Retrospective Review of Leptospirosis in Guadeloupe, French West Indies 1994–2001

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ABSTRACT

Demographic, clinical, biological and personal data were obtained from patients hospitalized with symptoms of leptospirosis in the Hospital of Pointe à Pitre, Guadeloupe, French West Indies from 1994 to 2001. Of the 897 screened patients, 212 were acute cases, 607 were non-infected and 78 were undetermined cases. There was no predominant age group. Leptospirosis transmission followed the rainfall cycle and was greater in rural areas. Jaundice and conjunctival suffusion were significantly more frequent in cases than non-cases. Males, professions considered to be at risk and contact with swine or bovine were associated with infection. Serogroups Icterohaemorrhagiae, Cynopteri, Australis, Sejroe, Pomona and Ballum were serovars presumed responsible for acute cases.

Revisión Retrospectiva de la Leptospirosis en Guadalupe, Indias Occidentales Francesas 1994–2001

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RESUMEN

Se obtuvieron los datos demográficos, clínicos, biológicos y personales de pacientes hospitalizados con síntomas de leptospirosis en el Hospital de Pointe à Pitre, Guadalupe, Indias Orientales Francesas, en el período comprendido de 1994 a 2001. De los 897 pacientes investigados, 212 eran casos graves, 607 eran no infectados y 78 eran casos indeterminados. No hubo grupo etario predominante. La transmisión de la leptospirosis seguía el ciclo hidrológico y era mayor en las áreas rurales. La ictericia y sufusión conjuntival fueron significativamente más frecuentes en los casos que en los no casos. Los varones, las profesiones consideradas en riesgo, y el contacto con cerdos o bovinos estuvieron asociados con la infección. Los serogrupos Icterohemorragia, Cynopteri, Australis, Sejroe, Pomona y Ballum fueron serovares presumiblemente responsables de los casos graves.

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INTRODUCTION

Leptospirosis is a worldwide zoonotic bacterial infection caused by spirochetes belonging to the genus Leptospira which comprises about 250 serovars. Humans usually become infected through contact with water or soil contaminated with urine from infected wild or domestic animals (1, 2). The bacterium can enter the body through broken or intact skin and mucous membranes. Severe clinical symptoms include Weil's syndrome and severe pulmonary haemorrhage. Asymptomatic or dengue-like infections are more common (3).

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Leptospirosis is endemic in Guadeloupe, an island in the French West Indies, where it was responsible for 8.8 deaths per million inhabitants from 1991 to 1999, with an incidence rate of 13.7 cases in 1999 (4). Physicians in Guadeloupe consider leptospirosis as the second most important infectious disease after dengue (5). No analysis was done before this study to elucidate the epidemiology of this zoonosis in this Caribbean Island. This descriptive analysis is a preliminary study which can help to increase the prevention of leptospirosis in this French department.

A descriptive retrospective study is presented on patients screened for leptospirosis in Hospital of Pointe à Pitre, Guadeloupe, from 1994 to 2001. Data were collected on the clinical manifestations, demographic characteristics, exposure to known risk factors of leptospirosis and the serological results with serogroup determination of patients exhibiting symptoms of leptospirosis. Some professions were considered at risk from infection by Leptospira because

of contacts with domestic or wild animals, fresh water or earth (agriculture, construction, dogs training, fish breeding, farming, rodent control). Comparisons were made between confirmed leptospirosis cases and non-cases concerning demographic characteristics, symptoms and risk of exposure.

MATERIALS AND METHODS

Study Area

The Guadeloupe archipelago in the French West Indies is composed of three main islands: Grande-, Basse- and Marie Galante. The hospital of Pointe à Pitre (1100 beds) is situated on Grande-Terre (268 000 inhabitants) in the middle of the island's largest urban community (154 000 inhabitants). Another hospital (270 beds) which is not included in the study is located at the west of Basse-Terre. Sugarcane fields and banana plantations, cattle rearing and swine breeding are common everywhere in Guadeloupe.

Study Population

The 897 patients hospitalized at Hospital of Pointe à Pitre from January 1994 to December 2001 who were suspected of having leptospirosis and who had serological screening were included in the study. Sera were sent to the National Reference Centre for Leptospirosis at the Pasteur Institute, Paris, France, along with associated data on the patients obtained by interviews including age, gender, profession, place of residence, clinical manifestations, exposure to animals and exposure to natural bodies of fresh water. Age and residence were known for 687 and 732 patients respectively. Clinical and biological data were available for 131 patients. The profession was known for 77 patients, including 20 unemployed persons (15%).

