

Research Article

# Challenges in Elimination of Filariasis: New Foci of *B. Malayi* Infection in Odisha, India

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## A B S T R A C T

**Background:** Odisha was endemic for *B. malayi* along with *W. bancrofti* for Lymphatic Filariasis, but since 2004, there was no evidence of *B. malayi* in Elimination of Lymphatic Filariasis (ELF) program. We conducted the present study to reconfirm the presence of *B. malayi* in Baleswar and Bhadrak districts of Odisha.

**Methods:** We conducted a night blood survey in 12 villages of Baleswar and 11 villages of Bhadrak district of Odisha in June 2017. Villages were selected purposively based on highest morbidity of reported lymphatic filariasis. A total of 6230 and 5606 blood slides were collected in Baleswar and Bhadrak districts respectively. Data was analyzed by using Microsoft Excel, 2007. Results were presented in the form of rates & ratios appropriately. Chi square, students't test & SEP was used as test of significance and  $p \leq 0.05$  was considered statistically significant.

**Results:** In Baleswar and Bhadrak district 0.99% and 0.43% of the slides were positive for microfilariasis (Mf). In Baleswar district Mf was detected in 83.3% of villages and in 5 villages the Mf infection rate was more than 1 percent. In Bhadrak district Mf was detected in 72.7% of villages and in 2 villages the Mf infection rate was more than 1 percent. In Baleswar and Bhadrak district 98.4% and 33.3% of positive slides were due to *B. malayi* infection and the difference was statistically significant ( $p < 0.001$ ). The difference in the age and sex wise distribution was statistically insignificant.

**Conclusion:** Present study confirms the presence of *B. malayi* infection in Baleswar and Bhadrak districts of Odisha.

**Keywords:** Microfilariasis, *B. Malayi*, *W. Bancrofti*, Lymphatic Filariasis, ELF, MDA

## Introduction

Filariasis has been a major public health problem in India. The disease was recorded in India as early as 6th century B.C. by the famous Indian physician, Susruta in his book 'Susruta Samhita'.<sup>1,2</sup> In India, the disease is endemic in 256 districts across 21 States/ UTs (16 States & 5 UTs). The population at risk is about 630 million.<sup>3,4</sup>

Filariasis is the common term for a group of diseases caused by parasitic nematodes belonging to super family Filarioidea. Adult worms of these parasites live in the lymphatic system, cutaneous tissues or body cavity of the humans and are transmitted through vectors. Filariasis caused by nematodes that live in the human lymph system is called Lymphatic Filariasis (LF), commonly known as elephantiasis.<sup>3,4</sup>

Three nematode parasites causing LF in human are *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*. In India, 99.4% of the LF cases are caused by the species - *Wuchereria bancrofti* whereas 0.6% of cases are due to *Brugia malayi*.<sup>2-4</sup>

*Wuchereria bancrofti*, transmitted by the ubiquitous vectors: *Culex quinquefasciatus*. It breeds preferably in dirty polluted waters, but in the absence of it they can breed in clean water also. *Mansonia (Mansonioides) annulifer* is the principal vector and *M. uniformis* is the secondary vector for transmission of *B. malayi* infection. The breeding of these mosquitoes is associated with aquatic plants such as *Pistia stratiotes*, *Salvinia auriculata*, *Salvinia molestes*, *Eichhornia speciosa*, *E. crassipes*, etc. Both *W. bancrofti* and *B. malayi* infections in mainland India exhibit nocturnal periodicity of microfilariae.<sup>3,5</sup>

*B. malayi* infects 13 million people in South and South-East Asia and is responsible for nearly 10% of the world's total cases of lymphatic filariasis. *B. malayi* infection is endemic or potentially endemic in 16 countries, where it is most common in Southern China and India, but it also occurs in Indonesia, Thailand, Vietnam, Malaysia, the Philippines, and South Korea.<sup>6,7</sup>

