Volume 2 (3), 2014, Page-246-254
e-ISSN: 2348-6465

Pharma Health Sciences

International Journal of Pharma Research and Health Sciences

Available online at www.pharmahealthsciences.net

Original Article

Knowledge, Attitude and Practice towards Leptospirosis among municipal workers in Tiruchirapalli, India

Prabhu N [1 *], Meera J [1], Bharanidharan G [1], Natarajaseenivasan K [2], Ismail M [1], Uma A [1]

[1] Department of Microbiology, Chennai Medical College Hospital and Research Centre (SRM Group), Tiruchirapalli – 621105, Tamilnadu, India

[2] Department of Microbiology, School of Life Sciences, Bharathidasan University, Tiruchirapalli – 620 014, Tamilnadu, India.

ARTICLE INFO

Received: 23 May 2014
Accepted: 27 June 2014

ABSTRACT

A cross sectional study was conducted to assess the knowledge, attitude and practice (KAP) on leptospirosis among 106 municipal workers in Tiruchirapalli, Tamilnadu. Workers were interviewed using a validated questionnaire consist of demographic data, knowledge, attitude and practice questions. The collected data were statistically analyzed using SPSS version 12.0.1 software. All respondents were municipal workers with the mean age of 42.1 (SD 8.38) years old. The mean duration of employment was 15.6 (SD 8.62) years. Majority of workers had poor knowledge (87.2%) and unsatisfactory practice score (64.5%); but showed, 64.9% of satisfactory attitude score. In conclusion, known weakness was noted in knowledge as well as in practice level. The findings of this study recommend that health promotion for municipal workers could be improved and necessitate for further and unique consideration.

Keywords: Municipal workers, leptospirosis, knowledge, attitude, practice

1. INTRODUCTION

Leptospirosis is the most widespread re-emerging zoonotic disease in the world, particularly in tropical and subtropical regions where climatic conditions provide an optimal environment to support the survivability of leptospires. The disease presents as mild febrile illness and subsides without complications in the majority of patients. Transmission of leptospires

Corresponding author *

Dr. N. Prabhu, Department of Microbiology, Chennai Medical College Hospital and Research Centre (SRM Group), Tiruchirapalli – 621105, Tamilnadu, India. E Mail: leptoprabhu@gmail.com

© International Journal of Pharma Research and Health Sciences. All rights reserved

may follow direct contact with urine, blood and tissue form an infected animal or exposure to a contaminated environment during occupational or recreational use . [1,2,3] According to World Health Organization from their currently available reports, the incidence of leptospirosis ranges from 0.1 to1 per 1,00,000 per year in temperate climates and 10–100 per 1,00,000 in the humid tropics. The incidence may reach over 100 per 1,00,000 in high-exposure risk groups and during outbreaks[4,5]. A number of leptospirosis outbreaks have been reported in the last few years in various countries including India. In spite of this, leptospirosis remains a grossly neglected disease and suffers for unawareness. Most cases, this disease is not considered by the clinician; even they are not suspected. [6]

Human leptospirosis is endemic infection in India and it has great potential for outbreaks to occur, so the disease surveillance as well as awareness programs should be stepped up and sustained. It has a considerable public health and economic impact, primarily, an occupational disease affecting many labourers including farmers, field workers, municipal workers, fishermen, sugarcane cutters etc.[7,8] Municipal workers were chosen as a study population because they pose risk for leptospiral infection in every step of the drainage cleaning as well as other risk oriented works related to animal contact. Some studies also reported that the prevalence of seropositive among municipal workers up to almost 18%. Surveys of knowledge, attitudes, and practices (KAP) are a common strategy for collecting information and to assess the safe work practice among populations at risk. [9]

The surveys also provide a suitable format to evaluate existing programs and to identify effective strategies for behavior change. Indeed, a good KAP among municipal workers at risk is essential in ensuring successful prevention and control of the disease. Unfortunately no research has been conducted so far in this area in India. This study presents the results of a study on KAP on leptospirosis among populations at risk of infection in Tiruchirapalli, India. The study will also provide a baseline data to assist policy makers in developing appropriate evidence based strategies to prevent and control leptospirosis in India.

