

CAPABILITY OF NURSES ON THE PREVENTION AND CONTROL OF LEPTOSPIROSIS IN MANILA, PHILIPPINES

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Abstract. This study described the nurses' current knowledge and perceived relevance and capability in performing skills related to the prevention and control of leptospirosis in the City of Manila, Philippines, utilizing cross-sectional descriptive design. A total of 103 nurses working at the barangay health centers participated in the study. The results showed that nurses had a mean score of 72% in the knowledge part of the assessment, indicating good knowledge on leptospirosis and high-perceived relevance and capability in the performance of the skills except in the collection of samples from contaminated environments. The nurses' perceived capability to perform the skills is slightly lower than the perceived relevance of the skills. An educational program reorienting the nurses on leptospirosis control and treatment guidelines particularly the administration of antibiotic prophylaxis, and a training program in collecting environmental samples is recommended to address the nurses' low perceived capability in these particular areas.

Keywords: assessment, capability, leptospirosis, nurses, prevention and control, Philippines

INTRODUCTION

Leptospirosis is a zoonotic disease endemic in the Philippines (Amilasan *et al*, 2009). Aside from being an occupational hazard, leptospirosis cases occur due to widespread rains and flooding caused by storms and monsoon that occur seasonally.

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After Typhoon Ketsana (Local name Typhoon Ondoy) in 2009, a sudden increase in leptospirosis cases in the National Capital Region (NCR) was observed. Most of the cases reside in the Cities of Manila, Marikina, Caloocan, Malabon, Navotas, and Valenzuela (CAMANAVA) area (Cavinta *et al*, 2011, unpublished research). In 2012, monsoon winds or *habagat* caused massive flooding in the National Capital Region (NCR). The *habagat* incident resulted to cases, with a case fatality rate of 3.78% in Manila (DOH, 2013). Manila

was the city with the highest number of leptospirosis cases in 2012.

The term *barangay* refers to a village and represents the lowest geopolitical subdivision in the Philippines. In the Philippine setting, rural health units and barangay health centers are the primary healthcare units responsible for delivering quality healthcare services to the public (Grundy *et al*, 2003). These health facilities are manned by physicians, midwives, nurses, and barangay health workers. As a primary health care worker, a public health nurse has an important role in preventing and controlling leptospirosis in the community. Based on Department of Health (DOH) treatment protocols, nurses must be knowledgeable (particularly during emergencies and disasters) on the general signs and symptoms of leptospirosis, modes of transmission, warning signs, local emergency measures, and referral for the hospital management of the cases (DOH-Health Emergency Management Staff, 2013). In addition, the World Health Organization (WHO) Regional Health Office for South-East Asia, identified the skills nurses must possess in order to prevent and control leptospirosis, which include: health teaching, case reporting, administration of chemoprophylaxis and investigation of contacts and sources of the infection (WHO-SEARO, 2010).

As there have been no studies assessing the ability of nurses to combat leptospirosis, this serves as a baseline study to determine the current knowledge and skills of nurses on the prevention and control of leptospirosis. Specifically, this study described the: (a) profile of the nurses in terms of age and sex, (b) current knowledge on leptospirosis, and (c) perceived relevance and capability in performing skills related to the prevention and control of leptospirosis in the City of Manila.

MATERIALS AND METHODS

Study site and population

The study was implemented in the City of Manila, which is being serviced by the Manila Health Department (MHD) as the working arm of the city in delivering primary health care services (Ballesteros, 2011), due to the high incidence of leptospirosis. The study population included the staff nurses currently working in the barangay health centers of the City, who have had at least 1 year of service as public health nurse, based in one of the health centers as regular staff, and available and willing to participate at the time of data collection. Those who did not meet the criteria or did not give their consent to participate were excluded from the study.

