Filarial Etiology in Vaginal Hydrocele – A Hospital-Based Observational Study from an Endemic Zone of Bangladesh

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ABSTRACT

Background: Lymphatic filariasis (LF) is a significant cause of long-term disability in endemic low- and middle-income countries, where filarial hydrocele represents the most common chronic manifestation in men, leading to substantial physical, social, and economic consequences. **Methods & Materials:** This prospective observational study was conducted in the Department of Surgery at Rangpur Medical College Hospital, northern Bangladesh, over 12 months (January–December 2014) among adult males with clinically diagnosed vaginal hydrocele who were admitted from the surgery outpatient department. Data were analyzed using SPSS 26.0, and $p < 0.05$ was considered statistically significant. **Results:** Among 100 adult males with vaginal hydrocele, 83% were classified as definite, highly likely, or suspected filarial cases. In contrast, 17% were non-filarial, indicating that most hydroceles in this setting are attributable to lymphatic filariasis. Filarial hydrocele was more frequent among rural residents, those living with poor sanitation, and men working in the biri industry, with significant differences compared to non-filarial cases. In multivariable analysis, rural residence (AOR 3.85; 95% CI 1.42–10.45), poor sanitation (AOR 2.67; 95% CI 1.01–7.08), and employment in the biri industry (AOR 4.28; 95% CI 1.36–13.46) remained independent predictors of filarial hydrocele. **Conclusion:** In this northern Bangladeshi endemic setting, most adult vaginal hydroceles were filarial and clustered among rural men with poor sanitation and biri-related occupations, indicating that filarial hydrocele is driven by socio-environmental disadvantage and should be addressed through targeted morbidity management, sanitation improvement, and focused preventive strategies for high-risk groups.

Keywords: *Filarial hydrocele, Lymphatic filariasis, and Socio-demographic correlates.*

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INTRODUCTION

Lymphatic filariasis (LF) is a mosquito-borne neglected tropical disease that remains a significant cause of long-term disability in many low- and middle-income countries. Globally, an estimated 120 million people are infected, and more than 1.2–1.3 billion are at risk, with approximately 40 million individuals living with chronic clinical manifestations such as lymphoedema and genital disease [1]. Although LF is rarely fatal, its chronic sequelae result in substantial years lived with disability and economic loss, justifying its designation as a significant public health and development problem [2]. Hydrocele is the most common chronic clinical manifestation of bancroftian filariasis in men; in some endemic communities, 40–60 % of adult males are affected [3]. The condition arises from lymphatic dysfunction and damage to scrotal lymphatics, with ultrasonographic and clinical studies suggesting that adult Wuchereria bancrofti worms preferentially lodge in these vessels, leading to dilatation, lymphangiectasia, and accumulation of transudative fluid in the tunica vaginalis [3,4]. Detailed work by Norões and Dreyer has further clarified the mechanisms of chronic filarial hydrocele and its implications for surgical repair [4]. Beyond the physical deformity, filarial hydrocele exerts a profound social and economic toll. Studies from Ghana and India show that men with hydrocele experience pain, difficulties with mobility and work, reduced productivity, and substantial treatment-related costs [5,6,7]. Qualitative and ethnographic research has documented stigma, marital strain, and sexual dysfunction associated with hydrocele, with effects on marriageability, conjugal life, and self-esteem [5,8,9]. These impacts are reflected in broader disability literature, indicating that LF-related disability affects work capacity, social roles, and psychological well-being, and that hydrocele contributes significantly to the overall disability burden of LF [4,10]. Surgical correction of a hydrocele has been shown to improve function and quality of life. Recent work has emphasized standardized hydrocele classifications and context-appropriate operative approaches to guide morbidity management in endemic areas [6,10,11]. South Asia bears a large share of the global LF burden, and India has been extensively studied with respect to epidemiology, transmission dynamics, and control strategies [12]. Bangladesh is also highly endemic, with LF reported from most regions, and approximately one-third of the districts are classified as endemic. Population-based surveys in northern districts have documented a moderate to high prevalence of LF, with hydrocele recognized as a common clinical manifestation among men and strongly associated with poverty, illiteracy, and limited access to preventive measures, including bed nets [13]. These areas are predominantly rural, and many affected individuals are engaged in low-income manual occupations, increasing the economic impact of disability. Despite this, there are relatively few analytic studies from Bangladesh that characterize the clinical and socio-demographic correlates of filarial hydrocele at the individual level. Existing work has primarily focused on community-based prevalence mapping or descriptions

