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RESEARCH ARTICLE

Socio-Demographic profile of Cutaneous Leishmaniasis patients in Hambantota District, Sri Lanka

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Abstract: Cutaneous leishmaniasis (CL) is known to Sri Lanka from 1992. The distribution of the disease is increasing and large numbers of CL cases are reported from Hambantota district. This study was focused on selected clinical features and socio-demographic factors of CL positive patients in Hambantota district and this information were collected using a questionnaire from CL suspected patients who attended to the Tangalle Hospital from June, 2016 to January, 2017. For selecting the CL positivity, slit skin smears were obtained from lesions of suspected patients. These smears were stained and examined for *Leishmania* amastigotes. Smears were positive in 183 patients. Majority of them had one lesion on the body and 117 patients were males ($p<0.001$). The most affected age group was ≥50 years. House-wives and students were identified as highly affected occupants. The higher number of CL patients lived in rural areas ($p<0.001$). Most of the CL patients lived in houses with cemented floors and walls with tiled -roofs meanwhile 117 houses had cracks, either in floors or walls. Further, 95.5% of patients were unaware of sand-fly biting. These findings highlight the socio-demographic profile of the CL patients in Hambantota district which will be important for the disease management strategies.

Keywords: age groups, *Leishmania sp*., occupation, skin lesions, slit-skin smears.

INTRODUCTION

Leishmaniasis is a vector-borne protozoan parasitic disease and it is widely distributed in tropical and subtropical countries throughout the world (Alvar *et al*., 2012). Mainly it has three clinical forms such as cutaneous leishmaniasis (CL), visceral leishmaniasis (VL) and muco-cutaneous leishmaniasis (MCL) (WHO, 2010). Cutaneous leishmaniasis is the most common form of leishmaniasis and VL and MCL are potentially fatal. The causative agent of CL in Sri Lanka is *Leishmania donovani* which is the causative agent of human VL in the Indian subcontinent (Elamin *et al*., 2008). MON-37 is the causative *Leishmania* strain in Sri Lanka (Karunaweera *et al.*, 2003). Further analysis of *Leishmania* datasets with microsatellite analysis revealed that *L. donovani* isolates of Sri Lanka tend to cluster on a geographic basis, with isolates of *L. donovani* from India, Bangladesh and Nepal. However, some critical genetic difference in Sri Lanka parasites may exist and cause them less virulent than *L. donovani* from other countries such as India and Bangladesh (Siriwardana *et al.*, 2007).

The sand fly, *Phlebotomus argentipes* had been identified as the likely vector of CL in Sri Lanka (Gajapathy *et al*., 2013). Lane *et al.,* (1988) reported that *P. argentipes* shows geographical variation which is associated with several morphological characteristics. In 2011, Gajapathy and his team stated that all three members of *Argentipes* complex such as *P. argentipes s.s*, *P. annandalei* and *P. glaucus* are presence in the northern Sri Lanka. First Sri Lankan CL patient was reported in 1992 from Hambantota district (Athukorale *et al*., 1992)**.** After few years it became an established disease and it has spread in many districts in the country (Karunaweera and Rrajapaksa, 2009). Initially, majority of CL patients were soldiers working in the northern part of the country (Siriwardana *et al*., 2012). In 2004, 26 CL cases were reported from Hambantota district (Rajapakse *et al*., 2007 and in 2014 it had increased to 270 (Sudarshani *et al*., 2016). Findings in other countries suggested that socio-demographic features, environmental conditions, human behaviour and genetic factors facilitate the prevalence of CL in a country (Votypka *et al*., 2012). The vector sandfly species and reservoir hosts which support for the transmission of *Leishmania* species in Hambantota district are yet to be identified. However, knowing of risk factors which are associated with CL transmitting is very important for designing proper control measures for CL. Therefore, the present study was carried out to identify the socio-demographic profile of CL suspected patients in Hambantota district, Sri Lanka which may be helpful for future studies in the area.

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MATERIALS AND METHODS

Hambantota is one of the three districts in Southern Province of Sri Lanka (6° 6' N, 81° 8' E) and it consists with 12 DSDs (District Secretary Divisions). The total land area is 2609 km^2 with population 596,917 and 96% of them are living in rural areas (Department of Census and Statistics, 2011) (Figure 1). Town areas of Tangalle, Hambantota and Ambalantota DSDs are considered as urban areas in the district. Average annual rainfall of Hambantota district is 1045 mm and the mean temperature, is at 27.2^{o}C (Wikipedia.org/wiki/Hambantotaw).

