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"Gheorghe Asachi" Technical University of Iasi, Romania

RISKS OF LEPTOSPIROSIS LINKED TO LIVING AND WORKING ENVIRONMENTS

Doina Carmen Manciuc[1,2*], Ioana Florina Iordan[2], Anca Maria Adavidoaiei[2], Maria Alexandra Largu[1]

[1] *"Gr. T. Popa" University of Medicine and Pharmacy, 16 Universităţii Street, 700115 Iasi, Romania*
[2] *"Sf. Parascheva" Infectious Diseases Clinical Hospital, 2 Octav Botez Street, 700116 Iasi, Romania*

Abstract

Although considered a rare disease, endemic to low-income regions and unsanitary environments, leptospirosis is still encountered in some parts of Romania, in both rural and urban environments. Its specific pathways of transmission caused it to be a threat to people working with animals, pest control, farmers or those whose jobs place them in the presence of waters, sewers or in flooded areas. This paper investigates the occurrence and effects of leptospirosis by analyzing 17 cases of infection occurring between 2013 and 2015 in Iasi, Romania. The retrospective study revealed that 82% of leptospirosis cases were determined by serovars of *Leptospira spp.* known to be transmitted in a professional context or coming from household animals or rodents. These zooantroponosis lead to health risks and renal, hepatic and meningeal damage, which determined a high number of admission days as well as higher costs for care. Prevention of the disease includes non-exposure to risk factors, assuming protecting actions, immunization, chemoprophylaxis in several combinations, as well as education for proper environmental and body hygiene.

Key words: contaminated water, hepatic function, leptospirosis, rural area, serology

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1. Introduction

Leptospirosis is a potentially fatal global zoonosis caused by the infection with bacterial spirochetes belonging to the genus *Leptospira spp*. The majority of human infections with *Leptospira* come from exposure to contaminated freshwater or dampened soils. Here, the pathogenic *Leptospira spp.* is able to persist for long times (Reis et al., 2008; Thibeaux et al., 2017). The capability of leptospires to live in the aqueous media contributes essentially to the propagation of infection diseases generated by *Leptospira spp.* in new hosts. Therefore, the understanding of *Leptospira spp.*'s survival in the environment and its detection are key steps in ascertaining critical interventional factors and public health actions to diminish the problems associated with leptospirosis (Kumar et al., 2015; Wynwood et al., 2014). In humans, the infection occurs through direct contact with the urine or tissues of infected animals (rodents, swine, wolves), or indirectly by exposure to wet soil, water, contaminated food. *Leptospira* penetrates through the skin, in areas with wounds or abrasions, through mucous membranes or aerosols (inhalation of contaminated drops) (Mandell et al., 2009). It shows an increased incidence in areas with heavy rain and floods (Garba et al., 2017), the susceptibility being general, more common in males (Levett, 2001) and linked to occupational exposure – most common in veterinarians, farmers, dairy farm workers, slaughterhouses, butchers (Haake and Levett, 2015). The most frequent source of infection is represented by the animals that are excreting *Leptospira spp.*, generally rodents and other small mammals; pets are also incriminated in a smaller percentage (Rebedea, 2000). An infected human can

* Author to whom all correspondence should be addressed: e-mail: dmanciuc@yahoo.com

be a source of *Leptospira spp.* only under unhygienic conditions (Manciuc et al., 2007a).

Clinical examinations revealed that the disease has a sudden onset with high fever (39-40ºC), chills, myalgia and muscle stiffness, headache, marked physical asthenia, gastrointestinal symptoms (nausea, vomiting, diarrhea, abdominal pain), respiratory symptoms (cough, runny nose) and may progress to acute kidney damage (oliguria, hypopotassemia, serum creatinine> 3mg/dL), respiratory insufficiency with dyspnea, pathological obesity, nonspecific hepatic impairment (liver transaminases do not exceed 200UI/L), hypertension and arrhythmias (Mandell et al., 2009; Yilmaz et al., 2015). Although in the majority of cases the diseases are benign and heals without treatment, it is highly recommended that in all cases of suspicion of leptospirosis, antibiotic therapy be initiated as close as possible to the occurrence of symptoms, in order to prevent an unfavorable evolution. For hospitalized patients supportive care is essential.

