ORIGINAL ARTICLE

Socio-demographic determinants and risk factors for Lymphatic Filariasis in Bundelkhand region of Uttar Pradesh: A Community based Case-Control Study

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ABSTRACT

Background: Lymphatic Filariasis (LF) is reported in 345 districts across 20 states and Union territories across India and Banda district in Bundelkhand region of Uttar Pradesh continues to experience high LF prevalence. **Aims and objectives**: to assess the socio-demographic determinants and risk factors for LF in Banda. **Materials and methods**: This case-control study included 233 LF cases, with equal number of age- and sex-matched controls. A two-stage random sampling method was used and data was collected through face-to-face interviews in the community. Appropriate statistical methods were used and odds ratios were calculated. **Results**: The study found that male and individuals in the age group of 41-50 years were most commonly affected. Farmers; those using public toilet as well as those who were having animal shelter or water source inside their houses had higher odds of LF; whereas individuals who were living in a nuclear family or belong to upper & middle socio-economic class; and had a water and solid waste management system in their community had significantly lower odds of LF. **Conclusion**: Apart from finding differences in key socioeconomic and environmental factors, study emphasizes the need to reduce mosquito breeding sites and improve housing and environmental conditions to combat LF.

KEYWORDS

Lymphatic Filariasis; Case-Control Study; Socio-Epidemiological Factors; Bundelkhand Region

INTRODUCTION

Lymphatic Filariasis (LF), also known as Elephantiasis, is a debilitating disease, endemic in 72 countries, with India being one of the most affected countries. Lymphedema and hydrocele are two common complications of LF and in 2021, India contributed to 46% of global lymphedema and 25% of hydrocele cases(1). As of 2023, LF remains endemic in 345 districts across 20 Indian states and union territories, presenting a significant public health challenge, particularly in the state of Uttar Pradesh(2) which contributed to approximately 15% of national lymphedema and 19% of hydrocele cases in 2023(3). Banda district, in the Bundelkhand region of Uttar Pradesh, is situated in the southernmost part of the state, and shares its borders with the state of Madhya Pradesh. Despite ongoing efforts, including yearly mass drug administration (MDA) campaigns and vector control programs, the prevalence of LF still remain high in Banda. As India is committed to eliminate LF by 2027, a five-pronged strategy involving MDA, public awareness, community engagement, research, and innovative solutions is being implemented(2).

Aims and Objectives: With this scenario, a case control study was conducted to find socio-

demographic determinants and to identify risk factors for Lymphatic Filariasis in Banda District of Bundelkhand region in Uttar Pradesh.

Material & Methods

Study type and study design: The present study is a community based case control study which was conducted in selected urban and rural parts of Banda district in Bundelkhand region of Uttar Pradesh.

Study setting: Banda district has 8 rural blocks and 2 urban areas out of which Mahua block (rural) and Banda city (urban) were randomly selected for the present study.

Study population: All diagnosed cases of Lymphatic Filariasis, line listed by the CMO Banda consisted the study population. Equal number of age and sex matched controls (without disease) were selected from the same vicinity as cases.

Study duration: 18 months from January 2023 to June 2024.

Sample size calculation: A total sample size of n=294 (147 matched case control pairs) was calculated to detect an OR of 2.0, assuming the prevalence of exposure to be 30% with one sided alpha of 0.05 and 90 % of power.

When line list of LF cases was obtained from the CMO office of Banda district, it was found that total number of reported cases in selected rural block was 168; while total number of reported cases in selected urban area was 65. It was then decided to include all these cases in the present case-control study and so as a result, a total of 233 LF cases and equal number of age and sex-matched controls became part of the study.

Inclusion criteria: All the LF cases of the selected rural and urban areas and matched controls from the same vicinity were included in the study.

Exclusion criteria: Those who did not gave their written consent were excluded from the study

Sampling technique: A two stage random sampling was used where in first stage one rural block (Mahua) and one urban area (Banda city) were selected randomly. Next; all 233 cases and equal number of randomly selected age & sex matched controls were selected.

