

Estimation of Population at Risk of Infection and Number of Cases of Leishmaniasis

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In this paper, Dick Ashford, Philippe Desjeux and Peter deRaadt attempt to estimate the total number of people at risk of acquiring disease caused by infection with *Leishmania* spp. In many areas a very small risk is distributed among large numbers of people so, although the number of people at risk may be large, the number of infections may be very small. An estimate of the global annual incidence of new cases has also been made. This refers to reported clinical disease and probably grossly underestimates the number of infections. The methods by which the estimates have been made are specified so that they, as well as the estimates themselves, may be criticized and modified with some degree of objectivity.

Some of the problems involved in providing realistic estimates of numbers of people at risk of parasitic infection, or actually infected, have been discussed and illustrated by the leishmaniasis¹. Previous estimates of the number of cases and risk of leishmaniasis vary widely in both definition and quantity. Walsh and Warren² used World Health Organization (WHO) and Tropical Diseases Research Programme (TDR) sources, amplified by unspecified reports, to estimate 12 million annual cases of infection with *Leishmania* spp in Africa, Asia and Latin America, and an equal number of cases of disease. They also estimated that leishmaniasis causes 100–200 days of life lost per case and 5000 deaths annually. The figure of 12 million cases has been repeated, with or without reference, in various publications^{3,4}. However, a figure of 1.2 million has also been quoted^{5,6}, possibly misquoting the above. Schofield⁶ estimates only 1000 deaths annually. The most conservative figure is, perhaps, that from WHO (Ref. 7) of 400 000 cases annually worldwide. At the opposite extreme, Learmonth⁸ states that cutaneous leishmaniasis (CL) 'affects' some eight million people and visceral leishmaniasis (VL), some ten million. WHO (Ref. 3) estimated some 350 million as the global number of people

'at risk', without defining or quantifying the risk.

With estimates varying by a factor of 45, it is difficult to know which one, if any, is accurate. It is possible that there are enormous differences between the number of cases occurring and the number reported. For example, by extrapolating from an active case detection exercise in Guatemala, it was estimated that 2574 CL cases occurred in a period during which only 64 were reported⁹. In India, a similar exercise estimated 100 000 VL cases in Bihar State, in a year in which only 18 585 were reported, and most of these from a special survey¹⁰. There is also good evidence of large differences between the numbers of people exposed to infection and the numbers of cases of clinical disease.

In view of these problems, any estimate of numbers must be carefully defined and, even then, treated with

great caution. We have attempted to derive useful estimates of numbers of cases and of numbers of people at risk, giving sufficient definition and detail that they may be corrected and updated.

Calculation of Population at Risk

National populations, urban and rural, were taken from Ref. 11, as were total numbers of under five-year-olds. For countries not listed in Ref. 11, figures for total populations given for 1987 by the World Bank¹² were used; the under five-year-old populations were taken as 0.1 of the total. The proportion of the area of each country in which each disease is endemic was estimated from distribution maps held and continuously updated at WHO.

For each main disease type, the population at risk was estimated by multiplying the 'relevant population' by

Table 1. Parameters used to calculate 'relevant population' for each endemic country

Parasite	Parameter
Visceral leishmaniasis^a	
<i>L. infantum</i>	Total under-five population
<i>L. donovani</i>	Rural population, all ages
Cutaneous leishmaniasis^b	
<i>L. tropica</i>	Urban population, all ages
<i>L. aethiopia</i>	Rural population, all ages
<i>L. major</i>	Rural population, all ages
<i>L. braziliensis</i> s.l.	Rural population, all ages
<i>L. mexicana</i> s.l.	Rural population, all ages

^a The figure for visceral leishmaniasis is the sum for *L. infantum* and *L. donovani*. *L. infantum* is taken to include *L. chagasi*. Although *L. infantum* also causes cutaneous leishmaniasis and does affect people over five years of age, the numbers involved are insignificant on a global scale.

