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EPIDEMIOLOGICAL PANORAMA OF LEPTOSPIROSIS IN THE STATE OF PARÁ/BRAZIL, IN THE PERIOD FROM 2012 TO 2017

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ABSTRACT

This study aimed to describe the epidemiological panorama of Leptospirosis in the state of Pará from 2012 to 2017 highlighting the variables: age, race, confirmation criterion, zone of residence, municipalities, schooling, sex and evolution. This is a retrospective, descriptive, quantitative approach, carried out by means of the situational survey of Leptospirosis in the State of Pará through the database of the Information system of grievance notification with subsequent selection and extraction of the variables of interest. The study demonstrated the prevalence of leptospirosis in the male population in the brown color, the predominant age group of 20-39 years, in the urban zone of residence, and the most used confirmation criterion was laboratory-clinical, the predominant county was in Belém, the predominant schooling was from the 5th to the 8th grade, and there were 87 deaths due to the reported illness. Therefore, the importance of educative actions for the low-income population living in agglomerated areas, bordering streams and it is up to the government and health managers to devote a little more attention to this issue.

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INTRODUCTION

Leptospirosis is considered a bacterial disease with high incidence in Brazil, approximately 13,000 cases are reported each year, of which 3,500 are confirmed and the average lethality is 10,8%. Leptospirosis is an infectious disease caused by an aerobic helicoidal bacterium (spirochete) of the genus *Leptospira*.Its basic taxonomic unit is the *serovar* (serotype).There were more than 200 soroaves and were grouped into 25 subgroups. The etiologic agent is classified as a zoonosis and that generates high sanitary, social and economic impacts (PEREIRA, 2013; POLACHINI; FUJIMORI, 2015; RODRIGUES, 2016). The major reservoirs of the disease are rodents of the species *Rattus norvegicus* (rat or sewer rat), *Rattus rattus* (roof mouse or black rat) and *Mus musculus* (mouse or quantum).When infected, these animals do not develop the disease and host leptospira in the kidneys and subsequently eliminate them live into the environment. Rattus norvegicus is the main carrier of the serovar *Icterohaemorrhagiae* (one of the most pathogenic to man). Man is considered only the sudden and final host in the middle of the transmission chain (BRASIL, 2017). Previously leptospirosis was seen as a disease of rural areas, but due to the high population agglomerations of low income in urban areas, that live at the edge of streams and in places with precarious sanitary infrastructure with infestations of rodents the disease happened to be considered of urban zone (ALEIXO and SANT'ANNA NETO, 2010). In places subject to floods caused by rain, epidemic outbreaks of leptospirosis occur. In this way, it becomes a disquieting disease for public health due to the seriousness and the way it is disseminated in the big cities (Gonçalvez *et al*., 2016). The individual contracts the disease when the infectious agent comes into direct contact with the mucous membranes and skin lesions, contamination can occur through urine of infected animals, soil, water and infected foods (Gonçalvez *et al*., 2016). rdinance Nº. 204 of February 17, 2016 defines the National List of Compulsory

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Notification and leptospirosis is included within this list and must be notified within 24 hours to the Municipal Health Secretariat (BRASIL, 2016). The objective of the present study was to describe the epidemiological panorama of leptospirosis in the state of Pará in the period from 2012 to 2017 highlighting the sociodemographic variables.

MATERIALS AND METHODS

The present study is a descriptive epidemiological survey, with a quantitative approach, carried out through the situational survey of leptospirosis in the state of Pará, from the period of 2012 to 2017. The study was carried out having as main tool the online database of the Department of Informatics of the National Health System (SINAN), in which the information of the Information System of grievance notification. SINAN net aims to collect, transmit and disseminate data generated routinely by the Epidemiological Surveillance System, through a computerized network, to support the investigation process and contribute to the analysis of information on epidemiological surveillance of compulsory notification diseases (BRASIL, 2018). After the selection and extraction of the variables of interest with the help of the TABNET tool provided by DATASUS. The raw information tabulated was exported to Microsoft Excel® - Excel software to perform percentage calculations.

