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Cutaneous leishmaniasis in southern Sri Lanka

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Summary Cutaneous leishmaniasis is an established disease in Sri Lanka. The majority of cases have been reported from the North-Central Province, with the southern parts of the country considered less affected. However, during 2004, when the services of a dermatologist were available, a considerable number of patients were referred from the Southern Province, which formed the basis for this study. The clinical pattern, detailed geographical distribution within the Southern Province and periodicity of the cases were studied over a period of 12 months. Of the 113 patients diagnosed, the highest number was within the 10—19 years age group. Most patients were from densely populated rural areas around Matara, a large town within this province. There was a notable increase in the number of cases presenting during February—March and August—September, which are periods following monsoonal rains. Exposed areas of the skin were commonly affected, with the majority of patients having single lesions. Females and males were equally affected. This is in contrast to our previous findings in the North-Central Province where the majority of patients were male soldiers with multiple lesions.

1. Introduction

Cutaneous leishmaniasis (CL) is considered an established disease in Sri Lanka, with over 600 cases reported from various parts of the country during the past 4 years. The causative organism was identified as *Leishmania donovani* zymodeme MON-37 (Karunaweera et al., 2003). The majority of patients previously reported were from the North-Central Province, with the rest of the island, especially the southern parts, being less affected (Siriwardena et al., 2003). However, during 2004, when the services of a dermatologist were available, there was a significant increase in the number of cases referred to the Department of Parasitology, Faculty of Medicine, University of Colombo, from the Southern Province, with most cases concentrated in two foci. In addition to the geographical distribution, this study analysed the clinical pattern, periodicity and gender distribution of the cases.

2. Materials and methods

2.1. Study location

The Southern Province of Sri Lanka has the coastal belt bordering it from the south and the Sabaragamuwa Province at

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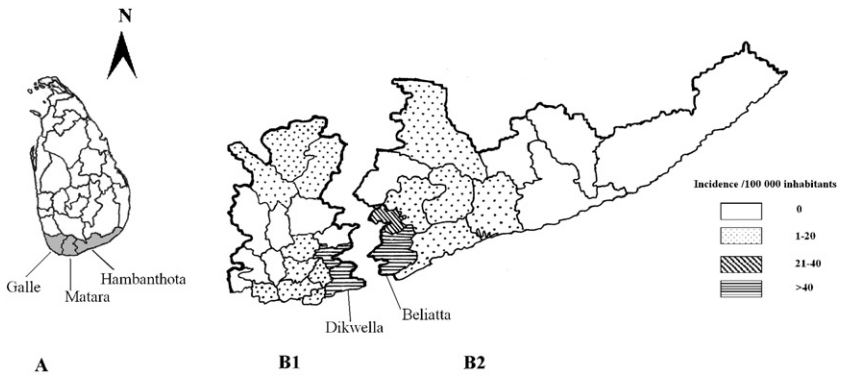

Figure 1 Map of Sri Lanka with the Southern Province shaded (left). The spatial pattern of the cumulative incidence (per 100 000 inhabitants) of cutaneous leishmaniasis in different Divisional Secretariat Divisions in the districts of Matara (B1) and Hambanthota (B2) during 2004 (right).

its northern border (Figure 1). The province is divided into three districts, Galle, Matara and Hambanthota (Figure 1). The patients included in this study were those referred to the Department of Parasitology from Matara and Hambanthota districts where the total population is 1 286 606 inhabitants according to the census of 2001 (Department of Census and Statistics, 2001). The majority of patients came from two foci in the Southern Province, Dikwella in Matara district and Beliatta in Hambanthota district, with the two Divisional Secretariat Divisions (DSD; Dikwella and Beliatta) having a common border (Figure 1). DSDs are administrative units below the district level with a median population of approximately 50 000 and an average surface area of 208 km^2. Ambalanthota also had a high number of cases. Almost all the patients lived and/or worked away from the main cities.