Ethical approval: The study was approved by the Institutional Ethics Committee, RDMC, Banda via letter no.: IEC/RDMC/Cert/03 dated January 19th, 2023.

The actual data collection for the study was done in the latter part of 2023 which involved face-to-face interviews using a pre-tested semi-structured questionnaire. The clinical condition of all the LF cases was assessed and information related to socio-demographic and other epidemiological factors of both cases and controls was collected.

Data analysis: Data analysis involved entering information into Microsoft Excel and transferring it to the Statistical Package for Social Science (SPSS) software version 25.0 for analysis. Chi-square test was employed and a significance level was set at p-values <0.05. Odds ratio was calculated to compare socio-epidemiological factors between cases and controls.

Results

The present case-control study conducted in Banda district of Uttar Pradesh, revealed notable difference in the clinical presentation among LF cases in selected rural and urban areas, as scrotal swelling was the most predominant feature in rural block (64.88%) whereas lymphedema was prevalent in urban Banda (93.84%). Overall, the majority of LF cases were presented with either scrotal swelling or lymphedema, while breast swelling was quite rare (Figure 1). The age and gender distribution of LF cases indicated a predominance of males (63%) and that too in the age group of 41-50 years. Among females, the most affected age group was 31-40 years (Figure 2).

Figure 1 Distribution of cases according to their clinical features/symptoms

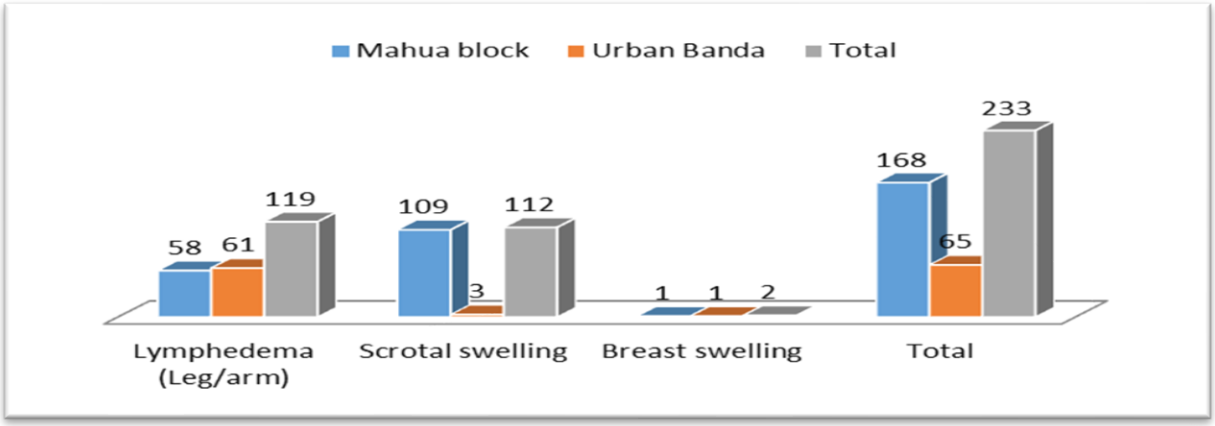

Figure 2 Distribution of LF cases based on their age and sex

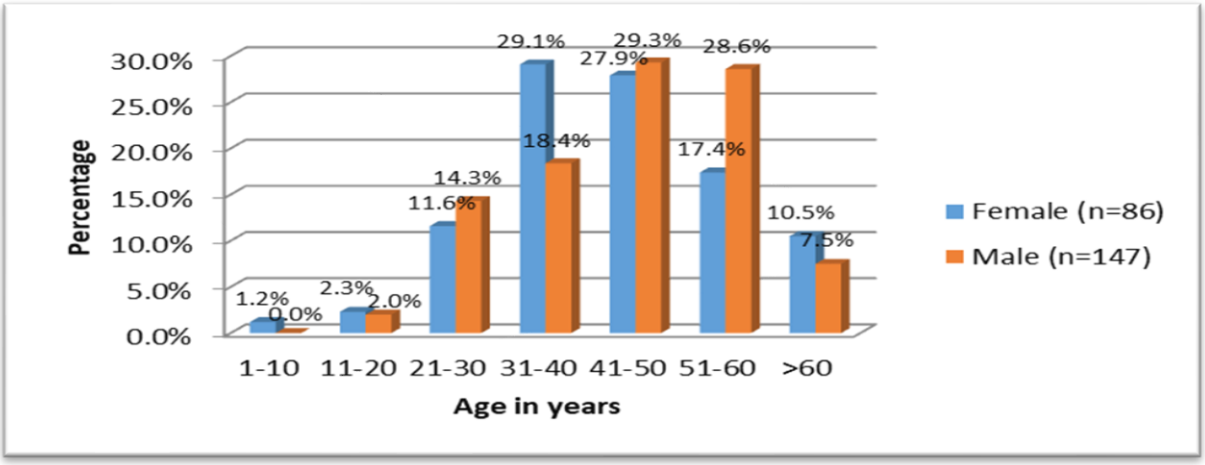

Table 1 shows that educational attainment showed no significant difference between cases and controls; however, occupational differences were noteworthy, and a significantly higher proportion of LF cases were farmers compared to controls (42.9% v/s 25.8%). Regarding family dynamics and socioeconomic status, LF cases were more likely to live in joint families (77.7% v/s 68.7%), and a larger proportion of them belonged to a lower socioeconomic class (48.5% v/s 37.8%). Housing conditions revealed that fewer controls were residing in pucca houses at present