2. MATERIALS AND METHODS

2.1 Study Design and Selection of Participants

A cross sectional study was conducted among municipal workers employed by Tiruchirapalli Corporation in January – March 2014. They were comprised of three main job categories namely garbage collector, drainage cleaner and septic tank cleaners. The objective was to assess their knowledge, attitude and practice on leptospirosis. Up to the study date, there is no health education program for municipal workers regarding the awareness of their risk and the related preventive measures that can be practiced in order to reduce the risk of infection. Sample size was calculated based on pilot study using a single mean formula. The largest and the most feasible sample size were determined from standard deviation (SD) of the practice score which was 8.6. With the precision of 1.0, the estimated sample size calculated was 120. With an anticipated 10% non-response rate, the total sample size required was 106.

The total list of municipal workers in the corporation was the sampling frame. We included selected area municipal workers in this study who had served continuously for at least six months so as to make sure that they were really engaged with work activities. However, permanent workers in the corporation area included and contract workers and those doing part time jobs elsewhere were excluded from this project. There were a total of 106 workers who met the inclusion and exclusion criteria for this research. In view of that, no sampling was carried out and all of

© International Journal of Pharma Research and Health Sciences. All rights reserved

them were taken as study subjects to meet the required sample size.

2.2 Questionnaire and Interview

The municipal workers were subjected to an interviewer guided questionnaire which probed into demographic data and information on knowledge, attitude and practice. It was designed to be completed within 20 minutes for an average participant. The language used was Tamil in which the mothers tongue of the municipal workers. Any technical terms were translated and explained by the interviewer. The interview was conducted by one of the researchers throughout to avoid the problem of inter-interviewer variations. A pilot study was conducted among 106 municipal workers in four major areas of Tiruchirapalli to validate the KAP questionnaire before the actual study was conducted.

The questionnaire was developed in stages which included literature search, discussion with experts and pre-testing the questionnaire to ensure good content validity. Sixty (60) final items were selected out of 123 constructed items which are need based and required for the survey analysis. Knowledge questions started asking whether the respondents had ever heard of leptospirosis and they were asked to specify the source of their information. Only those who had ever heard of the disease were allowed to proceed to answer the rest of knowledge questions which were designed to solicit correct, incorrect and don't know answers. 2 marks were given for a correct response, 1 mark for don't know and 0 mark for incorrect response.

There were 24 knowledge questions which covered causes, signs, symptoms, complications, treatment, prevention and risk factors of leptospirosis. There were a total of 12 questions on attitude which covered safe work practices, personal protective equipment (PPE) and general practices. Questions on attitude were designed to be answered using a Likert scale (strongly agree/ agree/ not sure/ not agree/ strongly not agree). For positive attitude items, scores of 4, 3, 2, 1, and 0 for strongly agree, agree, not sure, not agree and strongly not agree were given respectively. For negative attitude, the above scoring system was reversed. Ten (10) questions on practice were also designed to be answered using a Likert scale (never / seldom / sometimes / often / always). For good practice items, scores of 4, 3, 2, 1, and 0 for always, often, sometimes, seldom and never were given respectively. For bad practices items, the above scoring system was reversed. A total of 14 questions on preventive practices were asked containing questions on safe work practice, PPE and general practices.

2.3 Statistical analysis

Data was entered and analyzed using SPSS Version 12.0.1. All continuous variables were described using mean (SD) whereas the categorical data were presented as frequencies (%). The mean (SD) for each item of the KAP was also analyzed. The proportion of respondents who gave the correct answer for each item in the knowledge domain was expressed as a correct percentage. The proportions for positive attitude and good practice for each item of the KAP were also displayed. Those who answered strongly agree or agree for the attitude that they should have and disagree or strongly disagree for the attitude that they should not have are considered as having positive attitude.

