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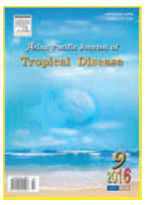

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Bancroftian filariasis in four slums of Bankura, West Bengal, India

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ABSTRACT

Objective: To assess the prevalence of disease and microfilaremia in four slums of Bankura, West Bengal, India.

Methods: Data on age and sex-specific of all the respondents were collected and compared with microfilaria rate and density (20 mm^3 blood was collected by finger prick) to examine the relationship between the dynamics of *Wuchereria bancrofti*. Screening of the population for the main signs and symptoms of lymphatic filariasis (LF) in both sexes and hydrocele in men, was performed in a health facility setting (health center/health post) by physicians/trained nurses. Disease rate and endemicity rate were also calculated. Aspects related to vectors were also studied by regular collection and dissection of mosquitoes.

Results: Microfilaria rate, mean microfilarial density, disease rate and endemicity rate were 5.04%, 7.03%, 13.83% and 18.37%, respectively. Causative parasite was identified as *Wuchereria bancrofti* and *Culex quinquefasciatus* was recorded as vector. Per man hour density, infection and infectivity rates of the vector *Culex quinquefasciatus* were found to be 14.12%, 5.98% and 0.87%, respectively.

Conclusions: Using these baseline data would be useful in planning for the elimination of LF in slums of Bankura, West Bengal, India as per World Health Organization goal to eliminate LF by 2020.

1. Introduction

Infection by the filarial parasite, *Wuchereria bancrofti* (*W. bancrofti*), is the most common cause of lymphatic filariasis (LF), accounting globally for approximately 90% of all infections[1]. LF is a parasitic disease of man caused by three species of filarial parasites: *W. bancrofti*, *Brugia malayi* and *Brugia timori*, which are transmitted by anopheline and culicine mosquitoes[2,3]. These worms are endemic in 72 countries in the tropics and sub-tropics where more than 1.4 billion people are at risk of infection. Estimates suggest that 120 million people are presently infected with one or more of the LF. Although many people with filarial infections are asymptomatic, some 40 million people have clinically evident disease (mostly hydroceles and lymphedema), making LF a leading cause of long-term disability[4-7]. A district-level endemicity map created for India in 2000 shows that of the 289 districts surveyed up to 1995 (62% of all districts), as many as 257 were found to be endemic[8]. Seventeen states and six union territories were identified to be endemic with about 553 million people exposed to the risk of infection; and of them, about 146 million live in urban and the remaining in rural areas. About 31 million people are estimated to be the carriers of microfilariae and over 23 million suffer from filarial disease manifestations in India[9]. Information regarding filariasis in West Bengal is scanty. Some urban areas of the state surrounding mainly Kolkata were surveyed by some workers[10]. But very few rural areas have been covered by them[11-14]. A large part of West Bengal is uncovered and practically very little information about filarial epidemiology is available among the rural people who live in the remote villages. No previous systematic information about the different parameters of filarial epidemiology and its vector was available from the area. Due to its significant medical, social, and

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economic impact, the World Health Organization has targeted LF for elimination by the year 2020[15]. The Global Program to Eliminate Lymphatic Filariasis relies on mass administration of anthelmintic drugs to disrupt parasite transmission in endemic communities. By the end of 2005, mass drug administration (MDA) programs had reached nearly half of the global at-risk population. By halftime in 2010, MDA had successfully reduced disease rates (DR) in many areas[16]; however, confounding factors impede the fight for global elimination.

Besides, monitoring of the success of the LF elimination programme depends on entomological studies of the mosquito vectors that transmit the disease in endemic communities[17].

The present study is an attempt to determine the abundance of different species of mosquitoes as well as to identify those responsible for the transmission of LF. The study also aimed to gather epidemiological information such as microfilaria rate (MR), mean microfilarial density (MMD), filarial DR, filarial endemicity rate (ER) among slums of Bankura, West Bengal, India.

