

USER-FRIENDLY DATABASE for INTEGRATED CONTROL of BANCROFTIAN FILARIASIS in EAST and WEST GODAVARI DISTRICTS of ANDHRA PRADESH, INDIA

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Abstract A user-friendly database on Bancroftian Filariasis has been developed for its application in endemic zones. East and West Godavari districts of Andhra Pradesh are the endemic zones of the diseases where the complete information on vectors, vector transmission, and disease pattern has been collected. This database contains the entomological, epidemiological, and socio-economic details from which any type of combinational reports can be retrieved very quickly, according to user request. The database containing the complete information on socio-economic details can generate more than 13 reports according to the user's choice. The size of the database is 48 MB, which can be imported on any windows-based system since it has the auto setup. Online help is provided to facilitate the operation. Literature from 1936 to date that helps young researchers working in filariasis research is also provided in this program. Details are discussed.

INTRODUCTION

Bancroftian filariasis is one of the mosquito-borne diseases that is prevalent in tropical and subtropical regions. It is caused by the nematode worms *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*, and transmitted by a number of Culicine and Anopheline mosquito species (Webber, 1991). In India, present estimates are that about 454 million people are living at risk of infection, of whom 113 million live in urban areas and 315 million in rural areas; 49 million are infected, 28 million with microfilaria and 21 million with chronic disease (Ramaiah et al., 2000). It is prevalent in the urban and rural areas, the majority of cases occurring among the poor (Ramaiah et al., 2000). Economic loss in India has been estimated at nearly \$1.5 billion per year (Dash et al., 1998). During the 1962-1971 phase of the National Filaria Control Program (NFCP), the Bancroftian filariasis was recognized as a rural area problem (Ramaiah et al., 1989).

The use of information technology in mosquito-borne disease control is manifold. The developed countries are extensively spreading the uses of IT in the health-care sector. Certain regional groups such as the European Economic Community are already working on a common strategy for Advancement of Informatics in Medicine (AIM). Though we have found a number of informatics solutions to old challenges in mosquito-borne disease control, many other challenges still remain. By collecting, storing, processing, managing, and distributing information on all aspects of the filariasis as well as on the mosquitoes, we can enhance our efficiency in fighting against the disease. Management information systems (MIS) can play a critical role by converting the large information database into knowledge, a tool for fighting filariasis.

Since the DBMS has a key role in public health, an attempt has been made to construct a user-friendly, menu-driven database on Bancroftian filariasis from the two endemic districts of East and West Godavari in Andhra Pradesh. This database contains the entomological, epidemiological, and socio-economic details from which any type of combination reports can be retrieved

very quickly accordingly to the user’s request. The output will help in planning the control operations well in advance.

MATERIALS and METHODS

Study Area. The study areas of East and West Godavari Districts lie between the 16.25 N-18.10E latitude north and 80.75 N - 82.65 E longitude east on the Bay of Bengal coast of peninsular India. The climate is characterized by humid summer (46°-20°C), winter (32°-11°C), and monsoon (June – December) (Figure 1).

Database. Visual Basic is the Rapid Application Development (RAD) tool available either as a stand-alone product or as a part of the Visual Studio suite of tools. VB version 6.0 has been used as the front end of the database, and the back end is Microsoft Access.

The database is designed to store category-wise information, namely socio-economic details; mosquito collection and mosquito dissection; filariasis survey and mass blood survey details; and lymphatic filariasis details. Forms were designed for data entry and information retrieval of the above information.

By using the integrated database, one can generate 13 important parameters, which are proliferating the disease, and also several combinations according to the requirements of the user. The quick retrieval of the reports will help in planning the control operations well in advance. The versatility, menu-driven, and built-in facilities of the database were given in the full text.

