Acta Tropica
Published by Elsevier

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ISSN: 0001-706X
Imprint: ELSEVIER
Commenced publication 1944

Subscriptions for the year 2007, Volumes 101-104, 12 issues

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Audience
All clinicians and researchers dealing with tropical diseases, including parasitologists, microbiologists, immunologists and epidemiologists

Impact factor of this journal
2005: 1.80

ELSEVIER

Acta Tropica 82 (2002) 31–38

ACTA TROPICA

www.parasitology-online.com

The economic loss due to treatment costs and work loss to individuals with chronic lymphatic filariasis in rural communities of Orissa, India

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Received 28 May 2001; received in revised form 24 September 2001; accepted 16 November 2001

Abstract

This paper is based on 1 year round case control study to investigate the economic burden, in terms of treatment costs and loss of work to people affected with chronic lymphatic filariasis in rural communities of Orissa, Eastern India. Around three-fourths of the chronic patients have sought treatment for their condition and spent, on average an amount of INR 396 (approximately US$ 8.7) per year. The major component of the expenditure is the cost of medicines. The data on loss of work time due to chronic condition reveal that the total absenteeism to the work is significantly higher among chronic filariasis patients than controls. The total number of working hours spent per day by patients and controls are 4.94 and 6.06, respectively with a significant difference. The total absenteeism and the total number of working hours per day are influenced significantly by disease condition and other personal characteristics, namely age, sex and family type. The chronic patients lose a total of 68 days of work per year, which is equivalent to 19% of the total working time of the year. The present results show that the chronic conditions of lymphatic filariasis pose considerable burden on the patient, family and community.

Keywords: Lymphatic filariasis; Elephantiasis; Hydrocele; Economic loss; Disability; Orissa; India

1. Introduction

Lymphatic filariasis is one of the important public health problems in India. India is estimated to have about 19 million diseased cases and about 25 million microfilaria carriers. Orissa, one of the eastern States of India, contributes 7.2% of diseased cases and 8.8% of microfilaria carriers of the total figures of India (Central Bureau of Health Intelligence, 1993). Though huge population is affected due to this disease, its control has been neglected. Only about 11% of those live in endemic areas of India fall within an active control programme (National Filaria Control Programme, 1995). Also it is to be mentioned that lymphatic filariasis was designated as an eradica-

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0001-706X/02/$ - see front matter
PII: S0001-706X(02)00030-X

ble disease (Center for Disease Control, 1993) and World Health Assembly passed a resolution to eradicate the disease as a public health problem (WHO, 1997). Hence, the data on socio-economic loss due to the disease is important and these data are essential to health managers and policy makers for prioritising the control programme and for undertaking advocacy measures.

It is estimated that the global burden of lymphatic filariasis was only 0.23% of the total burden of parasitic and infectious diseases (World Bank, 1993). This has been recognised as a serious underestimate (WHO, 1994), as the disability, and social and economic burden caused by lymphatic filariasis is poorly understood and remains unquantified (Evans et al., 1993). There are some studies on social and economic burden of the lymphatic filariasis from a few endemic areas in the world (Gyapong et al., 1996; Dreyer et al., 1997; Ahorlu et al., 1999, etc.) including South India (Ramu et al., 1996; Ramaiah et al., 1997, 1998, 1999, 2000). However, the information on the economic loss in terms of loss of work time due to lymphatic filariasis from different endemic areas is scanty. Hence, both direct (costs of treatment) and indirect costs (loss of work time) to patients suffering from chronic forms of lymphatic filariasis, i.e. elephantiasis and hydrocele were studied in rural communities of Orissa, an eastern State of India.

2. Materials and methods

2.1. Study area

This study has been undertaken in Khurda district of Orissa, India. The study area is known for its endemicity for lymphatic filariasis caused by *Wuchereria bancrofti*, which is transmitted by *Culex quinquefasciatus* with microfilaria rate and density of 9.4% and 19.2 (Dash et al., 1998). The total disease and chronic disease rates are 12.5 and 7%, respectively (Babu et al., 2001). The study area is rural in nature and its inhabitants are mostly small farmers and daily wage labourers. The wage per day in the study area is INR 50 (US$ 1.1) for men and INR 40 (US$ 0.9) for women. The opportunities for daily wage labourers are more in monsoon period and during the rest of the year, these are now and then.