Study design and sampling method

The study utilized the cross-sectional descriptive design (Barrat and Kirwan, 2009) and used a quantitative method of data collection. The sampling units were the nurses working at the health centers in the six districts of Manila. The sample size computed for the study was 103 from a total of 150 nurses from the barangay health centers in six health districts in the city of Manila. The study employed proportionate stratified random sampling technique to ensure that all nurses were represented in the study.

Using the available data on the current population of community nurses in each district, the proportionate sample size per stratum was 68.7%. This computed proportionate sample (68.7%) was selected from the population of nurses on each of the six districts as shown in Table 1. When a selected nurse refused to participate, withdrew from participation or did not meet a specific inclusion criterion, a substitute participant was randomly selected again from the original sampling

Table 1
Sample size per stratum in the City of Manila.

| District | Number of nurses | Sample size = 68.7%, <i>n</i> |
|----------|------------------|-------------------------------|
| 1 | 31 | 21 |
| 2 | 17 | 12 |
| 3 | 20 | 14 |
| 4 | 25 | 17 |
| 5 | 31 | 21 |
| 6 | 26 | 18 |
| Total | 150 | 103 |

frame of the same district until the target sample size for each district (stratum) was reached.

Data collection

The research team coordinated with the Manila Health Department for the implementation of the study. Approval and endorsement of the study were sought from the Manila Health Department before data collection, and a list of all the nurses working in each district of the City of Manila was obtained for the random participant selection. Prior to actual data gathering, data collectors were oriented again on the study protocol. After the respondents were selected from each district, the research team approached the health centers where the selected nurses were working. During participant recruitment, informed consent was obtained after making sure that participants have completely understood the details relayed by the researcher through a recruitment script.

After obtaining consent, the pretested questionnaire was administered to the participants with guidance from the data collectors. The questionnaire is divided into 3 sections. The first section (Section A. Demographic Profile) included the demo-

graphic information (age and sex) of the respondents. The second section (Section B. Knowledge) assessed the knowledge of the participants on leptospirosis prevention and control using multiple choice type of questions. There were 15 items covering knowledge specifically on etiology and symptoms (5 items); transmission and risk factors (4 items); antibiotic prophylaxis (3 items); and control interventions and case reporting (3 items).

The questions were formulated based on standard guidelines gathered from the World Health Organization, Centers for Disease Control and Prevention, Department of Health of the Philippines and other relevant literature. The last section (Section C. Skills) which is divided into two sub-sections (1 Perceived relevance of skills and 2 Perceived capability in performing the skills) dealt with the skills of the participants in relation to the prevention and control of leptospirosis and it is composed of 20 items.

For the perceived relevance of the skills (composed of 10 items), the respondents were instructed to rate themselves if the skills listed were relevant to their work on the prevention and control of leptospirosis in their community. Rating scheme of 1-4, where 1 means 'no relevance,' 2 means 'low relevance,' 3 means 'high relevance,' and 4 means 'very high relevance' was used. For the perceived capability in performing the skills (composed of 10 items) the respondents were instructed to rate themselves on how capable they were in performing the listed skills. Rating scheme of 1-4, where 1 means 'no capability,' 2 means 'low capability,' 3 means 'high capability,' and 4 means 'very high capability' was used.

Data analysis

Encoding and analysis was done using

Epi Info Software. Measures of central tendency and dispersion (mean and standard deviation) were calculated from the scores obtained for each subtopic of items and for the total knowledge/skills assessment scores. For the knowledge, proportion and frequency counts of the participants who answered each item correctly was determined. On the perceived relevance of the skills and perceived capability in performing the skills, proportion and frequency counts of each rating (no relevance/capability, low, high, excellent) given by the participants for each item was measured.

Ethical approval

Prior to data collection, the study proposal went through the technical approval from the College of Public Health, University of the Philippines Manila and research ethics board approval from the University of the Philippines Manila - Research Ethics Board (UPMREB). The study protocol (UPMREB 2014-309-01; 2014 Oct 13) was reviewed and granted approval for implementation.

RESULTS

Demographic profile

The mean age of the nurses working in the barangay health centers of Manila is 41.13 years old, and majority (86.4%) of the participants is female.