Survey. A door-to-door mass blood survey was conducted to detect the microfilaria from 9,000 people of 1800 households in 45 villages in 9 NFPC units from East and West Godavari Districts; these households were selected randomly on the basis of population sizes from October 1999 to March 2001. The blood smears were collected between 20.00 to 23.00 hrs because the *Wuchereria bancrofti* (microfilaria) inhibits the nocturnal periodicity. Apart from that, sex, age, clinical manifestations, clinical history, and duration of lymphoedema were also recorded from available people on the basis of questioning, and all consenting persons >1year of age were included in the study. The study reveals that the microfilaria rate ranges from 2.97% to 10.14% from the East Godavari District and 7.29% to 8.34% from the West Godavari District.

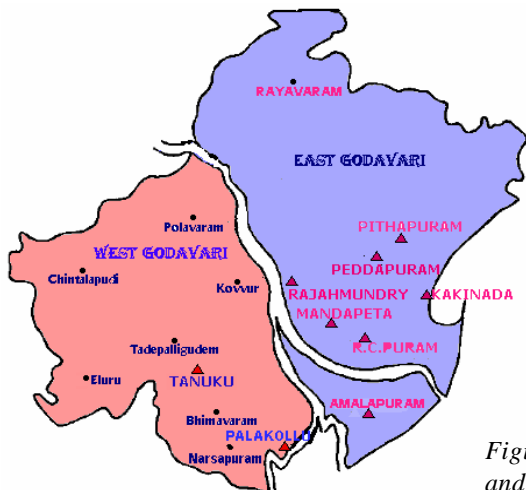


Figure 1. Map showing the study area of East and West Godavari districts of Andhra Pradesh.

Insects. Indoor-resting mosquitoes were collected at fortnightly intervals with the help of mechanical aspirators (Hausherr's Machine Works, Toms River, NJ 08753 U.S.A.) during 06.00 to 09.00 hours from 12 fixed catching stations from every unit area of urban and rural areas of all the nine National Filaria Control Program units during February 2000 to January 2001. Only female *C. quinquefasciatus* mosquitoes, which is the principal vector of Bancroftian filariasis (Dash et al., 1988), were identified with the help of a key developed by Ruben et al. (1994). The vector abundance is expressed as number of female *C. quinquefasciatus* mosquitoes collected per man per house.

C. quinquefasciatus females were dissected for identifying the I, II, and III stages of microfilaria by using the key developed by Nelson (1959) and Yen et al. (1982). Compound microscopes were used for identification of the different stages of filarial larvae. All stages were recorded, and mature infected larvae were identified on the basis of the morphology of their caudal papillae. Infection rate is calculated by the presence of any stage of microfilaria, and infectivity rate is based on the presence of III stage microfilaria only.

Socio-economic details. Successful control of Filariasis depends upon a detailed knowledge of its epidemiology, including knowledge of the social and economic factors that influence its prevalence. So socio-economic parameters such as age, sex, literacy rate, habitat, structure of house, income, etc., were collected from 9000 individuals, where the blood surveys were conducted in both Godavari districts from October 1999 to March 2001. Filariasis is associated with poor quality of sanitation and unawareness about the prevalence of the disease and its mode of transmission.

Certain important socio-economic parameters — such as age, sex, village, taluk, district, unit, affected organ, occupation, family background, children, knowledge of filariasis, mosquito avoidance, water supply and storage, structure of house, presence of animals, habitat, number of earning persons, average income and education of parents — are provided to correlate the prevalence of the disease.

Mosquitoes. Comprehensive information helps in assessing the vector scenario, such as principal vector species, associated vector species, vector density, etc. These data will help in estimating the rate of vector transmission and control. Such vital information as infection and infectivity rate is provided in this category. The I, II, III stages of microfilaria can be entered and retrieved from these data, which will help in assessing the rate of vector transmission.

RESULTS and DISCUSSION

In order to facilitate users, the database will be developed in three categories: raw databases, processed databases, and querying in databases. In raw databases the conventional type of data — such as details of socio-economic, entomological, and other details — will appear. Based on the raw data, the further processing will be done at every category. Finally, querying in databases all possible info can be retrieved through proper querying methodology by the user.