2.2. Study design

For this study, 12 villages were selected randomly from the district and house-to-house census was undertaken. The information collected during census is total number of family members, their sex, age and occupation for each member. Also, it is attempted to record the presence of any overt filarial conditions among the household members. Altogether, a total of 377 patients with different overt chronic filarial manifestations were identified. From this a cohort of 62 patients (12 male elephantiasis + 22 female elephantiasis + 21 hydrocele + 7 elephantiasis and hydrocele) were selected following stratified random sampling, for further studies on various aspects of direct and indirect costs due to chronic lymphatic filariasis.

For examining some aspects of costing due to the disease, in a case control design, age, sex and occupation matched controls were selected for all the 62 patients, from nearest households. Care has been taken to see that the controls have no history of either acute or chronic filariasis. All the cases as well as controls were visited for every 4 months for 1 year (total three visits: July–October 1999, November 1999–February 2000, March–June 2000), to cover all seasons of the year in this study area. Out of 62 patients, only 58 were available in all the three visits. The controls were visited accordingly. The data on expenditure on treatment were collected from cases only, where as the data on the loss of work time were collected from both cases and controls. Every time, the consent of the respondents (both patients and controls) was obtained by explaining the purpose of the study.

2.3. Direct costs (expenditures on treatment)

Direct costs to chronic filarial patients include the expenditure made on the medical treatment for the chronic condition. The expenditure made by patients includes various components of the treatment like consultation fee, cost of medicines,

expenditure on travel, stay and food, and expenditure incurred on the accompanying persons (escort). These details on expenditure were obtained at each visit to get the total expenditure made by the patient for the last 4 months. Care was taken to avoid the expenditure made for other diseases including acute filariasis. The expenditures were shown in Indian currency, i.e. Indian rupees (INR) along with approximate value in U.S. dollars (US$). Approximately, INR 1 is equivalent to US$ 0.022.

2.4. Loss of productive work

Data on daily activity pattern of the 24 h of the previous day of the visit were collected from both cases and controls for every 4 months. The data contain chronological list of activities taken up by him/her along with the time spent. The daily activities include economic activities related to their occupation such as working in agriculture fields, cattle herding, working in stone-mines, grass cutting, etc.; domestic activities like cooking and related activities, cleaning of house and cattle shed and collection of firewood; travel; personal works like toileting, bathing, eating and health seeking activities; leisure activities like gossiping, sleeping, watching television, listening radio and religious activities. Of all these, the time spent on occupation related and domestic activities is considered here as working time, as these activities are productive.

2.5. Data analysis

The data were computerised and analyses were done using SPSS V.8 for Windows. The treatment costs varied widely and hence, the means of treatment costs are expressed as geometric mean. The statistical significance of difference between the proportion of patients and controls, who completely lost the day's work (total absenteeism) was assessed by using χ^2-test. Paired t-tests were used to assess the significance of difference in mean number of productive hours per day between patients and controls. The Student's t- and F-tests were used to examine the difference in mean productive hours among the sexes and various pathology groups, respectively. The effect of disease status and other variables namely, sex, age, occupation, education, family type and presence of cattle-shed on individuals total absenteeism from day's work (coded taking part in work as 1 and not taking part in work at all as 0) was examined by using logistic regression analysis by forward likelihood ratio method. Similarly, the effect of above variables on total number of productive hours per day is assessed by multiple regressions through forward elimination procedure.

3. Results

3.1. Characteristics of the patients and controls

The details of various characteristics of both patients and controls are given in Table 1. The mean age of patients and controls is 46.22 and 45.60 years, respectively. As the study area is rural and agriculture is the prime occupation of the people, majority of the male patients are agriculturists (45%) and labourers (25%), and women are housewives, engaged in domestic works such as cooking and cleaning household things and cattle shed. Regarding the educational status a higher proportions of patients as well as controls are illiterates and people with more than 10 years of education are very less. Most of the families are nuclear type and live in thatched houses. More than three-fourths of houses were electrified and most of them possess cattle-shed at the entrance of the house. Regarding the behavioural pattern related to personal protection from mosquitoes, majority do not use either bed-nets or mosquito repellents.