The proportions for good practice include those who answered always or often for the practice that they should adopt and never or seldom for the practice that they should avoid. The scores for knowledge, attitude, and practice were transformed into percentage scores by dividing the scores obtained by the respondents with the possible maximum scores and multiplied by 100. The percentage score was used in the analysis rather than the raw score because it is easier to appreciate the level of scores in the scale of zero to 100. The

© International Journal of Pharma Research and Health Sciences. All rights reserved

categories of knowledge, attitude and practice scores were decided by consensus among the researchers. For the knowledge category, the participants who had never heard of leptospirosis are considered to have poor knowledge. Those who scored <72% are considered to have moderate knowledge and those who scored ≥72% are considered to have good knowledge.

The difference between moderate and good knowledge depends on the mean percentage of total knowledge score among those who had ever heard of the disease. Considering the maximum possible score of four points for each item in the attitude and practice domains, the total maximum scores for attitude and practice domain were 48 and 56 respectively. Allowing the minimum average of three points for each item, a total score of less than 36 (3 points x 12 items) out of 48 indicates unsatisfactory attitude while a total score of less than 42 (3 points x 14 items) out of 56 indicates unsatisfactory practice. If we convert them into percentages, a score from zero to <75% may be considered unsatisfactory whereas a score of ≥75 to 100% may be taken as satisfactory attitude and practice scores.

3. RESULTS AND DISCUSSION

3.1 Demographic characteristics

The response rate was 95.8%: 106 municipal workers out of the 120 eligible workers were recruited into the study because 14 workers refused to participate. All participants were native of Tiruchirapalli and working in this area for three generations with the mean age of 42.1 (SD 8.38) years old. The age ranges from 21 to 57 years old. Most of the respondents were married (90.5%). A majority of them had lower secondary school education and below (46.2%): no schooling (7.5%), primary school (33%) and upper secondary school education (13.3%). The mean duration of employment was 15.6 (SD 8.62) years with a range of 2.5 to 35.0 years.

3.2 Knowledge on leptospirosis

Study subjects answered a total of 24 questions about leptospirosis. A large majority of the participants had never heard about the disease leptospirosis. Thus they were considered to have poor knowledge (81.1%). Only 20 workers (18.9%) had ever heard of leptospirosis. Among them, 11 (55%) knew about it from television, 4 (20%) obtained the information from newspapers and 5 (25%) knew about the disease from both in television and newspapers. The mean percentage score for knowledge was 72.0 (SD 8.48). Based on that, 6.7% had good knowledge and 6.1% had moderate knowledge (Table 1). However, the analysis for each knowledge item was carried out only for those who had ever heard about leptospirosis (n=20). The mean score (SD) and the percentage (%) of correct answer for each items are displayed in Table 2.

Table 1: Category of knowledge, attitude and practice score among participants (n=106)

Category	Frequency
Knowledge	
Good (score ≥72%)	7 (6.6)
Moderate (score <72%)	13 (12.3)
Poor (never heard about leptospirosis)	86 (81.1)
Attitude	
Satisfactory (score ≥75%)	74 (69.8)
Unsatisfactory (score <75%)	32 (30.2)
Practice	
Satisfactory (score ≥75%)	45 (42.4)
Unsatisfactory (score <75%)	61 (57.6)

Figures in parentheses are in percentage

3.3 Attitudes towards leptospirosis

Regarding the attitudes towards leptospirosis, all participants obtained a mean percentage score of 76.8 (SD 10.96). The attitude towards leptospirosis was generally good as 69.8% of the participants had satisfactory attitude score and 30.2% had unsatisfactory score (Table 1). For each item on attitude, the majority of participants had positive attitudes. There were, however, 34 (32.1%) of the participants who showed some concern regarding

© International Journal of Pharma Research and Health Sciences. All rights reserved

following the universal safety precautions especially wearing footwears and 62 (58.4%) participants showed doubts about drinking while working. The detailed analysis of attitudes towards leptospirosis among municipal workers is described in Table 3.

