AJAB

Asian J Agri & Biol. 2018;Special Issue:103-107.

Original Research Article

Spatial distribution of knowledge, attitude and practice on leptospirosis prevention and its predictors using stratum risk identification methods among residents in a flood prone area in Kuantan, Pahang, Malaysia

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Received:
November 09, 2017

Accepted:
February 28, 2018

Published:
May 30, 2018

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Abstract

Leptospirosis is a preventable zoonosis of public health importance. Due to seasonal floods and paucity of studies regarding leptospirosis preventive practices in community setting in this country, a study was conducted to determine spatial distribution of knowledge, attitude and practice on leptospirosis preventive practices using stratum risk identification methods among residents in a flood prone area in Kuantan via Geographical Information System (GIS). A cross-sectional study was conducted in Perkampungan Sungai Isap, Kuantan, Pahang, which obtained 568 respondents by stratified proportionate random sampling technique. Data were collected using a validated guided questionnaire. Geographical coordinates were obtained using Garmin gpsmap 62s. Multivariate logistic regression was done using SPSS version 22.0 and spatial mapping using ArcGIS version 9. The response rate was 83.4%. Flood-risk strata were divided into high risk (less than 500 metres), medium risk (500 to 1000 metres) and low risk (more than 1000 metres). Linear measurements were made using ArcMap. Overall, majority (68%) of the respondents had good knowledge. However, only 38% of the respondents had satisfactory attitude and 18% had satisfactory practice. Spatial mapping showed that the lower the stratum risk towards flooding, the poorer the preventive practices. Multivariate logistic regression showed the predictors of satisfactory leptospirosis preventive practices were high-risk stratum (aOR=4.28, 95% CI [1.92, 9.57], $P<0.001$), good knowledge (aOR=1.73, 95% CI [1.04, 2.90], $P<0.05$) and age group 30 to 39 (aOR=0.30, 95% CI [0.11, 0.83], $P<0.05$). In conclusion, GIS is a valuable tool for leptospirosis surveillance by facilitating disease prevention programmes to targeted risk areas.

Keywords: Leptospirosis, Preventive Practices, Stratum Risk Identification, GIS.

Introduction

Leptospirosis is a worldwide zoonotic disease of great public health importance. Seasonal floods provide suitable medium for leptospirosis transmission that lead to large outbreaks which, in disaster conditions, are difficult to control. GIS has been used worldwide as a tool in predicting outbreaks, such as hotspots

where the environmental risk factors are correlated with the distribution of reported cases (Lau et al., 2012). The association between different stratums and practices towards leptospirosis was convincing in another study in flood-prone Davao, Philippines, where high rating of practice in one particular stratum was attributed to more health education in that area compared to other stratums (Lupo et al., 2013). Those who reside nearer to rivers have an increased likelihood of acquiring leptospirosis due to poor hygiene practices (Robertson et al., 2012). Thus, one of the options for determining high-risk areas for a disease of interest is by mapping the area using GIS.

The incidence in Malaysia is increasing in trend with an increment of 88% of the total cases in Kuantan during the same epidemiological week (Lim et al., 2011; Pahang State Health Department, 2014). There have been few published studies in Malaysia as well as other regions regarding the awareness of people towards leptospirosis, and those studies were focused only on high-risk occupational groups such as town service workers (Mohd Rahim et al., 2012; Prabhu et al., 2014). A study on preventive practices in flood-stricken community setting showed that preventive practices could be improved with health education and awareness activities (Lupo et al., 2013). In view of the nature of the disease and the risk of transmission of the organism during flood occurrences in this country, more studies need to be conducted in the general population to assess awareness on leptospirosis prevention.

Materials and Method

A cross-sectional study was conducted in Perkampungan Sungai Isap, Kuantan, Pahang from February 2015 until June 2015, which obtained 568 respondents by stratified proportionate random sampling technique. The inclusion criteria were all residents who were aged 18 years and above, and Malaysian citizens. The exclusion criterion was those who were illiterate.

Data were collected using a validated guided questionnaire, which consisted of sociodemographic characteristics, knowledge, attitude and practice towards leptospirosis prevention. The cut off points for total knowledge, attitude and practice were set at 75%, whereby equal or above 75% were considered as good for knowledge and satisfactory for attitude and practice. On the other hand, a score of below 75% was denoted as poor for knowledge and unsatisfactory for attitude and practice (Mohd Rahim et al., 2012).

Geographical coordinates were obtained using Garmin gpsmap 62s. Data were analyzed using IBM Statistical Package for Social Science (SPSS) version 22.0. The values of knowledge score, attitude score and practice score were mapped in GIS by using ArcGIS software version 9. Level of significance was set at an alpha level of 0.05.