compared to cases. LF cases though, exhibited inadequate sanitation facilities, nearly one third of them were found using public toilet or open air defecation/urination in compare to only 9.4% of the controls. The presence of animal shelters inside the home was another risk factor, as cases significantly had higher proportion of such shelters in compared to controls in the present study (24.9% v/s 14.2%). In terms of water and waste management; LF cases were found to have more reliance on taps or hand pumps for drinking water in compared to controls (86.3% v/s 67.8%). Additionally, the absence of water drainage systems and effective solid waste management was more pronounced among cases than controls.

Further statistical analysis reinforced these findings, indicating significant association on calculation of odds ratio. Farmers had a 2.16 times higher odds of LF compared to those in other occupations, while the presence of tap/hand pump in their premises, use of public/open toilets and the presence of animal shelters inside the house increased the odds of contracting LF by 2.98, 2.98, and 1.96 times, respectively (Table 2). Odds of having LF were lowered to 0.62, 0.64, 0.26 and 0.60 among those living in nuclear families, belonging to upper & middle class, and with presence of water drainage system and solid waste management system in compared to their counterparts.

Table 1: Socio-epidemiological characteristics of LF cases and controls

Variable		Cases (n=233)	Controls (n=233)	χ2, df. and p-value
Religion	Hindu	223 (95.7%)	226 (97.0%)	χ2=0.549 df=1
	Muslim	10 (4.3%)	07 (3.0%)	P=0.459
Marital Status	Married	209 (89.7%)	213 (91.4%)	χ2=1.159 df= 3
	Unmarried	11 (4.7%)	8 (3.4%)	p=0.763
	Widow/widower	7 (3.0%)	9 (3.9%)	
	Separated/divorced	6 (2.6%)	4 (1.7%)	
Education	Illiterate	63 (27.0%)	69 (29.6%)	χ2=2.744 df= 4
	Upto 5th	73 (31.3%)	80 (34.3%)	p=0.601
	Upto 12th	47 (20.2%)	34 (14.6%)	
	Graduate	40 (17.2%)	41 (17.6%)	
	Postgraduate	10 (4.3%)	9 (3.9%)	
Occupation	Unemployed/housewife	31 (13.3%)	17 (7.3%)	χ2=37.957
	Farmers	100 (42.9%)	60 (25.8%)	df= 4
	Businessmen/shopkeeper	61 (26.2%)	58 (24.9%)	p<0.001
	Service (govt/pvt)	19 (8.2%)	39 (24.5%)	
Family type	Nuclear	22 (9.4%)	59 (38.2%)	χ2=4.821 df=1
	Joint	181 (77.7%)	160 (68.7%)	p=0.028
	Upper class	18 (7.7%)	31 (13.3%)	χ2=12.327 df=4