Table 2: Knowledge with mean score (SD) and percentage of correct answers (n = 20)

Knowledge items	Mean (SD)	Correct answers in %
Causes		
Leptospirosis is caused by a microorganism	1.8 (0.37)*	17 (85)**
It is transmitting by animals	1.8 (0.46)	17 (85)
Leptospires can enter our body through cuts	1.6 (0.60)	13 (65)
Leptospires can enter our body through contaminated foods	1.7 (0.55)	16 (80)
It is a mosquito borne disease	0.8 (0.83)	5 (25)
Human to human infection is possible	1.3 (0.77)	9 (45)
Signs, Symptoms and Complications		
Patient may have fever and headache	1.6 (0.55)	13 (65)
Patient may have myalgia and arthralgia	1.3 (0.70)	9 (45)
Patient may have jaundice	0.9 (0.70)	4 (20)
Cause death	1.7 (0.53)	14 (70)
Cause cancer	0.9 (0.70)	4 (20)
Cause liver damage	1.4 (0.60)	9 (45)
Cause kidney failure	1.4 (0.59)	8 (40)
Cause ocular manifestations	1.2 (0.80)	8 (40)
Risk factors		
Handling animals in bare hands cause infection	1.2 (0.83)	9 (45)
Eating and drinking while working cause infection	1.1 (0.88)	9 (45)
Bare foot and bare hands are high risk	1.2 (0.89)	10 (50)
Municipal workers is consider as risk group	1.4 (0.79)	12 (60)
Therapy and prevention		
Blood investigation is better diagnostics	1.8 (0.41)	16 (80)
Easily treatable	1.9 (0.34)	18 (90)
Prevented by taking bath after working	1.5 (0.69)	12 (60)
Universal safety precautions may help to prevent the infection	1.9 (0.39)	19 (95)
Fever is the primary indicator of this disease; early diagnosis and prompt therapy reduce the mortality risk	1.5 (0.73)	12 (60)
Earliest disposal of dead animals including rodents may reduce the community risk	1.8 (0.49)	16 (80)

Figures in parentheses are in *standard deviation and **percentage

Table 3: Attitude with mean score (SD) and percentage (%) for positive attitude (n = 106)

Attitude items	Mean (SD)	Positive attitude in %
Safe work practice and personal protective measures		
Drinking while working is not a problem	2.8 (1.45)*	60 (56.6)**
Need safe work practice to get rid from disease	3.1 (0.64)	98 (92.4)
Gloving is important during work	3.0 (1.00)	90 (84.9)
Gloving during working is niggling	3.5 (0.97)	88 (83)
Gloving during working make work slower	3.6 (0.97)	92 (86.8)
Gloving during working make discomfort	3.3 (1.15)	85 (80.2)
Booting during working make discomfort	3.5 (1.04)	88 (83)
General practice (Off work)		
Knowing about the disease is interesting	3.1 (0.66)	97 (91.5)
Follow universal safety precaution is must	1.8 (1.27)	36 (33.9)
Make my environment free from rodents	2.8 (0.95)	94 (88.7)
Disposing the dead animals is important	3.6 (0.85)	97 (91.5)
Worry by walking through flood	2.9 (1.17)	76 (71.7)

Figures in parentheses are in *standard deviation and **percentage

Table 4: Practice with mean score (SD) and percentage (%) for good practice (n = 106)

Practice items	Mean (SD)	Correct answers in %
Safe work practice and create the infection free environment		
Eat while working	3.5 (0.75)*	94 (88.7)**
Drink while working	3.1 (1.06)	69 (65.1)
Smoke while working	3.4 (1.00)	85 (80.2)
Always insist my colleagues to follow proper working procedure	2.1 (1.31)	36 (33.9)
Encourage my colleagues to follow universal safety precautions	3.6 (0.75)	39 (36.8)
Insist myself and my colleagues for proper hand washing	2.2 (1.31)	48 (45.3)
Personal protective measures (PPE)		
Wearing gloves while working	1.9 (1.69)	38 (35.8)
Wearing boots while working	2.5 (1.50)	47 (44.3)
Wearing long sleeves shirt while working	3.7 (0.94)	91 (85.8)
Wearing mask while working	1.0 (1.55)	21 (19.8)
Verify the quality of the gloves before wearing	1.7 (1.72)	35 (33.0)
Hand washing with mild antiseptics	3.6 (0.97)	74 (69.8)

