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RESEARCH ARTICLE

Evaluation of the Level of Knowledge of the Population and Risk Factors Related to Leptospirosis in an Endemic City

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Abstract

Leptospirosis is an infectious-contagious zoonosis caused by gram-negative bacteria, a spirochete of the genus Leptospira. It is largely related to high rainfall levels, accumulation of litter, presence of rodents and lack of basic sanitation. The present study aimed to verify the level of knowledge of the population and the risk factors of leptospirosis in a region frequently affected by floods in Blumenau/Santa Catarina/Brazil, as well as the control of rodents carried out by the interviewees. The data were collected through questionnaires applied to a sample of 270 interviewees and the results were analyzed in Epi info V7 software. It was verified that in the neighborhood there are several risk factors related to leptospirosis, being the river near the residences, the presence of garbage, lack of sanitation and rodents in the streets. Regarding the knowledge of the population, it was possible to verify that a great part of the interviewees (93.33%) had some knowledge about leptospirosis, they knew the transmitter, the symptoms and how to prevent it, however only the basic knowledge and 42.49% actually tried to prevent the spread of the disease. The results of this research allow us to conclude that a large part of the population has some basic knowledge about leptospirosis, however, they unknown all forms of transmission, hosts and symptoms and not associate the risk factors with the spread of the disease in the locality.

Keywords

Leptospira spp., Floods, Zoonosis, Public health

Introduction

Leptospirosis is an infectious-contagious disease of compulsory notification caused by a gram-negative spirochete bacterium of genus *Leptospira* of the Family *Leptospiracea*, from the order *Spirochaetales* and among the pathogenic species *L. interrogans* is one of the most importance. The main host of the disease is the *Rattus norvegicus* that inhabits empty lots, sewers or places with large amount of garbage. Dogs are considered an important source of infection by human leptospirosis in urban areas, due to their proximity to man and because they eliminate bacteria in the urine for months without characteristic symptoms [1-3].

Risk factors for leptospirosis are exposure to water contaminated with urine or tissues from infected animals, its occurrence being favored by the environmental conditions of countries with tropical and subtropical climate, particularly in times with high rainfall. Humans are accidental hosts, contracting a disease when they come in contact with the urine of infected animals or with water, soil and food contaminated with a bacterium. Humans the infection is characterized by high fever, muscular pain, cough, fatigue, chills nausea, diarrhea, dehydration, and can also cause jaundice, hemorrhages and renal problems in their most severe form. In the evolution of the disease the bacterium penetrates actively through the ocular, digestive, respiratory or genital mucosa and multiplies in the vascular system, kidneys, liver, spleen, central nervous system, eyes and genital tract, characterizing a leptospiremia. However, this zoonosis can still manifest subclinically, further exac-

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erbating the risks of disease spread [2].

Leptospirosis is a public health problem, so it is essential to have prevention and control measures in order to minimize risk factors and to attenuate the incidence of the disease. Vaccination of dogs is another measure of great importance, as this can reduce the contamination of dogs and consequently the prevalence of the disease [2].

The city of Blumenau, state of Santa Catarina, southern Brazil, is frequently affected by floods. In 2010, there were seven large floods with a rainfall of between 8.0 and 12.8 m (CEOPS) [4]. It is common that people access floodwaters during these events for different causes, and thus end up contacting the bacteria [2,5]. The present study was conducted in Itoupava Norte neighborhood, the most affected by floods, located in the Northeast region of the city of Blumenau and is limited to the West and the South with the river Itajaí-Açú. Of the 230 streets in the neighborhood, 84 have already been hit by flooding [5]. This study aimed to verify the level of knowledge of the population and the risk factors of leptospirosis in this region, as well as the control of rodents carried out by the interviewees.

Methods

A cross-sectional study was conducted in Itoupava Norte neighborhood in the city of Blumenau/Santa Catarina/Brazil. The data were collected randomly using two questionnaires, one applied among the population of that area in order to evaluate their knowledge about the disease and the other applied throughout each street in the neighborhood in order to verify the risk factors of the neighborhood. A sample of 270 interviewees, out of a total of 5,336 residences, was analyzed, with 30 streets, of a total of 230 streets, with a sampling error of 5% and confidence level of 95%. The interviews were conducted during November 2015. People under the age of 18 were considered as exclusion criteria. The research was approved by the Ethics Committee on Research in Human Beings under the number 1,644,366. The home visits were composed by reading and signing the Term of Free and Informed Consent and using a structured questionnaire containing questions regarding the knowledge of the population about the disease, host, transmission form, symptoms, prevention and control of rodents.