Knowledge on leptospirosis

The mean total score of the nurses in the knowledge assessment is 10.85 out of 15 items, or 72%. It is shown in Table 2 that majority of the questions have been answered correctly by the respondents. The items that received the highest number of correct answers are about the usual collected clinical samples for laboratory test in leptospirosis (98.1%), the identi-

fication of risk groups (95.1%) and the proper immediate action for severe cases of leptospirosis (89.3%). However, there were 2 items that were answered correctly by only less than 20% of the total number of respondents (14.6-17.5%). Only 18 respondents (17.5%) were able to answer the question about the treatment drug of choice for severe cases of leptospirosis correctly (Item number 10) while only 15 respondents (14.6%) correctly answered the control intervention at the infection source (Item number 14).

Although they are very much familiar with the control interventions that interrupt transmission of leptospirosis such as wearing protective clothing and avoiding contact with potentially contaminated environment, it was observed that they are having difficulty in classifying an intervention whether it directly interrupts the transmission or control the sources of leptospirosis infection, and they cannot fully differentiate these two concepts from each other.

There were three other items that scored lower than the mean total score of the participants. Item number 11 which was another treatment-related question was answered correctly by only half (50%) of the participants. It assesses the knowledge of the nurses on the dosage of post-exposure prophylaxis for non-pregnant, non-lactating adults. The transmission and risk factor questions regarding animal hosts (Item number 7) and risk exposure levels (Item number 9) were correctly answered by 59.2% and 69.9% of the nurses, respectively. The former assessed the understanding of nurses on animals that can potentially transmit the disease to humans, while the latter focused on the nurses' comprehension and ability in classifying exposures based on their risk level, which is important in determining

Table 2
Proportion of correct answers of nurses regarding knowledge on the prevention and control of leptospirosis.

| Items | Frequency of correct answers | % correct (95% CI) |
|--|------------------------------|--------------------|
| Etiologic agent | 87 | 84.5 (77.5-91.5) |
| Common symptoms | 89 | 86.4 (79.8-93) |
| Warning signs | 88 | 85.4 (78.6-92.3) |
| Usual collected clinical samples for laboratory test | 101 | 98.1 (95.4-100) |
| Immediate action for severe case | 92 | 89.3 (83.4-95.3) |
| Modes of transmission | 87 | 84.5 (77.5-91.5) |
| Animal hosts | 61 | 59.2 (49.7-68.7) |
| Risk groups | 98 | 95.1 (91-99.3) |
| Levels of risk exposure | 72 | 69.9 (61.1-78.8) |
| Treatment drug of choice for severe case | 18 | 17.5 (10.12-4.8) |
| Recommended dosage of prophylaxis | 51 | 49.5 (39.9-59.2) |
| Precautions in antibiotic prophylaxis intake | 91 | 88.3 (82.2-94.6) |
| Control intervention (interrupting transmission) | 84 | 81.6 (74.1-89) |
| Control intervention (controlling the source) | 15 | 14.6 (7.8-21.4) |
| Case reporting | 84 | 81.6 (74.1-89) |

the post-exposure prophylaxis that will be given to the patient.

Perceived relevance and capability regarding skills on the prevention and control of leptospirosis

On the perceived level of relevance of skills, the overall mean rating given by the respondents to the skills presented is 3.4 or equivalent to high relevance. Table 3 shows that majority of the assessment, as well as health promotion and education skills were given a rating of very high relevance (Level 3). Only the skill of collecting water samples of suspected contaminated water bodies got a low mean rating which is 2.2 or equivalent to low relevance.

On the perceived level of capability in performing the skills, the overall mean rating given by the participants is 3, which is equivalent to high capability. Majority of the skills are given a rating of high capa-

bility (Level 3). Only the skill of collecting water samples from suspected contaminated water bodies got a low mean rating which is 1.9, equivalent to low capability. One third of the respondents have rated this as not applicable (NA), which means that they find this skill unnecessary. Table 4 summarizes the nurses' perceived level of capability in performing the skills related to the prevention and control of leptospirosis.

