 1).

#### Knowledge on the Prevention, Control and Treatment of Leptospirosis

Almost all of the respondents (99%) said that wearing boots and maintaining the house clean and orderly can prevent leptospirosis. Other prevention and control measures that the respondents knew were the following: maintaining good sanitation (98%); not going to canals and



destroying places/grounds that can be sources of diseases (91%); not going to rivers/streams after the flood (78%); avoidance of drinking stream water (73%); avoidance of swimming in water contaminated with rat urine (69%) and avoidance of walking barefooted (67%). When asked about the treatment for leptospirosis, ninety-nine percent (99%) of the respondents said that the person with leptospirosis should be treated in a health facility while three fourths (74%) mentioned that antibiotics are given to patients with Leptospirosis. In spite of these favorable results, it is also a concern that a sizable proportion of respondents were resorting to the use of incense and herbal medicines as treatments for leptospirosis (Table 2).

**Table 1.** Proportion of respondents with correct knowledge on Leptospirosis

Knowledge on the Nature of Leptospirosis	Frequency (% Correct)
Causes of Leptospirosis	
Caused by bacteria	375 (91)
Comes from urine of infected rats	369 (89)
Rat bite**	347 (84)
Caused by a virus**	19 (5)
Modes of Transmission	
Contact with the abrasions in the skin	293 (71)
Contact of infected rat urine with eyes, mouth and nose	236 (57)
Signs and Symptoms	
Acute febrile illness with myalgia	358 (87)
Difficulty of breathing and poor urine output	299 (72)
Screaming like a rat**	197 (48)
Gum bleeding after brushing the teeth**	162 (39)
Elevated blood sugar level**	106 (26)
Show signs of hypertension**	7 (19)

\*\*False Statement

**Table 2.** Proportion of respondents with correct knowledge on prevention, control and treatment of Leptospirosis

Knowledge on Prevention, Control and Treatment	Frequency (% Correct)
Prevention and Control	
Not going to canals can prevent leptospirosis	374 (91)
Not going to river/stream right after floods can prevent leptospirosis	322 (78)
Avoidance of drinking stream water is a preventive measure against leptospirosis	302 (73)
Avoidance of walking barefooted cannot prevent leptospirosis**	276 (67)
Maintaining clean and orderly house prevent Leptospirosis	407 (99)
Maintaining good sanitation because it helps control the proliferation of rodents	405 (98)
Destroying places/grounds that can be source of the disease can prevent leptospirosis	376 (91)
Wearing of boots can prevent leptospirosis	407 (99)
Avoidance of swimming in water contaminated with rat urine is not a preventive measure **	285 (69)
Treatment for Leptospirosis	
A person with leptospirosis should be treated in a health facility	407 (99)
Antibiotics are given to patients with leptospirosis	306 (74)
Incense can cure leptospirosis **	280 (68)
Herbal medicines can cure leptospirosis **	204 (49)

\*\*False Statement

*Attitudes toward Leptospirosis*

It is shown in Table 3 that the majority of respondents had positive attitude towards the various aspects of leptospirosis. They had positive attitude towards the preventive practices of wearing boots or following health advisories of the health department during the rainy season (99% each). Majority believed that leptospirosis is curable if detected early (99%) or that it is a serious disease (98%). Similarly, more than 90% had positive attitude when it comes to health care that could be beneficial to leptospirosis patients, e.g., bringing the patient to the nearest health care facility (94%) to decrease the risk of more serious disease and that medicine can treat the disease (93%). The respondents also believed that wading in floodwater (93%), walking barefoot in the flood (85%) or cleaning after the flood (63%) can predispose or make one vulnerable to the disease.