RESULTS AND DISCUSSION

Data collected from the national system of notification grievances. Table 1 shows that of a total of 762 (100%) cases, the predominant age group was 20-39 years representing 297 (38,98%) cases. Taking into account the range between 20-59 years, it is verified that it represents more than half of the population of Pará, with 500 (65,62%) cases.

20 and 49 years of age, as they are more exposed to risk situations and are the most economically active population in Society (OLIVEIRA, 2012; BRASIL, 2017; BRASIL, 2018). Other studies point to the age group of 20 to 59 years (PEREIRA and SANTOS, 2016; BRASIL, 2018). The adults were the most affected by the disease, which corroborates with the literature, which states that the disease is more affected in the adult population. It is plausible to say that the probable reason why the greatest occurrence of the disease is in adult males is because they are more exposed because they perform the function such as urban garbage collection, sewer cleaning, installation and maintenance of the sewage network, control of rodents, for being responsible for the rescue of victims in the event of flooding by torrential rains (SOARES *et al*., 2016). These occupations are almost exclusively carried out by men, so it can be said that these functional positions are risk factors, because in these occupations there is a greater probability of contamination of the disease, because these sectors put the worker in situations that involve contact with the urine of infected animals frequently without any personal protective equipment. It is important the knowledge on the part of the workers on the risks that exercise of the profession can entail for their health. The lack of knowledge about the risk factors can lead to the late diagnosis of the disease and increase the chance of evolution to death. Table 2 shows the confirmation criterion for cases of leptospirosis according to the area of residence in Pará, between 2012 and 2017, where it was verified that of a total of 762 (100%) cases there were 550 (72,18%) confirmed by the Clinical-Laboratory criterion. The urban region presented the highest confirmation rate with 495 (64,96%) confirmed cases. In Minas Gerais, more specifically in the city of Itajubá, during the period from 2006 to 2016, 58,18% of the confirmed cases of leptospirosis were in a population that lived in an urban area and 27,27% were residents of a rural area (BRASIL, 2018).

Table 1. Age group of lep tospirosis cases accordion to the period form 2012 to 2017

Age group	Race						Total
	Ignored/White*	White	Black	Yellow	Brown	Indigenous	
<1 year	-	-	1 (0,13%)	-	-	-	1 (0,13%)
1-4	-	2 (0,26%)	-	-	8 (1,05)	-	10 (1,31%)
5-9	1 (0,13%)	1 (0,13%)	2 (0,26%)	-	23 (3,02%)	1 (0,13%)	28 (3,67%)
10-14	4 (0,52%)	4 (0,52%)	3 (0,39%)	-	50 (6,56%)	-	61 (8,01%)
15-19	4 (0,52%)	6 (0,79%)	6 (0,79%)	1 (0,13%)	67 (8,79%)	1 (0,13%)	85 (11,15%)
20-39	25 (3,28%)	27 (3,54%)	11 (1,44%)	1 (0,13%)	233 (30,58%)	-	297 (38,98%)
40-59	21 (2,76%)	15 (1,97%)	4 (0,52%)	1 (0,13%)	161 (21,13%)	1 (0,13%)	203 (26,64%)
60-64	1 (0,13%)	3 (0,39%)	1 (0,13%)	-	30 (3,94%)	-	35 (4,59%)
65-69	1 (0,13%)	1 (0,13%)	-	-	16 (2,10%)	1 (0,13%)	19 (2,49%)
70-79	2 (0,26%)	2 (0,26%)	1 (0,13%)	-	16 (2,10%)	-	21 (2,76%)
80 e +	-	-	-	-	2 (0,26)	-	2 (0,26%)
Total	59 (7,74%)	61 (8,01%)	29 (3,81%)	3 (0,39%)	606 (79,53%)	4 (0,52%)	762 (100%)

Source: Ministry of Health/SVS-Information system of grievance notification
*Dadosignordos e sem informacao.