of overall LF morbidity, with limited attention to specific risk profiles for hydrocele among adult males presenting for surgical care [13]. Furthermore, while the international literature has identified associations between hydrocele and low socio-economic status, rural residence, certain occupations, and poor housing or sanitation conditions, there is a need to verify these relationships in different ecological and programmatic contexts [8-10]. Understanding which socio-demographic groups are most likely to present with filarial hydrocele in a high-endemic Bangladeshi setting is essential for planning targeted health education, vector control, MDA coverage improvement, and surgical morbidity management services. In this context, the present study was conducted in a tertiary-care surgical department in northern Bangladesh, an area recognized as highly endemic for LF. Therefore, this study aimed to determine the etiological spectrum of vaginal hydrocele and to identify clinical and socio-demographic correlates of filarial hydrocele among adult males in an endemic northern region of Bangladesh.

METHODS & MATERIALS

This prospective observational study was conducted in the Department of Surgery at Rangpur Medical College Hospital, Rangpur, a major tertiary care center in northern Bangladesh that serves a large population from both rural and urban areas. The study was carried out over 12 months, from January to December 2014. The study population comprised adult male patients diagnosed clinically with vaginal hydrocele who attended the surgery outpatient department and were admitted to the general surgery wards for treatment. Both new and recurrent cases were included, while patients with hydrocele secondary to trauma, tumors, tuberculosis, or systemic diseases such as nephrotic syndrome were excluded to ensure etiological specificity.

A total of 100 patients were enrolled as the study sample. Participants were selected through random sampling among eligible patients presenting during the study period to minimize selection bias. Data were collected prospectively using a structured questionnaire that covered socio-demographic variables, including age, residence, occupation, housing type, monthly income, and sanitation status, as well as detailed clinical findings. Each case was examined and categorized as definite, highly likely, suspected, or non-filarial hydrocele based on clinical features and, when indicated, parasitological or serological evidence.

All data were checked for completeness and consistency before entry and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Descriptive statistics were computed to summarize baseline characteristics and etiological categories, and categorical variables were expressed as frequencies and percentages. The chi-square test was applied to determine associations between filarial and non-filarial cases across socio-demographic and clinical variables. Factors that showed significant associations in bivariate analysis were subsequently entered into a multivariable logistic regression model to identify independent predictors of filarial hydrocele while adjusting for potential confounders. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated, and a *p*-value of less than 0.05 was considered statistically significant.

RESULTS

Among the 100 adult male participants with hydrocele, the majority (53%) were diagnosed as definite filarial cases, while 10% were considered highly likely and 20% suspected to be of filarial origin. Non-filarial causes accounted for 17% of cases. These findings indicate that nearly four out of five hydrocele cases in this endemic area are attributable to lymphatic filariasis, underscoring the ongoing transmission and endemicity of the disease in northern Bangladesh (*Table I*).

Table I
Distribution of Study Participants by Etiological Category of Hydrocele.

Etiological category	Frequency (n)	Percentage (%)
Definite filariasis	53	53.00
Highly likely filariasis	10	10.00
Suspected filariasis	20	20.00
Non-filarial	17	17.00

Filarial hydrocele was more prevalent among rural residents (69.9%) compared with urban dwellers (30.1%), a difference that was statistically significant (p = 0.001). Poor sanitation was also significantly associated with filarial cases (81.9% vs. 58.8%; p = 0.03). Occupational exposure showed a strong relationship, with 57.8% of filarial cases working in the biri industry compared to only 17.6% of non-filarial cases (p = 0.002). Although not statistically significant, filarial hydrocele tended to occur more often among individuals aged 31–40 years, those from low-income households, and those with unilateral hydrocele. These associations suggest that environmental, occupational, and hygiene factors play critical roles in disease occurrence (*Table II*).

