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CROSS SECTIONAL ANALYSIS OF SELECTED FACTORS ASSOCIATED WITH LEISHMANIASIS CASES NOTIFIED TO MOH OFFICES OF MATARA DISTRICT DURING 2018-2020

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Keywords:

Leishmaniasis, socio-demographic factors, body-parts affected, diagnoses, treatments, investigations

Abstract

Background: Leishmaniasis stands as a neglected tropical ailment comprising three primary clinical variants: visceral, mucocutaneous, and cutaneous. It emerges due to infection by a protozoan parasite, with over 20 distinct Leishmania species being responsible for its occurrence.

Objectives: This study aimed to describe selected factors associated with clinically confirmed Leishmaniasis cases notified to MOH Offices of Matara District during 2018-2020.

Methods: This was a descriptive cross-sectional survey of Case Investigation Forms of all clinically confirmed Leishmaniasis cases treated from 2018-2020 to MOH Offices of Matara District.

Findings: With 24% of affected individuals belonging to the 5-9 years age group. Females constituted 56.67% of the cases. Students were 47.36% of the cases. The Sinhalese showed higher vulnerability [93.03%] compared to Muslim community. The MOH Dickwella area reported the highest percentage of cases [50.96%]. Diagnostic practices indicate preferences for skin biopsy and culture [44.52%] and histology [35.87%] of cases. earth floors and thatched or tiled roofs associated with lower risks.

Conclusion: Rural areas within the Matara district, as identified by the MOH [Medical Officer of Health] regions, exhibited a high prevalence of cutaneous Leishmaniasis suggesting a need for targeted preventive efforts, especially through focused public awareness campaigns.

Introduction

Leishmaniasis is a neglected tropical disease that has 3 main clinical forms, visceral, mucocutaneous, and cutaneous. Leishmaniasis is caused by a protozoa parasite from over 20 *Leishmania* species. Transmission to humans is through the bite of infected female phlebotomine sandflies. Over 90 sandfly species are known to transmit *Leishmania* parasites.

For decades in Sri Lanka, Leishmaniasis was considered an imported disease. This changed in 1992 with the detection of locally acquired cases of cutaneous Leishmaniasis [CL] [1, 2*]*. In 2003, Karunaweera et al. [3] reported that CL in Sri Lanka is caused by the parasite *Leishmania donovani* zymodeme MON-37.

Poverty increases the risk for Leishmaniasis [4]. Poor housing and domestic sanitary conditions [such as a lack of waste management or open sewerage] may increase sandfly breeding and resting sites. Sandflies are attracted to crowded housing. Human behaviour, such as sleeping outside or on the ground, may increase risk. The use of insecticide-treated bed nets may reduce risk [4].

Malnutrition, population mobility, occupational exposures, deforestation, urbanization, settlement into forested areas and climate changes as Leishmaniasis is climate-sensitive, and strongly affected by changes in rainfall, temperature and humidity. Global warming also affects the epidemiology of Leishmaniasis [4].

Knowledge of local epidemiology of Leishmaniasis in Matara District is very scant. Proper understanding of selected characteristics and geographic distribution of Leishmaniasis cases will also be very useful for planning public awareness and advocacy in controlling, and this study will provide above information for policy planners and health administrators in Matara district.

Methods

This was a descriptive cross-sectional survey of Case Investigation Forms [16] of all clinically confirmed Leishmaniasis cases treated from 2018-2020 to MOH Offices of Matara District. The study data collection was conducted from 01.05.2022 to 20.05.2022.

Leishmaniasis Surveillance Forms from clinically confirmed Leishmaniasis cases of Matara district were included in this project for the period 2018-2020.

But in the rare case of partially filled Case Investigation Forms, the PI contacted the relevant MOH office and trace the relevant patient through Area Public Health Inspector [PHI] [case by case] to obtain all relevant data. If the PHI was unable to provide full data requested, the PI traced the patient's Bed Head Ticket [BHT] at the relevant hospital to retrieve necessary data.

[Before starting this research, the PI had the confirmation from all MOHs of Matara District that all Case Investigation Forms [of clinically confirmed cases of Leishmaniasis] were complete for the period 2018-2020. This was the result of special project conducted by the RDHS Office, Matara to complete missing data of all especially investigable disease surveillance forms [since 2018 January to 2022 January] of all MOH areas in Matara District in early January 2022. This project was coordinated by Regional Epidemiologist [RE], and Supervising Public Health Inspector [SPHID], Matara.