2.2. Patients

The General Hospital, Matara, is the only government institute in the study area where the services of a consultant dermatologist and treatment facilities were available. Patients included in the study were those who presented themselves to the General Hospital, Matara, and those who were referred to this hospital by general practitioners in the province. Those patients who were clinically suspected of having CL were then referred to the Department of Parasitology for confirmation of the diagnosis. All patients with their diagnosis confirmed by isolation of *Leishmania* were included in the study.

A retrospective, descriptive study was carried out using a previously validated, interviewer-administered questionnaire (Siriwardena et al., 2003). Details of the patients, such as demographic parameters (age, sex), location (likely site where the infection was acquired), clinical history, the size, site and type of lesion, and systemic features etc. were recorded.

2.3. Diagnosis

Diagnosis was confirmed by microscopic examination of saline aspirate smears or slit-skin smears of the lesions and/or culture, performed after obtaining voluntary informed consent.

Direct smears from the lesions were air-dried and stained with Giemsa's stain and screened for *Leishmania* amastigotes under a light microscope. A few drops of the aspirate were inoculated into Evans' modified Tobie's medium (WHO, 1990) in glass test tubes and the cultures were examined for promastigotes. If all three investigations were negative, they were repeated once more before excluding the diagnosis. Once the diagnosis was confirmed, patients were referred back to the local dermatologist who treated the patient with either cryotherapy (liquid nitrogen) or antimonials (intramuscular or intralesional sodium stibogluconate 20 mg/kg body weight).

2.4. Statistical analysis

A hierarchical database was generated with SPSS 10.0 (SPSS Inc., Chicago, IL, USA) using the individuals as statistical units. The distribution of CL cases in the Southern Province was mapped using the GIS package ArcView (Briët et al., 2003). The type and number of lesions were analysed by frequency distribution, percentage and cumulative factor parameters. The monthly distribution of cases was represented graphically.

3. Results

A total of 140 clinically suspected cases were referred to the Department of Parasitology from November 2003 to November 2004. The diagnosis was confirmed as CL in 113 cases (80.7%).

3.1. Geographical distribution

The patients were from the districts of Matara ($n = 67$; 59.29%) and Hambanthota ($n = 46$; 40.71%), including four from Embilipitiya, a village bordering Hambanthota. The highest number of cases from these two districts were concentrated in two rural DSDs bordering each other: Dikwella, Matara district ($n = 29$) and Beliatta, Hambanthota district ($n = 26$). Other DSDs with a noteworthy number of cases were

Table 1 Age and sex distribution of the diagnosed cutaneous leishmaniasis patients

Age group (years)	No. (%) male	No. (%) female	Total frequency (%)
0–9	5 (8.8)	10 (17.9)	15 (13.3)
10–19	15 (26.3)	12 (21.4)	27 (23.9)
20–29	9 (15.8)	8 (14.3)	17 (15.0)
30–39	8 (14.0)	1 (1.8)	9 (8.0)
40–49	8 (14.0)	8 (14.3)	16 (14.2)
50–59	3 (5.3)	9 (16.1)	12 (10.6)
60–69	5 (8.8)	6 (10.7)	11 (9.7)
≥70	4 (7.0)	2 (3.6)	6 (5.3)
Total	57 (100)	56 (100)	113 (100)

Kirinda-Puhulwella ($n = 11$), Devinuwara ($n = 7$), Matara Four Gravets ($n = 7$), Okewela ($n = 6$) and Ambalanthota ($n = 6$). In these areas the majority of patients came from rural settings. Eleven other DSDs all had less than five cases and the total number of cases was 113.

The mean annual incidence of diagnosed CL cases in affected areas was 11.64 per 100 000 inhabitants for the year 2004. The cumulative incidence during the period of study ranged from as high as 56.92 (Dikwella), 56.53 (Kirinda-Puhulwella) and 49.73 (Beliatta) to 1.56 (Kotapola). The spatial pattern (Figure 1) shows that the three DSDs with the highest incidence are adjoining each other, forming a single, case-concentrated 'mega subdistrict' adjacent to which there is sparse distribution mainly to the east and then to the west. Interestingly, no cases have been reported from the DSDs immediately to the north.