Table II
Comparison of Socio-Demographic and Clinical Characteristics between Filarial and Non-Filarial Hydrocele Cases.

Variable	Category	Filarial cases n (%)	Non-filarial cases n (%)	p-value
Age group (years)	18–30	25 (30.1)	3 (17.6)	0.49
	31–40	35 (42.2)	6 (35.3)	
	≥41	23 (27.7)	8 (47.1)	
Residence	Rural	58 (69.9)	5 (29.4)	0.001
	Urban	25 (30.1)	12 (70.6)	
Housing pattern	Kuncha	52 (62.7)	7 (41.2)	0.08
	Semi-pacca	22 (26.5)	7 (41.2)	
	Pacca	9 (10.8)	3 (17.6)	
Sanitation status	Poor	68 (81.9)	10 (58.8)	0.03
	Good/Very good	15 (18.1)	7 (41.2)	
Occupation	Biri industry	48 (57.8)	3 (17.6)	0.002
	Others	35 (42.2)	14 (82.4)	

Income level	Poor	66 (79.5)	11 (64.7)	0.18
	Middle/Upper	17 (20.5)	6 (35.3)	
Laterality	Unilateral	75 (90.4)	13 (76.5)	0.09
	Bilateral	8 (9.6)	4 (23.5)	

After adjusting for potential confounders, rural residence (AOR 3.85; 95% CI: 1.42–10.45; p = 0.008), poor sanitation (AOR 2.67; 95% CI: 1.01–7.08; p = 0.047), and occupation in the biri industry (AOR 4.28; 95% CI: 1.36–13.46; p = 0.013) remained significant independent predictors of filarial hydrocele. Although low income and unilateral hydrocele showed elevated odds, these associations were not statistically significant. The model demonstrates that exposure to unhygienic living conditions and certain occupations in rural settings substantially increases the risk of developing filarial hydrocele (*Table III*).

Table III
Multivariable Logistic Regression Identifying Independent Predictors of Filarial Hydrocele among Study Participants.

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Rural residence	3.85	1.42 – 10.45	0.008
Poor sanitation	2.67	1.01 – 7.08	0.047
Works in biri industry	4.28	1.36 – 13.46	0.013
Low income	1.82	0.63 – 5.28	0.26
Unilateral hydrocele	2.12	0.68 – 6.56	0.19