The present study was carried out during the period from June, 2016 to January, 2017. CL suspected patients who attended to the Dermatology clinic in Tangalle base hospital during the above period were included in the study. After clinical examination of each CL suspected patient, they were interviewed to collect additional research information such as socio-demographic information as sex, age, occupation, residence area, condition of the house, presence of cracks, holes or crevices in floor and walls. To get an idea about the awareness of sand flies and their biting activity relevant to the lesions on body of the patients, questions such as 'did you see or feel biting of any insect before the appearance of lesions?" and if the answer was "yes", "time of the day and place you saw or felt the biting" and answered given by patients were reported. After getting the written consent, slit- skin smears were taken at the most indurated margin under aseptic conditions by the Dermatologist of the respective hospital on the day of enrolment to the hospital. After cleaning the lesion with surgical spirit, a slit, 1-2 millimeter in long and deep was made at the active margin, into the upper dermis with a sterile, disposable surgical blade and the blood was cleaned by using sterile cotton wool. Once the bleeding had stopped, dermal tissue from the wall of the slit was scrapped with the blade and the material obtained was smeared onto glass slides to form a thin smear. Prepared thin smears were stained with Giemsa and examined under a light microscope using an oil immersion lens to identify *Leishmania* amastigotes at the Department of Zoology, University of Ruhuna, Matara, Sri Lanka.

The data were statically analyzed using SPSS 16.0 version. Descriptive statistics and frequency distributions were performed to describe clinical features. Nonparametric chi-square test was used to determine the significance level of socio-demographic factors. This statistical test determined whether the counts were uniformly distributed across categories of mentioned socio-demographic factors. Further, crosstabulations with gender and age groups and gender and occupation were performed.

Ethical approval for this study was obtained from the ethical review committee of the Faculty of Medicine, University of Ruhuna, Galle, Sri Lanka.

RESULTS

A total of 310 CL suspected patients were screened in the study.Out of them, 183 (59%) slit-skin thin smears were positive for *Leishmania* amastigotes (Figure 2). Clinical features of CL lesions of this study profile displayed in Table 1. Majority of the CL patients (N=158, 96.3%) presented with one lesion in their body ($\chi 2$ (2) =234.32, p<0.001). Large number of lesions were observed in their upper limbs (N=92, 44.3%) followed by lower limbs (N=36, 17.3%). Meanwhile a few number of lesions were on ears (N=7, 3.4%) and on neck (N=2, 1.0%) (Figure 3).

