

Prevalence of Lymphatic Filariasis: Mosquito (Class: Insecta) borne disease in rural areas of Chimur Tehsil, Chandrapur, Maharashtra, India

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Abstract

Approximately 304 million people are at risk of contracting filariasis because they reside in identified endemic locations. 16 million people have clinical symptoms, while an estimated 22 million people have microfilaria in their blood. The study's goal was to find out common lymphatic filariasis in a tribal community in Chimur tehsil of Chandrapur district. Cross-sectional research with a community focus was conducted. By using the finger prick method, night blood smears were acquired between 9.00 pm to 11.30 pm. Thick smears were made and the standard staining process was carried out. The next day, a provocative test using diethyl carbamazine (DEC) was conducted. An oral dose of 100 mg DEC was given and an hour later a blood sample was obtained using standard procedures. DEC could only be given to 300 people, despite every effort being made to guarantee compliance. Out of 7019 persons examined (3461 males and 3558 females), 0.44% were showing clinical manifestations (0.605 males and 0.28% female). Overall microfilaria rate was 1.42% (1.79% males and 1.06% females). Total endemicity rate was 1.86% (2.34% and 1.34% females). Average microfilaria density was 2.78(2.48 males and 3.52 females). The prevalence of filariasis in this area was high. Mf rate was 1.42%. Endemicity rate was 1.86%. Elephantitis and Hydrocele was the commonest clinical manifestation.

Keywords: Prevalence, Lymphatic Filariasis, insect, mosquito-borne disease

Introduction

Three types of filarial worms—*Wuchereria bancrofti*, *Brugia malayi*, and *B. timori*—cause lymphatic filariasis (LF), a neglected tropical disease (NTD) that is spread between humans by a variety of mosquito species, including *Aedes*, *Culex*, and *Anopheles* (WHO, 2018). The worms enter the lymphatic system after a mosquito injects LF larvae into the circulation of a new host. There, they develop into adults, reproduce, and release microfilariae (Mf) (Taylor *et al.*, 2010) [27]. Worms may emit millions of Mf and survive for five to seven years as adults. While the majority of infected people do not exhibit any symptoms, some may experience lymphatic dysfunction, which can lead to severe lymphedema (elephantiasis), particularly in the lower limbs, and in men, scrotal hydrocele (WHO, 2020). In addition to being disfigured and disabled, people with these chronic consequences frequently face social shame, mental health problems, and detrimental economic impacts.

According to recent estimates, LF affects more than 120 million people worldwide, primarily in Africa, Asia, the Western Pacific, and a small portion of the Americas, across 72 nations (Ramaiah and Ottesen, 2014) [19]. There are still at least 3.6 crore persons who exhibit this chronic illness symptom. Approximately 552 million people are at risk of contracting lymphatic filariasis, which is prevalent in 17 states and 6 union territories (WHO, 2004.) Native instances of lymphatic filariasis have been documented from 20 states in India, where over 600 million people are at risk. A total of 250 districts have been shown to be filariasis endemic (Programme NVBDCP, 2014.)

The Global Programme to Eliminate Lymphatic Filariasis (GPELF) was created in 1997 by the World Health

Organisation (WHO) (Ottesen EA 2000) [18]. Its two main goals are to: i) stop the disease's spread by treating populations in endemic areas on a large-scale using mass drug administration (MDA) and ii) treat individuals with chronic complications to lessen their suffering. Initially, two-drug regimens consisting of either ivermectin and albendazole (for places where LF co-endemic with onchocerciasis) or diethylcarbamazine and albendazole (for other areas) were advised for MDA. It was observed that the villagers had little to no knowledge of the disease's origin. It was suggested that to sensitize the public, there should be a strong emphasis on public awareness (Dudhmal *et al.*, 2015a) [7].

Acute dermatolymphoceleadenitis (ADLA) and elephantiasis, which are visible chronic symptoms of lymphoedema, and hydrocele and lymph scrotum, which are male urogenital diseases, are examples of the painful and deeply disfiguring apparent chronic manifestations of morbidity in LF. Phases of ADLA bacterial infections are characterised by severe pain and fever. Additional less often documented clinical manifestations include vulva swelling, rheumatoid arthritis, and breast lymphoedema (Melrose, 2002) [14].