The predominant race is of the brown population, where it presented 606 (79,53%) cases. Although there is no gender or age predisposition to contract the disease, the most affected age group was young adults. According to the literature studied, leptospirosis occurs most frequently in men between

Within the clinical-laboratory diagnosis are included the serological tests as the ELISA or Microagglutination Method (MAT), Isolation of Leptospira or Components of the Bacteria and Detection of Bacteria in the Tissues. The Clinico-Epidemiológico are all suspected cases that present fever and

Table 2. Criterion for confirming of lep to spirosis cases according to the zone of residence, in Para, in the period from 2012 to 2017

Confirmation Criterion	Zone of residence				Total
	Ignored/White*	Urban	Rural	Peri-urban	
Ignored/White	9 (1,18%)	5 (0,66%)	-	1 (0,13%)	15 (1,97%)
Clinical laboratory	91 (11,94%)	353 (46,33%)	97 (12,73%)	9 (1,18%)	550 (72,18%)
Clinical epidemiology	37 (4,86%)	137 (17,98%)	16 (2,10%)	7 (0,92%)	197 (25,85%)
Total	137 (17,98%)	495 (64,96%)	113 (14,83%)	17 (2,23%)	762 (100%)

Source: Ministry of health/SVS- Information system of grievance notification-Sinan Net
*Ignored data and no information.

Table 4. Schoooling of leptospirosis case according to the sex, in Para, in the period from 2012 to 2017

Schooling	Sex		Total
	Male	Female	
Ignored/White *	217 (28,48%)	61 (8,01%)	278 (36,48%)
Illiterate	7 (0,92%)	4 (0,52%)	11 (1,44%)
Incomplete 1st to 4th grade EF	54 (7,09%)	26 (3,41%)	80 (10,50%)
EF Complete 4th Grade	23 (3,02%)	7 (0,92%)	30 (3,94%)
Incomplete 5th to 8th grade EF	90 (11,81%)	22 (2,89%)	112 (14,70%)
Complete middle school	37 (4,86%)	14 (1,84%)	51 (6,69%)
Incomplete high school	49 (6,43%)	17 (2,23%)	66 (8,66%)
Complete high school	69 (9,06%)	28 (3,67%)	97 (12,73%)
Incomplete higher education	2 (0,26%)	4 (0,52%)	6 (0,79%)
Complete higher education	6 (0,79%)	7 (0,92%)	13 (1,71%)
Not applicable	10 (1,31%)	8 (1,05%)	18 (2,36%)
Total	564 (74,02%)	198 (25,98)	762 (100%)

Source: Ministry os Health/SVS - Information system og grievance notification - Sinan Ne

* Ignored data and no information.

EF= basic education

Table 5. Evolution of lep to spirosis case, in para, in the period from 2012 to 2017

Evolution	Confirmed Cases
Ignored/White	130 (17,06%)
Cure	542 (71,13%)
Death by grievance notified	87 (11,42%)
Death by another case	3 (0,39%)
Total	762 (100%)

Source: Ministry of Health/SVS -Information system of grievance notification - Sinan Net

* Ignored data and no information.

alterations in the liver, renal or vascular functions, associated with epidemiological antecedents and that it has not been possible to collect material for specific laboratory tests or these have had non-reagent result with single sample collected before the 7th day of illness (BRASIL, 2014). The clinical-laboratory method was the most reliable diagnostic procedure for the detection of the disease because through it it is able to detect more specifically the pathology that the individual can have, however, one should not abandon the clinical-epidemiological criterion, both have to be evaluated concurrently by the health professional. It is known that leptospirosis suffers the influence of seasonality, where the majority of cases occur in rainy periods, it is also significant the predominance of leptospirosis in urban areas because they are heavily populated.

The metropolitan regions being more populous of the states are more subject to flooding in the rainy periods due to topographic and climatic conditions, with emphasis on the attention of the public power, regarding basic sanitation, rodent control, rainwater drainage system. These regions are often affected and at risk of epidemics (CARVALHO *et al*., 2016). Table 3 shows the number of confirmed cases by municipality, in Pará, in the period from 2012 to 2017, where from the total of 59 municipalities in Pará, Belém had the highest expression with 300 (39,37%) confirmed cases followed by Santarém with 51 (6,69%), Castanhal and Ananindeua with 43 (5,64%) cases each. In 2010, the municipality of Belém presented the highest frequency of confirmed cases, a municipality considered one of the priority of the disease in the country, followed by Abaetetuba, Breves,