© International Journal of Pharma Research and Health Sciences. All rights reserved

General practice		
My environment is free from rats and rodents	2.8 (1.26)	60 (56.6)
Enter into the sewage without protection	2.5 (1.39)	54 (50.9)
Cover always the prepared foods	3.8 (0.55)	104 (98.1)
Looking after the cattles	3.6 (1.19)	94 (88.7)
Handling the dogs and cats in home	3.1 (1.48)	79 (74.5)

Figures in parentheses are in *standard deviation and **percentage

3.4 Practice regarding leptospirosis prevention

The mean percentage score on preventive practices against leptospirosis was 69.0 (SD 13.31). In contrast with attitude, 42.4% of the respondents showed satisfactory practice score while 57.6% showed unsatisfactory score (Table 1). The analysis for each item on practices showed that the use of PPE while the workers are in working was relatively poor: only 21 (19.8%) wore mask and mask like clothes and 12 (11.3%) wore rubber gloves while working. Table 4 shows the mean (SD) score for each item as well as the percentage of municipal workers who adopted good preventive practices on leptospirosis.

3.5 Relationship of job characteristics with knowledge, attitude and practice

There were no difference between knowledge, attitude and practice with education level, age, duration of employment and job category. Table 5 highlighted the significant difference between knowledge, attitude and practice level with job category.

In this investigation, there were a low percentage of participants who had ever heard about leptospirosis (18.9%). Of those who did, they heard about it from either the television or newspaper or both. This is probably due to the fact that the government as well as the media reported extensively on the recent outbreaks of the disease that were exposed to flood water. In contrast, a report on leptospirosis in Kelatan (2012) and in Queensland noted that 12.8% and 52% of leptospirosis cases have heard about the disease respectively. [4,10] Some of the participants clearly mentioned that they received the information through the posters and word of mouth. Similarly another study among the canoeist in North Wales, (1991) revealed a very high proportion (95%) of respondents who had ever heard of the disease because they were exposed to a good health promotion program. [11]

With disparity to our present investigation, such studies probably found a higher percentage of participants ever heard about the diseases because they were either carried out among leptospirosis cases or the subjects were exposed to systematic if not intensive information whereas our study was focused on asymptomatic subjects who were exposed to information on leptospirosis on ad hoc and voluntary basis. As like other studies, in our investigation also it was showed that the Tiruchirapalli is a weakest area of knowledge among those who had ever heard of leptospirosis. It must be noted here that there were workers who even obtained zero percent score. Indeed, without knowing the risk factors, it is very tough for the interviewers and community surveyors for giving the awareness about leptospirosis and expecting the workers to be aware of the disease and as a corollary it is almost impossible for them to be motivated to adopt good preventive work practices.

The knowledge received by the municipal workers on cause and treatment and prevention of leptospirosis was relatively better compared to risk factors. This may imply that the workers know that the disease is caused by a microorganism and it is related to rat's urine but they have little knowledge on the factors that contributed to the disease. The knowledge score on the signs, symptoms, and complication was also relatively very poor. Approximately 20% of the participants knew about the clinical manifestations. This fact indicates that the majority of people are not aware of the disease as most of the infected persons are asymptomatic. In addition to this, our participants were all asymptomatic and healthy during this interview.

© International Journal of Pharma Research and Health Sciences. All rights reserved

Table 5: Relationship of job category with knowledge, attitude and practice levels