17 districts in Maharashtra (Gadchiroli, Chandrapur, Gondia, Bhandara, Wardha, Nagpur, Amravati, Akola, Yawatmal, Jalgaon, Nandurbar, Nanded, Latur, Osmanabad, Solapur, Sindhudurg, Thane) are endemic for the lymphatic filariasis illness. In particular, nine of these seventeen districts are located exclusively in Maharashtra's Vidarbha area (Mahakalkar *et al.*, 2017) [13]. The Indian government has been attempting to eradicate this infection through the use of mass drug administration (MDA), which involves the oral administration of a single dose of 400 mg of

albendazole to control filarial worm infestation and the age-appropriate dosage of 100 mg of DEC or Ivermectin (NVBDCP Programme 2014). The National Filariasis Control Programme was established in Maharashtra in 1957 and is carried out by 06 Filarial Survey Units, 16 Filaria Control Units, 10 Filaria Night Clinics, and 1 Filaria Training Centre. It was founded on the findings of a one-man commission report. This study set out to determine the prevalence of lymphatic filariasis in a rural Chimur tehsil in the Chandrapur district. to assist the GPELF's advancement concerning the morbidity pillar.

Materials and method

The current study was carried out in the Tehsil Chimur from January to December of 2021. With an elevation of 260 metres, Chimur is a tehsil in the Chandrapur district. There are 238 settlements in the Chimur Tehsil. Total 169547 people are living in Chimur Tehsil. There are 85898 men and 83649 females. The number of domestic animals and flowers in urban areas is significantly smaller than in rural areas, which are rich in domestic animals (such as cows, buffalo, goats, dogs, chickens, and birds). Septic tanks, drains, and other contemporary sanitary facilities are rare in rural areas. A blood sample (20µl) was obtained by prickling the finger between 1900 and 2300 hours, in accordance with Gubler's methodology. (Gubler et. al., 1973) ^[10] Humans selected a protective zone by random sampling (Zar, 2010) ^[28], which included around 10% to 15% of the population in the selected observe region. Samples of collected blood are spread on glass slides and then placed in the laboratory. After being dehydrated in distilled water and stained with Leishman's stain, blood-smear slides were examined under a microscope to check for the presence of microfilaria. If any were found, the filarial parasites (microfilaria) were counted and recorded against each microfilaria patient (Simonsen, 2003) ^[25]. Every challenge's age, gender, medical history, and socioeconomic and financial conditions have been disclosed. The overall survey was segmented by age group: 0–10 years, 11–20 years, 21–30 years, 31–40 years, 41–50 years, 51–60 years, and everyone above 60 years old.

Results and discussion

In the study area 369 people brought into study of age group 0-10 years and overall mf rate, disease rate, endemicity rate and average microfilarial density was 0%. Likewise, 1017 people were brought into study of age group 11-20 years and overall mf rate, disease rate, endemicity rate and average microfilarial density was 0.39%, 0%, 0.39% and 2.5 respectively. 935 people brought into study of age group 21-30 years and overall mf rate, disease rate, endemicity rate and average microfilarial density was 0.74%, 0.21%, 0.96% and 2.71 respectively. 1003 people brought into study of age group above 31-40 years and overall mf rate, disease rate, endemicity rate and average microfilarial density was 2.29%, 0.99%, 3.29% and 2.78 respectively. Likewise, 1073 people brought into study of age group 41-50 years and overall mf rate, disease rate, endemicity rate and average microfilarial density was 2.05%, 1.11%, 3.16% and 3.22 respectively. 1122 people brought into study of age group 51-60 and overall mf rate, disease rate, endemicity rate and average microfilarial density was 1.78%, 0.44%, 2.22% and 2.80 respectively. 1150 people brought into study of age group 60 above and overall mf rate, disease rate, endemicity rate and average microfilarial density was 2.08%, 0.17%, 2.26% and 2.83 respectively. Out of 7019 persons examined (3461 males and 3558 females), overall, 0.44% were showing clinical manifestations (0.60 males and 0.28% female). Overall microfilaria rate was 1.42% (1.79% males and 1.06% females). Total endemicity rate was 1.86% (2.34% and 1.34% females). Overall average microfilarial density was 2.78(2.48 males and 3.52 females). Overall mf rate was higher in age group of 31-40 years (2.29%) than other age group. Overall disease rate was higher in age group of 41-50 year (1.11%) than other age group. Overall endemicity rate was higher in age group 31-40 year (2.29%) than other age group. Overall average mf density was higher in age group of 60 above (2.83) than other age group. In this study area out of 31 people (21 Males and 10 Females) found with filarial disease. In this study area all the parameters were higher in males than females.