3.2. Age and sex

Patient age ranged from 2.5 years to 77 years, with a median of 28 years. The highest number of cases was within the 10–19 years age group (Table 1). Gender distribution showed both males and females affected almost equally (Table 1).

3.3. Clinical presentation

All lesions were seen on exposed sites. The majority were on the face ($n = 46$; 41%) and upper limbs ($n = 37$; 33%) (Table 2). Eighty-eight lesions (78%) were painless and non-pruritic (Table 2). More ulcers ($n = 41$; 36%) were seen than other types of lesions (Table 2). Papules were the least common type of lesions ($n = 6$; 5.3%). Single lesions were the most prevalent ($n = 84$; 74%). Multiple lesions were rare (2% each for four and five lesions; Table 2). The most common surrounding skin changes were hypopigmentation (44%) and scaling (28%) (Table 2). The duration of first detection of lesion and initial presentation ranged from 2 months to 1 year. Three patients had lesions with oral mucosal tissue involvement (Rajapaksa et al., 2005).

3.4. Monthly distribution

Case distribution on a monthly basis was also analysed (Figure 2). The mean number of patients presenting was 9.5 for a given month during the period of study. However, there was an increase ($n = 11$) during February/March and July–September, with the highest ($n = 16$) being recorded in August. These periods with a high number of cases immediately follow the monsoonal rainy periods (November–January and May–June).

Table 2 Distribution of lesions by site, type, the number of lesions and features of surrounding skin in diagnosed cutaneous leishmaniasis cases

	Frequency	Percentage
Site of the lesion		
Face	46	40.7
Upper limbs	37	32.7
Body	13	11.5
Lower limbs	3	2.7
Pinna	4	3.5
Other	10	8.8
Presentation of lesion		
Typical	88	77.9
Atypical	25	22.1
Type of lesion		
Ulcer	41	36.3
Nodule	32	28.3
Ulcerated nodule	20	17.7
Plaque	7	6.2
Ulcerated plaque	7	6.2
Papule	6	5.3
No. of lesions		
One	84	74.3
Two	17	15.0
Three	8	7.1
Four	2	1.8
Five	2	1.8
Surrounding skin changes		
Increased pigmentation	17	15.0
Reduced pigmentation	50	44.2
Scaling	32	28.3
Erythema	22	19.5
Satellite nodules	8	7.1

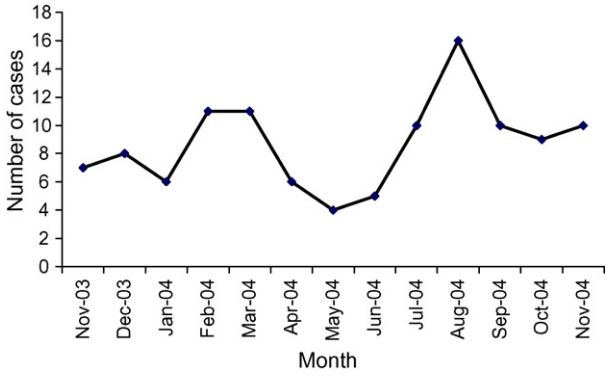

Figure 2 Distribution of the number of cutaneous leishmaniasis cases according to the month of presentation during the study period.