Reports of *Brugia malayi* infection have been documented earlier in some rural areas of seven states viz., Kerala, Odisha, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Assam and West Bengal. However, its prevalence is now limited to rural areas of Kerala and in some pockets in other states.<sup>5, 8</sup> As per the historical records, Odisha was endemic for *B. malayi*, but since 2004, there was no evidence of *B. malayi* in Elimination of Lymphatic Filariasis (ELF) program.<sup>4,9</sup>

During the cross-check examination of additional random site survey of 10 randomly selected villages in both districts at ROH and FW Bhubaneswar, *B. malayi* was detected in 04 slides of two villages in Baleswar and 03 slides of two

villages in Bhadrak district. We conducted the present study to reconfirm the presence of *B. malayi* in two districts namely Baleswar and Bhadrak in view of ELF.

## Objectives

- To reconfirm the presence of *B. malayi* infection in Baleswar and Bhadrak districts of Odisha
- To study the microfilariasis infection rate in Baleswar and Bhadrak districts of Odisha
- To study the age and sex wise distribution of the *B. malayi* infection in Baleswar and Bhadrak districts of Odisha

## Methods

We conducted the present study in Baleswar and Bhadrak districts of Odisha by doing a field-based survey. Survey was designed and conducted by a team of experts from NVBDCP, VCRC Pudduchery, ROH & FW Bhubaneswar and NCDC, Kozhikode. We conducted the study in 12 and 11 purposively selected villages from Baleswar and Bhadrak districts respectively. All these selected villages had reported highest morbidity of Lymphatic Filariasis. We decided to collect blood samples for Mf slides from 500 or more individuals from each village. The sample size of 500 Mf slides from each village was calculated conveniently as it was sufficient to study the stated objectives and draw the logical conclusions.

During the survey a total of 6230 blood slides were collected from 12 villages in Baleswar district and 5606 blood slides were selected from 11 villages in Bhadrak district. The survey was conducted in the month of June 2017 with the help of the team consisting of LT, Health worker, ANM and ASHA of the village.

Blood slides were collected from all age groups in the selected survey villages from 8:30 pm onwards. After collection of Mf slides from each village, staining was carried out in Central lab of NVBDCP, Odisha under the guidance of ROH&FW Bhubaneswar using JSB stain and stained slides were examined by NCDC units at Varanasi, Rajahmundry and Kozhikode.

Permission for the study was obtained from the appropriate authorities. The information obtained during the survey was kept confidential and not shared or used for any other purpose. The study participants found positive for Mf were referred for appropriate treatment and further management.

We analyzed data using Microsoft Excel, 2007. The results were presented in the form of rates & ratios appropriately. Standard error of difference between two proportions was used to compare the slide positivity rate & *B. malayi* infection rate, chi square test was used to study the difference in the sex wise distribution and student's 't' test was used to

study the difference in the age wise distribution. The value of  $p \leq 0.05$  was considered statistically significant.

## Result

A total of 6230 and 5606 blood slides were collected from 12 villages in Baleswar districts and 11 villages in Bhadrak district. Out of total 6230 slides collected in Baleswar district 62 (0.99%) slides were positive for Mf. Out of total in Bhadrak district 24 were positive for Mf. Slide positivity rate in Baleswar district was more as compare to the slide positivity rate in Bhadrak district and the difference in the proportion was statistically highly significant ( $p < 0.001$ ) (Table 1).

**Table 1. District wise distribution of slide positivity rate**

Name of the district	Total Mf slides collected	Total slides positive
Baleswar	6230	62 (0.99%)
Bhadrak	5606	24 (0.43%)

**Table 2. Site wise distribution of Mf rate in Baleswar district**

S. No.	Village name	Blood slides examined	Slide positive for Mf	Mf rate in percentage
1.	Rapeya	539	09	1.67
2.	Dagara	502	04	0.79
3.	Chaumukh	538	00	0.00
4.	Betagadia	520	06	1.15
5.	Ratai	536	02	0.37
6.	Nuagaon	516	16	3.10
7.	Ada	504	02	0.39
8.	Panchupali	507	09	1.78
9.	Balikuti	511	10	1.96
10.	Pratappur	564	02	0.36
11.	Khirkona	489	02	0.41
12.	Bhikagadia	504	00	0.00
Total		6230	62	0.99