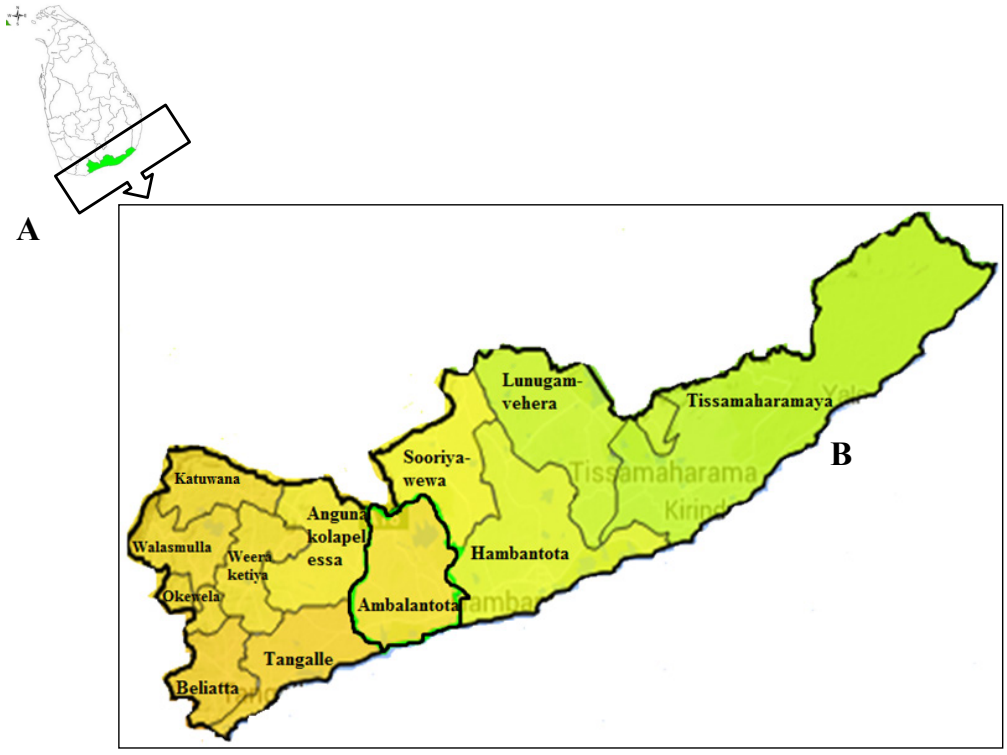

Figure 1: A: Map of Sri Lanka with Hambantota district shaded. B: District Secretary Divisions in Hambantota district.

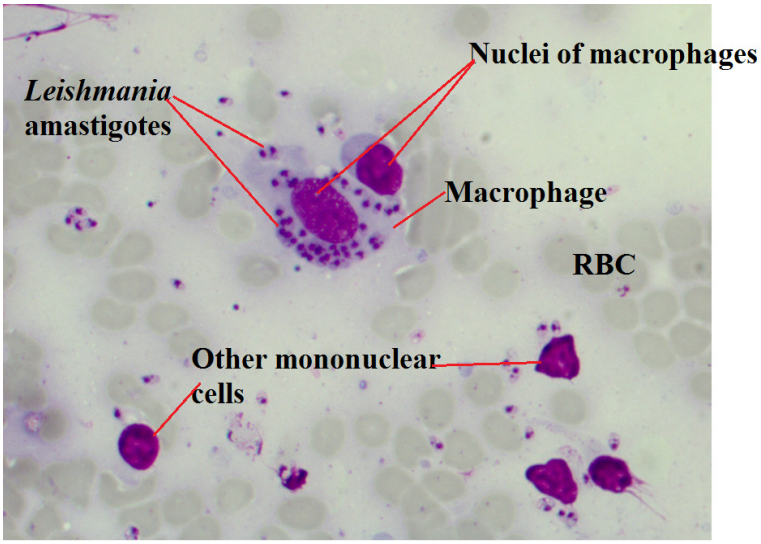

Figure 2: *Leishmania* amastigotes present in slit- skin smear of CL positive patients (1X400).

Table 1: Clinical characteristics of CL cases in Hambantota district, Sri Lanka.

Details	No. of patients affected (%)
1. No. of lesions (N=208)	
1	158 (96.3)
2	22 (12.1)
3	3 (1.6)
2. Site of lesion (N=208):	
Head	11 (5.3)
Face	27(13.0)
Ears	7 (3.4)
Neck	2 (1.0)
Trunk	33 (15.9)
Upper limbs	92 (44.3)
Lower limbs	36 (17.3)

Figure 3: CL lesions a: on hand b: on arm c: on face of patients in current study profile.

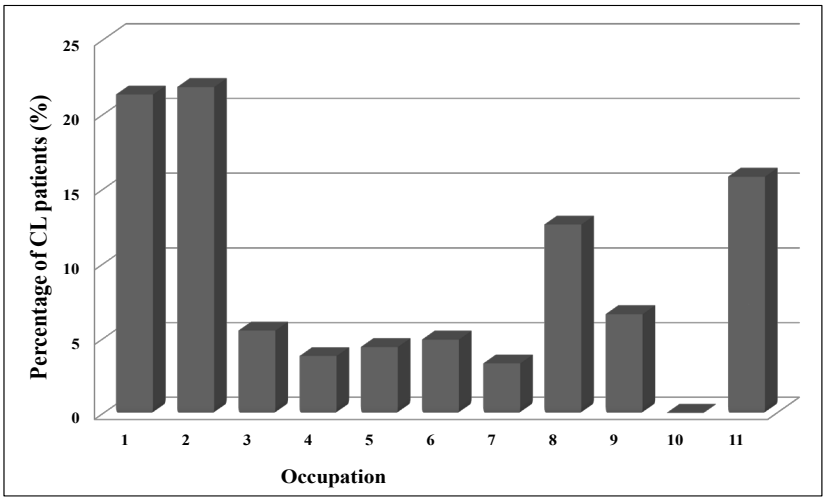

Figure 4: Frequency distribution of different occupations of CL patients in Hambantota district, Sri Lanka. 1: Students; 2: House wives; 3: Unemployed; 4: Laborer; 5: Farmer; 6: Fisherman; 7: Skill worker; 8: Self-employed; 9: Government servant; 10: Military personal; 11: Others (Retired & private sector etc.).

