



ASSOCIATION OF DOMESTIC ANIMALS SITUATION/CONDITION FOR KALA-AZAR IN RURAL AREA OF EAST CHAMPARAN, BIHAR

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ABSTRACT

Introduction: Kala-azar continued to be an important public health problem in India. It is endemic in the north Bihar. Kala-azar is a parasitic infection caused by *L. Donovanii*. The infection is transmitted by the bite of infected female sand fly *Phlebotomus argentipes*. *Leishmania donovani* infects all age groups of people. To explore the potential role of domestic animals in transmission, we performed a case-control study in an area of active kala-azar transmission in the East Champaran district, Bihar.

Objective: To find out the socio-demographic characteristics, risk factors of the kala-azar and to assess the role of domestic animal towards kala-azar in rural area of East Champaran, Bihar.

Methods: A case-control study was conducted to find socio-demographic characteristics and the role of domestic animal towards kala-azar in rural area of East Champaran district. A total of 139 Kala-azar cases and 139 healthy controls selected from the neighbourhoods of cases.

Results: Majority of the study population belongs to age group 6-15 year i.e. 37.4% in which cases were 39.6% and controls were 35.3%. The male population were more than female in the case (54%). Presence of granary inside the house, vegetation, banana tree and presence of domestic animal near the house were statistically significant.

Conclusion: Proper implementation of existing health awareness programmes could help people in the rural areas to modify their behavioural pattern by keeping granary outside from their living rooms, minimising vegetation around the houses and separate shelter of domestic animals that supports sand flies.

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INTRODUCTION

Kala-azar continued to be an important public health problem in India. Kala-azar is a parasitic infection caused by two leishmanial species, *L. Donovanii*. The infection is transmitted by the bite of infected sand fly *Phlebotomus argentipes*. *Leishmania donovani* infects all age groups [1]. The worldwide burden of this disease is estimated to be between 146,700 and 282,800 cases per year [2]. With an estimated 200 million people at risk, India, Nepal and Bangladesh harbour an estimated 67% of the global kala-azar disease burden [3]. 50% of kala-azar cases worldwide occur in India. About 84% of all VL cases being reported from Bihar [4]. In India, the conditions that favour epidemics of kala-azar are rural areas. More than 600 metres above sea level, heavy annual rainfall, mean humidity above 70%, a temperature range of 15°C to 38 °C with a diurnal variation of more than 7°C, abundant vegetation, subsoil water and alluvial soil [5]. The female sand fly needs blood for its eggs to develop, and becomes infected with the *Leishmania* parasite while

biting an infected person or animal. Over a period of 6 to 9 days, the parasite develops inside the sand fly gut [6]. When an infected female sand fly feeds on an uninfected person or animal, it simultaneously inoculates the parasite, thus completing the transmission cycle. The incubation period from infection to clinical kala-azar is between 2 to 6 months [7]. The possible role of domestic animals in anthroponotic VL has been studied in Bangladesh [8]. Kala-azar is familiar in the communities of Bihar. Maximum research activities concerning kala-azar have primarily focused on the characteristics of the parasite and the host. However, information on the role of domestic animals in kala-azar in India is scanty. To explore the potential role of domestic animals in transmission, we performed a case-control study in an area of active VL transmission in the East Champaran district, Bihar.

Objective

1. To find out the socio-demographic characteristics of the study subjects.
2. To identify the associated risk factors of the kala-azar.

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- To assess the role of domestic animal towards kala-azar in rural area of East Champaran, Bihar.

MATERIALS AND METHODS

Study Design: This was Case-Control study. The study was based on primary data and quantitative nature.

Study Duration: Data has been collected during June 2016 to November 2016 from East Champaran District of Bihar.

Study subjects: The registered cases at government hospital during the period January 2014 to December 2014 of East Champaran District. Informed consent was obtained from all cases and controls subjects before including them in the study.

Selection of Controls: Controls were selected from neighborhood of the cases other than kala-azar or they were healthy controls.

Inclusion criteria: All the kala-azar cases aged 2 years and above were included in the study.

Exclusion criteria: Cases less than 2 year were excluded from the study.

Study area: This study was conducted in the rural area in the East Champaran district in north Bihar.

Sample size: In this study 139 kala-azar cases were taken from the study area and 139 healthy controls were neighborhood of the cases. There were 27 Blocks in the East Champaran District.

hich 10 blocks had reported kala-azar cases more than 20, in the year 2014. Seven Block having larger number of kala azar cases were chosen randomly. From each block 20 kala-azar cases were taken as per convenience.

Data collection: Schedules methods were used for collection of data. It includes socio- demographic profile of study group, role of domestic animals and the associated risk factors of the kala-azar in the rural area of East Champaran, Bihar.