3.2. Treatment costs

The mean annual treatment costs on treatment in relation to sex and pathology group of the patient are presented in Table 2. Out of the 58 chronic filariasis patients, only 43 (74.14%) had sought treatment and spent money in this 1 year of study period. These 43 patients had sought treatment for 74 times during a period of 1 year.

Of these 74 times, 32 (43.2%) times are from government hospitals, 18 (24.3%) times are from private pharmacists or medicines shops and 17 (23%) times are from private practitioners. A small proportions of visits were made to homeopathic practitioners (5/74) and traditional healers (2/74). They incurred a geometric mean ($n = 58$) of INR 396 (approximately US$ 8.7). The total expenditure per patient varied widely, i.e. INR 5–8600 (US$ 0.11–189.2). Relatively male elephantiasis patients spent more than the remaining patient groups. The details of various components of the expenditure on treatment reveal that out of the total amount spent, 63% was spent on purchase of medicines. It is followed by the expenditure on stay and food when they go for treatment (18%). The expenditures on travel (8%), on escorted person (8%) and for consultation (3%) are relatively less.

3.3. Loss of productive time

The data on daily activities of patients and controls reveal that total absenteeism or total loss of work was recorded in 22.6% of visits among chronic patients. However, among controls also,

Table 1
Characteristics of patients and controls

Characteristics		Patients ($n = 62$)	Controls ($n = 62$)
Sex	Male	40 (64.5%)	40 (64.5%)
	Female	22 (35.5%)	22 (35.5%)
Clinical condition	Elephantiasis	34 (54.8%)	–
	Hydrocele	21 (33.9%)	–
	Both	7 (11.3%)	–
Age[a]	Mean ± standard deviation	46.22 ± 16.57	45.60 ± 16.59
Occupation	Agriculturist	18 (29.0%)	18 (29.0%)
	Labourer	11 (17.7%)	11 (17.7%)
	Others	33 (53.2%)	33 (53.2%)
Education[b]	Illiterate	26 (41.9%)	27 (43.5%)
	Primary (1–5)	16 (25.8%)	18 (29.0%)
	Secondary (6–10)	17 (27.4%)	13 (21.0%)
	High (11+)	3 (4.8%)	4 (6.5%)
Type of family[b]	Nuclear	40 (64.5%)	45 (72.6%)
	Joint	22 (35.5%)	17 (27.4%)
Type of house[b]	Thatched	53 (85.5%)	48 (77.4%)
	Others	9 (14.5%)	14 (22.6%)
House electrified[b]	Yes	26 (41.9%)	19 (30.6%)
	No	36 (58.1%)	43 (69.4%)
House with cattle-shed[b]	Yes	44 (71.0%)	46 (74.2%)
	No	18 (29.0%)	16 (25.8%)
Logging water[b]	Yes	28 (45.2%)	30 (48.4%)
	No	34 (54.8%)	32 (51.6%)
Use of bednet[b]	Yes	25 (40.3%)	27 (43.5%)
	No	37 (59.7%)	35 (56.5%)
Use of repellent[b]	Yes	16 (25.8%)	23 (37.1%)
	No	46 (74.2%)	39 (62.9%)

[a] The difference is not significant, which is assessed by t-test.
[b] The differences are not significant, which are assessed by χ^2-test.

Table 2
Treatment costs (in INR) for chronic cases per year

Patient group	No. of patients	No. of those taken treatment (%)	Geometric mean cost	Range of costs among treated
Total	58	43 (74.14)	396	5–8600
Male	36	24 (66.67)	401	5–6313
Female	22	19 (86.36)	390	60–8600
Elephantiasis-male	12	10 (83.33)	576	20–5540
Elephantiasis-female	22	20 (90.91)	425	60–8600
Hydrocele	17	7 (41.18)	195	5–880
Elephantiasis + hydrocele	7	6 (85.71)	381	53–6313

Approximately one INR is equivalent to US$ 0.022.

