

Outbreak Investigation of Cutaneous Leishmaniasis

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ABSTRACT

Objective: to assess the magnitude, evaluate risk factors and recommend control measures for Cutaneous Leishmaniasis.

Study Design: Cross-sectional study.

Place and Duration of Study: Combined Military Hospital, Landikotal Pakistan, from Jan to Feb 2017

Methodology: Active case finding was conducted amongst entire group of 414 individuals. A case was defined as skin lesion in a person residing in nomadic group of Khar Kamar from October 2015 to January 2017. Age and gender-matched controls were identified at 1:2. Data was collected using a pretested structured questionnaire.

Results: A total of 31 cases were identified with mean age of 26.4±6.5 years (range 18-48). Epi curve showed intermittent exposure. The index case had onset of symptoms in January 2016 with a peak in November 2016, 10(32%) while last case appeared in January 2017. Overall attack rate (AR) was 7.5% while most severely affected age group was 18-27 years 21(9.1%). A total of 17(55%) cases had 2-4 multiple lesions with size of 0.5-3.5 cm. Of the 31 cases, 25 reported sleeping on the ground (OR 3.2, 95% CI 1.2-9.0, $p < 0.02$), however wearing full clothing and use of repellents showed a protective effect.

Conclusion: Most probable cause of outbreak was sleeping on the floor. Awareness lectures were imparted and repellent was issued to entire group.

Keywords: Outbreak, Repellents, Leishmaniasis.

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INTRODUCTION

Cutaneous leishmaniasis (CL) is a neglected disease with significant public health impact and spreads by the bite of an infected sand fly. It presents in a variety of forms ranging from self-healing ulcers or nodules to mutilating disfiguring lesions. The habitats of sand fly include abandoned buildings, cracks in walls & floors, burrows, domestic animal shelters, garbage, latrines, under stones, caves, soil, tree roots and leaf litter.¹ The World Health Organization (WHO) considers leishmaniasis as the sixth most important disease in tropical and subtropical areas.² Cutaneous Leishmaniasis is prevalent in 88 countries of the world.² According to the studies an estimate, 12 million people are currently infected and the disease is known to have highest prevalence in the Middle East.² Out of 22 countries in the eastern Mediterranean region, 14 countries have reported cases of leishmaniasis on multiple occasions.³ It also causes serious economic loss, being expensive in terms of treatment and impedes socioeconomic development in many developing countries. Most of the cases occur in Afghanistan, Algeria, Brazil, the Islamic Republic of

Iran, Peru, Pakistan, Iraq, Saudi Arabia and Syrian Arab Republic.⁴

According to National institute of Health, Pakistan, the incubation period may last from 2 weeks to several months and cases up to 3 years have been reported in Old World cutaneous leishmaniasis.⁵ Out of three clinical forms (cutaneous, mucocutaneous and visceral) anthroponotic cutaneous leishmaniasis or ACL is the commonest type in Pakistan. The disease is prevalent because of presence of predisposing and precipitating factors like, fewer number of baths and poor hygiene, low level of literacy, contact with soil and dirty contaminated water.⁴

On January 17, 2017, seven cases of CL were reported to Combined Military Hospital, Landikotal, from a nomadic group from village Khar Kamar, Tehsil Miran shah, North Waziristan Districts of Newly Merged Tribal District (NMDs). It is a small village located at 10km from Pak Afghan border, 40km west of Miran shah at an elevation of 2901m in North Waziristan Districts.⁶ Weather is hot in summers and cold in winters with moderate to heavy winds. The people in this group resided in multiple tents alongside a local stream in this region. Their residence also included semi-constructed buildings as well as open posts. This group of nomads stayed in Khar

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Kamar for a period of 13 months. An outbreak investigation was initiated on 18th January which involved active screening of all individuals.

The objectives of this study were to verify the existence of outbreak of cutaneous leishmaniasis in this nomadic group, identify the risk factors associated with occurrence and spread of disease, control the outbreak and formulate measures to control and prevent further spread of cutaneous leishmaniasis.