In Baleswar district, more than 500 blood slides were collected from each of the selected 11 villages while from 1 village Khirkona only 489 blood slides were collected. In 10 (83.3%) out of 12 villages Mf was detected, however in 2 villages (Chaumukh and Bhikagadia) Mf was not detected in any of the blood slides. Over all Mf rate was 0.99 percent and 5 villages (Rapeya, Betagadia, Nuagaon, Panchupali and Balikuti) had Mf rate more than 1 percent. Mf rate was maximum (3.1%) in Nuagaon village (Table 2).

In Bhadrak district, more than 500 blood slides were

collected from each of the selected 11 villages. In 8 (72.7%) out of 11 villages Mf was detected, however in 3 villages (Chaumukh and Bhikagadia) Mf was not detected in any of the blood slides. Over all Mf rate was 0.43 percent and 2 villages (Korkara and Bandola) had Mf rate more than 1 percent. Mf rate was maximum (1.51%) in Korkara village (Table 3).

**Table 3. Site wise distribution of Mf rate in Bhadrak district**

S. No.	Village name	Blood slides examined	Slide positive for Mf	Mf rate in percentage
1.	Kherualpur & Khempur	514	02	0.39
2.	Makhalpur	500	01	0.20
3.	Bramangan	505	01	0.20
4.	Urnia	502	02	0.40
5.	Khadiapada	501	00	0
6.	Sohada	503	02	0.40
7.	Palikiri	500	01	0.20
8.	Korkara	530	08	1.51
9.	Bandola	519	07	1.35
10.	Routraipur	522	0	0
11.	Sendhatira	510	0	0
Total		5606	24	0.43

**Table 4. District wise distribution of slide positivity rate for B malayi**

Name of the district	Total slides positive for Mf	Slides positive for B malayi
Baleswar	62	61 (98.4%)
Bhadrak	24	08 (33.3%)

In Baleswar district out of total 62 slides positive for Mf, 61 (98.4%) slides were positive for B malayi and 1 (1.6%) slide was positive for W bancrofti. In Bhadrak district out of total 24 slides positive for Mf, 08 (33.3%) slides were positive for B malayi and 16 (66.7%) slides were positive for W bancrofti. B malayi infection rate was more in Baleswar district and this difference in proportion was statistically highly significant ( $p < 0.001$ ) (Table 4).

Out of total 86 slides positive for Mf 69 (80.2%) slides were positive for B malayi infection. Out of these 69 slides positive for B malayi infection 61 (88.4%) were from Baleswar district and 08 (11.6%) were from Bhadrak district. Out of total 69 persons positive for B malayi infection 43 (62.3%) were male and 26 (37.7%) were females. Mean age was 43 years however it ranges from 4 years to 82 years.

**Table 5. Age and Sex wise distribution of B Malayi cases**

		District Name		Total (N=69)	P value
		Baleswar (N= 61)	Bhadrak (N= 08)		
Age in years	Mean±SD	42±19.62	49±13.7	43.04±19.07	0.18
	Range	4 to 82	27 to 70	4 to 82	
Sex	Male n (%)	37 (60.6)	06 (75)	43 (62.3)	0.43
	Female n (%)	24 (39.4)	02 (25)	26 (37.7)	

In Baleswar district out of total 61 persons infected with B malayi 37 (60.6%) were males while in Bhadrak district out of total 08 persons infected with B malayi 06 (75.0%) were males and this difference was statistically insignificant ( $p=0.43$ ). In Baleswar district mean age of the persons infected with B malayi was 42 years with SD of 19.62 while in Bhadrak district mean age of persons infected with B malayi was 49 years with SD of 13.7 years and this difference was statistically insignificant ( $p=0.18$ ) (Table 5).