Marituba and Santarém (BRASIL, 2011). According to a study by Lima *et al*. (2018), the scenario of leptospirosis in the city of Belém between 2006 and December 2011 demonstrated that the neighborhoods with the greatest risk for the occurrence of leptospirosis cases were the districts of Guamá, Jurunas and Montese (Terra Firme) because these sites are influenced by high tides, suffer from difficulty in draining rainwater and deficient in basic sanitation infrastructure. In the study by Gonçalves *et al*. the highest number of cases of leptospirosis in the neighborhoods of Belém during the period studied from 2007 to 2013 were in the neighborhoods of Guamá, followed by Jurunas and Condor. According to the Brazilian Institute of Geography and Statistics (IBGE) the estimated population of Pará for the end of 2018 are 8,513,497 individuals. According to the latest IBGE survey in 2010, Belém has 67,9% of its area with adequate sanitary sewage, Santarém 38,1%, Castanhal 36,1%, Ananindeua 55,1%, Marituba 18,8% and Breves 6,1%.It is estimated that only the city of Belém has an average population of 1,485,732 in 2018, the highest in all of Pará[19]. Because of globalization and for reasons of survival, people decide to move to state capitals because they are more active and have more job opportunities (main reason).With this, there is a significant increase in the rural exodus. Such transitions are the main causes of agglomerations of people living in peripheral areas of large cities, most of which are very precarious and are built in areas where there is little or no sanitation. Such sites are usually at sewerage bays, which most often the sewer is open. It is noted that the population living in these areas is not small, usually the citizens come with their respective families and they all live in the same house, increasing even more the probability of accumulation of garbage and the transmission of diseases.

Table 4 shows that males are the most affected with leptospirosis, about 564 (74,02%) cases. The most expressive schooling was the incomplete 5th to 8th grade of elementary school with 112 (14,70%) cases. In the study by Carvalho *et al*., conducted in the state of Rio de Janeiro between 2007 and 2014, the male sex presented a higher frequency among the confirmed cases. Such a result is corroborated by Pelissari *et al*. in a review study on risk factors for leptospirosis in Brazil, showing that more than 80% of the cases studied were male, a comparison similar to this study. In the study of Baracho, Lima and Costa (2015), carried out in Pernambuco in 2015, it was observed that the range of education of 5th - 8th grade was the one of greatest expression. Therefore, it can be deduced that the level of education can be an important factor for the infection, since the information is not equally accessible to the entire population. In the study by Souza *et al*. (2011), this conclusion was also observed in a similar way. The schooling factor is of high relevance for the occurrence of zoonosis. People with low schooling often have difficulty assimilating information about the characteristics of diseases and how to prevent it. Such individuals usually live in precarious places with little or no basic sanitation structure, which can favor the proliferation and dissemination of rodents as a result of organic garbage offers arranged in an inadequate environment and also by improvisation and without sanitary care of pets and of production. The portion of the population with the highest levels of schooling has more access to information about the disease, and is better able to learn the characteristics of the disease. This process occurs when there are reports by the media or in home visits of primary care, reverting to less exposure to zoonoses, which in general also live in places with better sanitation conditions (CARVALHO *et al*., 2017). The same, in his study showed that individuals with elementary education were the ones that had more cases of leptospirosis. People with low schooling have a higher chance of contracting the disease than more educated people, so health education is necessary not only in urban areas, but also in more peripheral areas of large cities, with an education in effective health care of professionals in relation to the teaching of risk factors for this disease may reduce the incidence of leptospirosis. Nursing is the profession whose one of its main aspects is teaching in health, is to educate in order to explain the risk factors of a particular disease, and through this, minimize the occurrence of pathologies. Nursing as an educator has a fundamental role to not only teach about leptospirosis, but about any other topic that is of public health interest and themes pertinent to the population. Health education should not only be carried out in the consultations in the health units, but also must transcend such environments and reach the schools, through lectures and play activities in order to better explain on the subject, thus generating a better understanding of the participants. It is primordial to take this knowledge to more precarious places, because these environments are where the greatest emergencies occur neglected diseases. Health education combined with theoretical-practical activities should be a main method for people with low levels of education, because through this method, learning is easier and thus reducing such public health problems. Table 5 shows that of 762 (100%) cases of leptospirosis in Pará, 542 (71,13%) cases evolved to cure, and 87 (11,42%) cases evolved to death due to the disease.