Pre tested Data Recording Sheet was used to collect data. [This Data Recording Sheet was adapted from Case Investigation Form of Epidemiology Unit [16] Sri Lanka].

If the surveillance forms were not complete, the PI followed the procedure described above in Study design to retrieve full data.

Co-investigators [Medical Officers] collected data. Training session was organized to train the data collectors and 10 % of cases data was checked by the Principal Investigator for validation.

SPSS 11.2 [17] statistical package was used to enter and analyze data. Frequency and percentages of selected characteristics was described. Odds ratios [OR] and 95% Confidence Intervals was calculated. Significant level of ≥ 0.5 was applied.

Ethical clearance was obtained from Ethics Committee of National Hospital, Colombo and relevant administrative clearance was obtained from Regional Director of Health Services, Matara District.

Results

In total, 775 Case Investigation Forms of clinically confirmed Leishmaniasis cases were recruited to the study.

Table 1- Socio-demographic characteristics of patients with clinically confirmed Leishmaniasis (N=775)

Socio-demographic parameter		NO.	%
Age (Years) 0-4		77	9.94
5-9		186	24
10-17		102	13.61
18-24		138	17.81
25-39		115	14.84
40-64		80	10.32
>65		77	9.94
Sex	Male	335	43.23
	Female	440	56.77
Occupation Student		367	47.36
Government job		83	10.71
Private sector job		105	13.55
Self employed		80	10.32
Unemployed		101	13.03
On pension		39	5.03
Ethnic group	Sinhala	721	93.03
	Muslim	54	6.97

In this study, 775 Leishmaniasis case Investigation forms of confirmed Leishmaniasis cases were examined. (Table 1). According to Table 1, 24% of Leishmaniasis cases were of age 5-9 years; 56.67% were females; 47.36% were students; 93.03% were Sinhalese.

Geographical distribution of clinically confirmed Leishmaniasis cases in Matara district according to MOH, PHI and GN areas 2018-2020

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Table 1.1.1- Distribution of Clinically confirmed Leishmaniasis cases in Matara District according to MOH areas 2018-2020

MOH area	NO.	%
Dickwella	395	50.96
Devinuwara	215	27.74
Kirinda Puhulwella	23	2.97
Matara PS	120	15.48
Thihagoda	22	2.84
Total	**795**	**100**

Highest Leishmaniasis cases (50.6%) were reported from MOH Dickwella and least (2.84%) from MOH Thihagoda (Table 1.1.1)

Table 1.1.2-Dickwella MOH Area

PHI area	GN Area	NO.	%
Bambarenda	Dandeniya south	27	6.83
	Bambarenda North	40	10.12
	Rathuwala	19	4.81
	Bambarenda Central	9	2.27
Urugamuwa	Bodaratenna	28	7.08
	Rannawela	25	6.32
	Wehella	17	4.30
	Wehella North	43	10.88
	Urugamuwa East	39	9.87
	Urugamuwa South	12	3.03
Dickwella	Batheegama West	15	3.79
	Batheegama Central	20	5.06
	Dickwella Central	11	2.78
Kottegoda	Pathegama South	12	3.03
Walasgala	Wewurukannala	9	2.27
	Dodampahala Central	7	1.77
	Dodampahala East	42	10.63
	Dodampahala South	3	0.75
	Dickwella North	12	3.03
	Walasgala East	5	1.26
Total		**395**	**100**

In MOH Dickwella, highest incidence of Leishmaniasis cases were reported from PHI area Urugamuwa; least from PHI area Kottegoda. Highest incidence (10.88%) of cases were reported from GN area Wehella North of PHI area Urugamuwa; least incidence (0.75%) from GN area of PHI area Walasgala (Table 1.1.2)

Table 1.1.3-Devinuwara MOH Area

PHI area	GN area	NO.	%
Naotunna	Thalalla South	20	9.30
	Thalalla East	13	6.04
	Naotunna	15	6.97
	Naotunna North	14	6.51
	Pathegama North	15	6.97
	Thalalla North	21	9.76
Aparekka	Baddegammedda	17	7.90
	Uda Aparekka West	23	10.69
Devinuwara	Kapugama Central	11	5.11
Thalalla	Gandara Central	15	6.97
	Gandara West	21	9.76
	Thalalla East	20	9.30
	Kapugama East	10	4.65
Total		215	100