Variables	Knowledge (n=20)					Attitude (n=106)					Practice (n=106)				
	Good		Poor		*p* value	*Satisfactory*		*Unsatisfactory*		*p* value	*Satisfactory*		*Unsatisfactory*		*p* value
	Mean SD	n (%)	Mean SD	n (%)		Mean SD	n (%)	Mean SD	n (%)		Mean SD	n (%)	Mean SD	n (%)	
Job Category															
Garbage collector	-	3 (15.0)	-	23 (26.7)	0.141[a]	-	17 (24.6)	-	8 (21.6)	0.006[a]	-	16 (42.1)	-	9 (13.2)	<0.01[a]
Drainage cleaner	-	13 (65.0)	-	28 (32.5)		-	28 (40.6)	-	14 (37.8)		-	15 (39.5)	-	22 (32.3)	
Septic tank cleaner	-	4 (20.0)	-	35 (33.0)		-	24 (34.8)	-	15 (40.5)		-	7 (18.4)	-	37 (54.4)	
Educational category															
Lower secondary school and below	-	12 (60.0)	-	58 (67.4)	0.189[a]	-	49 (71.0)	-	27 (72.9)	0.779[a]	-	26 (68.4)	-	53 (77.9)	0.378[a]
Upper secondary school and above	-	8 (20.0)	-	28 (32.6)		-	20 (29.0)	-	10 (27.1)		-	12 (31.6)	-	15 (22.1)	
Age	41.7 (7.58)	-	42.2 (8.50)	-	0.759[b]	41.6 (8.35)	-	42.9 (8.39)	-	0.199[b]	41.4 (8.54)	-	42.5 (8.29)	-	0.293[b]
Duration of employment	15.7 (8.92)	-	15.6 (8.59)	-	0.935[b]	15.2 (8.66)	-	16.3 (8.55)	-	0.325[b]	16.2 (8.67)	-	15.3 (8.60)	-	0.413[b]

[a] Chi square; [b] independent test; Figures in parentheses are in standard deviation (Mean SD) and percentage

Knowledge of the signs, symptoms and complications among the workers are indeed crucial because it will help them to recognize the danger of leptospirosis at an early stage and this may lead to proper case management, for early diagnosis, prompt treatment to reduce the mortality. [12,13]

It is interesting that the most of participants in this study had false belief that leptospirosis can be transmitted through mosquito bites and it may also cause lung cancer. This wrong belief may spread to other workers as well as the community and may finally contribute to poor disease control. To some extent, wrong belief about the disease also implies that the workers had gross misconceptions about leptospirosis and they may confuse it with some other diseases which are more familiar to them such as typhoid, malaria, dengue and other PUOs that may consider as an important issue which needs to be emphasized to them[3,7]. The results of this investigation suggest that municipal workers needs special attention by providing awareness and pamphlets. It seems crucial that to create awareness among them should be carried out immediately may reduce the risk in the following seasons.

Generally, a majority of the workers had positive attitude with only 30.2% of them having unsatisfactory attitude score. This is a good starting point to carry out a successful prevention and control programs because there still exist difficulties in convincing people to take all the necessary universal safety precautions even though they may be well aware of the disease. This investigation is also suggesting that the attitude towards the non use of PPE and taking a drink while working are important risk areas in their attitude that need to be corrected. The workers may not appreciate the importance of such practices as disease preventions because they simply lack knowledge on the disease and the preventions against it.

In comparison to attitude, a majority of workers, (61%) had unsatisfactory practice score. This was probably because they failed to see the benefits of a given

© International Journal of Pharma Research and Health Sciences. All rights reserved

behavior. It is possible that the information provided by media was not sufficient to address the information for understanding the disease prevention. The attitude and practice regarding the leptospirosis revealed that very less percentage of workers practiced wearing of proper boots, rubber gloves, as well as wearing of mask while working in the drainage and garbages. Many studies demonstrated that PPE are important and remained the main predictors for leptospiral infection. [14,15] Evidently and in spite of the majority of the workers having poor knowledge and unsatisfactory preventive practices, the participants had relatively satisfactory attitude level. This suggests the importance of practical ways to prevent leptospirosis by educational campaigns with theater, pamphlets and performing drama related to risk factors and pathogenesis of leptospirosis. Other than lack of knowledge, it is also possible that the participants cannot find time to conduct activities that relate to disease prevention, lack of skills or some their factors hindering preventive practices.

Further studies should actively look into other factors hindering preventive practices against leptospirosis such as their health behavior and beliefs. It is possible that the participants might not tell the truth especially questions on attitude and practice which may introduce to social desirability bias. It was minimized by assuring participants of their anonymity and confidentiality of individual reports. [16] Our present study may be applicable to other population with similar characteristics in the municipalities which have the same settings as like this study.