**Table 3.** Proportion of respondents with positive attitudes towards various aspects of Leptospirosis

Attitudes towards Leptospirosis	Frequency (% Positive)
Believes that wearing boots can prevent leptospirosis	407 (99)
Believes in the importance to follow the health advisory given by the health department during rainy season	407 (99)
Believes that leptospirosis is curable once detected early	408 (99)
Believes that leptospirosis is a serious illness	406 (98)
Believes that bringing sick member of the family to the nearest health facility would decrease the risk of having serious illness	388 (94)
Believes that medicines can treat leptospirosis	383 (93)
Believes that wading in floodwaters makes vulnerable to leptospirosis	385 (93)
Believes that walking barefoot when there is flood predisposes me to leptospirosis	35 (85)
Feels that cleaning/clearing activities after the flood would make vulnerable to leptospirosis	260 (63)
Believes that no ways to prevent infection on leptospirosis**	153 (37)

\*\*False Statement

*Practices and Health Seeking Behavior on the Prevention and Control of Leptospirosis*

Forty percent (40%) of the respondents clean their surroundings/backyard to protect themselves from acquiring leptospirosis. Moreover, preventive measures such as not wading in floodwaters and wearing of boots were also practiced by nearly one-fifth of the respondents.

Forty percent (40%) of the respondents resort to self-medication when they feel unwell. Almost half (48%) of the respondents sought the help of doctors when they feel unwell followed by immediate family members (17%) and relatives (16%) (Table 4).

*Sources of Information on General Health and on Leptospirosis*

It was shown in the results of the study that health workers (37%), health facilities (25%) and mass media (22%) were the major sources of information of the household residents on health matters. However, focusing on leptospirosis, almost half of the respondents (46%) obtained

information through the mass media (46%) while less of them acquire the information from health workers and health facilities (17% and 14%, respectively). Majority of the respondents have not read any materials that contain information about leptospirosis. The most commonly read materials containing information on leptospirosis were flyers (9%), posters (8%) and leaflets (7%). (Table 5)

**Table 4.** Practices of respondents and health seeking behavior on Leptospirosis

Practices and Health Seeking Behavior	Frequency (Proportion)
<i>Action to protect themselves from leptospirosis</i>	
Cleaning the surroundings/backyard	164 (40)
Not wading in floodwaters	101 (25)
Wearing of boots	86 (21)
Personal hygiene	19 (5)
Staying at home when it is raining	18 (4)
Not walking barefooted during floods	8 (2)
Others (not drinking stream water, not going to canals during flood, kill rats, not engaging in recreational activities when there is flood, take medication, screening test, bring patient to hospital, raise cat as pet, eat clean food)	17 (6)
<i>Action done when they feel unwell</i>	
Drink over the counter medicines	205 (40)
Stay at home	82 (20)
Go to the nearest health center	75 (18)
Seek professional help in the nearest hospital	20 (5)
Drink more water (water therapy)	6 (2)
Go to the private clinic	6 (2)
Others (drink herbal medicine, seek help from significant others, have to perspire more, drink vitamins and minerals, eat nutritious food, seek help from traditional healers)	19 (4)
<i>Person sought when they feel unwell</i>	
Doctor	200 (48)
Immediate family members	70 (17)
Relatives	65 (16)
Quack Doctors	32 (8)
Nurse	15 (4)
Midwife	8 (2)
Others (divine providence, neighbors, friends, barangay health workers)	23 (6)

**Table 5.** Sources of information of respondents on general health and on Leptospirosis

Sources of Information on General Health and on Leptospirosis	Frequency (Proportion)
<i>Source of information on health matters</i>	
Health workers	152 (37)
Relatives	36 (9)
Health facilities	104 (25)
Mass media	92 (22)
No answers	29 (7)
<i>Source of information on leptospirosis</i>	
Mass media	190 (46)
Health workers	69 (17)
Health facilities	57 (14)
None	71 (17)
Relatives	26 (6)
<i>Printed materials read containing information on leptospirosis</i>	
None	303 (73)
Flyer	38 (9)
Poster (paper or tarpaulin)	35 (8)
Leaflet	28 (7)
Newspaper	23 (6)

## Discussion

Overall, majority of the respondents exhibited high knowledge on the nature of the disease which includes the causative agent (bacteria), modes of transmission, and signs and symptoms. The bacteria are called leptospire which are found in both wild and domestic animals, including rats, dogs, cattle, pigs, and horses. Large amounts of these bacteria are shed in the urine of a rat which contaminates water, damp soil, vegetation or mud allowing for a possible human transmission to occur through contact with skin and mucous membranes.<sup>13</sup>