Results

A total of 700 questionnaires were distributed to potential respondents. Out of these, 681 were eligible, based on the inclusion criteria and 19 were non-eligible due to being non-Malaysian citizens. Among the eligible, 622 respondents consented. Only 568 questionnaires came back complete, thus making a response rate of 83.4%.

Figure 1, 2 and 3 show the spatial distribution of knowledge, attitude and practice on leptospirosis prevention, respectively. Flood-risk strata were divided into high risk (red line, measuring less than 500 metres), medium risk (yellow line, measuring 500 to 1000 metres) and low risk (green line, measuring more than 1000 metres). Linear measurements were made using ArcMap. Majority (68%) of the respondents had good knowledge. However, only 38% of the respondents had satisfactory attitude and 18% had satisfactory practice. Spatially, a large proportion of poor total knowledge score on leptospirosis was distributed near to the river bank, corresponding to the high-risk stratum. Majority of the distribution falls under unsatisfactory total attitude score. The proportion on unsatisfactory total practice score was distributed along the lower part of the residential area, corresponding to the village-type stratum which is Kg Sg Isap.

Overall, spatial mapping showed that the lower the stratum risk towards flooding, the poorer the preventive practices. Multivariate logistic regression analysis showed that the significant predictors of satisfactory leptospirosis preventive practices were high-risk stratum, good total knowledge score and age group 30 to 39, as in Table 1.

Table 1. Predictors of Satisfactory Leptospirosis Preventive Practices

Variable	β	SE	Wald	Adjusted Odds Ratio	95% CI		*P* value
					Lower	Upper	
Stratum							
Low risk[a]				1			
Moderate risk[b]	0.22	0.25	0.78	1.25	0.77	2.03	0.38
High risk[c]	1.45	0.41	12.56	4.28	1.92	9.57	<0.001*
Total Knowledge Score							
Poor				1			
Good	0.55	0.26	4.38	1.73	1.04	2.90	0.036*
Age group							
≥40				1			
30-39	-1.19	0.51	5.45	0.30	0.11	0.83	0.02*
18-29	-0.02	0.24	0.01	0.98	0.61	1.56	0.93
Income (RM)							
<1000				1			
≥1000	-0.39	0.24	2.71	0.68	0.43	1.08	0.10

*Significant at P<0.05

[a]Distance >1000 meters from Kuantan river bank (Sg Isap Jaya, Kg Sg Isap, Sg Isap Aman)

[b]Distance between 500 to 1000 meters from Kuantan river bank (Sg Isap 1, Sg Isap 2, Sg Isap Damai, Sg Isap Perdana 2, Taman Murni

[c]Distance less than 500 meters from Kuantan river bank (Sg Isap Perdana 1)

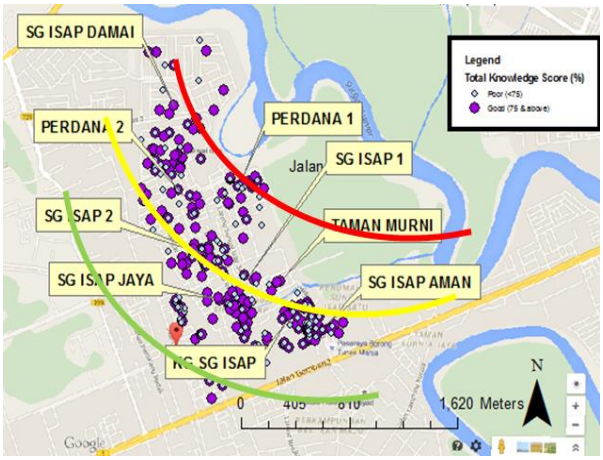

Fig 1. Spatial distribution of total knowledge score on leptospirosis.