The socio-demographic factors of the CL positive patients are described in the Table 2 and Figure 4. As stated in Table 2, significantly higher number of CL positive patients were males (63.9%) compared to females in the Hambantota district ($\chi 2$ (1) =14.213, p<0.001).

More patients were found in ≥50 years and ≤19 years age and there was a significant difference in CL positivity among age group categories ($\chi 2$ (4) =24.787, p<0.001). In this study profile, significantly high number of CL patients lived in rural areas ($\chi 2$ (1) =14.213, p<0.001). As shown in Figure 4, high number occupants such as house-wives and students were infected with CL parasites, followed by retired and private sector occupants and self-employed people ($\chi 2$ (9) =88.311 p<0.001). Meanwhile, gender and occupation crosstabulation indicated that more infected males in this profile occupied as students, self-employed persons or retired persons or bank managers or private security persons (Pearson $\chi 2$ (9) =98.298, p<0.001).

Majority of the CL patients participated in the current study had houses with floor-cement (N=139, 95.8%), walls –cement (N=65, 44.8%) and roof-tiles (N=61, 42.1%). Further, seventeen patients (17.5%) had houses with clay-walls or brick-walls and three patients had houses with clay-floor. Meanwhile large number of CL patients lived in houses with coconut leave thatched roofs (N=46, 31.7%) or thatched walls (N= 51, 35.2%).Yet, 80.1% of patients' houses were with cracks or holes in walls and floors. Significantly large number of patients in this study profile was unaware of biting activity of sand flies (Table 2).

DISCUSSION

Previous studies indicated that Hambantota is considered as an endemic area for localized cutaneous leishmaniasis as large number of CL cases was reported (Ranasinghe *et al.*, 2013; Sudarshani *et al*., 2016). According to the findings of the current study, out of 312 suspected patients who participated in this study profile, 183 (59%) patients were infected with localized cutaneous leishmaniasis. These patients were reported from Katuwana, Okewela, Walasmulla, Weeraketiya, Beliatta, Tangalle, Ambalantota and Angunakolapelessa District Secretary Divisions in Hambantota district. Clinical features such as one lesion on exposed body parts was very common in Hambantota district and several studies done in other areas of the country also documented that most lesions had appeared in exposed areas of the body (Rajapakse *et al.*, 2007; Ranasinghe *et al*, 2013). A previous study done in southern province of Sri Lanka reported that the highest number of CL cases reported ranging the age group 10-19 years and both males and females were affected almost equally (Rajapakse *et al.*, 2007). The current study confirmed that the age group ≥50 years were highly affected (31.7%) by CL and followed by the age group ≤19 years (25.2%) which mainly consists of students. This age distribution pattern was somewhat similar to our earlier study done in 2014 in Hambantota district which reported that 33% of CL patients were ≥ 50 years (Sudarshani, *et al*., 2016). The same study (Sudarshani *et al*., 2016) documented that males were more affected than females in Hambantota district in 2014. Meanwhile a cross-sectional study done in Matara district which is adjacent to Hambantota district, Kariyawasam *et al.*, (2015) indicated that more females were affected than males. Siriwardana *et al.*, (2019) in their study done throughout the country in different time periods from 2001 to 2013 reported that more young adult patients between ages of 21-40 years were males and females showed a wider age distribution with involving younger and elderly patients. Age and gender cross-examination in the current study profile indicated that number of males infected in all age- groups were higher than females as men do more outdoor activities such as walking, playing, travelling and outdoor occupations such as fishermen, farmers and skill workers than females at dawns and dusks of the day. It increases the exposure

Table 2: Socio-demographic factors of CL positive patients in Hambantota district, Sri Lanka.