In MOH Devinuwara, highest incidence of Leishmaniasis cases were reported from PHI area Naotunna; least from PHI area Devinuwara. Highest incidence (%) of cases were reported from GN area Uda Aparekka West of PHI area Aparekka; least incidence (%) from GN area Kapugama East of PHI area Thalalla (Table 1.1.3)

Table 1.1.4-Kirinda-Puhulwella MOH Area

PHI area	GN area	NO.	%
Walakanda	Karathota	16	69.56
	Walakanda South	7	30.43
Total		**23**	**100**

According to Table 1.1.4, highest incidence of 69.56% were reported from GN area Karathota of PHI area Walakanda.

Table 1.1.5-Matara PS- MOH Area

PHI area	GN area	NO.	%
Kekanadura	Kekanadura East	67	55.83
	Kokawela	7	5.83
	Kekanadura Central	12	10.84
	Parawahera South	7	5.83
Navimana	Makavita	5	4.16
Thalpawila	Gandarawatta	6	5.0
	Wewa-Ihalagoda	10	8.33
	Thalpawila North	6	4.16

Total		**120**	**100**

In MOH Matara PS, highest incidence of Leishmaniasis cases were reported from PHI area Kekanadura; least from PHI area Navimana. Highest incidence (%) of cases were reported from GN area Kekanadura East of PHI area Kekanadura; least incidence (%) from GN area Gandarawatta of PHI area Thalpawila (Table 1.1.5).

Table 1.1.6-Thihagoda- MOH Area

PHI area	GN area	NO.	%
Yatiyana	Kottawatta	22	100

In MOH Thihagoda, all 22 cases of Leishmaniasis were reported from Kottawatta GN area of PHI area Yatiyana (Table 1.1.6).

Table 2- Socio-demographic factors associated with clinically confirmed Leishmaniasis

Socio-demographic parameter		OR	95% CI
Age (Completed years) 0-4		1.0	-
5-9		1.2	0.5-2.0
10-17		2.0	0.9-4.7
18-24		1.3	0.5-3.0
25-39		1.6	0.1-2.9
40-64		2.2	1.1-4.3
>65		0.9	0.3-3.9
Sex	Male	1.0	-
	Female	1.0	0.5-2.2
Occupation Student		1.0	
Government job		1.2	0.7-2.2
Private sector job		1.0	0.5-1.8
Self employed		1.5	0.8-2.7
Unemployed		1.6	0.3-3.6
On pension		1.4	1.2-4.5
Ethnic group	Sinhala	1.0	
	Muslim	0.3	0.1-3.7

According to Table 2, compared to 0–4-year age group, highest risk was associated with 40-64 age group (OR:2.2; 95% CI: 1.1-4.3) while the lowest risk was for >65 age group (OR:0.9; 95% CI: 0.3-3.9). Males and females share equal risks of having infected with Leishmaniasis. Compared to students, the unemployed have the highest risk of getting Leishmaniasis (OR:1.6; 95% CI: 0.3-3.6) while all other groups were having higher risks compared to students. Muslims had a lower risk (OR:0.3; 95% CI: 0.1- 3.7) compared to the Sinhalese.

To describe body parts affected, number and types of lesions and types of diagnoses of clinically confirmed Leishmaniasis cases.

Table 3- Body parts affected, number and types of lesions and types of diagnoses of clinically confirmed Leishmaniasis cases

	NO.	%
Body parts Upper limbs	315	40.7

Lower limbs	174	22.5
Face	345	44.5
Others	05	0.6
NO. of lesions Single	739	95.3%
Multiple	37	4.7%
Type of lesion Papule	85	10.9%
Ulcer	684	88.3%
Other (Nodules=3, Plaques 2, blisters=1)	6	0.8%
Rash in photo distributed area Yes	0	0
No	775	100%
Types of diagnoses Cutaneous Leishmaniasis	775	100%

According to Table 3, face was most affected body part followed by upper limbs (44.5% and 40.7% respectively). Single lesions were found in 95.3 % of cases. Ulcer was the most prevalent (88.3%) type of lesion. No rash was observed in photo-distributed area.