Although it is a potentially lethal pathology, its impact on the health of the population is still underestimated (SOUZA *et al*., 2011). In a political and mediatic context the disease has almost no visibility, which has a marginalized and unknown disease by the general public (CAVACA and VASCONCELLOS-SILVA, 2015; HALLIDAY *et al*., 2015). Not only leptospirosis, but other diseases that when diagnosed early favor the evolution to cure. It is necessary to look for a health post in order to attend a professional immediately when any health problems and / or complaints appear, for, seeking help at the beginning of any grievance is decisive in order to further reduce the incidence of mortality, because leaving the disease to evolve will lead to difficulties in the treatment, and with that, a negative outcome. Although the cure rate in Table 5 is more significant than the death rate, it is still important to discuss the disease with the population. Due to its relationship with poverty and public disregard for its resolution and the possible need for expensive or permanent treatment after infection, leptospirosis is considered in the international literature as Neglected Tropical Disease, a classification that refers to many diseases in populations of humbler areas that do not have the means (economic and infrastructure) to move the investment in the evils they convalesce and on the part of the pharmaceutical industries or their rulers, since they do not arouse the interest for the production of medicines and vaccines (HOTEZ, 2009, 2014).

Conclusion

It is concluded from this study that the largest number of cases of leptospirosis, according to the SINAN database was brown, in the age group between 20 to 39 years of age, the Clinico-laboratorial method was the most used, the urban area was the site with the highest number of cases, the municipality most affected by the disease was in Belém, education between 5th

and 8th grade of elementary school, the predominant gender was male, and there was a greater evolution to curing the disease than death. In this way, the importance of educative actions for the low-income population living in agglomeration and border areas is one of the strategies to reduce the incidence of leptospirosis. However, not only educational actions should be prioritized but also it is the responsibility of the government and health managers to devote a little more attention to this issue by seeking to carry out basic sanitation works, such as adequate collection of solid waste, cleaning of open canals and sewers, rodent control, packaging and proper disposal of waste to minimize the aggravations as a public health problem.

REFERENCES

Aleixo, N.C.R; Sant'anna Neto, J.L. 2010. Eventos pluviométricos extremos e saúde: perspectivas de interação pelos casos de leptospirose em ambiente urbano. Rev Brasile de Geo Méd e da Saúde.

Baracho, J.L; Lima, N.B; Costa, A.P.R. 2017. Incidência de casos de leptospirose humana em Pernambuco: uma análise dos dados epidemiológicos de 2015. CiênciasBiológicas e de Saúde Unit.

Brasil, Boletim Epidemiológico de Itajubá. 2018. leptospirose. Secretaria municipal de Saúde de Itajubá, Prefeitura de Itajubá.

Brasil. Departamento de Vigilância em Saúde Secretaria Municipal de Saúde Campinas (DEVISA). 2017. Informe Epidemiológico Leptospirose. São Paulo; Avaliable online on: http://www.saude.campinas.sp.gov.br/vigilancia/informes/informe_leptospirose.pdf

Brasil. Ministério da Saúde. 2011. Secretaria de Vigilância em Saúde. Sistema nacional de vigilância em saúde: relatório de situação*:* Pará. Brasília: Ministério da Saúde.

Brasil. Ministério da saúde. 2017. Secretaria de vigilância em saúde. Coordenação-Geral de desenvolvimento da epidemiologia em serviços. Guia de vigilância em saúde: Volume Único – 2 ed. Brasília: Ministério da saúde.

Brasil. Ministério da Saúde. Portaria no 204, 2016. Define a Lista Nacional de Notificação Compulsória de doenças, agravos e eventos de saúde pública nos serviços de saúde públicos e privados em todo o território nacional, nos termos do anexo, e dá outras providências. Diário Oficial da República Federativa do Brasil, Brasília (DF).

Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. 2014. Leptospirose: diagnóstico e manejo clínico. Departamento de Vigilância das Doenças Transmissíveis. Brasília: Ministério da Saúde.

Brasil. Secretaria de estado de saúde do rio de janeiro, subsecretaria de vigilância em saúde, superintendência de vigilância epidemiológica e ambiental, coordenação de vigilância epidemiológica. 2018. Boletim epidemiológico leptospirose Nº 001/2018. Rio de Janeiro.