Laboratory analyses and case definition

The microscopic agglutination test (MAT) was performed by standard methods (Faine, 1999) using a battery of live antigens including 16 serovars of leptospirosis. IgM titer was determined by enzymatic immunological assay (EIA) at the Reference Centre of Leptospirosis, Pasteur Institute, Paris, France.

A case was considered as confirmed for leptospirosis if the IgM titer was = 1/400 or if there were a minimal four-fold increase in MAT antibody titer between acute and convalescent samples. A case was considered suspected for leptospirosis if the IgM titer < 1/400, and with a titer > 1/100 in MAT when a unique serology was available or less than four-fold increase between acute and convalescent sample when two samples were available. A non-case was MAT and IgM negative in acute and convalescent serum or negative in serum later than 20 days after onset of symptoms when convalescent sample was not available. An undetermined case was seronegative and too early or with IgM titer <1/400 and agglutinins >1/100 in MAT without available convalescent sera.

Statistical analysis

Epi-Info version 6.02 was used for entering data and generating univariate descriptive statistics. Analysis of variance (ANOVA), chi-square tests, Fisher's tests and multivariate analysis were performed using SPSS version 11.01.

RESULTS

Of the 897 patients tested for leptospirosis, 212 (23.6%) were confirmed cases, 3 (0.3%) were probable cases, 607 (67.6%) were considered non-cases and 78 (8.3%) were undetermined cases. Among the 78 undetermined cases, 51 had IgM titer < 1/400 (among them 28 had serum taken too early), 27 had IgM titer = 1/400 without titer > 1/100 in MAT in acute sera, without convalescent sera being available).

The mean age distribution is shown on Fig. 1. Mean age of the total screened population was 43.3 years (SD: 18.7) and median age was 42 years. Only 2.9 % of confirmed cases occurred in children, 14 years of age or younger (Fig. 1). Gender ratio (male/female) was higher in confirmed cases than in non-cases (4.9 *vs* 1.7, $p < 0.001$). However, there was no significant difference in the gender ratio between undetermined cases and non-cases. Rural areas were more affected by leptospirosis than urban areas (Fig. 2). The density of cases was particularly high on Marie Galante Island. The variation of incidence of leptospirosis according to the districts does not seem to depend on the number of screened patients (Fig. 3). Monthly cases of leptospirosis and rainfall cycle are presented on Figure 4.

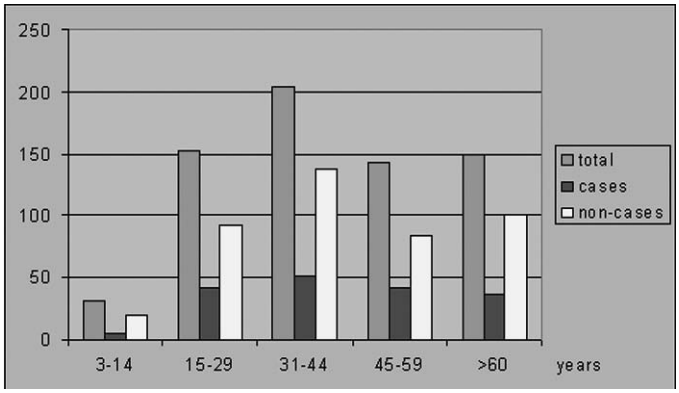

Fig. 1: Age distribution of 681 patients among 897 patients tested for leptospirosis in the Hospital of Pointe à Pitre, Guadeloupe, French West Indies, from 1994 – 2001.

NB: 175 cases, 428 non-cases, 78 undetermined.

There is a positive association between rainfall and incidence of leptospirosis. The cycle of transmission begins about one month after the onset of heavy rain, although no peak of leptospirosis incidence was recorded after Hurricane Lenny in November 1999. The timing of the transmission cycle was almost the same each year from 1996 to 2001, with

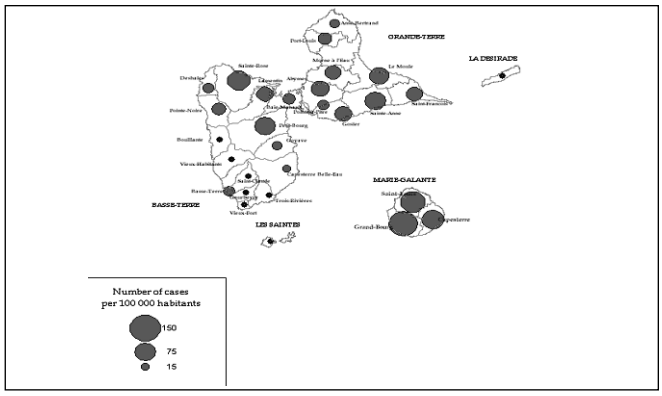

Fig. 2: Prevalence of Leptospirosis diagnosed in Hospital of Pointe à Pitre according to district, Guadeloupe, French West Indies, from 1994–2001.