To describe treatments given and investigations performed during management of clinically confirmed Leishmaniasis cases.

Table 4- Treatments given and investigations performed during management of clinically confirmed Leishmaniasis cases

	NO	%
Treatments given		
Oral	241	31.09
Parenteral	288	37.16
Cryotherapy	221	28.52
Others	25	3.23
Investigations performed		
Microscopy	57	7.36
Histology	278	35.87
Skin biopsy and culture	345	44.52
PCR	0	0
Serology	0	0
Others	178	22.97

Parenteral treatments were given for 37.16% of cases followed by oral therapy (31.09%) according to Table 4. Out of investigations performed, skin biopsy and culture were the most performed tests (44.52%). PCR and serology were not done on any case.

To describe selected patient related factors associated with clinically confirmed Leishmaniasis

Table 5- Distribution of selected patient related factors in clinically confirmed Leishmaniasis patients

Housing condition	NO.	%
Floor		
Cemented	697	90.19
Earth	48	6.19
Sand	01	0.13

Dung	01	0.13
Other	28	3.61
Wall		
Plastered (cemented)	524	67.61
Brick	202	26.07
Thatched	24	3.09
Plank/ metal sheets	25	3.23
Other	0	0
Roof		
Thatched	54	6.97
Tin	91	11.74
Tiled	267	34.45
Asbestos	363	46.84
Other	0	0
Surrounding environment		
Muddy	175	22.58
Dump area	202	26.07
Paddy fields	267	34.45
Water canals	18	2.32
Plantation/ cultivation	234	30.19
Shrub jungles	306	39.48
Animals in the environment (wild or domestic)		
Dog		
Cat	456	58.84
Bird	478	61.68
Cattle	45	5.81
Pig	600	77.42
Goat	23	2.97
Monkey	12	1.55
Rat	172	22.19
Mongoose/ Kalavedda	678	87.48
	89	11.48

According to Table 5, 90.19% house-floors were cemented; 67.1% walls were plastered; 46.84% roofs were asbestos; 39.48% households had shrub jungles in the surrounding environment. Rats (87.48%), cattle (77.42%), cats (61.68%) and dogs (58.84%) were in the household environment.

Selected patient related factors associated with clinically confirmed Leishmaniasis.

Table 6- Selected patient related factors associated with clinically confirmed Leishmaniasis

	OR	95% CI
Floor		
Cemented	1.0	-
Earth	0.7	0.2-1.1
Sand	0.03	-1.7-3.2
Dung	0.03	-1.7-3.2
Other	0.2	-0.7-2.7
Wall		
Plastered (cemented)	1.0	-
Brick	0.8	0.6-3.2
Thatched	0.7	0.01-1.5
Plank/ metal sheets	0.6	-2.4-2.2
Other	NA	-

Roof		
Thatched	0.3	0.1-2.7
Tin	0.5	-1.1-3.3
Tiled	0.8	0.5-5.3
Asbestos	1.0	-
Other	NA	-
Surrounding environment		
Muddy	0.4	0.02-2.9
Dump area	0.5	0.05-1.6
Paddy fields	0.8	-0.5-1.5
Water canals	0.1	0.00-2.1
Plantation/ cultivation	0.6	0.2-2.1
Shrub jungles	1.0	-
Animals in the environment (wild or domestic)		
Dog	0.6	0.1-2.6
Cat	0.7	-1.1-2.4
Bird	0.3	-2.5-1.9
Cattle	0.8	0.1-2.6
Pig	0.1	-0.2-3.4
Goat	0.01	-1.4-2.7
Monkey	0.5	0.2-2.6
Rat	1.0	-
Mongoose/ Kalavedda	0.4	-1.3-3.5

Earth floors had less risk for getting Leishmaniasis compared to cemented floors (Table 6). Compared to asbestos roofs, thatched and tiled roofs had less risk; compared to shrub jungles, all other surrounding environments had lower risks for Leishmaniasis; all other animals in the environment had lower risks compared t

Discussion

We used already available data from Case Investigation Forms at RDHS Office, Matara in conducting the current study.

