

# Epidemiological Surveillance of Leishmaniasis in Montenegro, 1992–2013

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## SUMMARY

**Introduction** The diseases caused by *Leishmania* are spread worldwide and represent a significant public health problem.

**Objective** The aim of this study was to present the results of epidemiological surveillance of leishmaniasis in humans in Montenegro in the period from 1992 to 2013.

**Methods** The study was planned and realized as a descriptive epidemiological study. The sample included patients of leishmaniasis in Montenegro in the period from 1992 to 2013. The health and demographic data were collected from medical records. The disease was microbiologically proven in the patients. For statistical analysis the  $\chi^2$ -test was used, which examined the significance of the incidence rate.

**Results** During this period, 66 cases of leishmaniasis were identified (40 men and 26 women) aged 0 to 62 (mean  $15.61 \pm 16.76$  years). A visceral form of the disease was diagnosed in 65 (98%) patients, and one patient was diagnosed with cutaneous leishmaniasis. The average incidence rate for the abovementioned period is 0.48 per 100,000 inhabitants. The highest average incidence rate was identified in patients up to seven years of age (3.50 per 100,000 inhabitants). The highest average incidence rates of leishmaniasis were identified in the coastal region of Montenegro, while seasonal distribution indicates that the disease occurs throughout the year with predominance in late spring and summer.

**Conclusion** The research has shown that Montenegro is among the countries with low incidence of leishmaniasis. Nevertheless, because of leishmaniasis re-emergence in the entire Mediterranean Basin, a comprehensive research of ecological and epidemiological characteristics of leishmaniasis, including better monitoring and notification system, is required.

**Keywords:** leishmaniasis; incidence; Montenegro

## INTRODUCTION

Leishmaniasis is defined as a spectrum of diseases caused by protozoan parasites of the genus *Leishmania*. It is a parasite that causes clinical manifestations from localized ulceration of the skin and mucous membranes, to systemic changes. Clinically, it can be described as cutaneous, mucocutaneous or visceral leishmaniasis. The disease is transmitted to animals and from animals to humans by phlebotomine sandflies of the genus *Lutzomyia* and it is more common in warmer climates [1].

The diseases caused by leishmanii are registered in 98 countries worldwide and represent a significant public health problem. An estimated incidence of visceral leishmaniasis is between 0.2 and 0.4 million cases and of cutaneous leishmaniasis from 0.7 to 1.2 million cases worldwide annually [2]. Epidemiological studies show that leishmaniasis is spread worldwide, in tropical zones of South and Central America and Africa, as well as in temperate regions of South America, Southern Europe and Asia. [3]. More frequent human migrations represent a risk for the occurrence of leish-

maniasis in Europe, together with the spreading of the disease from endemic regions, such as the Mediterranean, to the neighboring areas where there are no vectors of the disease, and the re-emergence of the disease in the Mediterranean Region because of a larger number of immunosuppressed people [4]. The incidence of visceral leishmaniasis in the Mediterranean Region is 1,200–2,000 cases annually while on a global basis it is 202,200–389,100 cases annually [2].

This disease, caused by *Leishmania infantum*, is endemic in almost all countries of the Mediterranean Basin. In former Yugoslavia, endemic areas of visceral leishmaniasis were Macedonia, southern Serbia, southern Hercegovina, Dalmatia and the coastal part of Montenegro. According to the epidemiological data, in the territory of Serbia and Montenegro, 39 cases were reported in the period from 1991 to 2000. [5]. In Montenegro, as well as in the surrounding region, the visceral form of leishmaniasis is dominant. The first case of the disease was detected in the area of the town of Bar, which is also the endemic focus of visceral leishmaniasis [6]. The increase in the number

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of individuals infected by leishmaniasis pathogens occurs due to the disturbance of the ecosystem, increasing density of vectors and reservoirs of infection. Since 2005, one to three cases have been registered per year [7].

In March 2010 the World Health Organization convened a leishmaniasis expert panel, which emphasized the need for updating the epidemiological data base of this disease in order to plan appropriate control of leishmaniasis [8].

## OBJECTIVE

The aim of this study was to present results of epidemiological surveillance of leishmaniasis in humans in Montenegro in the period from 1992 to 2013.

## METHODS

The study was planned and conducted as a descriptive epidemiological study. The sample included patients of leishmaniasis in Montenegro in the period from 1992 to 2013.