In Romania, the most common route of *Leptospira spp.* transmission is through contaminated water, especially from still waters such as lakes, pond, or flooded basements (Manciuc et al., 2007b). The main occupations that are at risk for leptospirosis are plumbers, working in flooded basements or any water source contaminated with rodent urine (serovars *icterohemoragiae* and *grippotiphosa*), or farmers and other agricultural workers, as well as people living in rural areas, who do not have running water and have a low degree of sanitation (Kingscote, 1986). For example, in Romania, the infection with *Leptospira sv. pomona* is also called the "swine grower's disease", due to the high hazard of this specific occupation. In most rural areas in Romania, farming practices such as washing animals in ponds, corroborated with lack of sewerage and running water, increase the risk of exposure to leptospirosis.

Ways to prevent this disease include avoiding exposure to risk factors, adopting protective measures, immunization and the use of chemoprophylaxis in various combinations, depending on the environmental conditions and the degree of activity (Benacer et al., 2017).

The "Sf. Parascheva" Infectious Diseases Clinical Hospital in Iasi, Romania treats infectious diseases that occur in the North-Eastern part of Romania. The most severe cases are referred to this regional center for treatment. This study aims to analyze the specific aspects of patients admitted with this disease in the "Sf. Parascheva" Infectious Diseases Hospital, Iași, highlighting the impact of the occupational context in leptospirosis cases.

2. Material and methods

This study is retrospective and it consists of analyzing the medical records of patients diagnosed with leptospirosis, hospitalized in the "Sf. Parascheva" Infectious Diseases Hospital, Iasi, between 2013 and 2015. From the observation files, we focused our attention on the general information of the patients (sex, age, origin, occupation – which are mandatory in the admittance file), symptomatology at admission, comorbidities, laboratory tests specific to hepatic and renal function both at admission and discharge, the presence of possible associated organ damage (lung, meningeal), serological diagnosis and treatment during hospitalization. All laboratory tests were performed in the hospital's own laboratory, which is accredited. Attention was also given to the number of days of hospitalization and that of antibiotic therapy.

3. Results and discussion

Between January 2013 and December 2015, a total of 17 patients with suspected leptospirosis were hospitalized in our clinic, all of them being male, 12 (70.59%) coming from a rural environment, aged between 25 and 80 years, with an average age of 45 years. The prevalence of presentations was more pronounced in August-November (14 cases, 82.35%), a smaller percentage being in December-February (3 cases, 17.65%). This distribution of admission cases is influenced by professional outdoor activities, as well as by environmental and climatic conditions.

Concerning the occupation, a significant percentage is equally represented by farmers (4 patients, 23.53%) and workers in unsanitary conditions that come in contact with rodents (4 patients, 23.53%), followed by builders (3 patients, 17.65%), butchers and unemployed persons (2 patients, 11.76%), other lines of work (1 patient, 5.88%). The remaining 3 patients were retired (41.17%).

The most common onset symptoms reported by patients were fever, malaise, asthenia, loss of appetite, and appearance of sclera-tegument jaundice.

Upon admission, only 3 patients had serologically confirmed the diagnosis of leptospirosis, of which in 2 cases the serological harvest was performed at a previous admission in our clinic, being evident and presented at the time for re-evaluation, and the third case was a patient newly diagnosed on the basis of thorough private examination before submitting to the hospital in Iași.

After sampling blood to perform biological assessment at admission, laboratory tests revealed that for 11 patients the creatinine values were above normal, in 14 cases there were elevated levels of transaminases, and bilirubin levels were reported to be elevated in 12 of the samples.

At discharge, only one patient maintained elevated serum creatinine levels, indicating an improvement in renal function during hospitalization. This was not the case for the value of transaminases and total bilirubin, which remained elevated in a significant number of patients (9 and 7 respectively) even prior to the established treatment. In the paraclinical examination, the abdominal ultrasound method showed an increase of the liver volume above the normal limit, in 10 patients (58.82%).