Selected socio-demographic factors associated with clinically confirmed Leishmaniasis

The cutaneous Leishmaniasis patients comprised 52.47% female and 47.53% males with a mean age of 16.48±0.23 years in one study [18]. Another case–control study [19] conducted for epidemiological data collection from families with and without CL [Cutaneous Leishmaniasis] cases. The average age of the new cases was 33.1 ± 22.3 years, and 69.0% were women. Another observational study [20] was conducted using information from the clinical records and epidemiological reports of patients diagnosed and confirmed with Leishmaniasis of any age and sex, including sociodemographic, clinical, and pharmacological variables of the therapy received. A total of 539 cases of Leishmaniasis were confirmed, with 29.5% occurring in children under 5 years of age. The median age was 10 years, with predominance in males [55.5%]. The CL patients comprised 52.47% female and 47.53% males with a mean age of 16.48±0.23 years in a case control study [18]. The average age of the new cases of CL was 33.1 ± 22.3 years, and 69.0% were women in another case control study [21]. In other studies [21,22], highest incidence of CL was reported from 5–9-year age group with lowest incidence reported from > 20-year age group. In the current study, 775 Leishmaniasis case Investigation forms of confirmed Leishmaniasis cases were examined. In the current study, 24% of Leishmaniasis cases were of age 5-9 years which is consistent with some study findings but most studies found that much elder population groups have high risk of getting cutaneous Leishmaniasis; 56.67% were females which corroborated with other study findings; 47.36% were students; 93.03% were Sinhalese.

Leishmaniasis prevalent MOH areas of Matara district

Highest Leishmaniasis cases [50.6%] were reported from MOH Dickwella and least [2.84%] from MOH Thihagoda. All other MOH areas where Leishmaniasis cases were reported are all classified as rural MOH areas. In the current study, all the Leishmaniasis cases were reported from rural areas which is consistent with other studies. This may be due to other

environmental risk factors such as more prevalence of muddy lands; shrubbery jungles and animals which may act as reservoirs of Leishmaniasis parasite in rural areas compared to urban settings in Sri Lanka. In a study done in Iran, 68.2% of CL cases were also reported from rural areas [23].

Socio-demographic factors associated with clinically confirmed Leishmaniasis

In the current study, compared to 0–4-year age group, highest risk was associated with 40-64 age group [OR:2.2; 95% CI: 1.1-4.3] while the lowest risk was for >65 age group [OR:0.9; 95% CI: 0.3-3.9]. In one study done in Ethiopia [24], highest prevalence was reported from age groups of 0-9 years [4.5%] and 10-19 years [2.5%]. In the current study, males and females shared equal risks to be infected with Leishmaniasis. Compared to students, the unemployed have the highest risk of getting Leishmaniasis [OR:1.6; 95% CI: 0.3-3.6] while all other groups were having higher risks compared to students. Muslims had a lower risk [OR:0.3; 95% CI: 0.1- 3.7] compared to the Sinhalese.

Body parts affected and types of diagnoses of clinically confirmed Leishmaniasis cases

In a study of cutaneous Leishmaniasis [20] ,46.6% cases affected the upper limbs ,41.0% the face, and 25.8% the lower limbs. A study done in Ethiopia[24] reported that, face was affected in 82.1% cases and upper limb in 13.1% cases. In the current study, face was most affected body part followed by upper limbs [44.5% and 40.7% respectively]. Single lesions were found in 95.3 % of cases. Ulcer was the most prevalent [88.3%] type of lesion. This finding is also consistent with other studies. No rash was observed in photo-distributed area. Current study reported all diagnoses as CL but many other studies [25,26,27] of different parts of the world reported multitude of diagnoses other than CL.

Treatments given and investigations performed during management of clinically confirmed Leishmaniasis cases

In one study [20] Pentavalent antimony salts [n-methyl glucamine and Sodium stibogluconate] were prescribed in 77.6% [*N* = 418] of the cases; Miltefosine was the second most frequently prescribed medication [21.5%, *N* = 116]. In another study [23---28], local treatment is applied in patients with a small, single lesion. Based on expert opinion, systemic treatment is used in patients with multiple lesions or large lesions [>5 cm]. Systemic treatment is also recommended in patients with metastatic spread and in cutaneous lesions unresponsive to local treatment. Local treatment may be considered in patients for whom systemic treatment is contraindicated, such as those who are pregnant or have cardiac problems. In the current study, parenteral treatments were given for 37.16% of cases followed by oral therapy [31.09%]. Out of investigations performed, according to the current study findings, skin biopsy and culture were the most performed tests [44.52%] which is consistent with other studies[29,30].PCR and serology were not done on any case which is mostly due to facilities and logistics available in GH Matara. All the cases were diagnosed as cutaneous Leishmaniasis.