2. Materials and methods

2.1. Study area

Bankura is one of the districts of West Bengal, India, located in the western part of the state and known as "Rarh" in Bengal. It is bounded by latitude 22°38' N and longitude 86°36' E to 87°47' E. The Damodar River flows along the northern boundary of Bankura; the adjacent districts are Bardhaman in the north, Purulia in the west, Paschim Medinipur in the south and Hooghly and Bardhaman in the east. The study area comprises town, semi-towns and numerous villages, covers an area of 6882 km^2 and literacy rate of population of 3 192 695 is 63.84%. Susunia, Biharinath and few small hillocks are located. Soil is red and lateritic type. There is a forest land of 1 481.77 km^2 in the district (21.5% of total geographical area). The variety of trees, shrubs and creepers are noteworthy in the territory of Bankura. The climate in the area is subtropical, with summer (Mar–Jun), monsoon (Jul–Oct) and winter (Nov–Feb). The temperature generally ranges from 19 ℃ to 35 ℃ and humidity from 62% to 93%. The area lies in sub-humid zone having average annual rainfalls of 0–25.56 mm. Early morning mist is common in winter season.

Most of the human habitations are hutments, without or with very small windows and ventilations, single storied, some of which (very few) are of reinforced cement concrete structures. Most of the houses are made up of mud, bamboo *etc*, with thatched roofs made up of straw, jute sticks, corrugated tins, tally *etc*. Houses are often situated in very close association or together in clumps and cattle sheds are often found attached with those houses. Modern sanitary facilities like drains, septic tanks *etc*. are very few in this area. Waste water and garbage are generally dumped in dobas (big ditches) near the house.

2.2. Survey and collection of vectors of LF in four slums

A number of houses in each slum were randomly selected for collection of mosquitoes. The purpose of the investigation was explained to the head and members of each of the household selected. Permission to enter each of the household was sought and the right to refuse or withdraw at any time was respected. Mosquitoes were collected in two different ways for an accurate entomological assessment and to assess their role in transmitting bancroftian filariasis in the study area. Mosquitoes were collected with the help of glass test tubes. Collection method was adopted according to recommendation of World Health Organization[18].

In the morning between 0600 and 0800 h India Standard Time, indoor-resting mosquitoes were captured for 12 min from each human habitation by one insect collector with the help of test tube. The test tube was brought perpendicularly up to a mosquito and it was imprisoned in the opening of test tube. After a mosquito had been taken, the tube was closed with a piece of cotton wool and was pushed with the mosquito towards the bottom of the tube. A space was given between the bottom surface of the test tube and the woolen plug, so that the mosquito could move freely. The operation was repeated until there were five or six mosquitoes in a long test tube, each isolated from others by layer/s of cotton wool/s. The tubes were labeled separately for each human habitation and taken to the laboratory.

Human habitations of each of slums were searched serially (1st slum in the 1st week, 2nd slum in the 2nd week and so on) once in each month from March 2007 to February 2009. Mosquitoes were collected from 40 fixed human habitations of the selected 4 slums, namely, Rampur, Kenduadihi, Lokepur and Pratapbagan once in each month for 2 years. One year was divided into 3 seasons, namely, summer (March–June), rainy (July–October) and winter (November–February). Collections were made employing 32 man-hours in each season, *i.e.* 192 man-hours during the 2 year study period. Collections were made serially from different slums in one season (one season includes four months *i.e.* 16 weeks). Collections were made in all seasons of the year *i.e.* rainy (July–October), winter (November–February) and summer (March–June) following the method of De and Chandra[11]. Mosquito samples collected were placed gently into plain containers containing modified Carnoy's fixative (ethanol + glacial acetic acid 3:1 respectively + glycerin) at 20 ℃. Samples were carefully transported to laboratory for examination.

The percentage of a sample of a population found to be carrying microfilariae is considered as MR. Average microfilaria count of positive samples of a population is considered as MMD. The percentage of a sample of a population showing visible manifestation of filarial diseases is considered as filarial DR. Combination of MR and filarial DR (any subject with both microfilaria and disease manifestation was counted once) is considered as ER.

Infection rate = Number of infected mosquitoes/Total number of mosquitoes dissected × 100

Infectivity rate = Number of mosquitoes with L3 larva/Total number of mosquitoes dissected × 100

2.3. Identification and dissection of mosquitoes

A mosquito was placed on the middle of a grease free slide and identified up to generic or species level based on morphological features of mosquitoes done following the keys of different authors[19-22] under a 40× microscope (Olympus CH20i). After identification of mosquitoes, the legs and wings were removed, laid in a drop of saline on a slide which was then placed on the stage of a dissecting microscope. The head, thorax, and abdomen were separated and transferred to separate drops of saline. The severed head was steadied with one needle, and with the aid of another very