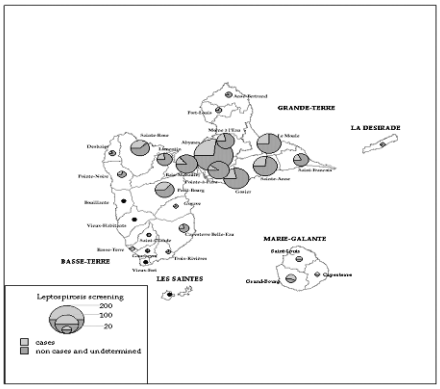

Fig. 3: Ratio of number of cases and total number of screening for Leptospirosis in Hospital of Pointe à Pitre according to district, Guadeloupe, French West Indies, from 1994–2001.

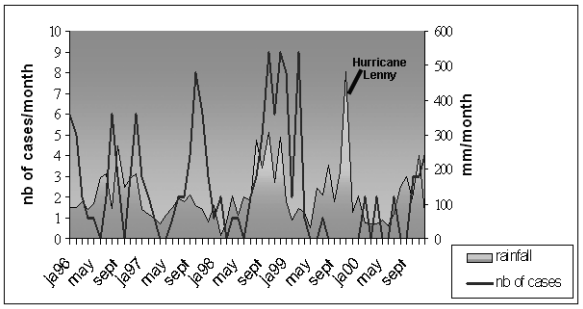

Fig. 4: Rainfalls and Leptospirosis incidence, Hospital of Pointe à Pitre, Guadeloupe, French West Indies, from 1996–2000.

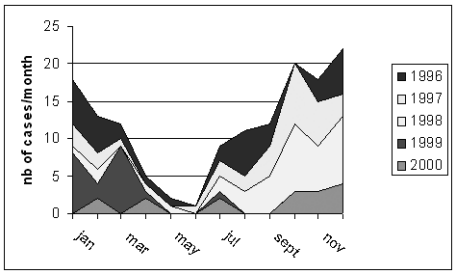

Fig. 5: Monthly leptospirosis incidence, Hospital of Pointe à Pitre, Guadeloupe, French West Indies, from 1996–2000.

the lowest incidence from March to May, increasing transmission from July to September and the highest incidence from September to December (Fig. 5). Clinical and biological data were available for 131 patients (32 cases, 59 non-cases and 40 undetermined) from the 897 patients of the study with fever (86%), myalgia (45%) renal disorder (42%), jaundice (34%) and coagulation disorders (24%). Comparative analysis was done between cases, non-cases and undetermined cases. Jaundice and conjunctival suffusion occurrence was more significant in cases than non-cases ($p = 0.002$ and 0.013, respectively) (Table 1). Jaundice with renal disorder (34%) and jaundice with conjunctival suffusion (22%), occurred significantly more frequently in cases than in non-cases (Table 1). Clinical and biological data were not significantly different between undetermined and non-cases.

Of the 77 patients for whom profession was known, 18 were considered to be at high risk for exposure to leptospirosis (Table 2). The patients with leptospirosis were significantly more likely to be in the high-risk professions (univariate analysis 43% *vs* 14%, $p = 0.001$, multivariate analysis $p = 0.048$). Fresh water contact was frequent for both confirmed and non-infected (43.4% and 30% respectively). Exposure to animals was found for 60% of the tested population (109 complete questionnaires). A higher proportion of cases reported contact with pigs (30% *vs* 6%, $p < 0.01$) and cattle (33% *vs* 14.3%, $p = 0.045$) than did non-cases. Undetermined cases were not significantly different from non-cases. The serogroup responsible for acute leptospirosis was identified in 19 cases but was undetermined for 193 cases (because of coagglutinins for 31 cases) (Table 3). Agglutinins against the serogroups Icterohaemorrhagiae, Cynopteri, Copenhageni, Sejroe, Australis, Tarrassovi, and Canicola were most commonly recorded (Table 3). No seropositivity to Javanica and Batavia was recorded.