The data was initially typed into a Microsoft Excel® 2013 worksheet, and then analyzed in EpiInfo V7 software. For the analysis of the data we used the descriptive statistics of frequency tables and the analytical statistics of the chi-square tests to compare direct distribution frequencies. For the significance of the tests, $P < 0.05$ was considered.

Results

Based on the data obtained from the 270 interviewees, 50.37% were female and 49.63% male. People between 18 and 90-years-old were interviewed, being the most frequent age group between 26 and 35 years (21.48%). The predominant level of schooling was the high school (32.96%).

Regarding knowledge about the disease, 93.33% of respondents stated that they had knowledge about the disease, and 98.89% of the interviewees affirmed that they had never leptospirosis yet and 18.89% knew people affected by the disease (Table 1). According to Ministry of Health, 17 cases of human leptospirosis were reported in 2017 in the municipality of Blumenau, being the second largest municipality in the number of notifications in the state.

Of the interviewees, 39.63% observed rodents in their homes, but 48.15% did not control them. As a rodent prevention method, 8.52% used mousetraps and 6.30% carried out dehiscation (Table 2).

On the knowledge of the transmitter, 94.44% stated to know who the transmitter was, but when asked about which animal was the transmitter, 94.07% responded correctly stating that they were rodents.

Table 1: Frequency and confidence interval of answers about the population's knowledge about leptospirosis and contact with the etiological agent, Blumenau/Santa Catarina/Brazil.

Answers	n (%)	CI (95%)	P
Know what is Leptospirosis?			
No	18 (6.67%)	(3.69-9.64)	
Yes	252 (93.33%)	(90.36-96.31)	< 0.01
Already have the disease?			
No	267 (98.89%)	(97.64-100.14)	
Yes	3 (1.11%)	(0-2.36)	< 0.01
Know someone that had Leptospirosis?			
No	219 (81.11%)	(76.44-85.78)	
Yes	51 (18.89%)	(14.22-23.56)	< 0.01

CI: Confidence Interval; P: P-value of Chi-square test. If $P < 0.05$ then significant differences between proportions.

Table 2: Frequency and confidence interval of answers about observation of rats by the population in the region and rodent control, Blumenau/Santa Catarina/Brazil.

Answers	n (%)	CI (95%)	P
There are rats in the region?			
No	163 (60.37%)	(54.54-66.2)	< 0.001
Yes	107 (39.63%)	(33.8-45.46)	
Rodent control?			
No	155 (57.41%)	(51.51-63.31)	< 0.001
Yes	115 (42.59%)	(36.69-48.49)	
How make rodent control?			
Deifies	80 (29.63%)	(24.18-35.08)	-
Cats	9 (3.33%)	(1.19-5.47)	
Cleaning	2 (0.74%)	(0-1.76)	
No	153 (56.67%)	(50.76-62.58)	
Traps/poison	2 (0.74%)	(0-1.76)	
Traps	23 (8.52%)	(5.19-11.85)	
All methods	1 (0.37%)	(0-1.09)	

CI: Confidence Interval; P: P-value of Chi-square test. If P < 0.05 then significant differences between proportions.

Table 3: Frequency and confidence interval of answers about the population's knowledge about the host, transmission form, symptoms and prevention of leptospirosis, Blumenau/Santa Catarina/Brazil.

Answers	n (%)	CI (95%)	P
Know who transmits leptospirosis?			
No	15 (5.56%)	(2.82-8.29)	< 0.001
Yes	255 (94.44%)	(91.71-97.18)	
Which is the animal transmitter?			
Cats	1 (0.37%)	(0-1.09)	< 0.001
Unknown	15 (5.56%)	(2.82-8.29)	
Rodents	254 (94.07%)	(91.26-96.89)	
How to transmit the disease?			
Contact with urine	238 (88.15%)	(84.29-92)	< 0.001
Unknown	30 (11.11%)	(7.36-14.86)	
Mosquito bite	2 (0.74%)	(0-1.76)	
Know which symptoms are?			
No	138 (51.11%)	(45.15-57.07)	< 0.001
Yes	132 (48.89%)	(42.93-54.85)	
How to avoid the disease?			
Garbage accumulation	1 (0.37%)	(0-1.09)	< 0.001
Avoid flood water	216 (80%)	(75.23-84.77)	
Not to touch animals	5 (1.85%)	(0.24-3.46)	
Unknown	48 (17.78%)	(13.22-22.34)	

CI: Confidence Interval; P: P-value of Chi-square test. If P < 0.05 then significant differences between proportions.