METHODOLOGY

The study was initially designed as an outbreak investigation through descriptive analysis in terms of time, place and person. It was latter followed by a case-control study. The outbreak investigation was conducted in North Waziristan Districts of NMDs. Newly Merged Tribal District are located in North West of the country and are further divided into seven different agencies. Waziristan Districts is one of the biggest and is further divided into South and North Waziristan (NWA).

Inclusion Criteria: All the cases falling under case definition of Cutaneous Leishmaniasis were included in the study.

Exclusion Criteria: Patients unwilling to participate were excluded.

This study was carried out amongst the individuals of nomadic group which comprised of illiterate, adult males. The literacy rate was 16% among locals, categorically 27% in males.⁷ The locals in this region are transporters, business men or into government service by occupation. A survey was conducted by a five-membered team consisting of an epidemiologist, a medical specialist, a lab technician and two field workers. The team performed active case finding via direct examination of all members of the group and traced all the cases at their respective place of work on nearby mountains. During the survey, blood samples for ELISA testing for leishmania were collected despite high specificity for cutaneous leishmaniasis as an invasive investigation could not be performed in the field. Skin smear and biopsy were latter performed in Peshawar after referral of the cases.

The cases and controls were enrolled at 1:2 in this outbreak investigation. All cases and controls were from nomadic group living in Khar Kamar from November 2015 to January 2017. A case was defined as skin lesion (ulcer or nodule) in a person residing in Khar Kamar from November 2015 to January 2017. Using WHO guidelines, cases were further divided

into new cases (in which lesion appeared within 04 months) and old cases (in which lesion present for more than 04 months duration). The controls were matched by age and gender from the same group after informed written consent by Institutional Review Board (IERB_Lkl_002/18). The outbreak investigation was carried out from 18th January 2017 to 22nd February 2017.

We collected the epidemiological and other required information from cases and controls through a structured pretested questionnaire which was translated into local language, pushto, for better understanding. The questionnaire contained some detailed yet simple questions on multiple variables. These variables included age, gender, migration history, date of diagnosis, date of onset of lesion, involvement of area of the body, number, type, size and evolution of lesion. Variable for exposure history included migration status, overcrowding, floor bedding, direct contact with soil, screening of windows, nature of work, use of preventive measure like repellents, beds, coils, use of indoor and outdoor sprays, full clothing and sanitation. All medical records of the study group were reviewed to complete the line listing. Controls were selected from the same group and interviewed through structured questionnaire. The socioeconomic status of members of this group was approximately the same and all belonged to lower socioeconomic class.

We entered the data on excel sheets and a line list was developed which was imported to Epi info® version 7.2. We calculated the frequencies and attack rates to compile results of descriptive analysis. We also computed the odds ratio for different variables at 95% confidence interval and 5% margin of error.

RESULTS

During active search, we identified 31 cases of cutaneous leishmaniasis out a total of 414 individuals. All the cases were male with a mean age of 26.4-6.5 ranging from 18-48 years, educated to a maximum of primary level. Index case was a 20 years old man with onset of symptoms in January 2016. The epi curve showed intermittent exposure in which the peak occurred in November 2016, 10(32%) and the last case was reported in January 2017 (Figure). Overall attack rate (AR) was 7.5%. The most severely affected age group was 18-27 years, 21(9.1%) whereas the least affected age group was 28-37 years, 1(2.1%) (Table-I). A total of 17(55%) cases had 2-4 multiple lesions with size of 0.5-3.5 cm (1.7±0.74). Upper and lower limb were involved in 23(74%) cases and 20(64%) cases

respectively whereas both were involved in 11(35%) of the cases due to multiple lesions. Involvement of face was (found in 1(3.2%) case. Ulcerative lesions were

0.1-0.8, $p<0.0$) and showed to have a protective effect (Table-II).