Table 5 summarizes the respondents' perception of the skills' relevance and their capability in performing these skills. It is shown that in all items, their perceived levels of capability in performing the various skills is related to, but lower than their perceived relevance of these skills.

DISCUSSION

In the knowledge assessment, the mean total score of the nurses is 10.85 out of 15 items, or 72%. Generally, this is

Table 3
Nurses' perceived level of relevance of various skills on the prevention and control of leptospirosis.

| Items | Perceived level of relevance <i>n</i> (%) | | | | Mean rating | Verbal interpretation |
|---|--|-----------|------------|----------------|----------------|--------------------------|
| | 1 No relevance | 2 Low | 3 High | 4 Very high | | |
| Identification of high risk groups | 1 (1.0%) | 5 (4.9%) | 36 (35%) | 60 (58.3%) | 3.5 | Very high relevance |
| Assessment of signs and symptoms of leptospirosis | 0 (0%) | 1 (1%) | 27 (26.2%) | 74 (71.8%) | 3.7 | Very high relevance |
| Identification of possible contaminated water sources/bodies | 0 (0%) | 9 (8.7%) | 31 (30.1%) | 55 (53.4%) | 3.2 | High relevance |
| Collection of water samples of suspected contaminated water sources/bodies | 6 (5.8%) | 10 (9.7%) | 29 (28.2%) | 29 (28.2%) | 2.2 | Low relevance |
| Development of health communication materials on the prevention and control of leptospirosis | 1 (1.0%) | 2 (1.9%) | 34 (33.0%) | 63 (61.2%) | 3.5 | Very high relevance |
| Pretesting of health communication materials | 3 (2.9%) | 8 (7.8%) | 47 (45.6%) | 42 (40.8%) | 3.2 | High relevance |
| Conducting information dissemination campaign (through house-to-house visits) in the community on the prevention and control of leptospirosis | 1 (1.0%) | 5 (4.9%) | 33 (32.0%) | 64 (62.1%) | 3.6 | Very high relevance |
| Conducting community education sessions on ways to prevent and control leptospirosis | 0 (0%) | 2 (1.9%) | 26 (25.2%) | 75 (72.8%) | 3.7 | Very high relevance |
| Organizing community in the implementation of prevention and control measures | 0 (0%) | 4 (3.9%) | 32 (31.1%) | 66 (64.1%) | 3.6 | Very high relevance |
| Development of health promotion and education plan for the prevention and control of leptospirosis | 0 (0%) | 3 (2.9%) | 34 (33.0%) | 65 (63.1%) | 3.6 | Very high relevance |
| Overall mean rating | | | | | 3.4 | High relevance |

equivalent to good knowledge on leptospirosis. However, there were five items that were answered correctly by less than 70% of the nurses. Two of the said items were correctly answered by even less than 20% of the nurses.

Leptospire can be carried by a number of animal hosts. In this research, one of the questions was about identifying animal hosts that can transmit leptospirosis to humans (7th question). Only 61 out of 103 nurses (59.2%; 95% CI: 49.7-68.7) knew that rodents, pigs and dogs are reservoir/potential reservoir for leptospiral infection while fishes and snails are not (ILS-WHO, 2003). Small mammal species such as rodents, and domestic animals are important sources of human infection while fur-bearing animals bred in captivity, amphibians and reptiles are possible carriers of leptospire as well (ILS-WHO, 2003; Bisen and Raghuvanshi, 2013).

Most of the health workers in the City of Manila knew that infected rodents are the animal hosts of the disease but were not aware that other animals can also be infected and can transmit the disease. This is an area that should be given attention by health workers in their health campaigns. Information, education and communication campaigns must include a segment that lets people be aware of the animal species that are known to cause leptospirosis.