Table 1: Showing Average Mf Density

Age group (years)	No. of persons examine			Mf Rate (%)			Disease Rate (%)			Endemicity Rate (%)			Average Mf Density		
	M	F	O	M	F	O	M	F	O	M	F	O	M	F	O
0-10	369	350	719	0	0	0	0	0	0	0	0	0	0	0	0
11-20	405	612	1017	0.74	0.16	0.39	0	0	0	0.74	0.16	0.39	2.66	2	2.5
21-30	465	470	935	0.86	0.64	0.74	0.43	0	0.21	1.29	0.63	0.96	2.75	2.66	2.71
31-40	503	500	1003	2.78	1.78	2.29	1.39	0.60	0.99	4.17	2.40	3.29	2.14	3.77	2.78
41-50	550	523	1073	2.18	1.81	2.05	1.45	0.76	1.11	3.33	2.67	3.16	2.66	3.9	3.22
51-60	569	553	1122	2.28	1.23	1.78	0.52	0.37	0.44	2.81	1.68	2.22	2.53	3.28	2.80
60-A.	600	550	1150	2.66	1.33	2.08	0.16	0.18	0.17	2.83	1.63	2.26	2.5	3.5	2.83
TOTAL	3461	3558	7019	1.79	1.06	1.42	0.60	0.28	0.44	2.34	1.34	1.86	2.48	3.52	2.78

According to the current investigation, the overall microfilaria rate was 1.42% (1.06% for females and 1.79% for men). Comparable research conducted in three villages in Kano State, Nigeria by Dogara *et al.*, (2012) ^[6] found that the prevalence was 1.5%. In contrast, the total mf rate in the Patna district of Bihar, where Singh *et al.* (2006) ^[26] conducted comparable research, was 6.2%. In contrast, another study carried out in 2019 by Lunge in a tribal region of Maharashtra found that the total mf rate was 14.4%. In a

different investigation conducted in Calcutta and Howarth, Bhattacharya *et al.*, (1964) ^[1] obtained mf rates of 13.6% and 7.8%, respectively. However, comparable research conducted in Reva by Mishra *et al.*, (1979) ^[16] revealed that the mf rate was 7.1%. In contrast, different research by Chandra *et al.*, (2000) demonstrates a higher mf rate of 1.23%. The total mf rate in our investigation was substantially lower, hence the frequency rate in this study did not match the previously cited studies. 31 of the 7019

individuals screened in this research had clinical signs of the illness, for an overall incidence of 0.44%. Gawda *et al.*, (1961)^[9] found that in Bangalore's shantytowns, the illness rate was a mere 0.03%. Mishra *et al.*, found a 2.7% overall disease rate. In west Bengal, Chandra *et al.*, (1996)^[3] found an overall illness rate of 1.38%. According to Shrivastava *et al.*, (1973)^[23], there was no disease in the 0–10 age range and an increased tendency after that. The total disease rate was Males (12.0%) had a greater disease rate than females (4.1%). Comparable to the age-related findings of the current investigation.

In the current investigation, the total endemicity rate was 1.86%. The endemicity rate of 15.4% was found by Srivastava *et al.*, (1969). They also noted a steady rise with age. An endemicity rate of 7.6% was reported by Mishra *et al.*, (1979)^[16]. A total endemicity rate of 2.60% was determined by Chandra *et al.*, (2013). As a result, our endemicity rate of 1.86% differs from that of earlier research.

The average microfilarial density in our research was 2.78 overall (2.48 men and 3.52 females). In Howrah and Calcutta, Bhattacharya *et al.*, found that the average microfilarial densities were 16.5 in males and 5 in females. The mean mf density was found to be 11.7 by Sukhvir Singh *et al.* A total of 4.61 microfilarial densities were collected (4.63 males and 4.57 females) by Chandra *et al.*, (1998)^[4].

