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Research Article

Analysis of gaps in the correct diagnosis of leishmaniasis at primary care level; socio-demographic and environmental risk factors of leishmaniasis transmission in Anuradhapura

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Abstract

Background

The leishmaniasis is an emerging health problem in dry zone of Sri Lanka. The multiplicity of factors involved in the transmission of leishmaniasis constitutes a challenge to its control. Knowledge of such factors may contribute to identify the control strategies. Although Medical officers have been given training on leishmaniasis, still patients with leishmaniasis had been diagnosed incorrectly. Aim of the study was to analysis of the diagnosis pattern of leishmaniasis patients by the primary care medical officers and to identify potential socio demographic and environmental risk factors of leishmaniasis transmission.

Methods

A descriptive cross sectional study conducted among the leishmaniasis patients attending to the Dermatology clinic, Teaching Hospital Anuradhapura during November 2015 to November 2016 using interviewer administered questionnaire.

Results

The study sample was 300 leishmaniasis patients .Male to female ratio was 2:1.The commonest affected age group was 20 to 40 years .Lesser number (33%) had heard about leishmaniasis. Nearly one forth (23%) of patients had been diagnosed incorrectly at the primary health care level. Nearly 50%of patients got leishmaniasis due to occupation related activities. Most (75%) of patients had paddy fields, large number of Banana bushes, Manna bushes and large wild area near their residence. Nearly 50% of patients had water channel near their residence. All most all (96%) patients use bed nets.

Conclusion

Nearly one forth of patients missed diagnosis at the primary health care level. Paddy fields, Banana bushes, Manna bushes, large wild area and water channels close to residence may play role in leishmaniasis transmission.

Key words: leishmaniasis, transmission, risk factors

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Introduction

Leishmaniasis is poverty related, neglected vector born disease caused by a protozoan parasite which is transmitted by the bite of an infected female phlebotomine sandflies^{1,2}.

The first autochthonous case of leishmaniasis was reported in 1992 from Southern province of Sri Lanka.³ In 2003, causative species was identified as *Leishmania donovani* zymodeme MON-37.⁴ Mucocutaneous and visceral involvements were first reported in 2005⁵,⁶ and 2006⁷,⁸ respectively caused by the same species. Although occasional cases are reported from all the provinces in Sri Lanka, Southern⁹ and North-Central province¹⁰ are the endemic reporting more than 2000 cases annually. The observed gradual increase in case number annually in Anuradhapura district could be due to actual increase in cases, increase in case detection or both.

Leishmaniasis is predominantly an occupational disease, related to activities such as farming, rubber tapping, military operations and road constructions. Environmental factors that can affect the incidence of leishmaniasis include urbanization, domestication of the transmission cycle and the incursion of agricultural farms and settlements in to forested areas.^{1, 11} Leishmaniasis is climate sensitive and strongly affected by changes in rainfall, temperature and humidity.

The proven reservoir hosts of leishmaniasis are dogs as well as other animals.^{1,11} The disease occurs in agricultural villages where houses are frequently constructed with mud walls and earthen floors, cattle and other livestock are kept close to human dwellings. Human behavior such as sleeping outside or on the ground, may increase the risk, while the use of bed nets tends to be associated with lower risk.^{1,11} Multiplicity of factors involved in the transmission of leishmaniasis constitutes a challenge to its control.

In Sri Lanka, until 2007 it was known as a disease of military personnel. From 2007 to 2010 Ranawaka RR and Weerakoon HS published several research articles^{10,11,12,13,14} showing that this is a disease of locals, where farmers and children who engaged in outdoor activities were the mostly affected. Leishmaniasis was not even known to most medical practitioners before 2007 and disease notification system included leishmaniasis as a notifiable disease in 2008. In 2007 awareness programs started focusing on health care workers, school children and public in Anuradhapura. Although health care workers including medical officers have been given training on leishmaniasis, continue to see many patients with leishmaniasis had been missed-diagnosed at the primary health care level. Most of the leishmaniasis patients have delayed presentation to the dermatology clinic and it may be due to missed-diagnosis or actual delayed presentation.¹⁰ The clinically diagnosed leishmaniasis

patients were confirmed by slit-skin-smear or histopathology to avoid misdiagnosis because there are several other diseases mimic cutaneous leishmaniasis clinically, such as leprosy, cutaneous tuberculosis and cutaneous sarcoidosis.