4. CONCLUSION

This investigation demonstrated an interesting pattern in the knowledge, attitude and practice of the municipal workers in this prevalent area and hint at the shortcomings of the control program. Considerable weakness was identified in the knowledge which obviously affects the practice. Examining the knowledge, attitudes and practice of the municipal workers and the strategies that recommends will help health professionals to better understand the barriers to action and factors that facilitate the adoption of recommended preventive actions. This highlighted the importance of the interventional awareness programmes required to this group of people. More over the public should be informed about the hazards via newspapers, television and alertness of notably clinicians, healthcare workers and decision makers should be created by targeted education and campaigns.

5. REFERENCES

1. Natarajaseenivasan K, Raja V, Narayanan R. Rapid diagnosis of leptospirosis in patients with different clinical manifestations by 16s rRNA gene based nested PCR. Saudi J Biol Sci 2012; 19: 151-155.
2. Prabhu N, Joseph PID, Chinnaswamy P. Case capsules of leptospirosis prevalence among children, Coimbatore, India. Bomb Hosp J 2009; 51: 296-300.
3. Prabhu N, Natarajseenivasan K, Uma A, Thirumalaikolundusubramanian P. Leptospirosis now: epidemiology, progress, challendges and research gaps. Elix Hum Physiol 2014; 67: 21173-21179.
4. Rahim M, Aziah BD, Nazri MS, Azwany YN, Habsah H, Zahiruddin WM, Zahila I, Rusli MA. Town service workers' knowledge, attitude and practice towards leptospirosis. Brun Darus J Hlth 2012; 5: 1-12.
5. WHO. Human leptospirosis: Guidance for diagnosis, surveillance and control. http://whqlibdoc.who.int/hq/2003/WHO_CDS_CSR_EPH_2002.23.pdf. Accessed on January 25, 2007.

© International Journal of Pharma Research and Health Sciences. All rights reserved

6. Jena AB, Mohanty KC, Devadasan N. An outbreak of leptospirosis in Orissa, India: the importance of surveillance. Trop Med Intern Hlth 2004; 9: 1016-1021.
7. Natarjaseenivasan K, Prabhu N, Selvanayaki K, Raja SSS, Ratnam S. Human leptospirosis in Erode, South India: serology, isolation and characterization of the isolates by randomly amplified polymorphic DNA (RAPD) fingerprinting. Jpn J Infect Dis 2004; 57: 193-197.
8. Poeppl W, Orala MJ, Herkner H, Muller m, Tobudic S, Faas A, Mooseder G, Allerberger F, Burgmann H. High prevalence of antibodies against *Leptospira* spp in male Australian adults: a cross sectional survey, April to June 2009. Euro Surveill 2013; 18: pii=20509.
9. Tan DS. Leptospirosis in West Malaysia: epidemiology and laboratory diagnosis. Malays J Pathol 1979; 2: 1-6.
10. Robertson H, Hanna J, Brookes D. Leptospirosis: Annual Report 2002. Queensland: Queensland Government. 2002.
11. Philipp R, King C, Hughes A. Understanding of Weil's disease among canoeists. Br J Sports Med. 1992; 26: 223-227.
12. Sharma M, Yadav A. Leptospirosis: Epidemiology, Diagnosis, and Control. J Infect Dis Antimicrob Agents 2008; 25: 93-103.
13. Hartskeerl RA. Leptospirosis: current status and future trends. Indian J Med Microbiol 2006; 24: 309-316.
14. Leal CCB, Garcia SR, Gonzalez FE, Fuentes AJL, Escobedo PJ. Risk factors and the prevalence of leptospirosis infection in a rural community of Chiapas, Mexico. Epidemiol Infect 2003; 131: 1149-1156.
15. Levett PN. Leptospirosis. Clin Microbiol Rev 2001; 14: 296-326.
16. Jena AB, Mohanty KC, Devadasan N. An outbreak of leptospirosis in Orissa, India: the importance of surveillance. Trop Med Int Health 2004; 9: 1016-1021.

© International Journal of Pharma Research and Health Sciences. All rights reserved