Exposure to leptospire can be classified into three levels, and the type of post-exposure prophylaxis is dependent on the level of exposure of the human host. One of the questions aimed to discover the capability of nurses to categorize an exposure under the three levels (9th question), and 72 out of 103 nurses (69.9%; 95% CI: 61.1 - 78.8) were successful in classifying "continuous exposure to flood or contaminated environment regardless of the pre-

sence or absence of wounds" as a high-risk exposure. The Philippine Clinical Practice Guidelines on the Diagnosis, Treatment and Prevention of Leptospirosis in Adults (2010) also stated that single exposure to flood or contaminated environment is classified to be of low or moderate risk depending on the presence of wounds/cuts in the skin (The Leptospirosis Task Force, 2010).

There are a number of choices of antibiotics that can be used to treat leptospirosis depending on its severity. For the question in identifying the treatment drug of choice for severe leptospirosis (10th question), less than 20% of the nurses, specifically 18 out of 103 nurses (17.5%; 95% CI: 10.1 - 24.8) got the correct answer. Most of the nurses answered that "Doxycycline" instead of "Penicillin G" is the drug of choice for treatment of severe leptospirosis.

This confusion may have occurred because they are more familiar with using doxycycline as prophylaxis when their patients are exposed to leptospirosis. In the Philippine Clinical Practice Guidelines on the Diagnosis, Treatment and Prevention of Leptospirosis in Adults (2010), it was stated that doxycycline is the drug of choice for treatment of mild leptospirosis, and also used for pre- and post-exposure prophylaxis regardless of the level of risk of exposure while penicillin G is the drug of choice for treatment of moderate to severe leptospirosis (Leptospirosis Task Force, 2010).

Knowledge on the drug of choice is important because more often than not, patients come to health centers only when they are already in the moderate to severe stage of the disease. Even though they do not administer penicillin G, the nurses must know that in these situations, penicillin G is the antibiotic of choice to treat

Table 4
Nurse perceived levels of capability in performing various skills on the prevention and control of leptospirosis.

| Items | Perceived level of capability in performing <i>n</i> (%) | | | | Mean rating | Verbal interpretation |
|---|---|------------|------------|----------------|----------------|--------------------------|
| | 1 No capability | 2 Low | 3 High | 4 Very high | | |
| Identification of high risk groups | 1 (1.0%) | 10 (9.7%) | 61 (59.2%) | 31 (30.1%) | 3.2 | High capability |
| Assessment of signs and symptoms of leptospirosis | 0 (0%) | 7 (6.8%) | 62 (60.2%) | 34 (33.0%) | 3.3 | High capability |
| Identification of possible contaminated water sources/bodies | 3 (2.9%) | 21 (20.4%) | 43 (41.7%) | 26 (25.2%) | 2.7 | High capability |
| Collection of water samples of suspected contaminated water sources/bodies | 4 (3.9%) | 22 (21.4%) | 30 (29.1%) | 14 (13.6%) | 1.9 | Low capability |
| Development of health communication materials on the prevention and control of leptospirosis | 1 (1.0%) | 17 (16.5%) | 55 (53.4%) | 27 (26.2%) | 3.0 | High capability |
| Pretesting of health communication materials | 3 (2.9%) | 18 (17.5%) | 57 (55.3%) | 20 (19.4%) | 2.8 | High capability |
| Conducting information dissemination campaign (through house to house visits) in the community on the prevention and control of leptospirosis | 0 (0%) | 8 (7.8%) | 53 (51.5%) | 41 (39.8%) | 3.3 | High capability |
| Conducting community education sessions on ways to prevent and control leptospirosis | 0 (0%) | 6 (5.8%) | 52 (50.5%) | 44 (42.7%) | 3.3 | High capability |
| Organizing community in the implementation of prevention and control measures | 0 (0%) | 9 (8.7%) | 54 (52.4%) | 38 (36.9%) | 3.2 | High capability |
| Development of health promotion and education plan for the prevention and control of leptospirosis | 0 (0%) | 11 (10.7%) | 55 (53.4%) | 34 (33.0%) | 3.1 | High capability |
| Overall mean rating | | | | | 3.0 | High capability |