DISCUSSION

Table-II: Odds ratios (95% CI) of risk factors for Cutaneous Leishmaniasis in Nomadic group in newly merged tribal district of Pakistan

Variable	Frequency of exposure in cases	Frequency of exposure in controls	Odds ratio	95% CI	p-value
Floor bedding	25/31 (81%)	35/62 (56%)	3.21	1.15-8.94	<0.02
Absence of indoor sprays	27/31 (87%)	49/62 (79%)	1.8	0.53-6.03	<0.18
Open sewerage	22/31 (71%)	23/62(37%)	1.6	0.65-4.17	<0.05
Absence of outdoor sprays	26/31 (84%)	48/62 (77%)	1.5	0.49-4.68	<0.24
Lesions among roommates	13/31 (42%)	22/62 (35%)	1.31	0.54-3.17	<0.27
Use of coil	5/31 (16%)	9/62 (10%)	1.13	0.34-3.72	<0.41
Out-door exposure	22/31 (71%)	45/62 (73%)	0.92	0.35-2.40	<0.43
Over crowding	24/31 (77%)	49/62 (79%)	0.90	0.32-2.57	<0.42
Inadequate screening of windows	3/31 (9.7%)	8/62 (13%)	0.7	0.17-2.83	<0.32
Use of mosquito nets	7/31 (23%)	22/62 (35%)	0.53	0.19-1.43	<0.11
Use of repellents	6/31 (19%)	28/62 (45%)	0.29	0.10-0.81	<0.01
Full clothing	10/31 (32%)	48/62 (77%)	0.14	0.05-0.36	<0.01

found in 22(71%) cases, papule or nodular lesion in 9(29%), and both were seen in 4(13%) cases. There were 23(74%) new cases with onset of symptoms within 04 months of date of investigation whereas 8(26%) were old cases with appearance of lesion for more than 4 months. On referral to a tertiary care hospital in Peshawar, 30 of 31 cases tested positive on skin smear whereas 1 smear negative case also tested positive on biopsy.

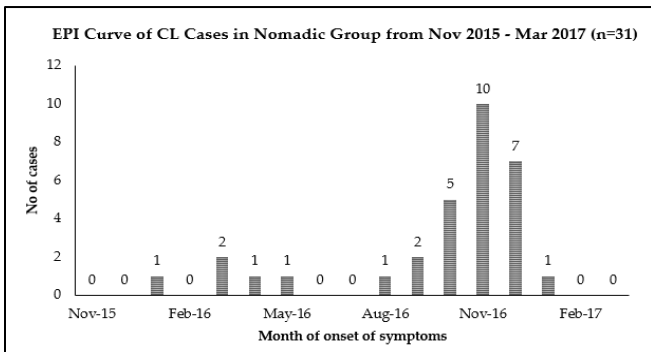


Figure: Cases of cutaneous leishmaniasis, by month of onset of symptoms, Khar kamar, Nov 2015- Mar 2017

Table-I: Age specific attack rates of cutaneous leishmaniasis in Nomadic group (n=414)

Age group (years)	No of cases	Total population	Attack rates
18-27	21(67.7%)	231	9.1%
28-37	8(25.8%)	124	6.4%
38-47	1(3.2%)	47	2.1%
48-57	1(3.2%)	12	8.3%

Of the 31 cases, 25(81%) reported sleeping on the ground (OR 3.2, (95% CI 1.2-9.0, $p<0.02$), however 10 cases (32%) practiced use of full clothing (OR 0.1, 95% CI 0.05-0.4, $p<0.0$) and use of repellents (OR 0.3, 95% CI

Cutaneous Leishmaniasis is largely considered as a disease among rural, poor populations.³ This study was aimed to describe the pattern of cutaneous leishmaniasis outbreaks among nomadic groups in NMDs, where it has been reported multipl times among locals and Afghan refugees from bordering areas.⁸⁻¹⁰ These nomads undergo continuous movement according to the need for placement, predisposing them to risk factors like semi constructed building with unscreened windows and many open areas like temporary tents. A similar outbreak was also reported in Tehsil Spinwam, North Waziristan Districts in 2016 which showed association between development of disease and lack of mosquito protective measures similar to our study.¹¹ Multiple lesions were found n 35% cases in our study which is similar to a study carried out n NMDs which found 41% cases with multiple lesions.¹²