Sex wise microfilaria in East and West Godavari districts is given in Tables 1 and 2, respectively. A comprehensive microfilaria rate is given in Table 3. The entomological details, such as infection and infectivity rates, are given in Tables 4 and 5. The database containing the complete information on socio-economic details can generate more than 13 reports according to the user's choice like age, sex, education, family background, habitat, income, occupation, water storage, structure of the house, mosquito collection, dissection, mass blood survey, and filariasis survey. The category can be in any form, such as month, year, or unit. The customized database has the following features: first-of-its-kind in operational programs on filariasis; epidemiological details

Table 1. Sex wise and NFCP unit wise prevalence of Microfilaraemia in East Godavari District of Andhra Pradesh

Name of the unit	Total no of persons examined			Total Mf carriers			Total Mf rate (%)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Amalapuram	455	530	985	19	32	51	4.17	6.03	5.17
R.C. Puram	478	525	1030	42	28	70	8.78	5.33	6.97
Mandapeta	490	520	1010	14	16	30	2.85	3.07	2.97
Kakinda	349	457	806	15	10	25	4.29	2.18	3.10
Peddapuram	556	479	1025	56	48	104	10.00	10.02	10.14
Pithapuram	461	557	1018	42	44	86	9.11	7.89	8.44
Rajahmundry	474	578	1052	21	21	42	4.43	3.63	3.99
Total	3263	3646	6926	209	199	408	6.40	5.45	5.89

Table 2. Sex wise and NFCP unit wise prevalence of Microfilaraemia in the West Godavari District of Andhra Pradesh

Name of the unit	Total no of persons examined			Total Mf carriers			Total Mf rate (%)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Tanuku	503	527	1030	52	34	86	10.33	6.45	8.34
Palakollu	479	536	1015	32	42	74	6.68	7.83	7.29
Total	982	1063	2045	84	76	160	8.55	7.1	7.9

Table 3. Sex wise microfilaria prevalence in both Godavari Districts of Andhra Pradesh

Name of the unit	Total no of persons examined			Total Mf carriers			Total Mf rate (%)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
East Godavari	3263	3646	6926	209	199	408	6.40	5.45	5.89
West Godavari	982	1063	2045	84	76	160	8.55	7.1	7.9
Total	4245	4709	8954	293	275	568	7.00	5.9	6.34

of 10,000 patients; quick information retrieval of vector transmission; infection rate; vector abundance; user-friendly and menu-driven package.

The size of the database is 48 MB, with the front end as VB 6.0 and back end as MS-Access. Persons with minimum computer knowledge can generate various reports, which will help in planning of control operations. Online help is provided to help young researchers working in filariasis research. This package can be installed on any Microsoft Windows-based machines and hence can be used in any endemic area of filariasis in this country and abroad as well. More details are available on institutional web site www.iictindia.org

Table 4 Month and Unit wise Infection Rates of *Culex quinquefasciatus* in the urban and rural areas of East and West Godavari Districts, of Andhra Pradesh