DISCUSSION

The present study reveals that most adult vaginal hydroceles in this filariasis-endemic area of northern Bangladesh are of filarial origin and are strongly associated with socio-demographic disadvantages, particularly rural residence, poor sanitation, and work in the biri industry. The overall proportion of hydroceles attributable to filarial etiology in our series is high, with 83% of cases classified as definite, highly likely, or suspected filariasis. This pattern is consistent with community and hospital-based reports from other endemic regions, where hydrocele is described as the dominant chronic manifestation of lymphatic filariasis among adult men and contributes substantially to the burden of disability and stigma [5,14]. Njenga et al. in Kenya similarly documented hydrocele and limb lymphoedema as the principal chronic clinical outcomes in highly endemic communities, supporting the view that so-called idiopathic vaginal hydroceles in such settings frequently represent unrecognised filarial disease rather than primary non-filarial pathology [14]. The age distribution in our study, with a peak in the 31–40 year age group, is similar to that in previous studies, indicating that chronic scrotal pathology typically develops after years of cumulative infection and progressive lymphatic damage [4,14-17]. A study showed that adult worm death within scrotal lymphatics and the formation of intrascrotal nodules play a central role in the pathogenesis of filarial hydrocele [15]. Subsequent work from the same group demonstrated persistent lymphatic dilation and altered mechanics as key mechanisms underlying chronic, often recurrent, hydroceles [4]. More recent experimental and imaging studies have further clarified that lymphatic remodeling and contractile dysfunction, driven by inflammatory responses to adult worms and their Wolbachia endosymbionts, underpin the evolution from subclinical infection to established morbidity [16,17]. These pathophysiological insights provide a biological explanation for our finding that unilateral hydrocele predominates, yet bilateral disease also occurs; the specific pattern likely reflects the focal distribution of adult worms within the scrotal lymphatic network rather than a distinct etiological category. The strong, independent association between rural residence and filarial hydrocele in our data mirrors spatial analyses from India, where geo-environmental risk models consistently show higher transmission and morbidity in rural, low-lying, and poorly serviced areas compared with urban centers [18]. Sabesan et al. mapped filariasis risk across India and identified clusters of high endemicity linked to poor drainage, high vector densities, and disadvantaged housing environments, all of which are standard features of the rural communities served by our hospital [18]. The additional effect of poor sanitation in our multivariable model is also plausible. Although faeco-oral transmission is not involved, inadequate drainage and waste management encourage breeding of Culex vectors, which thrive in polluted water and peri-domestic habitats [18,19]. Our finding that occupation in the biri industry is a powerful predictor of filarial hydrocele suggests that occupational setting may concentrate risk: similar to the plantation and informal-sector labourers described in Ghana and Kenya, these workers often live in overcrowded housing, have prolonged evening exposure to mosquitoes, and limited access to preventive services [5,14,18]. The socio-economic implications of these associations are considerable. Economic studies have shown that chronic lymphatic filariasis, particularly hydrocele and lymphoedema, imposes substantial productivity losses, out-of-pocket costs, and long-term income erosion on affected households [20-22]. In our setting, the concentration of filarial hydrocele among low-income rural men and biri workers suggests a similar cycle: poverty increases exposure to infection; established morbidity then reinforces poverty through reduced work capacity and the costs of surgery and repeated care. Treatment-seeking studies also highlight diagnostic delays, inappropriate or prolonged use of antifilarial drugs, and fragmented care pathways for chronic filarial morbidity; these patterns likely apply in northern Bangladesh as well and help explain why many of our patients present with long-standing, large hydroceles [21,23]. At the same time, global programmatic narratives have tended to privilege interruption of transmission through mass drug administration, while morbidity management and disability prevention have received less sustained emphasis [1,2]. Our data reinforce the arguments from Wynd et al. and Zeldenryk et al. that the full burden of lymphatic filariasis cannot be captured by microfilariaemia prevalence alone, and that chronic manifestations, such as hydrocele, carry profound social, psychological, and economic consequences [2,19].

LIMITATIONS

This single-centre, hospital-based study, with a relatively small sample size, may not accurately reflect community-level patterns of hydrocele in the broader population. Etiological classification relied mainly on clinical criteria with limited laboratory confirmation, so some misclassification is possible. In addition, the cross-sectional design and lack of data on factors such as detailed mosquito exposure or prior antifilarial treatment limit causal inference regarding the observed associations.

CONCLUSION

In this endemic area of northern Bangladesh, most adult vaginal hydroceles were of filarial origin and were strongly associated with rural residence, poor

sanitation, and employment in the biri industry. These findings highlight that filarial hydrocele is closely linked to socio-environmental disadvantage and underscore the need for targeted morbidity management, improved sanitation and focused preventive interventions for high-risk rural and low-income male populations.

RECOMMENDATIONS

Routine evaluation of adult male hydrocele in endemic areas should include consideration of filarial etiology, with timely referral for appropriate antiparasitic treatment and hydrocelectomy. Targeted health education and morbidity management services should focus on high-risk groups, particularly rural residents and bidi workers. Public health programmes should integrate hydrocele care with lymphatic filariasis control activities, emphasizing improved sanitation, vector control, and poverty-oriented interventions in vulnerable communities.

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CONFLICT OF INTEREST

None declared.

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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