About which form of transmission of leptospirosis 88.15% responded adequately and about the symptomatology of the disease 51.11% did not know (Table 3).

Regarding prevention methods 80.00% stated that avoid contact with flood waters and streams. In the epidemiological aspect of the neighborhood 61.85% believed that it was not possible that leptospirosis was a real issue in their neighborhood.

Of those interviewed, 56.30% said they had not seen advertisements about the disease. For those who saw advertisements, 38.52% said they had

Figure 1: Observation of leptospirosis risk factors in the locality, such as a dead rodent and the presence of stream, Blumenau/Santa Catarina/Brazil.

viewed on television, 1.85% television and radio, 1.11% received flyers and 0.74% responded that they saw in the newspaper.

Regarding the risk factors observed at the locality, of the 30 streets analyzed, 12 presented factors that led to the appearance of rodents, being these conditions the presence of streams, trash, rodents, lack of basic sanitation and areas prone to floods due to the low altitude (Figure 1). Furthermore, another relevant factor mentioned by the population was the lack of preventive actions and awareness of the municipality about the disease.

Discussion

Rodent control is composed of five stages: Inspection, identification, corrective and preventive measures (anti-ratification), rat control, and finally evaluation and monitoring [6] and, as observed, 57.41% of the interviewees do not control rodents in their residences and according to the Guide of Epidemiological Surveillance [7], anti-ratification measures are always indicated in endemic areas subject to floods, as is the case of Itoupava Norte neighborhood that is affected every year by floods, being the hardest hit neighborhood in the city. Of the residents that control rodents (42.59%), some used methods considered ineffective as using cats for control.

Of those interviewed, 94.44% reported knowing the transmitter of the disease and 94.07% answered correctly what rodents are. The rat *(Rattus norvergicus)*, in particular, is the main transmitter of the disease in urban centers due to its large proliferation in untreated sewage networks [1], of the 30 analyzed streets of the neighborhood, 12 of them had risk factors and among them were the streams, river, lack of basic sanitation besides the presence of rodents in the streets. However, no interviewee mentioned other possible hosts and it is know that the dog in important due to its proximity to the man, showing superficial knowledge [2].

In the present study, 88.15% of the interviewees knew the main form of transmission of the disease, but not another forms, showing superficial knowledge. Results were more satisfactory than those found in the city of Botucatu-SP, which found that 58.86% of the population interviewed had knowledge about the main form of transmission of the disease to man, although 75.38% of the participants had some previous knowledge [8].

About disease prevention, avoid getting in touch directly with the water from the floods is not enough. Other studies claim to be necessary to have an adaptation in basic sanitationthe regions that are continuously affected by the floods and that has a long period of rains during the year [3]. A well-structured sanitation prevents this from occurring high rain fall caused by floods [9]. The population claim that it is necessary to use other measures of control and prevention, and it is essential to improve hygiene conditions of the residences, avoiding mainly the proliferation of rodents and the accumulation of garbage [10]. Was ascertained that vaccination of domestic dogs is essential for the prevention of the disease in this species and to avoid the carrier state. In studies was that all of these factors associated with the unplanned population growth, are reasons that most influence the maintenance of the disease in these regions [10].

After verifying that the population had a basic knowledge about the disease, that would help in the reduction of casuistry, 61.8% believed that there was

no infection in the neighborhood, however due to the risk factors such as the proximity of the residences to the river, lack of basic sanitation and accumulation of garbage, favorable conditions for the spread of leptospirosis were observed. In this way, the risk factors observed in the studied neighborhood are in agreement with previous studies [11], being the exposure to areas that contain accumulated litter, open sewage and poor infrastructure, factors intrinsic to the spread of the disease.

Conclusion

The results of this research allow us to conclude that a large part of the population has some basic knowledge about leptospirosis, however, they unknown all forms of transmission, hosts and symptoms and not associate the risk factors with the spread of the disease in the locality.

Competing Interests

The authors declare that there is no conflict of interest that could affect the impartiality of the reported research.

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Statement of Equal Author's Contribution

We declare that all authors contributed equally.

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