In the following Figures we have detailed the values of laboratory tests at admission and at discharge, highlighting the following parameters: creatinine, TGO, TGP. This data was collected from the patients' observation files. Analyzing the data form Fig. 1, it can be clearly seen how serum creatinine values have normalized in most cases, with one exception, which shows a slight correction, but maintains the nitrate retention syndrome.

Regarding the hepatic function, transaminase optimizations are seen at discharge compared to admission value, but even so they remain elevated in more than half of the patients, despite therapy (Figs. 2, 3). No complications related to kidney and liver function have been reported during admission to our clinic in any patient. Analyzing the duration of the hospitalization, we observed an average of 15 days. In terms of antibiotic therapy, the average was also 15 days, due to initiating therapy immediately after admission. Antibiotic treatment was instituted in 16 out of the 17 cases, one other patient receiving only hepatoprotective agents. The antibiotics used were ampicillin in 14 cases (82.35%), ceftriaxone in 3 cases (17.65%), ciprofloxacin in 3 cases (17.65%) and combinations of these, in 6 cases (35.3%).

The medical history of the patients admitted during the 36-month period revealed past gastrointestinal pathology in 5 cases (29.41%), infectious pathology in 2 cases (11.76%), urological pathology in 1 case (5.88%), and nephrologic pathology also in 1 case (5.88%). The remaining 8 patients did not report any significant pathological medical history.

During hospitalization pulmonary manifestation was associated with 29.41% of patients (5 cases), hemorrhagic manifestations at 40.05% of patients (7 cases) and persistent febrile syndrome in 17.65% of patients (3 cases).