The gender-wise distribution of our study confirms previous findings that men had greater average microfilaria density, total mf rate, illness rate, and endemicity rate than women. (Rudra *et al.*, 2000^[22]; Chandra *et al.*, 1996^[3], Mishra. *et al.*, 2009^[5], Koroma *et al.*, 2012; Paramanik *et al.*, 2009)^[19]. Similar research was conducted in Maharashtra's tribal areas by Lunge (2019)^[12]. Data on the mf rate—1.33% for men and 1.11% for women—among the rural population in West Bengal was also similarly recorded in research conducted by Chandra G. *et al.* (2013). Similarly, data from the Howarth survey by Bhattacharya *et al.*, (1964)^[1] showed that the mf rate was 9.8% for women and 15.9% for men. Males had a greater disease rate (12.0%) than females (4.1%), according to Singh (2006)^[26]. Other studies by Rudra *et al.*, (1998)^[21] in West Bengal and Mishra *et al.*,

(1979)^[16] in District Datia M.P. also reported on the gender distribution. This can be explained by the fact that males and females were equally exposed to mosquito bites. Males may be more likely to get bitten by mosquitoes due to their outdoor lifestyle and lack of clothing.

Our study's age-wise distribution reveals that those in their middle age: between 21 and 40 years old have greater rates of mf, illness, and endemicity, which is partly consistent with findings from previous research (Chandra *et al.*, 2007^[2] and Paramanik *et al.*, 2009)^[19]. In contrast to previous research, the age group of 41–50 years old had greater overall average microfilarial densities. The age range in Chandra *et al.*, (2013) was 11–20 years. Similar to the current study findings with regard to age, Shrivastava *et al.* detected no sickness in the age category of 0–10 years and then an upward tendency. According to Lunge (2019)^[12], the detected microfilaria rate tended to rise with age. In men, this is especially noticeable. The age group of 45 years and above had the greatest rate of microfilaria. As per our findings, microfilaria was not observed in the age range of 1–4 years.

The most typical clinical manifestation is that of hydrocele with elephantiasis. Chandra *et al.*, (2013) found similar results in west Bengal. In this rural location, filariasis was moderately prevalent. The percentage of Mf was 1.42%. The percentage of endemism was 1.86%. Although it cannot be used completely, the DEC provocative test can be used in an emergency. The Chimur tehsil of the Chandrapur district is endemic for lymphatic filariasis, with a prevalence that is significantly higher than 1%. India has launched an MDA project to participate in Global Programmes to Eliminate Lymphatic Filariasis (GPELF); nevertheless, proper execution is frequently disregarded by filaria workers in the elimination of this particular disease (Dudhmal *et al.*, 2015b)^[7]. Based on the current investigation, It appears that several areas of Chimur tehsil are struggling with filarial issue control. To achieve the goals of GPELF, MDA applications must be strengthened here and implemented properly. To identify infected individuals, further research is necessary, as well as more accurate and dependable diagnostic methods like immunochromatographic (ICT) cards.



Fig 1: Larvae of Culex Mosquito



Fig 2: Male of culex mosquito

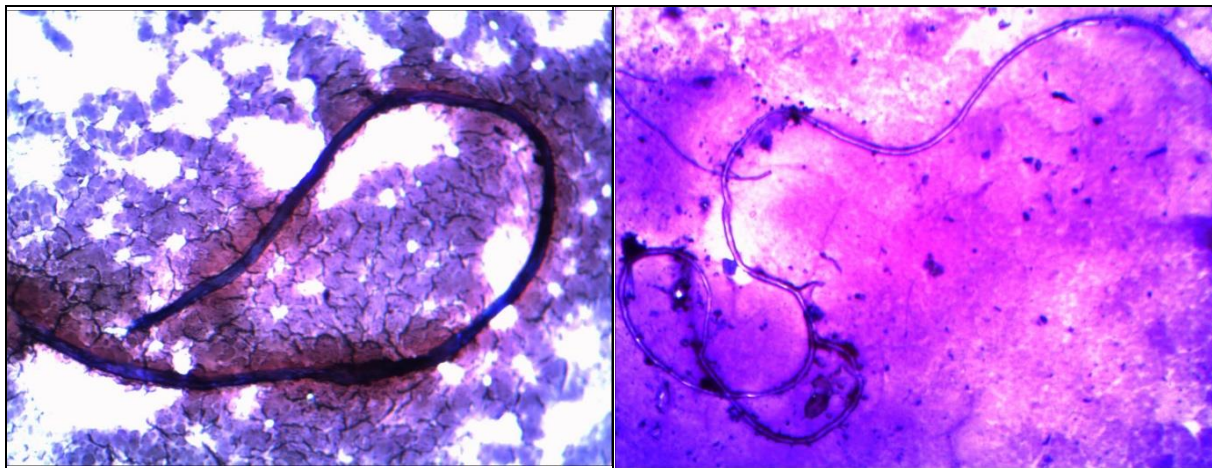


Fig 3-4: *Wuchereria bancrofti* observed from blood sample

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