Table 3
Number of work hours and mean difference per day between groups of patients and controls

Patient group	Number of visits	Number of work hours		Mean difference	Paired t-value
		Patients	Controls		
All	186	4.94 (3.33)	6.06 (3.22)	1.13 (3.13)	4.93***
Male	120	4.65 (3.29)	5.48 (3.17)	0.83 (2.95)	3.07**
Female	66	5.45 (3.37)	7.12 (3.07)	1.67 (3.37)	4.04***
Elephantiasis-male	42	4.45 (3.52)	5.26 (3.21)	0.81 (3.50)	1.50
Elephantiasis-female	66	5.45 (3.37)	7.12 (3.07)	1.67 (3.37)	4.04***
Hydrocele	63	4.98 (3.00)	5.78 (2.84)	0.80 (2.83)	2.25*
Elephantiasis + hydrocele	15	3.87 (3.83)	4.87 (4.32)	1.00 (1.70)	2.28*

Figures in parentheses indicate standard deviation.
* $P<0.05$.
** $P<0.01$.
*** $P<0.001$.

absenteeism is reported during 13.4% of the visits. The difference between patients and controls is statistically significant ($\chi^2 = 5.26$, $P < 0.05$). The total number of hours spent on work per day per a patient along with corresponding figures for controls were given in Table 3. Patients with chronic filariasis spent 4.94 ± 3.33 h per day on work when compared to 6.06 ± 3.22 h by the controls, with a statistically significant difference. The trend is similar and the differences are significant for both the sexes as well as among all pathology groups, but difference between the male elephantiasis patients and their controls is not significant. The loss of mean working time is slightly more among women than men, however this difference is not significant ($t = 1.70$, $P > 0.05$). Among different pathology groups, the loss of working time is more among female elephantiasis patients followed by men with both elephantiasis and hydrocele. Men with either elephantiasis or hydrocele recorded loss of lesser working time. These differences are not significant ($F = 1.05$, $P > 0.05$).

The logistic regression analysis revealed that the disease condition had significant impact on complete absenteeism from productive work. The patients' characteristics, i.e. sex, age and family type have also influence on the absenteeism (Table 4). Similarly, an attempt was made to examine the influence of these variables on number of productive hours (Table 5). The disease condition had a significant effect on the number of productive

hours per day. The number of productive hours per day was also affected significantly by sex, age and family type of the individual. The R^2, the measure of goodness-of-fit indicates that 16% of the variation in the number of working hours per day is explained by these variables.

4. Discussion

Lymphatic filariasis develops from asymptomatic infection through acute clinical manifestations to chronic disease. The major manifestations of the chronic disease are mostly irreversible and include lymphoedema of lower limb in men and women and hydrocele in men (Manson-Bahr and Apted, 1987). As the need of research on socio-economic burden of lymphatic filariasis has been highlighted in the recent past (Evans et al., 1993; Gyapong et al., 1996; Ramaiah et al., 1998, 1999, 2000), the present information on economic loss due to chronic forms of filariasis forms an important component of the total socio-economic burden of the disease from this endemic region. The treatment expenditure is an important economic burden to the patients and their families. In the present study site, relatively higher number of chronic patients (74%) had sought treatment, in the belief that it gives some relief. It is observed that 65% of these chronic patients are not aware that the condition is irreversible and incurable (unpublished data). Similarly higher number of chronic patients (75%) sought treatment in South Indian rural communities (Ramaiah et al., 1999), but in Ghana (Gyapong et al., 1996), chronic patients are less likely to seek treatment (44.5%). These patients seek treatment for relief due to social (Lu et al., 1988; Dreyer et al., 1997) and economic impact of the disease (Gyapong et al., 1996; Ramu et al., 1996; Ramaiah et al., 2000). The hydrocele patients know that corrective surgery is available for their condition but they

Table 4
Details of logistic regression analysis of various variables on total absenteeism from the work

Independent variable	Coefficient	Standard error of coefficient	P	R-statistic
Constant	3.62	0.65	0.0000	
Sex (male = 1, female = 2)	1.36	0.37	0.0002	0.18
Age (number of years)	−0.06	0.01	0.0000	−0.32
Clinical condition (normal control = 0, patient = 1)	−0.82	0.31	0.0074	−0.12
Occupation (others = 0, agriculturist = 1, labourer = 2)	–	–	–	–
Education (number of years of education)	–	–	–	–
Family type (nuclear = 0, others = 1)	−0.90	0.33	0.0062	−0.13
Cattle shed (presence = 0, absence = 1)	–	–	–	–