In this study, commonly identified by the respondents as clinical manifestations of leptospirosis were acute febrile illness with myalgia and difficulty of breathing with decreased urine output among other signs and symptoms. Leptospirosis in human is known to have wide range of manifestations including high fever, severe headache, muscle aches, redness of the eyes, diarrhea, abdominal pain, hemorrhages in skin or mucous membranes, vomiting and rashes. A second phase may occur again but in more severe case wherein a patient can have kidney/liver failure or meningitis.<sup>14</sup>

The prevention and control measures for leptospirosis were also identified correctly by the respondents. These include refraining from going to bodies of water (canals, streams, and rivers) after floods, wearing boots to avoid contact with contaminated water and maintaining good sanitation by destroying the breeding grounds of rodents. According to the World Health Organization, the prevention and control measures towards leptospirosis should be targeted at the infection source, at the route of transmission of infection or at level of the human host. A possible intervention at the infection source is deterrence of rodents and other animal sources of infection from human habitat by keeping the surroundings clean. On the other hand, wearing protective clothing (boots or gloves) interrupts the disease route of transmission to humans. At the level of human host, raising the awareness of general population is one of the important measures.<sup>6</sup>

For the treatment, results showed that there is high awareness among respondents that leptospirosis cases should be given prompt attention by being treated in a health facility and being administered with proper antibiotics. The early treatment of antibiotics on suspected leptospirosis cases has been recommended by the World Health Organization (WHO), which makes it unnecessary for clinicians to wait for laboratory test results before initiating treatment of antibiotics.<sup>6</sup> Doxycycline and penicillin G are among the recommended antibiotics used to treat leptospirosis, depending on the severity of the case.<sup>4</sup> Despite of the importance of early antibiotic therapy, it was revealed from the results that there are still a number of respondents who resort to use of incense or herbal medicine as cure to leptospirosis. This may give rise to untreated cases which can progress to more severe and potentially fatal stage.

This study showed consistency between the knowledge and attitudes of the surveyed respondents. In general, majority of the respondents had positive attitudes towards leptospirosis. They believe that leptospirosis is a serious disease which needs proper and early medical treatment. In line with this, majority showed positive attitude towards the importance of some health advisories such as early detection and bringing the sick member of the family to the nearest health facility. Most of the respondents agreed that wearing boots is a prevention practice against the disease. Consequently, respondents also believed that through wading in flood waters, walking barefoot and cleaning or conducting clearing activities after flood, a person becomes vulnerable to leptospirosis. In relation to this, a related study by Kawaguchi et al. has showed that flood and the activities that expose humans into floods has important role in the disease transmission, such as walking in stagnant water, particularly in developing countries.<sup>15</sup> In addition to this, participating in cleaning activities for more than four days has increased the risk of acquiring leptospirosis according to a study in India.<sup>16</sup>

However, only less than 40% of the respondents had been practicing the preventive measures against leptospirosis. Major actions of the respondents to protect themselves from acquiring leptospirosis are cleaning their surroundings/backyard, not wading in flood waters and wearing boots, if wading will not be avoided. Poor sanitation with frequent flooding was cited by the study on Leptospirosis in Asia Pacific Region<sup>17</sup> as a factor which increases the risk of Filipinos in acquiring leptospirosis. Avoiding high-risk exposure is considered the most effective preventive measure. However, use of personal protective clothing such as boots and gloves when high-risk exposure cannot be avoided is recommended (Grade A recommendation) by the Leptospirosis Task Force.<sup>4</sup>

It has been generally observed that the participating communities had high knowledge and positive attitudes towards the prevention and control of leptospirosis. However, these were not reflected in their practices. A study in Western Jamaica has considered the importance of having knowledge in the disease and its risk factors as protective factors for the individuals from acquiring leptospirosis.<sup>18</sup> However, not all studies have proved that high knowledge/positive attitude can lead to good and healthy practices. In a KAP (Knowledge, Attitudes and Practices) study conducted among urban slum residents in Brazil, factors such as lack of access on personal protective clothing and lack of support for daily garbage removal became potential reasons for the low adoption of risk reduction methods by the residents against leptospirosis.<sup>19</sup>

According to the Ecological Model of Health Behavior proposed by McLeroy et al (1988), there are five sources of influence on health behaviors: intrapersonal factors, interpersonal processes and primary groups, institutional factors, community factors, and public policy. Similarly, four

assumptions were presented by the Social Ecology Model for Health Promotion (Stokols, 1992, 2003): (1) health behavior is influenced by physical environments, social environments, and personal attributes; (2) environments are multidimensional, such as social or physical, actual or perceived, discrete attributes (spatial arrangements) or constructs (social climate); (3) human-environment interactions occur at varying levels of aggregation (individuals, families, cultural groups, whole populations); and (4) people influence their settings, and the changed settings then influence health behaviors.<sup>20</sup> The current study mainly looked into the personal factors and partly on physical and social factors and did not touch much on other factors such as institutional, public policy, and interactions occurring at various levels of aggregation which could have greatly influenced the practices of the surveyed respondents of National Capital Region communities.