### Discussion

Baleswar and Bhadrak districts are endemic for LF and were covered under annual round of MDA from 2004. These districts conducted 10 rounds of MDA using DEC and Albendazole. Main parasite for LF was *W. Bancrofti*. Baleswar and Bhadrak districts achieved Mf rate of <1% in 2015 and 2016 respectively.<sup>4</sup> Overall slide positivity rate was 0.73 percent and it was significantly more in Baleswar district as compare to the Bhadrak district. Similar study conducted by Gyan Chand et al in Madhya Pradesh in the year 2013, found that the slide positivity rate was 0.8 percent. Gyan Chand et al also reported new foci of B Malayi infection in Madhya Pradesh.<sup>10</sup>

In Baleswar district 5 villages and in Bhadrak district 3 villages had slide positivity rate more than 1 percent. Though it is known that five to six rounds of treatment with more than 65% of population coverage for MDA compliance could possibly eliminate the disease by reducing transmission to very low levels. The evaluation of MDA coverage in India and also in south India indicated that the compliance rates were not at desirable.<sup>9,11,12</sup>

Out of all cases positive for Mf, more than 80% were due to B Malayi infection. In Baleswar district proportion of B malayi infection was as high as 98.4 percent. Both Baleswar and Bhadrak districts are coastal districts of Odisha with lots of rivers and tributaries falling in the Bay of Bengal and the areas are highly vulnerable to flood during rainy season. Therefore, the habitants of the locality used to make their basement of the house little high by ditching ponds nearby the house to get rid of flood. Later the pond becomes an indispensable property of the habitants as it provides fish to their food basket. Besides these in villages, ponds are being

used by community for household water source and for bathing purpose also. In the due course of time the ponds are flooded with aquatic vegetation such as *Pistia* and *Eichhornia* plants which are highly conducive for breeding of vector for B. malayi i.e. *Mansonia*. The main occupation of population is farming and fishing.<sup>13,14</sup> The nocturnal form of brugian filariasis is more common and is transmitted in areas of coastal rice fields (by *Mansonia* and *Anopheles* mosquitoes), whereas the subperiodic form is found in the swamp forests (*Mansonia* vector).<sup>15</sup> Both districts Baleswar and Bhadrak have the environmental factors very much favorable for breeding of the vector *Mansonia* and *Anopheles* which makes them vulnerable for high burden of LF including B malayi.

Though the B malayi infection rate was significantly higher in Baleswar district as compare to the Bhadrak district however there was no difference in the age and sex was distribution of B malayi infection. In the year 2006 the study conducted by Kalyani Rath et al in Odisha reported that there was no difference in knowledge and perception of men and women about lymphatic filariasis however level of education was significantly associated with the knowledge and perception. Education level and socioeconomic status of the people in both the districts are almost similar.<sup>13,14,16</sup>

In Baleswar and Bhadrak district, B malayi infection was proportionately high inspite of having good coverage of MDA and Transmission Assessment Surveys (TAS). The clinical presentations of B malayi cases are very mild as compare to the *W Bancrofti* cases because of which during surveys it is very less likely to get the B malayi cases reported. The main clinical difference between brugian and bancroftian filariasis is the absence of hydroceles and other genital lesions and chyluria in areas endemic for B. malayi. Lymphoedema of the legs in *Brugia* infections usually does not extend above the knee whereas both the thigh and lower leg are often involved in bancroftian filariasis. Lymphoedema of the legs and arms seem to be both more common and less severe in brugian filariasis than in bancroftian filariasis. Acute adenitis of femoral lymph nodes is common in brugian filariasis and these may suppurate and drain pus, either spontaneously or following treatment with anti-filarial medications.<sup>17</sup>

## Conclusion

The study confirms the presence of B malayi foci in Baleswar and Bhadrak districts of Odisha, India. It is recommended that more of such surveys to be carried out in other districts of Odisha as well as in parts of India to achieve the goal of elimination of lymphatic filariasis.

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