There are several risk factors involve in leishmaniasis transmission¹ but there are no published research articles involving leishmaniasis patients in Anuradhapura district regarding risk factors although highest number of patients reporting in Anuradhapura District. There was one study done by Salindra Ranasingha et al regarding risk factors but it was involve in patients and community.¹⁵

This study was aimed to analyze the gaps in the correct clinical diagnosis of leishmaniasis by the primary care medical officers in Anuradhapura district and to identify potential socio- demographic and environmental risk factors of leishmaniasis transmission in an endemic district of Sri Lanka.

Methodology

Study setting

Anuradhapura district is located in North Central Province. It has an area of 6861 Km² and nearly 900000 inhabitants (2016). Anuradhapura district reported the highest leishmaniasis case incidence in 2010 to 2015 (Regional Epidemiology unit, Anuradhapura district and unpublished data). The altitude is generally less than 85 meters above mean sea level and the climate is typically tropical but some area are humid tropical with mean annual temperature of 28⁰c and mean annual rainfall of 140mm³ (Department of Meteorology, Sri Lanka).

People of Padaviya, Thalawa, Nuwaragam Palatha Central, Nuwaragam Palatha East, Nochchiyagama, Thambuttagama and Rajanganaya areas are commonly affected with leishmaniasis in Anuradhapura district. In these areas there are numerous paddy fields, water reservoirs, water channels, scrub jungles and forest areas in this district.

Study design

A descriptive cross sectional study was carried out on the leishmaniasis patients diagnosed from November 2015 to November 2016. Each patient was interviewed by using a questionnaire (in Sinhala and/or Tamil) after taking written consent from the patients. The collected data, relevant to the objective one and two analyzed separately.

Sample size

Study Sample included new leishmaniasis patients attending to the dermatology clinic Teaching Hospital Anuradhapura during one-year period from 1st November 2015 to 1st November 2016.

Data collection

Each leishmaniasis patient was interviewed using a questionnaire in Sinhala and/or Tamil, after obtaining informed consent. Questionnaire was drawn up to obtain data on the following group of variables; socio-demographic variables (ethnicity, sex, age, occupation, education, monthly income and place of stay); social awareness on leishmaniasis; variables relating to treatment pattern (number of medical officers visited before referral to dermatology clinic and from whom treatment was taken); variables relating to clinical aspects (duration of occurrence of disease before treatment, affected sites, number of affected sites, symptoms); variables relating to residence of the patient (whether patients is a new-comer to the area or not, the patients who stayed less than one year at their residence considered as a new-comer); variables related to household (wall, floor) and variables relating to the area surrounding the household and the environment (within 200 meters radiant paddy field, banana bushes, water channels, manna bushes, forest area and domestic animals outside the house); variables related to domestic habits (sleeping under the mosquito net, working outside the house at dusk and dawn, working outside with cloths covering whole body, sleeping outside the house and sleeping on the floor).

Results

Study included 300 leishmaniasis patients.

All of the study participants were Sinhalese except one Muslim. Most were males with sex ratio of nearly 2:1. Most (64%) were in the age group of 21 to 50 years and there were less proportion of cases below 10 years (2.1%) and above 70 years (5.0%) of age. The youngest patient was 3 years and the oldest was 83 years. Most (46.4%) were educated up to ordinary level. Local civilians were more (79.3%) affected than armed forces personals in this study. One third of patients (36.1%) had no permanent family income and were dependent on daily wages and 8.2% of them had monthly income within SLR 10000 to 20000. Only 1.1% of patients had more than SLR 60000 income per month. Thalawa Medical Officer of Health (MOH) area was the highest (18.5%) affected than other MOH areas. (Table 1)

Regarding social awareness on leishmaniasis, most (63.9%) of the patients had never heard about leishmaniasis before diagnosing the disease.

Majority (73.9%, n=207) of the patients were timely referred to the dermatology clinic for treatment after seeking medical advice but 26.1% (n=73) were not referred for treatment timely and warranted repeat treatment.