Table 5
Summary of mean ratings: perceived relevance of the skills and capability in performing the skills.

| Skills | Perceived relevance | | Perceived capability in performing | |
|---|---------------------|---------------------|------------------------------------|-----------------|
| | Mean rating | Interpretation | Mean rating | Interpretation |
| Identification of high risk groups | 3.5 | Very high relevance | 3.2 | High capability |
| Assessment of signs and symptoms of leptospirosis | 3.7 | Very high relevance | 3.3 | High capability |
| Identification of possible contaminated water sources/bodies | 3.2 | High relevance | 2.7 | High capability |
| Collection of water samples of suspected contaminated water sources/bodies | 2.2 | Low relevance | 1.9 | Low capability |
| Development of health communication materials on the prevention and control of leptospirosis | 3.5 | Very high relevance | 3.0 | High capability |
| Prefesting of health communication materials | 3.2 | High relevance | 2.8 | High capability |
| Conducting information dissemination campaign (through house to house visits) in the community on the prevention and control of leptospirosis | 3.6 | Very high relevance | 3.3 | High capability |
| Conducting community education sessions on ways to prevent and control leptospirosis | 3.7 | Very high relevance | 3.3 | High capability |
| Organizing community in the implementation of prevention and control measures | 3.6 | Very high relevance | 3.2 | High capability |
| Development of health promotion and education plan for the prevention and control of leptospirosis | 3.6 | Very high relevance | 3.1 | High capability |
| Mean rating | 3.4 | High relevance | 3.0 | High capability |

leptospirosis and doxycycline cannot be a substitute for it.

Although administration of prophylaxis does not always prevent infection, it can reduce the severity of a disease (ILS and WHO, 2003). Pre-exposure prophylaxis may be given when a person will be travelling to a leptospirosis endemic area or when the individual will be experiencing an event belonging to the high risk exposure category. The questionnaire determined the number of nurses who knew the dosage of pre-exposure prophylaxis administered to an average adult (11th question), and found out that around half of the respondents, or 51 out of 103 nurses (49.5%, 95% CI: 39.9-59.2) answered the question correctly.

Only a few nurses might have known that 200 mg of doxycycline weekly is the recommended pre-exposure prophylaxis for non-pregnant, non-lactating adults (Leptospirosis Task Force, 2010). This is likely because pre-exposure prophylaxis is not routinely done in the Philippines. Instead, the public health nurses always advise that the most effective preventive measure against leptospirosis is avoidance of exposure.

Measures against acquiring leptospirosis fall into three general categories: controlling the source, interrupting transmission and protecting the human host (ILS-WHO, 2003). Although they easily identified measures that prevent the transmission of the disease (13th question), the nurses had difficulty in identifying control measures against leptospirosis (14th question). Only 15 of 103 nurses (14.6%; 95% CI: 7.8-21.4) were able to distinguish the single leptospirosis prevention measure among the leptospirosis control strategies given in the choices.

The International Leptospirosis Soci-

ety and World Health Organization (2003) stated that animal and rodent control, animal vaccination, and environmental sanitation are intervention at the source, while wearing protective clothing, using waterproof dressings on wounds are interventions at the transmission route. The World Health Organization also added that animal control may be done through a culling program and can be combined with the strategies mentioned previously (WHO, 2013). Knowledge on prevention and control can affect the way nurses communicate the measures of preventing leptospirosis in the community.

The overall knowledge of the nurses on leptospirosis is important because based on their perceived relevance of skills; the participants rated most of the assessment and health promotion and education skills as very highly relevant to their occupation. The high level of knowledge especially on signs and symptoms, high risk groups and possible sources of infection were also evident when the respondents rated themselves as highly capable in performing skills in assessing signs and symptoms of leptospirosis, in identifying high risk groups and in identifying possible contaminated water sources/bodies.