Selected patient related factors associated with clinically confirmed Leishmaniasis

A case-control study [24] was conducted in the main active ACL foci in central Morocco. like proximity of vegetation [OR = 2.45; 95% CI: 1.14–5.25], Morocco such as the rural habitation [OR = 4.163; 95% CI: 2.91–5.96], and presence of animals [OR = 2.67; 95% CI: 1.14–5.25] increase the risk of ACL in Morocco. In one study [18], the vast majority of the cutaneous Leishmaniasis patients, 96.96%, lived in a lowland plains area and no patient lived in wetlands which is consistent with the current study. The types of houses were of concrete construction in 94.94% and stone in 1.61% and 1.41% lived in an apartment block. Animals were reported to be kept in the living area of 17.02% of patients. In another case control study [24-31], in central Morocco, factors such as proximity of vegetation [OR = 2.45; 95% CI: 1.14–5.25], the rural habitation [OR = 4.163; 95% CI: 2.91–5.96], Leishmaniasis. In another study [22], mud and brick walled houses had the highest odds for cutaneous Leishmaniasis cases to the contrast of the current study which cemented [plastered] walls reported the highest risk. In one study [20], 93.3% of cases occurred in people living in scattered rural areas. According to the current study, earth floors had less risk for getting Leishmaniasis compared to cemented floors. Compared to asbestos roofs, thatched and tiled roofs had less risk; compared to shrub jungles, all other surrounding environments had lower risks for Leishmaniasis; all other animals in the environment had lower risks compared to rats which some other studies suggested presence of animals in the environment increases the risk of getting cutaneous Leishmaniasis.

Conclusion

Findings of the current study suggest that elders more than 65 years are of low risk of getting cutaneous Leishmaniasis and more active younger population is having a higher risk. Females also carry a higher risk of getting Leishmaniasis in the study. Majority of cases were reported from students. All the MOH areas, PHI areas and GN areas where the cases reported are considered rural areas. This may be due to vector of Leishmaniasis may be more prevalent in rural areas due to various

environmental risk factors. Sinhalese people are more affected than the Muslims in the current study. Most of the skin lesions were found in uncovered body parts such as faces and upper limbs and majority cases were uncomplicated single ulcers which are more amenable to treatment interventions. Some of the treatment and investigation facilities were not available at GH Matara according to our study. Earth floors, asbestos roofs increase the risk for the population to be infected with Leishmaniasis. Presence of animals especially rates have increased the risk of getting Leishmaniasis in the current study.

The findings of the study suggests that in rural MOH areas in Matara district have the highest prevalence of cutaneous Leishmaniasis and it is prevalent in almost every age group and occupation irrespective of their gender. As certain PHI and GN area reported more Leishmaniasis cases preventive efforts such as public awareness could be more focused on these areas. It seems much more advisable that public of these MOH areas should be educated on common signs and symptoms of cutaneous Leishmaniasis so that they can seek treatments from dermatology clinic with available treatments. The GH Matara, is having limited investigation facilities, it is not possible to diagnose cutaneous Leishmaniasis cases in great detail. Some of the environmental and patient related factors which are associated with getting cutaneous Leishmaniasis, cannot be modified easily giving the socio- economic conditions of the current society but health education campaign could be launched to the Public and other stakeholders informing the potential risk of these factors. Though there is no definitive preventive method such ss prophylaxis or permitted insecticide to avert Leishmaniasis, Public health education seems to be the main strategy to combat the disease in the current context of Sri Lanka. As face and upper limbs were mostly affected according study findings, health messages regarding covering up upper limbs could be preventative. It is also suggested that awareness of all doctors and health care workers be trained on how to diagnose Leishmaniasis and its treatment modes. It is also recommended that future studies should be undertaken to find the ecology of Sand flies and their various types etc. and their reservoirs so that more targeted preventive work could be organized.

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