Table 5
Details of multiple regression analysis of various variables on the total number of productive hours per day

Independent variable	Coefficient	Standard error of coefficient	P	R^2
Constant	6.91	0.62	0.0000	0.16
Sex (male = 1, female = 2)	1.71	0.34	0.0000	
Age (number of years)	−0.01	0.01	0.0000	
Clinical condition (patient = 1, normal control = 0)	−1.11	0.32	0.0010	
Occupation (agriculturist = 1, labourer = 2, others = 0)	–	–	–	
Education (number of years of education)	–	–	–	
Family type (nuclear = 0, others = 1)	−0.65	0.32	0.0430	
Cattle shed (presence = 0, absence = 1)	–	–	–	

were generally not availing because of the cost and loss of work and income during recuperation period. In this study area, it costs around INR 2000 (US$ 44). Majority of patients with hydrocele were also reported not to go for surgery because of the cost involved in Philippines (Lu et al., 1988) and Ghana (Gyapong et al., 1996). In the present study, the average cost of treatment of chronic condition, i.e. INR 396 (approximately US$ 8.7) is considerable for poorer families, who mainly depend on minor farming and daily labouring. The per capita income of this population is INR 5648 (Government of Orissa, 2000). It indicates that about 7% of the per capita income is going for seeking treatment of their chronic condition due to lymphatic filariasis. Also, the mean expenditure per year is equivalent to the wage of 8–10 days.

In addition to treatment expenditures, the patients had the burden of loss of work by total absenteeism from the work and lessening of working time than the healthy people. The people with advanced stage of hydrocele and elephantiasis confine themselves to home. It leads to reduction of productivity and income, as reported in many studies (Kessel, 1957; Wijers and Kinyanjui, 1979; Wegesa et al., 1979; Muhondwa, 1983; Ramaiah et al., 1999). In the present study, 23% of patients, compared to 13% healthy individuals, reported the total absenteeism to the productive work. These results reveal that 77% of chronic patients are going normally to the work, though the total work time is lesser than healthy people. It is largely because of low socio-economic status that leads to adoption of coping mechanisms and most of these patients depend on the daily earnings. Gyapong et al. (1996) concluded, based on a study on filarial patients from farming community of Ghana, that the chronic patients adopt coping mechanisms to do some productive work. Muhondwa (1983) reported that those with hydrocele change occupation to cope with advanced disease in Tanzania. In the present study, each chronic patient is losing 1.13 productive hours per day, when compared to normal individuals. It means the chronic patients lose a total of 68 days of work per year, which is equivalent to around 19% of the total productivity workdays. Ramaiah et al. (1999), from their study from South Indian rural communities, reported that chronic patients lost about 17% of total workdays. The results also reveal that the productivity of chronic patients is also influenced by sex, age and family type of the patient, in addition to the disease condition. Increasing age with the progression of the disease further worsens the situation by lessening the working time. Apart from the social agony and psychological impairment with the chronic forms of the disease, most of the patients found themselves burden to the family (unpublished data). The present results along with the studies on effect of lymphatic filariasis on economic burden (Gyapong et al., 1996; Ramaiah et al., 1998, 1999), functional impairment and disability (Ramu et al., 1996; Dreyer et al., 1997; Ramaiah et al., 1997) indicate that the chronic conditions of lymphatic filariasis pose considerable burden on the patient, family and community. In the present study population, about 7% of the population was affected by different chronic forms of lymphatic filariasis (Babu et al., 2001). Similarly in many endemic areas, the prevalence of chronic disease is more (Michael et al., 1996). Therefore, it is necessary to develop and implement morbidity management strategies, in addition to filariasis control programme.

Acknowledgements

This study has been carried out with intra-mural funding of Regional Medical Research Centre (Indian Council of Medical Research). Authors are grateful to Dr K. Satyanarayana, former director and Dr S.K. Kar, present director, Regional Medical Research Centre, for their encouragement for research and publications. Authors are also thankful to Dr K.D. Ramaiah of Vector Control Research Centre, Pondicherry, India for his suggestions during preparation of protocol. Thanks are also due to S.C. Rout for his assistance during data collection. The authors are grateful to the villagers of study area for their participation and courtesy throughout the study period.

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