However, the collection of samples from suspected contaminated environments was found to be irrelevant by the respondents to their occupation. This specific skill is being performed by the sanitary inspectors in the Manila Health Department and not by the public health nurses. Likewise, in their perceived capability, the nurses also assessed themselves as having low capability in collecting water samples, while they rated themselves as highly capable in performing the other skills.

It can be seen in Table 5 that the perceived capability of nurses is related to

their perceived relevance of the skill, such that they believe they perform the skills better if they perceive that these skills are relevant to their occupation. However, the nurses seem to believe that their performance still has to be improved as evidenced by their slightly lower ratings of their perceived capability in performing the skills, compared to perceived relevance of the skills to their profession as public health nurses.

This study had some limitations. Only the perceived skills, not the actual skills of the nurses, were assessed. Measurement of the actual skills of the nurses could not be made because this entails observation during actual application on appropriate situations/settings and it would be too rigorous and too time consuming. This assessment of the perceived capability in performing the skills may contribute to information bias due to possible implication of Hawthorne effect (when the participants answered the questionnaires administered such that they may want to appear to be performing the best skills needed for leptospirosis prevention and control). The investigators minimized the bias by explaining to the participants the value of their honesty in answering the questions since the results may be a source of data in developing capability building activities in leptospirosis prevention and control for health care providers.

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REFERENCES

- Amilasan AT, Ujiie M, Suzuki M, *et al.* Outbreak of leptospirosis after flood, the Philippines, 2009. *Emerg Infect Dis* 2012; 18: 91-4.
- Ballesteros J. Manila Health Department profile. Manila: Manila Health Department, 2011 Jan 30. [Cited 2014 Dec 20]. Available from: <http://www.scribd.com/doc/47812471/MANILA-HEALTH-DEPARTMENT-profile#scribd>
- Barratt H, Kirwan M. Cross-sectional studies [Internet]. Bucks: Health knowledge, 2009. [Cited 2015 Feb 23]. Available from: <http://www.healthknowledge.org.uk/public-health-textbook/research-methods/1a-epidemiology/cs-as-is/cross-sectional-studies>
- Bisen PS, Raghuvanshi R. Leptospirosis. Ch 7. In: Emerging epidemics: management and control. Hoboken: John Wiley, 2013: 179.
- Department of Health (DOH), National Epidemiology Center. Disease surveillance report. Morbidity Week 36th, Sept 1-7, 2013. Leptospirosis reports. Manila: DOH, 2013: 4 pp. [Cited 2014 Dec 28]. Available from: <http://www.doh.gov.ph/sites/default/files/statistics/leptoup36.pdf>
- Department of Health-Health Emergency Management Staff. Manual on treatment protocols of common communicable diseases and other ailments during emergencies and disasters. 2nd ed. Manila: Department of Health, 2013.
- Grundy J, Healy V, Gorgolon L, Sandig E. Overview of devolution of health services in the Philippines. *Rural Remote Health* 2003 Jul-Sep; 3: 220.
- International Leptospirosis Society (ILS)-World Health Organization (WHO). Human leptospirosis: guidance for diagnosis, surveillance and control. Malta: World Health Organization, 2003: 109 pp.
- Leptospirosis Task Force. The Philippine clini-

cal practice guidelines on the diagnosis, treatment and prevention of leptospirosis in adults, 2010. Quezon City: Philippine Society for Microbiology and Infectious Diseases, 2010.

World Health Organization Regional Office for South-East Asia (WHO SEARO). A framework for community health nursing education. Manila: WHO SEARO, 2010:

47. [Cited 2014 Dec 28]. Available from: http://apps.searo.who.int/PDS_DOCS/B4816.pdf?ua=1

World Health Organization (WHO). Zoonoses and veterinary public health problem: leptospirosis. Geneva: WHO, 2013. [Cited 2015 Mar 14]. Available from: <http://www.who.int/zoonoses/diseases/leptospirosis/en/>