Statistical technique: The data was initially entered into MS excel and then transferred to trail version of SPSS 16.0. The number and percentage of socio-demographic characteristics for cases and controls group were calculated. The associated factors of kala-azar were estimated by calculating the odds ratio (OR) with 95% confidence intervals (CIs).

RESULT

A total of 278 subjects were taken in this study out of which 139 were case and the same were control. The Demographic profile of the study subjects of the East Champaran, Bihar were shown in the table 1. Majority of the study population belongs to age group 6-15 year i.e. 37.4% in which cases were 39.6% and controls were 35.3%. The male population were more than female in the case (54%) as well as in the control (56.8%). Further overall illiteracy was high in this area. i.e. 49.6%. Only 10.5% study subject were 10th pass and above. 51.4% of the study subject were married.

Table 1 Demographic profile of the study subjects in the East Champaran, Bihar

Subject Characteristics	Case	Control	Total	X ² -value	P-value
Age groups (in years)					
2-5	11(7.9%)	4(2.9%)	15(5.4%)	13.551	0.019
6-15	55(39.6%)	49(35.3%)	104(37.4%)		
16-25	18(12.9%)	12(8.6%)	30(10.8%)		
26-35	17(12.2%)	17(12.2%)	34(12.2%)		
36-45	23(16.5%)	21(15.1%)	44(15.8%)		
45+	15(10.8%)	36(25.9%)	51(18.3%)		
Gender					
Male	75(54.0%)	79(56.8%)	154(55.4%)	0.233	0.629
Female	64(46.0%)	60(43.2%)	124(44.6%)		
Educational status					
Illiterate	64(46.0%)	74(53.2%)	138(49.6%)	2.565	0.464
Primary	46(33.1%)	36(25.9%)	82(29.5%)		
Middle	13(9.4%)	16(11.5%)	29(10.4%)		
Matriculation+	16(11.5%)	13(9.4%)	29(10.5%)		
Occupational Status					
Unemployed	23 (16.5%)	17 (12.2%)	40 (14.4%)	5.322	0.256
Student	58 (41.7%)	45 (32.4%)	103(37.1%)		
House wife	15 (10.8%)	19 (13.7%)	34 (12.2%)		
Farmer	30 (21.6%)	42 (30.2%)	72 (25.9%)		
Private job	13 (9.4%)	16 (11.5%)	29 (10.4%)		
Marital status					
Married	62(44.6%)	81(58.3%)	143(51.4%)	5.195	0.023
Unmarried	77(55.4%)	58(41.7%)	135(48.6%)		
Income (per year)					
≤30,000	67(48.2%)	71(51.1%)	138(49.6%)	0.599	0.897
30001-60000	55(39.6%)	54(38.8%)	109(39.2%)		
60001-90000	119(7.9%)	8(5.8%)	19(6.8%)		
>90000	6(4.3%)	6(4.3%)	12(4.3%)		
Types of houses					
Pacca	8(5.8%)	16(11.5%)	24(8.6%)	4.156	0.245
Semi-pacca	44(31.7%)	35(25.2%)	79(28.4%)		
Kacha	39(28.1%)	35(25.2%)	74(26.6%)		
Hut	48(34.5%)	53(38.1%)	101(36.3%)		
Caste of the respondent					
General	10(7.2%)	8(5.8%)	18(6.5%)	0.241	0.887
OBC	91(65.5%)	92(66.2%)	183(65.8%)		
SC	38(27.3%)	39(28.1%)	77(27.7%)		

Majority (49.65%) of the family total yearly income was less than Rs. 30,000. Very few (4.3%) have yearly income more than Rs. 90,000. The Caste of the respondent were maximum OBC (65.8%), (27.7%) SC and only (6.5%) were from general caste. The majority of the respondents were living in hut (36.3%), kacha house (26.6%), semi-pacca house (28.4%) and only (8.6%) were having pacca house.

The unadjusted odds ratios of the risk factor kala-azar are shown in the table 2. The results showed that presence of granary inside the house (OR=9.086, 95% CI=5.035-16.395, $P<0.001$), presence of vegetation (OR =2.059, 95% CI=1.266-3.350, $P=0.003$), presence of banana tree (OR =2.559, 95% CI=1.504-4.354, $P<0.001$), presence of domestic animal near the house (OR=1.763, 95% CI=1.058-2.939, $P=0.029$), drainage system (OR =0.159, 95% CI=0.091-0.276, $P<0.001$), and sleeping near the domestic animal (OR =7.812, 95% CI=3.721-16.405, $P<0.001$) were significant risk factors by univariate analysis.