^b The figure for cutaneous and mucocutaneous leishmaniasis is the sum for other species in each country.

Table 2. Estimation, by order of magnitude, of cases of leishmaniasis occurring annually by country

Estimated cases annually	Annual case score	Accumulated as
less than one	1	1 case
1–10	2	3.2 cases
10–100	3	32 cases
100–1000	4	320 cases
1000–10 000	5	3200 cases
10 000–100 000	6	32 000 cases

Table 3. Estimated numbers of cases and people at risk with leishmaniasis

Countries	Africa	Americas	Asia	Europe	Total
VL	15	8	16	8	47
CL	20	21	12	8	61
Total	22	21	16	8	67
Population at risk (millions)					
VL	15.03	1.57	163.85	1.53	181.98
CL	37.95	39.27	107.86	?	185.38
Annual cases					
VL	32 800	16 100	39 500	109	88 500
CL	68 900	59 300	167 700	?	295 900

the proportion of the area of the country in which the disease is endemic. 'Relevant populations' depend on the species of parasite involved, and were calculated as outlined in Table 1.

Estimation of Number of Cases

For each country, a comprehensive review of the available data was used to estimate, on a logarithmic (order of magnitude) scale, the number of cases diagnosed and reported annually. An annual case score was thus allocated to each country. In many instances this refers to one or a small number of years for which figures are available. Frequently these are years in which special surveys have been carried out or years in which epidemics occurred. Where possible, an average has been taken for five recent years. The quality of the data is such that precision greater than an order of magnitude (\log_{10}) was considered to be unjustified.

In order to accumulate annual case scores for the calculation of global numbers of cases, the total for each country was taken as the logarithmic midpoint of the relevant case score, as shown in Table 2.

Global Figures

The country-by-country details are about to be produced as a WHO/LEISH programme mimeographed document¹³. Here, we are concerned with global totals rather than national details.

Table 3 summarizes the findings by continent and presents the overall totals. In addition to the 67 countries included, there are a further 12 where VL or CL are endemic but very rare, and from which we have no recent information. Endemicity is suspected in a further 18 countries, giving a total of 97 countries where leishmaniasis endemicity is confirmed or suspected.

VL is known to occur in 47 countries, with approximately 200 million people at risk, and 100 000 cases annually. CL occurs in 61 countries, with almost the same number at risk and 300 000 cases.

So What?

There can be no pretence that the figures presented here are definitive. However, they do provide a framework that can be updated as better information becomes available. The estimate of 400 000 cases annually worldwide agrees with that of WHO (Ref. 7), though the two estimates have been made independently. Excluded are (1) cases who have no access to medical facilities, (2) misdiagnosed cases, (3) cases that are seen clinically but not reported and (4) infections that remain subclinical and are therefore not seen. The fourth category doubtless includes a large proportion of both VL and CL infections. The total number of cases is therefore certainly considerably greater than we have estimated, and the number of infections is greater still.

While the large number of countries affected by the leishmaniasis emphasizes the global importance of the problem, more than half of the VL cases occur in just two countries: India and Sudan. (At the time of writing, October 1991, more than 2000 VL cases are being treated in just two treatment centres in Southern Sudan.) More than half the CL cases occur in eight countries: Afghanistan, Algeria, Brazil, Iran, Iraq, Saudi Arabia, Sudan and Syria.

The numbers of cases could be used to give an idea of the effort required to treat them all, if this were feasible; the number of people at risk indicates how many might benefit from vaccination or environmental intervention measures. It has been emphasized that knowing the number of cases alone is of little help to medical services in determining priorities², which will be set depending on the severity of the disease and what

can be done about it. In the case of the leishmaniasis, both the severity of disease and the possibility of control measures vary greatly; specific information at the national or regional level is required for the assessment of national priorities. The global figures can only be useful on a global scale. A cynic might be led to enquire as to the number of researchers and the funds supposedly devoted to the control of the leishmaniasis, and to compare this with the number of cases and the funds available for control.

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