Variable		Cases (n=233)	Controls (n=233)	χ2, df. and p-value
Socio economic status	Upper middle class	28 (12.0%)	35 (15.0%)	p=0.015
	Middle class	29 (12.4%)	45 (19.3%)	
	Lower middle class	45 (19.3%)	34 (14.6%)	
	Lower class	113 (48.5%)	88 (37.8%)	
House Type	Kutcha house	80 (34.3%)	100 (42.9%)	χ2=8.392 df=2
	Semi pucca house	63 (27.0%)	72 (30.9%)	p=0.015
	Pucca house	90 (38.6%)	61 (26.2%)	
Source of drinking water in house	Exist	201 (86.3%)	158 (67.8%)	χ2=33.906 df=1
	Not exist	32 (13.7%)	75 (32.2%)	p<0.001
Fuel used for cooking	LPG	157 (67.4%)	151 (64.8%)	χ2=0.345 df=1
	Wood or coal	76 (32.6%)	82 (35.2%)	p>0.557
Toilet Facility	Public/open	75 (32.2%)	32 (9.4%)	χ2=33.906 df= 1
	Private	158 (67.8%)	201 (86.3%)	p < 0.001
Shelter house	Inside house	58 (24.9%)	33 (14.2%)	χ2=8.559 df= 2
	Outside house	67 (28.8%)	75 (32.2%)	p = 0.014
	Does not have animals	108 (46.4%)	125 (53.6%)	
Water drainage system	Exist	23 (9.9%)	69 (29.6%)	χ2=28.658 df= 1
	Not exist	210 (90.1%)	164 (70.4%)	p < 0.001
Solid waste management	Exist	124 (53.2%)	152 (65.2%)	χ2=6.967 df= 1
	Not exist	109 (46.8%)	81 (34.8%)	p = 0.008

Table 2: Bi-variate analysis of socio-epidemiological factors associated with LF

Socio-epidemiological factors		Chi square	P value	OR	95% CI of OR
Religion	Hindu	0.54	0.458	0.72	0.27-1.92
	Muslim			1	
Marital status	Married	0.23	0.62	0.85	0.46-1.58
	Others			1	
Education	Illiterate	0.38	0.53	0.88	0.58- 1.31
	Literate			1	
Occupation	Farmer	15.22	0.0001	2.16	1.46-3.20
	Others			1	
Type of family	Nuclear	4.82	0.028	0.62	0.41-0.95
	Joint			1	
SES	Others	5.46	0.019	0.64	0.44-0.93
	Lower class			1	
Type of house	Kutcha	3.62	0.05	0.69	0.47-1.01
	Pucca			1	
Source of drinking water	Tap/hand-pump	33.90	0.001	2.98	1.87-4.73
	Well or river			1	
Fuel used for cooking	LPG	0.34	0.55	1.12	0.76-1.64
	Wood or coal			1	
Toilet facility	Public	33.90	<0.001	2.98	1.87-4.73
	Private			1	
Shelter house of animal	Inside house	6.11	0.013	1.96	1.14-3.37
	Outside house			1	
Water drainage system	Present	28.65	<0.001	0.26	0.15-0.43
	Absent			1	
Solid waste management	Present	6.96	0.008	0.60	0.41-0.88
	Absent			1	

DISCUSSION

The present case control study is a community-based study which was conducted on 233 LF cases and their age & sex matched controls (in a ratio of 1:1).