Pursuant to General Law on Prevention and Suppression of Contagious Diseases [9, 10], Law on Protection of Population against Communicable Diseases [11], and Rule Book on Reporting Communicable Diseases and Hospital Infections [12], leishmaniasis is included in the list of diseases which must be reported (report cards). The database on occurrence of communicable diseases is kept by the Centre for Control and Prevention of Diseases within the Institute for Public Health of Montenegro. For the period from 1945 to 1994 there are written reports on occurrence of communicable diseases and since 1995 to present day an electronic database has been used.

In our research, the source of data on the patients with leishmaniasis in Montenegro from 1992 until 2013 were the report cards from the database of the Centre for Control and Prevention of Diseases within the Institute for Public Health of Montenegro, and the medical documentation of the patients (gender, age, municipality and date of birth).

Data on parasitological diagnosis were collected from the Centre of Microbiology, the Institute for Public Health of Montenegro. In this center, microbiological confirmation of the disease, i.e. presence of parasites, was made using microscopy techniques while the ELISA and indirect Hemagglutination Assays were used to prove antibodies against the pathogen.

The survey instrument was the incidence rate per 100,000 inhabitants, based on the census of Montenegro for 1991, 2003 and 2011 [13].

The  $\chi^2$ -test was used to test the frequency of respondents of different gender and age in the observed group of patients. Material for the study was processed in the computer program SPSS v.13.0 (SPSS Inc.) and Microsoft Office 2003.

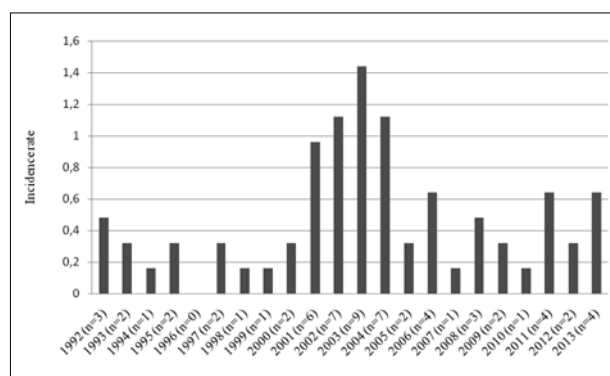
## RESULTS

In the period from 1992 to 2013, 66 people were affected by leishmaniasis in Montenegro, out of which 65 (98%) patients were diagnosed with visceral form of the disease, and one patient had cutaneous leishmaniasis (infected in 1999, female, aged 36 years).

The average morbidity incidence rate for the above-mentioned period was 0.48 per 100,000 inhabitants (range: 0 to 1.44). Slightly higher rates of incidence of the disease were registered in the four-year period from 2001 to 2004 (0.96, 1.12, 1.44 and 1.12 per 100,000 inhabitants, respectively) (Graph 1).

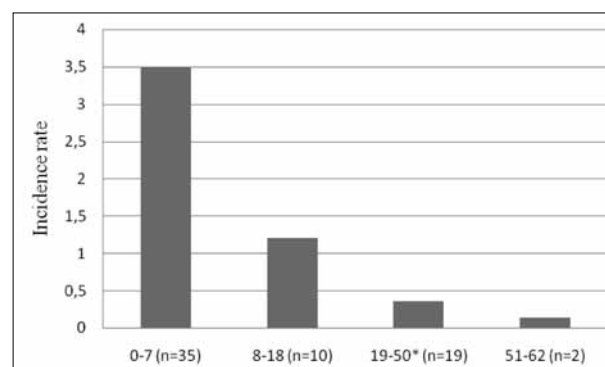
The distribution of patients according to gender indicates that 40 (61%) men and 26 (39%) women ( $p < 0.05$ ) were affected. The average incidence rate was 0.30 per 100,000 for men and 0.20 per 100,000 for women. The average age was  $15.61 \pm 16.76$  (range 0–62 years). The highest average incidence rate was in the age group of zero to seven years (3.50 per 100,000 population) and was statistically significantly higher than in all other age groups ( $p < 0.001$  for all comparisons) (Graph 2).