The high overall attack rate of 7.5% could be explained by multiple factors such as increased endemicity in the region, environmental factors like direct contact with soil, outdoor duties, poor sanitation, lack of adequate infrastructure and unawareness regarding preventive measures.⁴ The most affected age group (18-27 years) had an increased exposure to floor bedding and outdoor activities like herding cattle and selling goods. Cutaneous leishmaniasis is more common on lower limbs compared to upper limb.^{8,13} but in our study majority of the cases had involvement of upper limb as due to outdoor exposure at all times of day and night with full clothing, less gloves. Similar results have been reported by Patino in a study in Colombia where the involvement of upper limb was 59.8%.¹⁴ Full clothing which showed to have a

protective effect prevented direct exposure of skin to the sand flies in this group however insecticide treated clothes proved to have better effect in multiple studies.¹⁵ Incomplete clothing like lack of socks and sleeveless shirts/vests was also practiced.

Majority of cases in this group were unable to sleep on beds not only due to unavailability but also because of frequent mobility from one place to another. This risk factor has also been reported in certain other studies in which 84% and 61.9% cases respectively reported sleeping on the ground.^{16,17} Cutaneous leishmaniasis spreads through infected sandflies which has previously been fed on a host.¹⁸ The cases shared crowded rooms and those with active lesions remained in proximity to those without lesion leading to increased number of infected sandflies thus exposing more people to risk of acquiring CL. These findings were consistent with local transmission of disease in this group, from one person to another. Lack of awareness of preventive measures led to very limited use repellents leaving the individuals prone to be bitten by sand fly. Use of DEET with excellent results have been reported in a study in United States.¹⁹ The values of odds ratio for sprays were statistically insignificant in the study. Trials show that the effect of spraying on the internal walls is still found insignificant.²⁰

In this study most of the cases had their date of onset in November and December, despite their stay in endemic area for 13 months which has also been reported in other studies in which most of the cases of cutaneous leishmaniasis emerge in November.²¹ As majority of the cases were diagnosed during active screening, the likelihood of recall bias was there in terms of remembering accurate number of days since appearance of lesion and also noticing the lesion after reaching a notifiable size. Majority of cases were diagnosed during active search in January. Secondly the incubation period of sand fly is prolonged,²² so despite full clothing, the lesions were noticed in winters. The reason for delayed diagnosis was unawareness and inability to reach tertiary care centers in time.

LIMITATION OF STUDY

Despite certain limitations mentioned above our findings suggest that CL outbreaks in Khar Kamar and other endemic areas are related to sleeping on the floor and lack of preventive measures. Appropriate protective measures like repellents, coils, sprays, use of mosquito nets and full clothing can reduce the spread of disease. Findings of outbreak investigation were shared with the effected group

and the local community. As a result of our suggestions health education regarding preventive measures was imparted to this group, portable beds were arranged and a mosquito repellent was added to every individual's routine kit. Lack of knowledge among residents resulted in spread of CL leaving permanent marks of healed and unhealed lesions.

CONCLUSIONS

Outbreak of cutaneous leishmaniasis was confirmed in a nomadic group which occurred due to multiple exposure factors like outdoor exposure, lack of preventive measures like repellents, spray, mosquito nets and overcrowding. Odd ratios showed that there was an association between sleeping on the floor and developing cutaneous leishmaniasis whereas use of repellents and full clothing are protective for the disease. In endemic areas, many people are at an increased risk of developing cutaneous leishmaniasis as compared to local population, due to lack of awareness regarding preventive measures and unavailability of beds. These findings also have implications for other nomadic groups in endemic areas.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

IB & TI: Conception, study design, drafting the manuscript, approval of the final version to be published.

MAB & AK: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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