Brasil. Sistema de Informação de Agravos de Notificação (SINAN). 2018. Avaliable online on:http://portalsinan.saude.gov.br/

Carvalho, C.B.C; Gomes, M.L.C; Santos, C.L; Rabello, R.S; Thomé, S.M.G. 2017. Leptospirose humana no estado do Rio de Janeiro: análise espaço-temporal e perfil dos casos confirmados no período de 2007 a 2014. Acad Rev Cient da Saúde.

Cavaca, A.G, Vasconcellos-Silva, P;R. 2015. Doenças midiaticamente negligenciadas: uma aproximação teórica. *Interface Comunicação, Saúde, Educação*.

Gonçalves, N.V; Araújo, E.M; Junior, A.S.S; Pereira, W.M.M; Miranda, C.S.C; Campos, P.S.S; Matos, M.W.S, Palácios, V.R.C.M. 2016. Distribuição espaço-temporal da leptospirose e fatores de risco em Belém, Pará, Brasil. Ciên saúde colet.

Halliday, J.E; Allan, K.J; Ekwem, D; Cleaveland, S; Kazwala, R.R; Crump, J.A. 2015. Endemic zoonoses in the tropics: a public health problem hiding in plain sight. *Vet Rec*.

Hotez, P.J. 2009. Forgotten people, forgotten diseases: the neglected tropical diseases and their impact on global health and development. Emerg Infect Dis.

Hotez, P.J; Fujiwara R. 2014. Brazil's neglected tropical diseases: an overview and a report card. Microbes.

Instituto Brasileiro de Geografia e Estatística- IBGE. Cidades. Belém-Pa 2018. Avaliable online on: https://cidades.ibge.gov.br/brasil/pa/belem/panorama

Lima, R.J.S; Abreu, E.M.N; Ramos, F.L.P; Santos, R.D; Santos, D.D; Santos, F.A.A; Matos L.M; Saraiva, J.M.B; Costa, A.R.F. 2012. Análise da distribuição espaço-temporal da leptospirose humana em Belém, Estado do Pará, Brasil. Rev Pan-Amaz Saúde.

Oliveira, P.P.V. 2012. Fatores de risco para leptospirose como doença ocupacional em surto no interior do Ceará: estudo de caso controle; Dissertação. Rio de Janeiro: Fundação Oswaldo Cruz, Escola Nacional de Saúde Pública.

Pelissari D.M; Maia-Elkhoury A.N.S; Arsky M.L.N.S; Nunes M.L. 2011. Revisão sistemática dos fatores associados à leptospirose no Brasil, 2000-2009. Epidemiol Serv Saúde.

Pereira C.A. R. 2013. Custo social da leptospirose no Brasil e o efeito de chuvas extremas em Nova Friburgo para o incremento de casos da doença [dissertação]. Rio de Janeiro: Escola Nacional de Saúde Pública Sergio Arouca.

Pereira, F.C.S; Santos, E.F. 2016. Mortalidade por leptospirose no estado do Amapá (2005-2014). Rev Elet Estácio saúde.

Polachini, C.O; Fujimori, K. 2015. Leptospirose canina e humana, uma possíveltransmissão conjuntival no Município de São Paulo, Estado de São Paulo, Brasil. Rev Pan-Amaz Saude.

Rodrigues, C.M. 2016. O círculo vicioso da Leptospirose: ampliando o conceito de negligência em saúde no Brasil. 2016. 117 [Dissertação]. Rio de Janeiro: Fundação Oswaldo Cruz, Instituto de Comunicação e Informação Científica e Tecnológica em Saúde.

Soares, T.S.M; Latorre, M.R.D.O; Laporta, G.Z; Buzzar, M.R. 2010. Análise espacial e sazonal da leptospirose no município de São Paulo, SP, 1998 a 2006. Rev Saúde Pública.

Souza, V.M.M; Arsky, M.L.N.S; Castro, A.P.B; Araujo, W.N. 2011. Anos potenciais de vida perdidos e custos hospitalares da leptospirose no Brasil. Rev. Saúde Pública.

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