Table 1: Socio -demographic variables of the study group and control group

	n	%
Occupation		
Armed Forces	58	20.7
Students	15	5.4
Farmer	47	16.8
House wife	50	17.8
Laborer	31	11.1
Businessman	18	6.4
Field Officers	23	8.2
Teacher	8	2.8
Others	30	10.7
Education Level		
Grade 0-05	24	8.6
Grade 06-10	52	18.6
Ordinary Level	130	46.4
Advanced Level	66	23.6
Degree Holder	8	2.9
Family Income		
No permanent Income	101	36.1
10000 – 20000 SLR	30	10.7
21000 – 30000 SLR	55	19.6
31000 – 40000 SLR	60	21.4
41000 – 50000 SLR	22	7.8
51000 – 60000 SLR	9	3.2
> 60000 SLR	3	1.1
MOH area		
	n	%
Padaviya	7	2.5
Thalawa	52	18.5
NuwaragamPalatha East	30	10.7
NuwaragamPalatha Central	49	17.5
Nochchiyagama	24	8.6
Rajanganaya	20	7.1
Madawachchiya	5	1.8
Thambuththegama	8	2.8
Kebithigollawa	5	1.8
Ipalagama	5	1.8
Kekirawa	4	1.4
Galenbidunuwewa	3	0.4
Rambewa	10	3.6
Mihinthale	5	1.8
Kahatagasdigiliya	2	0.7
Horowpothana	2	0.7
Other Areas	47	16.1

Nearly 18% of patients had sought repeat treatment with two medical personnel and 6.1% from three, and 1.4% from 4 or 5 medical personnel. (Table 2)

Table 2: Treatment pattern of study group

	n	%
Number of medical personnel seen		
1	207	73.9
2	50	17.8
3	17	6.1
4	4	1.4
5	2	0.7
Type of medical personnel		
Hospital medical officer	193	68.9
Private medical officer	46	16.4
Consultant	25	8.9
Ayurveda	6	2.1
More than one type	10	3.2

Most (68.9%) of the patients had taken treatment for leishmaniasis from hospital medical personnel and 16.4% (n=46) had taken treatment from private medical personnel.

Table 3: Clinical details

	n	%
Site		
Upper limb	125	44.6
Lower limb	88	31.4
Face	33	11.8
Trunk	23	8.2
Multiple sites	11	4
Clinical presentation		
Papule/nodule/plaque	216	77.1
Erythematous indurate lesion with central ulceration	41	14.6
Ulcer	23	8.2
Feeling of symptoms		
Yes	279	99.6
No	1	0.4
Duration of lesion before treatment (months)		
1-6	170	60.6
7-12	74	26.4
13-17	3	1.1
>18	26	9.2

Six leishmaniasis patients had sought Ayurveda treatment at least once before seeking advanced medical treatment from Dermatology clinic.

Table 4: Housing conditions of the study group

	n	%
Floor		
With mud floor	34	12.1
Without mud floor	246	87.8
Wall		
Wall with plaster	218	77.8
Wall without plaster	62	22.1

Most (60.6%) patients presented for treatment within six months period. All lesions appeared in exposed areas of the body except 23 (8.4%) male patients who had lesions on the trunk. Most (44.7%, 122) patients had lesions on upper limbs, and the single lesion was the most (85.7%, 240) common. More than three fourth (77.1%, 216) had papular or nodular lesions. All most all (99.6%) the lesions were asymptomatic and only one had felt pain on the affected site. (Table 3)

Table 5: Presence of environmental risk factors around households

	n	%
Paddy field		
Yes	188	67.1
No	92	32.8
Banana bushes		
Yes	178	63.6
No	102	36.4
Water channel		
Yes	144	51.4
No	136	48.6
Manna bushes		
Yes	179	63.9
No	101	36.1
Forest area		
Yes	114	40.7
No	164	59.3
Pet		
Yes	208	74.3
No	72	25.7

Only a few (12.1%) had mud floor at their residence and 18.3% patients had houses without plastered walls. (Table 4)

There were 67.1% of patients had paddy fields and 63.6% had banana bushes near their residence within 200meters radiant. Most (63.9%) had Manna bushes and 51.4% of patients had water reservoirs within 200meters of radiant of their residence. Nearly 40% of the patients had large forest areas near their residence, while 74.3 % had dogs or cats as pets. (Table 5)

Almost all 98.2% patients used bed nets. Less number (29.2%) of patients had worked outside at dusk and dawn. Nearly 70% of the patients did not cover their body with cloths when working outside at dusk and dawn. Most (92.8%) patients had slept inside the house and only 7.1% patients slept on the floor (Table 6).