Mass media, health workers and the health facilities were found to be the primary sources of information on leptospirosis. Therefore, it only shows that health education campaigns need to utilize these resources and facilities more in the information dissemination on leptospirosis within communities. Media helps health workers expand their audience reach because face-to-face channels of communication often require too many human resources to reach greater number of people.<sup>21</sup>

In contrast to high value of mass media as source of information mentioned earlier, it was observed in the results that only less than ten percent have read information on leptospirosis from flyers, posters, and leaflets. This may be due to inadequacy or unavailability of these materials. With the help of the health workers in our health facilities, these materials can be reproduced and be made available to the general public. This will help in raising the level of awareness of the general population, which is one of the control interventions on leptospirosis at the level of human host.<sup>7</sup>

### Conclusions and Recommendations

In general, majority of the respondents were knowledgeable on the nature of leptospirosis including signs and symptoms, causes and modes of transmission and had favorable attitudes towards the prevention and control measures against leptospirosis. However, a big proportion of the respondents was revealed to be not practicing the prevention and control of leptospirosis measures against leptospirosis.

Because the sources of infection are apparently the poor environmental conditions that favor the breeding and thus proliferation of rodents within and outside the homes, public health workers should inform the public about the importance of maintaining good sanitary conditions within and outside their homes as a protective measure against Leptospirosis. The people should likewise be convinced to do their share in preventing floods through plastic use reduction and proper garbage disposal. In view of the fact

that people may heed the call to avoid wading in floods, comprehensive plan for flood control and its immediate implementation should be ensured. In the interim, environmental sanitation such as regular clean-up activities particularly of the multitude of stagnant creeks that traverse through the National Capital Region coupled with rodent control strategies should be implemented to restrain impending outbreaks during the rainy season.

Moreover, leptospirosis is not solely a problem of the health sector alone. A multisectoral approach is needed in order to address this public health problem. Different government, non-government and civil society organizations must work together by means of sharing their expertise and in mobilizing their human, material and financial resources in order to address this neglected public health problem.

Since this study is purely quantitative in nature, there may be a need to use qualitative methods in future research endeavors in order to uncover other reasons for not practicing the recommended preventive and control measures against leptospirosis. In this way, interventions can target the specific predisposing, reinforcing or enabling factors which hopefully would lead to practicing the recommended behaviors. There is also a need to produce health communication materials which can be used by the residents in order for them to obtain relevant information on the prevention and control of leptospirosis. These materials can also be used by the health workers in the community education sessions and can also be placed in health facilities where most of the respondents go to obtain information on leptospirosis.