Socio-epidemiological Characteristics:

LF primarily affects male and this male predominance was seen by the present study also where 63.10% of all LF cases were found to be male. Our finding is comparable to the findings of Mishra A et al (2009)(4) and Narain K et al (2018)(5) who reported that 79.5% and 61.9% cases of LF in Datia District of MP and in Delhi NCR respectively were male.

Though; similar to previous study by Mishra A et al (2009)(4), a high proportion of LF cases were found to be illiterate (27.0%), no statistically significant

difference was observed between education level of cases and controls in the present study (p=0.601). Our study has also shown that a higher proportion of cases (77.7%) used to live in a joint family compared to controls (68.7%), and a statistically significant difference in the distribution of the type of family among cases and controls existed with a p value of <0.05. This finding essentially indicates their residential arrangement at present and does not necessarily mean similar arrangements at the time of disease appearance. The finding probably reflect their preference for living in a joint family after getting the disease or might represent higher chances of disease transmission in joint families compared to nuclear families. There was a statistically significant difference in the distribution of socioeconomic status among cases and controls as 48.5% cases and 37.8% controls belonged to lower class (p<0.05). Similarly; Upadhyayula SM et al (2012)(6) reported, a noteworthy high frequency of filarial cases among poor people (income <1000/month) in rural Andhra Pradesh (P = 0.020).

The present study observed a statistically significant difference in the distribution of the type of house among cases and controls (p< 0.015) as 34.3% of LF cases and 42.9% of controls used to live in a kutcha house. This finding is in contrast with the findings of Mishra A et al (2009)(4) who reported that the majority of the LF cases resided in kuchcha house (74.35%) in Datia (M.P.). This paradox may be due to the fact that our team observed their current residence and not asked about the place where they used to live while acquiring the disease. Many LF cases might have shifted to new Pucca house after acquiring the disease while living in a Katcha/Semi-Pucca house under the pressure of their family, health care provider and or society. Similar to our study; Upadhyayula SM et al (2012)(6) also found that more number of LF cases used to reside in a tiled house and not in a hut in rural Andhra Pradesh (44.0% vs 28.8%).

In the present study, a significantly higher proportion of farmer (42.9%) was observed among cases, compared to controls (25.8%) (p<0.001). Similar finding was observed by Mishra A et al (2009)(4) in Datia (M.P.), where higher proportion (33.3%) of farmers was found among LF cases. Similarly, Upadhyayula SM et al (2012)(6) reported that a significant difference between microfilaria-positive cases and occupation existed in Karim Nagar (A.P.), with a p value of 0.049, indicating a link between specific professions and the occurrence of LF. Higher proportion of LF cases among farmers was probably related to their higher changes of exposure to the vector mosquito bite during work. Similarly; a significantly higher proportion of cases (86.3%) were found using taps or hand pumps as sources of drinking water compared to controls (67.8%) with a p value of < 0.001 indicating that there was higher chances of waste water collection in and around their house, leading to ample mosquito breeding sites, and resultant LF disease among them. Persons using a public toilet or going in open for defecation are also associated with higher exposure to mosquito bites as a significantly larger proportion of LF cases were found using public toilet or open air defecation (32.2%) compared to controls (9.4%) with a p-value of < 0.05. Similarly; presence of animal shelter in the house was significantly associated with disease as 24.9% of cases and 14.2% of controls has the animal shelter inside their house (p=0.014). Our study also showed that a significantly lesser proportion of cases had an existing water drainage system compared to controls (9.9% vs 29.6%). This finding is supported by studies by Sapada IE et al (2015)(7) and Mulyono RA et al (2008)(8) who found a significant association between the frequency of filariasis and the pool of water surrounding their home in Indonesia. A significantly higher proportion of controls were found to have an existing solid waste management system compared to cases in the present study (65.2% vs 53.2%) (p=0.008).