Table 1: Comparison of clinical and biological data between cases and non-cases of 131 patients among 897 patients tested for leptospirosis in the Hospital of Pointe à Pitre, Guadeloupe, French West Indies, from 1994 – 2001

	Cases(n = 32) n (%)	Non-cases(n = 59) n (%)	p
Fever	30 (94)	52 (88)	NS
Myalgia	17 (53)	25 (42)	NS
Nuchal rigidity	9 (9.3)	7 (12)	NS
Jaundice	18 (56.2)	14 (24)	0.002
Conjunctival suffusion	9 (28)	5 (8)	0.013
Hepatitis	2 (6)	7 (12)	NS
Conjunctival suffusion and jaundice association	7 (22)	3 (5)	0.02

NB: No difference between undetermined and non-cases

Table 2: Occupational hazards of patients in Hospital of Pointe à Pitre, Guadeloupe, French West Indies, from 1994–2001, cases versus non-cases.

	Cases n (%)	Non-cases n (%)	p
Professions at risk of transmission of leptospirosis*	9 (43)	5 (14)	0.001
Contact with water	10 (43.4)	12 (30)	0.42
Contact with animals	22 (73.3)	25 (51)	0.049
Rats	11 (28)	14 (36)	0.575
Dogs	6 (26)	13 (2)	0.69
Bovine	10 (33)	7 (14.3)	0.045
Swine	9 (30)	3 (6)	<0.01
Contact with several animals	10 (33)	11 (22.4)	0.29

Table 3: Leptospira serogroup distribution among cases of patients in Hospital of Pointe à Pitre, Guadeloupe, French West Indies, from 1994–2001.

Serogroup	Responsible for acute cases (n = 19)	Prevalence of agglutinins > 200 serogroup unknown (n = 193)
Icterohaemorrhagiae	12	40
Cynopteri	3	28
Sejroe	1	27
Australis	1	20
Tarassovi		15
Canicola		18
Hebdomadis		15
Ballum	1	12
Pomona	1	5
Pyrogenes		6
Grippotyphosa		3
Autumnalis		3
Panama		2
Javanica		0
Batavia		0

DISCUSSION

The finding that more males than females were infected with leptospirosis in Guadeloupe agrees with the findings in other countries with endemic leptospirosis (2, 3, 6-9).

There is no statistically significant predominance of any age among infected adults as seen in some countries of south East Asia (6, 10). In some other countries, middle age persons are the most highly infected group (7). As well, age groups were not different between cases and non-cases. Despite a higher exposure to surface water and animals, leptospirosis was rarely recorded in children, like in other studies (3, 6, 7) perhaps because of asymptomatic forms.

Frequency of fever, myalgia, nuchal rigidity, jaundice, conjunctival suffusion, hepatitis, renal dysfunction and haemostatic disorders among cases were similar to other studies (2). Living in rural areas has been reported as a risk factor for leptospirosis (8, 11). In Guadeloupe, the lowest density of cases was in urban areas.

The absence of leptospirosis boom after hurricane Lenny was surprising, given that epidemics of leptospirosis have been registered in South American countries after similar climatic event (9). Relatively high standard of living and good sanitary conditions in Guadeloupe might explain it. It is also possible that in Guadeloupe, persistent humidity and regular precipitation are better conditions for leptospirosis spread than short and heavy rainfalls of hurricanes.

The risk exposure during professional activities seems to have an important epidemiological impact. Providing information on the disease to workers in high-risk professions could facilitate controlling leptospirosis.

Cattle rearing and swine breeding seem to play a role in the transmission of leptospirosis in Guadeloupe and could be investigated by prospective study.

Identifying serogroups was difficult owing to cross-reactivity of agglutinins. Nevertheless, Icterohaemorrhagiae and Cynopteri serogroups were common in Guadeloupe unlike other Caribbean countries, which have a predominance of Icterohaemorrhagiae serogroup (12). Tarassovi serogroup agglutinin is common as well. Those serogroups are frequently found in industrial swine breading facilities in Guadeloupe where 60% of swine are seropositive (R Quirin, Personal Communication). Tarassovi and Icterohaemorrhagiae are serogroups often found in rats (2, 12, 13). Patients with leptospirosis often (33%) had contact with more than one kind of animal, so it was not possible to test for a correlation between kind of animal and the infected patients.

Contact with rats seems to be lower than in other studies in South America (80% of the population in Nicaragua come in contact with rodents) (3). Although there is a relatively high standard of living in Guadeloupe, rat populations in rural areas, particularly around traditional animal husbandry communities, can be large. Leptospira isolation from blood or urine samples during acute leptospirosis and veterinarian investigation in livestock and rats around the residence of cases could help to identify the

Leptospira species present, the main reservoirs of the disease and the infectious cycle in the island.

In summary, more men than women were infected with leptospirosis. There was no age correlation. Highest incidences were after peak rainfall, especially from September to December. Cynopteri and Icterohaemorrhagiae serogroups were the most common, and Jaundice and conjunctival suffusion were more frequent in cases than non-cases.

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