The geographical distribution of patients with leishmaniasis in Montenegro indicates that they are registered in 11 out of total of 21 municipalities. The average inci-



**Graph 1.** Incidence rate of leishmaniasis per 100,000 population, Montenegro, 1992–2013 (n=66)

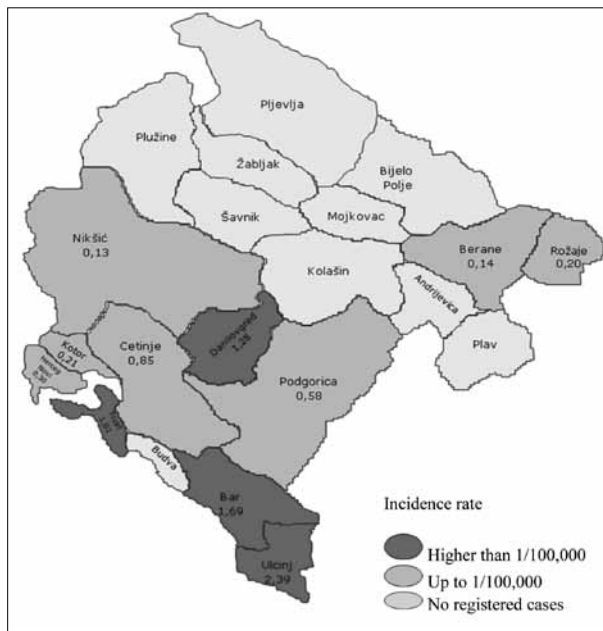
n – number of leishmaniasis cases



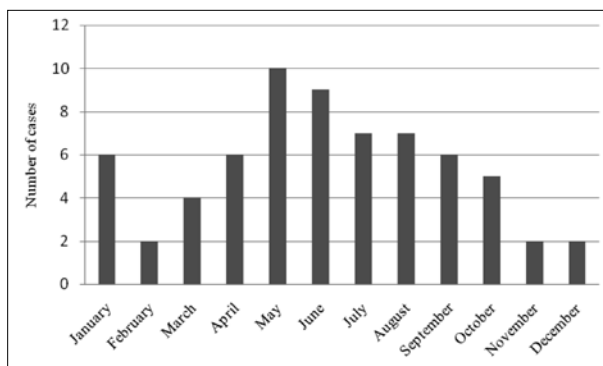
**Graph 2.** Average incidence rate of visceral leishmaniasis per 100,000 population depending on the age, Montenegro, 1992–2013 (n=66)

n – number of leishmaniasis cases

\* one case of cutaneous leishmaniasis



**Figure 1.** Average incidence rate of leishmaniasis per 100,000 population in municipalities, Montenegro, 1992–2013



**Graph 3.** Seasonal distribution of leishmaniasis to the number of patients, Montenegro, 1992–2013

dence rate of leishmaniasis is the highest in the coastal region of Montenegro, with 2.39 per 100,000 inhabitants in Ulcinj, and 1.69 per 100,000 inhabitants in Bar (Figure 1).

The number of new cases of leishmaniasis in relation to the reporting period within the year is shown in Graph 3. Seasonal distribution of leishmaniasis indicates that the disease occurs throughout the year with predominance in late spring and summer. In the period from April to October, the number of patients is 50, which represents 76% of all registered cases.

## DISCUSSION

This study presents the results of epidemiological surveillance of leishmaniasis in humans in the Republic of Montenegro in the period from 1992 to 2013. A total of 66 persons were registered in the database of the Centre for Control and Prevention of Diseases within the Institute for Public Health of Montenegro. During this period, the vis-

ceral form of leishmaniasis was dominant and was present in 65 (98%) patients, while one patient was diagnosed with cutaneous leishmaniasis. Considering the fact that vectors are the same for the both forms, it is unlikely that in the former period only one person was affected by cutaneous leishmaniasis. It is more probable that a lighter form of the disease was in question and that these patients did not contact a doctor, or, if they had contacted the Department for Skin Disease, these patients were not registered. The average incidence rate for the abovementioned period was 0.48 per 100,000 inhabitants. This is in accordance with the low incidence rate of the disease that is characteristic for the southern European countries, ranging from 0.02 to 0.49 per 100,000 inhabitants [14]. Low values of incidence were also found in other countries in the region such as Greece 0.36, Algeria 0.45, Spain 0.23 and France 0.24 [15, 16, 17].

Our study shows that a larger number of patients and a higher rate of incidence (0.96 to 1.44 per 100,000 inhabitants), were recorded in the four-year period from 2001 to 2004. Similarly, in neighboring Italy, in the period ranging from 2000 to 2004, the annual number of cases reached its peak and then began to decline. Similar results were reported in Bulgaria, although the incidence rate of visceral leishmaniasis was low (0.06 per 100,000 inhabitants) compared to other countries in the region [18, 19].