Bi-variate analysis and calculation of odds ratio:

Odds of having LF was 2.16 times more among farmers (95% CI 1.46-3.20), 2.98 times more in people using public toilet (95% CI 1.87-4.73), 1.96 times more among people with an animal shelter inside their house (95% CI 1.14-3.37) and was 2.98 times more in people who had tap or hand-pump in their houses (95% CI 1.87-4.73) compared to their counterparts. Reason for increase in odds of having LF among them was probably related to creation of water puddle in their vicinity which could have led to increased exposure to the mosquito bites compared to their counterparts.

Odds of having LF were lowered to 0.62 (95% CI 0.41-0.95) among residents of nuclear families, 0.64 (95% CI 0.44-0.93) among upper & middle class people, 0.26 (95% CI 0.15-0.43) among people with presence of water drainage system and 0.60 (95% CI 0.41-0.88) among people with presence of solid waste management system in compared to their counterparts. Reason for lower odds among nuclear families and upper/middle class people is probably related to their lesser exposure to infected mosquitoes while reason for lower odds among people who had water and solid-waste management systems is probably decreased mosquito breeding sites in their vicinity.

Conclusion

The present case-control study explored various demographic, socioeconomic, and environmental factors associated with Lymphatic Filariasis (LF). Odds of having LF was more among farmers, people using public toilet/open defecation, people with an animal shelter inside their house and those who had tap or hand-pump in their houses compared to their counterparts; while odds of having LF were lower among residents of nuclear families, among upper & middle class people, and those who had water and solid waste management system in compared to their counterparts

Recommendation

Apart from the ongoing activities against LF, environmental factors like solid and water waste management system, and animal raising practices need special attention for effective control of LF in study area.

Limitation of the Study

Current demographic features and socio-epidemiological factors of LF cases were recorded and those may not be the same when cases acquired the disease at the first place. Also being a single centric study, and that too in one of the most underdeveloped region of country i.e. Bundelkhand; the results of the present study cannot be extrapolated to the entire country.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

There are no conflicts of interest.

Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

References

1. WHO (2013) Towards eliminating lymphatic filariasis: progress in the South-East Asia Region (2001–2011).
2. CDC-lymphatic filariasis - general information – 2024; assessed from https://www.cdc.gov/parasites/lymphaticfilariasis/gen_info/faqs.html (on January 1st, 2024)
3. FILARIA VECTORS :: National Center for Vector Borne Diseases Control (NCVBDC). Assessed from https://ncvbdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=452&lid=3729 (on January 17th, 2024)
4. Mishra A, Bhadoriya RS. An Epidemiological Study of Filariasis in a Village of District Datia, MP. Indian J Community Med. 2009 Jul;34(3):202-5.
5. Gupta G, Marskole P, Yuwane P. A study on assessment of mass drug administration for elimination of lymphatic filariasis in Datia district, Madhya Pradesh. Int J Community Med Public Health [Internet]. 2018 Feb. 24 [cited 2024 Sep. 10];5(3):944-7.
6. Upadhyayula SM, Mutheneni SR, Kadiri MR, Kumaraswamy S, Nagalla B. A cohort study of lymphatic filariasis on socio economic conditions in Andhra Pradesh, India. PLoS One. 2012;7(3):e33779.
7. Ibrahim Edy Sapada, Chairil Anwar, Salni, Dwi Putro Priadi. Environmental and Socioeconomics Factors Associated with Cases of Cinical Filariasis in Banyuasin District of South Sumatera, Indonesia. International Journal of Collaborative Research on Internal Medicine & Public Health. 2015;7(6):132-140
8. Mulyono RA. Risk factor environmental and behaviour influence the occurance of filariasis (case study in area Pekalongan). Jurnal Bina Sanitasi. Desember 2008; 1 (1): 18 - 27