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#### References

1. Center for Disease Control. Leptospirosis [Online]. 2013 [cited 2014 Apr]. Available from <http://www.cdc.gov/leptospirosis/index.html>.
2. World Health Organization. Zoonoses – Leptospirosis [Online]. 2013 [cited 2014 Apr]. Available from <http://www.who.int/zoonoses/diseases/leptospirosis/en/>.
3. World Health Organization. The Global Burden of Leptospirosis [Online]. [cited 2014 Apr]. Available from <http://www.who.int/zoonoses/diseases/lerg/en/index2.html>.
4. Philippine College of Chest Physicians, Philippine Society of Microbiology and Infectious Diseases, Philippine Society of Nephrology. Guidelines on the Diagnosis, Management and Prevention of Leptospirosis [Online]. 2010 [cited 2012 Feb]. Available from <http://philchest.org/v3/wp-content/uploads/2013/05/Leptospirosis-CPG-2010.pdf>.
5. Department of Health. Disease Surveillance Report [Online]. 2012 [cited 2012 February]. Available from <http://www.doh.gov.ph/sites/default/files/2012lepto33WMR.pdf>.
6. World Health Organization. (2003). Human Leptospirosis: Guidance for Diagnosis, Surveillance and Control [Online]. 2003 [cited 2012 Feb]. Available from [http://whqlibdoc.who.int/hq/2003/WHO\\_CDS\\_CSR\\_EPH\\_2002.23.pdf](http://whqlibdoc.who.int/hq/2003/WHO_CDS_CSR_EPH_2002.23.pdf).
7. Pan American Health Organization. Leptospirosis-Fact Sheet [Online]. 2014 [cited 2014 Apr]. Available from [http://www.paho.org/hq/index.php?option=com\\_content&view=article&id=7821&Itemid=39696&lang=en&limitstart=1](http://www.paho.org/hq/index.php?option=com_content&view=article&id=7821&Itemid=39696&lang=en&limitstart=1).
8. World Health Organization Western Pacific Region. Factsheets: Leptospirosis [Online]. 2012 [cited 2014 Apr]. Available from [http://www.wpro.who.int/mediacentre/factsheets/fs\\_13082012\\_leptospirosis/en/](http://www.wpro.who.int/mediacentre/factsheets/fs_13082012_leptospirosis/en/).
9. College of Public Health. Prevention and Control of Leptospirosis in the Philippines [Online]. 2013 [cited 2014 Apr]. Available from <http://cph.upm.edu.ph/?q=node/234>.
10. University of Michigan School of Public Health. Cross Sectional Study/Prevalence Study [Online]. 2010 [cited 2014 Apr]. Available from [http://practice.sph.umich.edu/micphp/epicentral/cross\\_sectional.php](http://practice.sph.umich.edu/micphp/epicentral/cross_sectional.php).
11. Mendoza OM, Borja MP, Sevilla TL, et al. Foundations of Statistical Analysis for the Health Sciences. Department of Epidemiology and Biostatistics, College of Public Health, University of the Philippines Manila. Republic of the Philippines. 2007.
12. National Nutrition Council. NCR Profile [Online]. [cited 2014 Apr]. Available from <http://www.nnc.gov.ph/regional-offices/national-capital-region/57-region-ncr-profile/244-ncr-profile>.
13. Department of Health. The Surge of Leptospirosis [Online]. 2012 [cited 2014 July]. Available from <http://www.doh.gov.ph/content/surge-leptospirosis.html>.
14. Center for Disease and Control and Prevention. Leptospirosis Signs and Symptoms [Online]. 2011 [cited 2014 Apr]. Available from <http://www.cdc.gov/leptospirosis/symptoms/>.
15. Kawaguchi L, Sengkeopraseuth B, Tsuyuoka R, et al. Seroprevalence of leptospirosis and risk factor analysis in flood-prone rural areas in Lao PDR. *Am J Trop Med Hyg.* 2008; 78(6):957-61.
16. Bhardwaj P, Kosambiya JK, Desai VK. A case control study to explore the risk factors for acquisition of leptospirosis in Surat city, after flood. *Indian J Med Sci.* 2008; 62(11):431-8.
17. Victoriano AF, Smythe LD, Gloriani-Barzaga N, et al. Leptospirosis in the Asia Pacific region. *BMC Infect Dis.* 2009; 9:147.
18. Keenan J, Ervin G, Aung M, McGwin G Jr., Jolly P. Risk factors for clinical leptospirosis from Western Jamaica. *Am J Trop Med Hyg.* 2010; 83(3):633-6.
19. Navegantes de Araújo W, Finkmoore B, Ribeiro GS, et al. Knowledge, attitudes, and practices related to leptospirosis among urban slum residents in Brazil. *Am J Trop Med Hyg.* 2013; 88(2):359-63.
20. Sallis JF, Owen N, Fisher EB. Ecological models of health behavior. In: Glanz K, Rimer BK, Viswanath K, eds. *Health behavior and health education: Theory, research, and practice*, 4<sup>th</sup> ed. San Francisco, Ca: Jossey Bass; 2008. pp. 465-486.
21. Unite for Sight. Health Communication Course: Module 5- The Role of Media in Health Promotion [Online]. [cited 2014 Apr]. Available from <http://www.uniteforsight.org/health-communication-course/module5>.