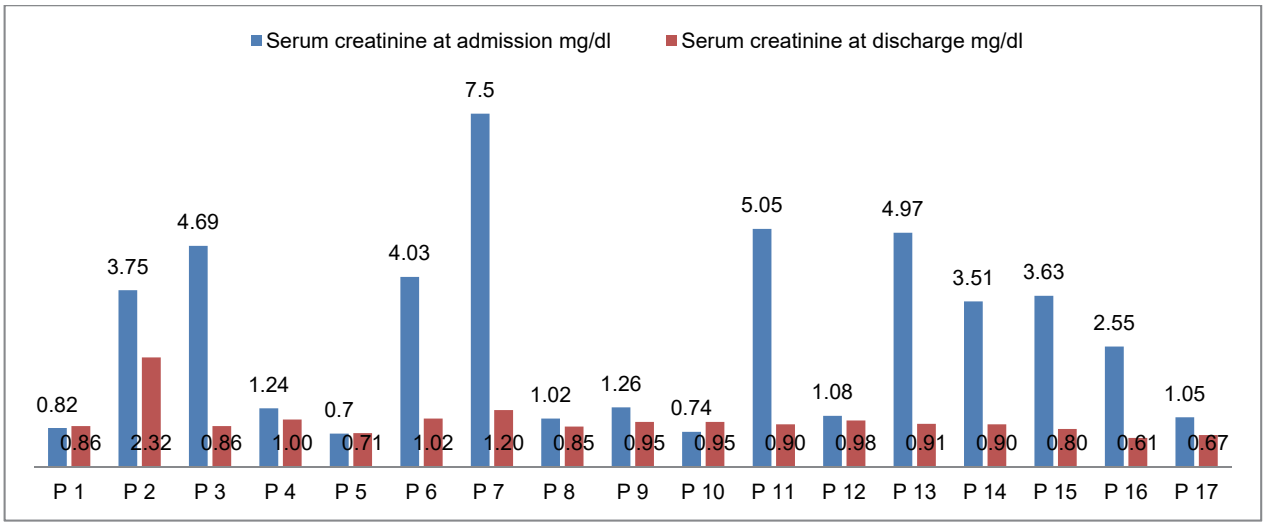

Fig. 1. Distribution of serum creatinine values for each patient-Renal function

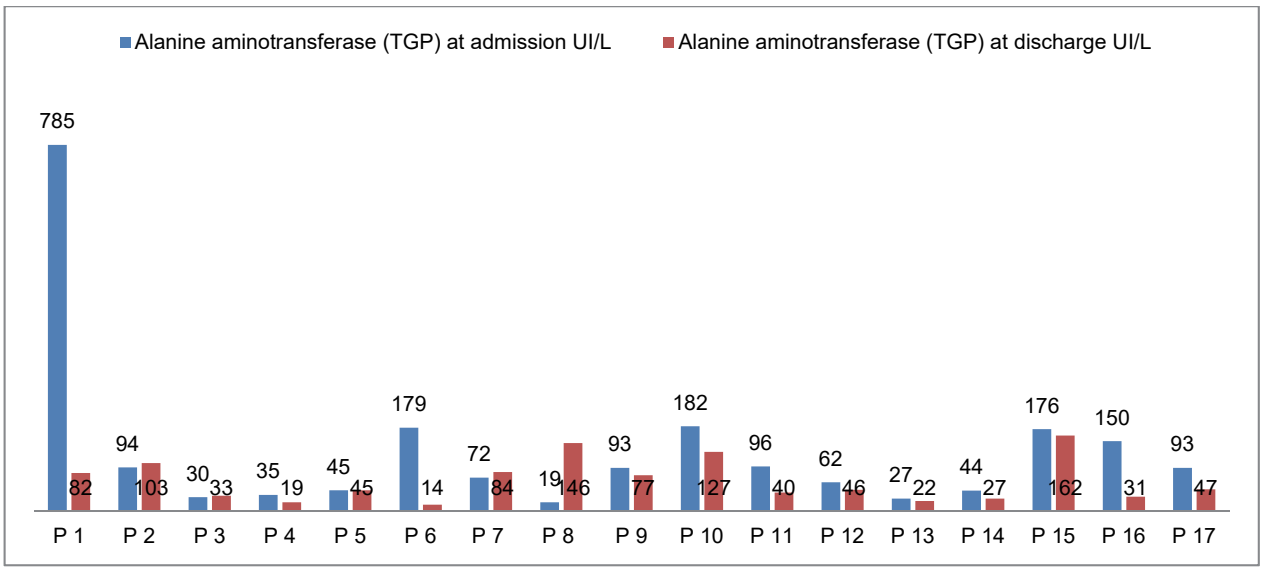

Fig. 2. Distribution of aspartate aminotransferase values for each patient-Hepatic function

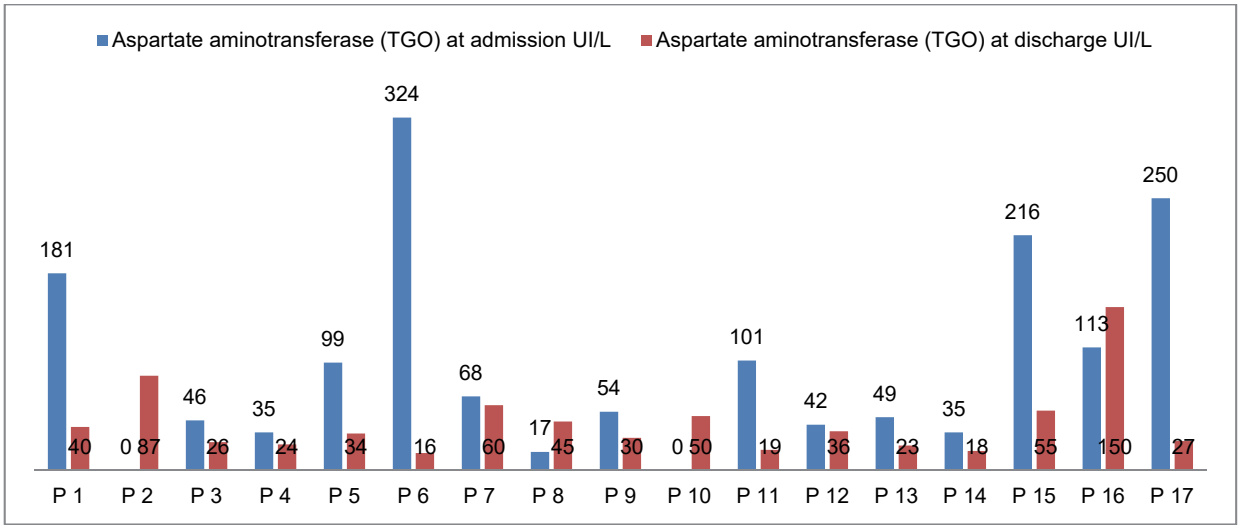

Fig. 3. Distribution of alanine aminotransferase values for each patient- Hepatic function