4. Discussion

The majority of patients previously reported to be infected with CL were from the North-Central Province and most of them were soldiers (Siriwardena et al., 2003). This high incidence was explained by chance acquisition of the infection owing to the stationing of military personnel within or close to thick jungles, exposing them to the danger of contracting the disease (Siriwardena et al., 2003). However, the situation in the south, the location of the present study, is quite different, with no military camps and being unaffected by civil war. Almost all those who were affected were civilians living in moderately built brick houses. Most of the occupants, perhaps except for a very few men, sleep indoors. The areas are residential, though rural, with no jungles in the immediate vicinity. The wild reservoir fauna is thus restricted. Males and females were equally affected. In two instances, several members of the same family were infected, which supports the view that the vector is an indoor biter and favours the theory of human-to-human transmission and/or that domestic/peridomestic animals act as reservoir hosts.

In the Southern Province, a wide age range was affected, with the majority of cases being young adults. Exposed areas of the body were commonly affected, with the face and upper limbs being the most frequent sites, and most patients had single lesions. However, in our previous study of patients from North-Central Province the age group that acquired the disease was generally 25—35 years (Siriwardena et al., 2003), multiple lesions were common and men with the disease outnumbered women (Karunaweera et al., 2005). This is not surprising, since the majority of affected cases were male soldiers (Karunaweera et al., 2005).

Information on the possible vector of CL in Sri Lanka is lacking and only two species of phlebotomine sandflies are known to exist in the country. *Phlebotomus argentipes*, which is a known vector of *L. donovani* in neighbouring India, is widespread on the island (Lane et al., 1990) and many of these sandflies have been found around houses. The other species, *P. stantoni*, is found around scrub jungle and is not a suspected vector of *Leishmania* (Lewis, 1978). Since no studies of Sri Lankan sandflies have been carried out, the possible vector of CL cannot be identified (Wijesundera, 2001). The close association between the increase in the number of cases and rainfall could be due to the rainy season creating optimal conditions of humidity and temperature for breeding of sandflies, resulting in greater vector densities. This could lead to an enhancement of vector—human contact, which is likely to have increased the spread of the disease.

The apparently high incidence in the south described in this study could be at least in part due to the ready access to medical care owing to the presence of a consultant dermatologist during this period. Public awareness through the media and messages conveyed by word of mouth by patients who have had similar symptoms in the neighbourhood may also have contributed to this finding.

Furthermore, the following factors may also have contributed to the high incidence of cases. The Southern Province is fast becoming suburban, with new settlements being established at a fast pace. As a consequence, deforestation is known to occur (Rathnayaka et al., 2002; WHO, 2002). In addition, the development of irrigation projects to improve agriculture in the province, especially the main Nilwala river dam project, is also known to cause a major change in the environmental balance (Mendis and Wadigamangawa, 1996). This situation on the ground together with the rains may have created conditions favourable for vector breeding (WHO, 2002). Migration of people into a newly conditioned environment is known to aid the spread of the disease (Desjeux, 2001). Another important contributory factor could be cattle breeding in the area. Buffaloes especially are used in the fields in paddy cultivation and in the production of curd, which is a cottage industry in the province (Department of Census and Statistics, 2004). These animals provide a ready warm blood meal for the sandfly and their dung may also form an ideal bedding for the fly to lay its eggs. All these factors could have contributed to the highly populated areas (population 103 232) of Dikwella and Beliatta becoming high-density foci of the disease. Interestingly, Ambalanthota, from where the first locally acquired CL case was reported (Athukorale et al., 1992), was noted to be a high prevalence area.

The disease incidence in the study area could be higher than shown here since the study was based on passive case detection. The apparent increase in the number of CL cases from Southern Province, possibly owing to the services of a dermatologist being available during this period, shows the importance of improving diagnostic and treatment facilities as well as public awareness of the disease. Maintaining a national database to monitor new cases is also necessary. A full-scale study will be helpful in curbing the spread of CL not only in the Southern Province but also in the whole of Sri Lanka at this early stage.

Authors' contributions: USR and NDK designed the study protocol; USR and CU carried out the clinical assessment; USR and RLI carried out the laboratory investigations and drafted the manuscript; USR, RLI and NDK analysed and interpreted the data. All authors read and approved the final manuscript. USR is guarantor of the paper.

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