When it comes to the age of patients, the disease was present in all age groups. The largest number of cases of visceral leishmaniasis was recorded in children up to seven years old (35 affected in total), with the highest average incidence rate (3.5 per 100,000 inhabitants). The results were similar in Bulgaria, Spain, Turkey and Malta [19–22]. The results of our study show that children are the most vulnerable segment of the population due to a weaker immune response. Contrary to our results, in Greece the largest number of patients were over 14, and in Italy over 17 years of age [15, 18].

By analyzing the gender structure of the patients, higher morbidity was recorded in men (61%) than in women (39%). A similar percentage ratio between the sexes was obtained in Greece and Spain [15, 20]. Greater susceptibility of men compared to women is due to men involvement in different activities such as fishing, agriculture and physical activities. However, other studies of this disease show no difference in occurrence among men and women within equal exposure [23, 24].

Our study shows that the highest average incidence rates of visceral leishmaniasis for the reporting period were in the municipalities of Ulcinj and Bar. In addition to these two municipalities, patients were registered in nine other out of 21 municipalities in Montenegro. In the paper by Dakić et al. [5] it is shown that a great number of patients affected by visceral leishmaniasis in Serbia in the period from 2001 to 2007 had been previously on vacation on the Montenegrin coast.

A seasonal variation of registered cases in Montenegro in the period from 1992 to 2013 was associated with the change of seasons. The disease occurs throughout the year, but in the period from April to October, 76% of cases were

registered. In Bulgaria, the majority were indigenous cases infected in warmer months (June–October), and the first clinical symptoms were recorded from October to January [19]. In our study, the largest number of cases were registered in May and June. Considering the fact that the incubation period lasts from two to 12 months, in Montenegro the disease has either minimal or maximal incubation. As the activity of vector is highest in the warm months, infection is possible either in early spring, in the case of shorter incubation, or at the end of the warm season the previous year, if the incubation is the longest.

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## CONCLUSION

The research has shown that Montenegro is among the countries with a low incidence rate of visceral leishmaniasis. This form of leishmaniasis is more frequent on the Montenegrin coast (municipalities of Bar and Ulcinj), in men and pre-school children.

Nevertheless, because of leishmaniasis re-emergence in the entire Mediterranean Basin, a comprehensive research of ecological and epidemiological characteristics of leishmaniasis, including better monitoring and notification system, is required.

## Епидемиолошко истраживање лајшманијазе у Црној Гори 1992–2013. године

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### КРАТАК САДРЖАЈ

**Увод** Обољења изазвана лајшманијама су распрострањена широм света и значајан су здравствени проблем.

**Циљ рада** Циљ рада је био да се представе резултати епидемиолошког истраживања лајшманијазе код људи на подручју Црне Горе у периоду 1992–2013. године.

**Методе рада** Истраживање је планирано и реализовано као дескриптивна епидемиолошка студија. Узорак истраживања су чинили оболели од лајшманијазе у Црној Гори од 1992. до 2013. године. Здравствени и демографски подаци прикупљени су из медицинске документације. Код свих оболелих болест је микробиолошки доказана. За статистичку анализу резултата коришћен је  $\chi^2$ -тест, којим је испитана значајност стопа инциденције.

**Резултати** У наведеном периоду од лајшманијазе је оболело 66 особа (40 мушкараца и 26 жена) старих до 62 године (просечно  $15,61 \pm 16,76$  година). Код 65 (98%) болесни-

ка дијагностикован је висцерални облик обољења, а код једног болесника кожни тип лајшманијазе. Просечна стопа инциденције била је 0,48 оболелих на 100.000 становника. Највиша просечна стопа инциденције била је у узрасту до седам година (3,50 на 100.000 становника). Просечне стопе инциденције лајшманијазе с највишом вредности биле су у приобаљу Црне Горе, док сезонска дистрибуција указује на то да се болест јавља током целе године с преобладањем с краја пролећа и на лето.

**Закључак** Наше истраживање је показало да је Црна Гора међу државама с ниском стопом инциденције оболевања од лајшманијазе. Ипак, због поновног појављивања ове болести у Медитеранском басену и значаја за народно здравље, потребно је свеобухватно истраживање еколошких и епидемиолошких одлика лајшманијазе, укључујући бољи мониторинг и систем регистрације.

**Кључне речи:** лајшманијаза; инциденција; Црна Гора

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