Factor	CL positive (%)
1. Gender	
Male	117 (63.9)
Female	66 (36.1)
2. Age Groups (years)	
≤19	46 (25.1)
20-29	21 (11.5)
30-39	28 (15.3)
1-49	30 (16.4)
≥50	58 (31.7)
3. Residence area	
Urban	66 (36.1)
Rural	117 (63.9)
4. Housing conditions:	
a. **Type of floor** :	
Cemented	139 (95.8)
Earth /Dampen earth	3 (2.1)
Clay	3 (2.1)
b. Type of walls	
Cemented	65 (44.8)
Brick	11 (7.6)
Thatched	51 (35.2)
Plank/ Metal sheets	12 (8.3)
Clay	6 (4.1)
c. Type of roof	
Thatched	46 (31.7)
Tin	19 (13.1)
Tiled	61 (42.1)
Asbestos	16 (11.0)
Wood ceiling	3 (2.1)
5. Presence of cracks, holes & crevices in walls & floor	
Yes	117 (80.1)
No	29 (19.9)
6. Awareness of sand fly biting:	
Yes	8 (4.5)
No	175 (95.5)

of men to the vector sand fly. A previous study of CL in the northern area of the country also reported that outdoor occupation was a risk factor for CL (Siriwardhana *et al*., 2010). Based on the findings of the current study most of the affected females were house-wives. This finding is supported by previous study carried out in India (Aara *et al.*, 2013). In addition, higher number of elderly people and self-employed people such as three-wheel drivers had CL; however affected military personnel were not reported in this profile. In contrast, a study done in Sri Lanka (2017) revealed that more security service personnel and farmers were infected with CL than the other occupants (Galgamuwa *et al*., 2017). According to the findings of current study more CL patients were reported from rural areas than urban areas in Hambantota. According to the government statistics (2012), Tangalle, Ambalantota and Hambantota town areas are considered as urban areas in Hambantota district while the rest is rural areas with patchy forests and agricultural lands. Rethinger *et al.*, reported in their study (2010), the vegetation near houses can provide resting places and breeding sites for sand-flies. According to the present findings, there may be an association between the condition of the houses and CL cases in Hambantota district. Majority of the CL patients participated in current study had houses with cemented floors and walls –cement and roof with tiles. However, houses of majority of CL patients' with either cracks or holes in walls or floor. A study in Kabul, Afghanistan reported that house with brick walls could significantly influence CL risk (Rethinger *et al*., 2010). In this study area, seventeen patients (17.5%) had houses with clay-walls or brick-walls and three patients lived in houses with clay-floor. Meanwhile large number of CL patients (N=46, 31.7%) lived in houses with coconut leave thatched roofs. Based on the previous findings, the dark un-plastered house walls, ceiling or floor with cracks and crevices are known breeding places and

resting places of vector sand-flies having moisture and humus (WHO, 2010; Singh *et al.*, 2010, Coura-Vital *et al*., 2013, Siriwardana *et al*., 2013). Further, the largest number of CL patients (95.5%) was unaware of the biting activity of sand flies as it is less painful (personal communication). Further, sex related behavioural patterns that increase human -vector contact, age, house design and construction materials are usually considered as risk factors for CL in Pakistan (Yared *et al.*, 2016).

In conclusion, the clinical profile of CL positive patients in the current study documented that the lesion number ranged from 1 to 3 and the highest number of patients had single lesion on their arms, legs or trunk. Males were more infected in each age group and two age groups namely, more than 50 years (≥ 50 years) and less than 19 years (≤ 19 years) had high CL infections. Analysis of CL infection and occupational categories indicated that house –wives and students were more infected with CL than the other occupants in this profile. Some patients lived in houses with clay-walls or brick-walls and clay-floors and coconut leave thatched roofs which are considered as preferred micro-habitats of vector sand flies. However, current study was focused on clinical features and socio-demographic factors of CL positive patients in Hambantota district. It is urgently needed to identify the other factors such as human life-style patterns and environmental factors which enhance CL transmission in Hambantota region. On the other hand investigations on bionomics of sand-fly vector species and reservoir hosts which facilitate the CL transmission in Hambantota district are needed for effective management of the disease. Otherwise CL becomes a major public health problem in Hambantota district, Sri Lanka.

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