DISCUSSION

This study is probably the first attempt to assess the risk factors for kala-azar in the East Champaran District, Bihar and the evidence on the role of domestic animals using a case-control study design approach. Poor housing condition, illiteracy, low income group, majority of the respondent were farmer, lack of knowledge on kala-azar and sanitation and also presence of domestic animals could be the major factors for the transmission of kala-azar.

In this study shows preponderance among male (54%). It was also observed in the previous study [9-11]. Majority of the cases were found that their housing condition was poor. And (49.6%) study subjects have low family income, which was less than Rs.30,000 per year. Which has been also previously reported [12]. The presence of granary inside the house was found significant. It provides good places to sand flies for breeding.

Table 2 Comparison of cases and controls by the possible risk factors

Characteristics	Cases	Controls	ORs	95% CI	P-value
Presence of granary					
Yes	120(86.3%)	57 (41.0%)	9.086	5.035-16.39	<0.001
No	19 (13.7%)	82 (59.0%)			
Presence of vegetation					
Yes	94 (67.6%)	70 (50.4%)	2.059	1.266-3.350	0.003
No	45 (32.4%)	69 (49.6%)			
Presence of banana tree					
Yes	110(79.1%)	83 (59.7%)	2.559	1.504-4.354	<0.001
No	29 (20.9%)	56 (40.3%)			
Presence of bamboo tree					
Yes	116(83.5%)	104(74.8%)	1.697	0.942-3.059	0.077
No	23 (16.5%)	35 (25.2%)			
Proper drainage system					
Yes	115(82.7%)	60 (43.2%)	6.309	3.628-10.97	<0.001
No	24 (17.3%)	79 (56.8%)			
Presence of domestic animal					
Yes	103(74.1%)	86 (61.9%)	1.763	1.058-2.939	0.029
No	36 (25.9%)	53 (38.1%)			
Separate shelter					
Yes	57 (55.3%)	38 (44.2%)	1.565	0.880-2.785	0.127
No	46 (44.7%)	48 (55.8%)			
Sleep near domestic animal					
Yes	55 (53.4%)	11(12.8%)	7.812	3.721-16.40	<0.001
No	48 (46.6%)	75 (87.2%)			

Table 3 Association of domestic animals for kala-azar in the East Champaran, Bihar

Domestic animal	Cases	Controls	Odds ratio	95% CI	P-value
Cow					
Yes	20 (14.4%)	32 (23.0%)	0.562	0.303-1.041	0.065
No	119 (80.6%)	107 (64.0%)			
Buffalo					
Yes	42 (30.2%)	28 (20.1%)	1.716	0.990-2.976	0.053
No	97 (69.8%)	111 (79.9%)			
Ox					
Yes	5 (3.6%)	7 (5.0%)	0.704	0.218-2.273	0.555
No	134 (96.4%)	132 (95.0%)			
Goat					
Yes	47 (33.8%)	24 (17.3%)	2.168	1.178-3.991	0.012
No	92 (66.2%)	115 (82.7%)			

In the table 3 the results showed that presence of cow (OR=0.562, 95% CI=0.303-0.1.041, $P=0.065$), buffalo (OR=0.1.716, 95% CI=0.990-0.2.976, $P=0.053$), ox near the house (OR=0.704, 95% CI=0.218-0.2.273, $P=0.555$) were insignificant and only the presence of goats near the house (OR =2.168, 95% CI=1.178-3.991, $P=0.012$) were significant risk factors by univariate analysis.

The dampness was a risk factor associated with kala-azar has also been reported in the West Bengal and in the Nepal [13-14]. The rural areas, houses were usually surrounded by the vegetation. The presence of vegetation around the house was significantly associated with kala-azar in the univariate analysis. This was also reported in the previous study [15]. In this present study presence of banana trees near the house was significant which was similar to the previous study [16]. The presence of domestic animals was also related to increase the

risk of kala-azar and the sleeping near the domestic animals was found to be the risk factors of kala-azar. Domestic animals such as buffalo and goat were found to be the risk factors of kala-azar in the East Champaran where as cow and ox were the protective factors. Somewhat contrasting to other studies. The cow and buffalos were as protective factors [17].

CONCLUSION

In this case-control study, we identified several factors such as granary, vegetation, banana tree, drainage system, presence of domestic animal near the house, shelter of domestic animals and sleeping near the domestic animals were statistically significant. These findings have important practical implication. Proper implementation of existing health awareness programmes could help people in the rural areas to modify their behavioural pattern by keeping granary outside from their living rooms, minimising vegetation around the houses and separate shelter of domestic animals that supports sand flies. But before the latter can leads to any intervention, the exact role of domestic animals in the transmission needs further study.

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