Lumbar puncture was performed in 8 cases, highlighting nucleated elements in CSF in 75% of the samples (6 out of 8 samples). Five samples had a clear cerebrospinal fluid, two had traces of blood and one sample had opalescent fluid.

The majority of patients (11 cases, 64.70%) were diagnosed using serology samples which came out positive. Of these, three main serovars were isolated: icterohaemorrhagiae (8 cases, 72.72%), wolffi (2 cases, 18.18%) and pomona (1 case, 9.09%). In the remaining 6 cases the diagnosis was based on clinical and epidemiological criteria for leptospirosis. An important instrument used for providing information on the epidemiological context of the disease, the patients' conditions of life and work and possible associated pathologies that may coexist or may influence their condition, was the anamnesis.

This study reveals that all the patients diagnosed with leptospirosis in the 24-month interval analyzed were male, which is consistent with other studies that prove a higher incidence in men (Mohd et al., 2016). Most cases were admitted the August – November interval. This can be explained by professional outdoor activities, as well as by environmental and climatic conditions (cool weather, heavy rain causing floods). Most of the patients admitted came from rural areas of the Moldova region in Romania, places were the main occupations are farming, raising animals and day labor in construction or cleaning. These occupations are known to present high risk of contact with sources of infection with *Leptospira spp.* (Gestal et al., 2015; Waitkins, 1986).

This study reveals the fact that 82% of leptospirosis cases (14 of the 17 patients admitted in the 36 month period) are determined by species of *Leptospira spp.* known to be transmitted in a professional context, or coming from household animals or rodents, a situation that is also mentioned in other studies (Schneider et al., 2014). These zooantroponosis lead to renal, hepatic and meningeal damage, which involve an increased number of admission days as well as higher costs for care (Popa et al., 2013). It is also important to mention the post-admission costs which include temporary incapacity for work of *Leptospira spp.* patients, as well as their recovery programs.

In a 24 month study conducted by a team in the same Infectious Diseases Hospital in Iași, between 2005 and 2006, the number of reported cases of leptospirosis was 26 (Manciuc et al., 2007a); our current research shows a significant drop in the number of cases, which may be explained by an improvement in sanitation and possibly better living conditions. The patients admitted in the 2007 study came from the Prut river basin and in the municipal waste dump in Tomești – Holboca area, which are considered to be inhabited by people with very low income. In comparison, the patients whose medical records we evaluated came from the entire Moldova region, and even though the majority were from a rural environment, five cases were reported to live in urban housing.

4. Conclusions

Leptospirosis is still a reality in the North-Eastern area of Romania, in disadvantaged environments and at workers with occupational activity during the months of August to September (farmers, builders etc.). Although in most cases has been involved *Leptospira spp. icterohaemorrhagiae*, the precision of antibiotic therapy and supportive measures have prevented us from experiencing fatal cases or renal failure requiring hemofiltration, unlike previous years.

Recognizing these cases early, not only by infectious disease workers, but also by the primary network, may conduct in a significant percentage of

all real cases that the treatment and monitoring will lead to composing an epidemiologic picture real disease for a given area, in a certain amount of time.

In the North-Eastern part of Romania, by increasing the income of people living in rural areas and in city outskirts, which leads to an increased in their standard of living, contact with leptospirosis-transmitting factors might decrease significantly, thus reducing the number of infections.

Sanitary education of the population has an essential role in prophylaxis, by helping individuals understand the risks they expose themselves to, and teaching primary hygiene measures, such as derating, water chlorination, hygiene of food, surfaces and housing, as well as proper body hygiene so as to diminish the human health risks.

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