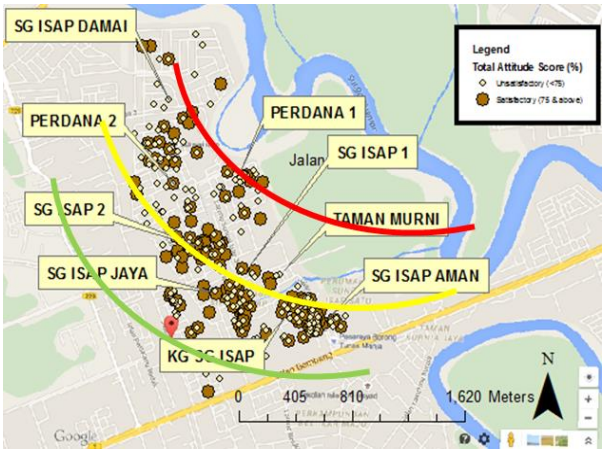

Fig 2. Spatial distribution of attitude on leptospirosis prevention

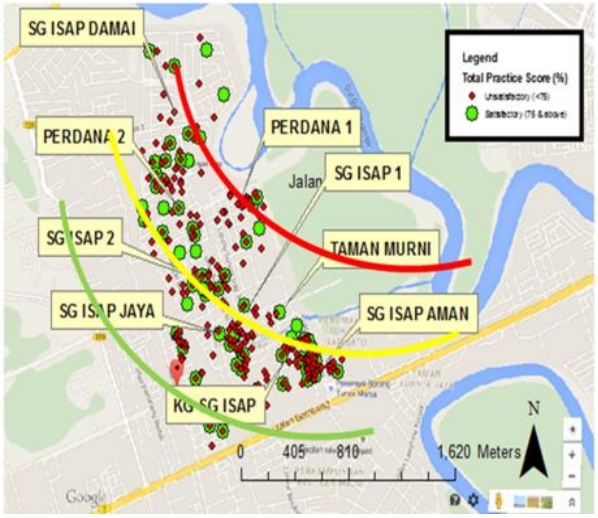

Fig 3. Spatial distribution of practice on leptospirosis

Discussion

High-risk stratum, which is Sg Isap Perdana 1, was one of the significant predictors of satisfactory preventive practices, having 4 times higher chances to have the said practices. They were the nearest to the Kuantan river bank, about 150 metres, where flood occurs first due to overflow. This means that geographically, the more nearer the community towards a risk, the more aware they are of the dangers and the better the practices. On the other hand, the farther the stratum is from the river, the less likely to have satisfactory practice. This may be due to the area having less perceived risk towards flooding, thus poorer preventive practices. Outbreaks of leptospirosis in certain areas have shown to be associated with shorter distance to rivers and densely populated areas (Robertson et al., 2012). Thus, primary preventive practices need to be advocated to control current outbreak and to prevent future outbreak. The high risk stratum was located far from the main road which connects to the healthcare facility. It could be possible that due to this, the people there was more cautious in their practices, as if anything happens during flooding that makes the road inaccessible to healthcare facility, they have made adequate preventive measures towards leptospirosis.

A study in Thailand showed significant association between distance of healthcare facility of more than 30 kilometers and severe leptospirosis, attributed to delay in seeking healthcare treatment (Suwannarong et al., 2014). Thus, having good practice albeit being far from the healthcare facility can lead to better outcome of treatment. The reason why high-risk stratum was a significant predictor could be attributed to education level. Majority (51.4%) of them attained highest education at tertiary level. The higher the level of attainment, the better the knowledge and subsequently better the practice. This was similar with the study among community in Trinidad and rural population in highly endemic area in Thailand (Mohan et al., 2011). Having good knowledge will increase the odds of having satisfactory preventive practices towards leptospirosis by a factor of 2. Thus, good knowledge predicts better practices. In relation to geographical location in this study, more health education needed to be given to those living in stratum Sg Isap Jaya, a stratum located farthest from the river which can overflow and cause flood, increasing possibility of leptospirosis transmission. A study in Queensland, Australia showed that "Cover, Wash, Clean Up" approach advocated by the health officials was a far more cost-effective leptospirosis preventive measure compared to immunization and chemoprophylaxis (Smith et al., 2013). For future research, case control studies should be conducted to measure association between socio-environmental risk factors and leptospirosis more precisely (Edre et al., 2015).

Conclusion

This study was able to provide baseline data on factors associated with leptospirosis preventive practices among residents in flood-prone area. Thus, various areas in Malaysia that are exposed to flood and leptospirosis are able to use the data for future comparison. GIS proved to be a valuable tool in predicting trends of prevention towards leptospirosis, as well as predicting as a part of surveillance system of predicting future outbreaks for rapid response.

Ethical Considerations

Ethical approval was obtained for this study from the UPM Ethics Committee for Research involving Human Subjects (UPM/TNCPI/RMC/1.4.18.1 (JKEUPM)/F2). During data collection, a written and informed consent were obtained from each of the respondents.

Acknowledgment

We would like to thank En Abdul Mubin, village chief and head of Jawatankuasa Kemajuan dan Keselamatan Kampung (JKKK) for giving permission to conduct the study in Perkampungan Sungai Isap, Kuantan.

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