Table 6: Variable related to domestic habits of study group

	n	%
Bed net usage		
Yes	275	98.2
No	5	1.8
Working out at dusk & dawn		
Yes	82	29.2
No	198	70.3
Cover with cloths when working outside		
Yes	77	27.5
No	203	72.5
Sleep outside of house	n	%
Yes	20	7.1
No	260	92.8
Sleep on the floor		
Yes	20	7.1
No	260	92.8

Discussion

Leishmaniasis is now considered as an endemic disease in Sri Lanka.^{17, 18} It is an emerging health problem in dry zone of Sri Lanka.¹⁰ Leishmaniasis is overtaking previously common public health problems such as malaria in Anuradhapura. Leishmaniasis and the environment are linked together by human behavioral factors, vector habits and their interaction with the environment. This study was mainly aimed at determining the risk factors for leishmaniasis. The multiplicity of risk factors involved in the transmission of the leishmaniasis constitutes a challenge to its control. The diversity of etiologic agents, variety of vector species, existence of both wild and domestic reservoirs, differences in environmental conditions and differences in human factors could play a role in transmission. Knowledge of such factors may contribute to identify the control strategies.

Our study population was Sinhalese except one Muslim patient. There was high chance to get leishmaniasis in Sinhala population in our study and it was same as another study.¹⁶ In our study the affected youngest child was 3years and the oldest was 83 years. It showed that the leishmaniasis can affect at any age. Field work or work near the forest area was a risk factor for acquiring leishmaniasis.¹ In our study also there was an association because most of our patients had worked related to the forest area; military personal, farmers, laborers and fieldworkers. It had been reported that outdoor occupation is a risk factor for cutaneous leishmaniasis in the Northern area of Sri Lanka favoring our association.¹⁹ But it was not shown in other studies.^{15, 20} In these two studies showed that there was no association between occupation and favors peridomestic transmission of leishmaniasis.

Leishmaniasis is a neglected tropical disease that affects poor and marginalized communities. In our study also most (36.1%) of them had no permanent income and 10.7% patents had less than 20000 Sri Lankan Rupees family incomes per month. But it was same as in study done at Alogoas, Brazil.²⁰ It was observed that people living in small towns or in rural area mostly affected.²⁰ In our study also most affected patients were from rural areas. The study population had poor awareness on leishmaniasis although highest number of leishmaniasis patients reporting from Anuradhapura since 2010.

In our study nearly one forth (26.1%)of leishmaniasis patients warrant repeat consultation from medical personal and it showed that there was a gap in correct diagnosis of leishmaniasis at primary care level. This needs to be address by health authorities because the only method of control of leishmaniasis practiced in Sri Lanka is early detection of cases and early treatment. Still there is no vector control methods established in Sri Lanka although leishmaniasis is an endemic disease in Sri Lanka.

The clinical profile of cutaneous leishmaniasis patients was similar to those reported in Anuradhapura in 2007 and 2010^{10, 12}. Leishmaniasis was more prevalent in villages where houses were frequently constructed with mud walls and earthen floors.¹ In another study done at Alagoas ,Brasil²⁰ reported that non-durable wall materials in the houses increases the chance of acquiring leishmaniasis but our study most of them had durable walls in study group.

One study done by Salindra et al mentioned that living near paddy field is associated with increased risk for transmission of leishmaniasis¹⁵. In our study also 67.1% of patients had paddy fields near their residence favoring that observation. Data in the literature suggested that some crops are more favor of transmission of leishmaniasis¹. In our study also 63.6% of patients had banana bushes near their residence

favoring banana near their residence increase the chance of acquiring leishmaniasis. It was same as another study done at Brazil also.²⁰ Most (63.9%) patients have Manna bushes and 51.4% of patients had water reservoirs within 200 meters of radiant of their residence in our study favoring that there was some association with acquiring leishmaniasis. The domestic animals have a variety of influences on leishmaniasis. They become reservoirs of the parasites thus participating in the transmission chain and increasing the risk of leishmaniasis. Sometimes it would perform a protective role such that humans would avoid being bitten. The role of domestic dogs as a reservoir for leishmaniasis transmission has been recognized in several studies.^{21,22} Most (74.3%) of the leishmaniasis patients have lived close with dogs or cats as pets in our study favoring some association. Some countries does not recognize that domestic animals are participants in the transmission chain even when infected with leishmaniasis.²⁰ Although domestic habits like sleeping

outside or on the ground may increase risk and the use of bed nets tends to be associated with lower risk.^{1,11} But in our study most of the patients has not slept outside or on the ground and use bed nets showing it was not increase the risk for transmission of leishmaniasis or due to variation of vector habits .

In conclusion we would like to draw the attention to recognize the multiplicity of factors involved in the transmission of leishmaniasis and its challenge to control. Knowledge of such factors among general community and health care workers may contribute to identify the control strategies.²³ Therefore it is necessary to do further research on risk factors for leishmaniasis transmission. From this research we recommend that to consider about presence of environmental risk factors for leishmaniasis transmission like banana and manna cultivations and paddy fields near community residential areas.

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