Month and Year	East Godavari District												West Godavari District													
	Amalapuram			Kakinada			Rajahmundry			Peddapuram			Pithapuram			R.C.Puram		Mandapeta		Palakollu		Tanuku				
	U	R		U	R		U	R		U	R		U	R		U	R	U	R	U	R	U	R			
Feb-00	2.4	8		1.8	11.4		2.3	15.1		2.4	14		0.8	13.5		1.2	11.2		0	4.2		1.6	15.2		2.5	21.2
Mar-00	3.6	8.8		0.7	6.4		4.3	28.7		1.8	15.4		0.8	11.2		1.1	4.1		0.4	4.7		1.3	13.5		1.2	23.5
Apr-00	3.1	12.2		0.9	4.7		7.5	18		2.9	9.0		1.6	9.5		1.7	4.0		1.3	3.8		1.5	12.6		1.3	21.0
May-00	3.3	8.6		2.9	0		1.9	17.6		4.4	5		2.3	16.2		0	3.5		0	3.4		0	11.6		2.7	19.8
Jun-00	1.4	6.5		0	6.3		1.7	43.6		5.5	6.8		0	29.5		0	3.2		0	4.0		0	17.5		1.5	16.7
Jul-00	0	1.6		0	5.5		0	15.3		0	5.1		0	42.7		0	6.2		0	2.6		1.08	12.6		2.5	13.8
Aug-00	0.7	0.5		0	3.0		0	32.1		2.5	10.2		2.2	39.6		00	18		0	3.6		0.3	16.5		1.3	15
Sep-00	0.6	6.1		0	2.9		8	33.0		4.8	6.7		0	14.8		0	3		0	7.7		0.9	13		2.7	0
Oct-00	3.3	7.1		5	3.8		5	35.2		0	5.4		2.7	21.5		0	38.6		0	7.3		1	16		0	7.7
Nov-00	0	8.9		0	2.8		0	38		0	6		0	16.7		0	36.7		0	7.9		0.8	14		0	7.5
Dec-00	1.2	10		0	5.8		1.3	22		0	6.8		0	12.3		0	28		0	8.3		0.5	11		0	11
Jan-00	0	3		0	3.8		0	25.7		0	14		0	13.1		0	43.2		0	6.6		0.5	9		0	11.3

U: Urban, R: Rural

Table 5. Month and Unit-wise Infectivity Rates of *Culex quinquefasciatus* in the urban and rural areas of East and West Godavari Districts, of Andhra Pradesh

Month and Year	East Godavari District												West Godavari District																	
	Amalapuram			Kakinada			Rajahmundry			Peddapuram			Pithapuram			R.C.Puram			Mandapeta			Palakollu			Tanuku					
	U	R		U	R		U	R		U	R		U	R		U	R		U	R		U	R		U	R		U	R	
Feb-00	0.4	7	0	0	0	0.9	2.1	0.8	11.	0	0	0	0.8	0.9	0	0.8	0.9	0	0.00	0.00	0	0.4	0	0	0.4	0	0	1.6	0	0
Mar-00	0.8	3.1	2.1	0	2.1	2.4	5.4	0.8	5.6	0	2.9	0.7	2.0	0.4	0	2.9	2.0	0.4	0	0	0	0.6	0	0	0	0	0	0	0.9	0.9
Apr-00	0.7	4.4	0.9	0	0.9	3.6	3	0	5.1	0	0	0.4	0	0.6	0	0	0	0.6	0	0.6	0	0.9	0	0	0	0	0	0.6	6.8	6.8
May-00	0	0	2.9	1.1	0	0	3.2	0	0	0.7	0	0.5	0	0.00	0	0.00	0	0.00	0	0	0	0.9	0	0	0	0	0	0	2.9	2.9
Jun-00	0.7	2.3	0	3.1	0	1.7	6.4	0	4.9	0	7.5	0	0	0	0	0	0	0	0	0	0	0.7	1.3	0	0	0	0	0	0	0
Jul-00	0	4.5	0	3.3	0	0	5.5	0	3.06	0	5.7	0	3	0	0	5.7	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
Aug-00	0	7.8	0	1.0	0	0	7.6	2.5	6.12	0.6	6.7	0	0	0	0	6.7	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0
Sep-00	0.6	6.7	0	0.9	0	4	6.2	0	4.0	0	2.5	0	5	0	0.5	2.5	0	0.5	0	0.5	0	0.4	2.9	0	0	0	0	0	0	0
Oct-00	0	11.2	0	0.7	0	0	11.2	0	4.3	0.9	4.6	0	8.1	0	1.3	4.6	0	1.3	0	1.3	0	0.5	4.2	0	0	0	0	0	0	0
Nov-00	0	13.2	0	0.5	0	0	13.0	0	5.3	0	0.2	0	11.2	0	0	0.2	0	0	0	0	0	0.8	2.3	0	3.1	0	0	0	0	0
Dec-00	0	11	0	0	0	0	9.7	0	6.8	0	0	0	6.06	0	0	0	0	6.06	0	0	0	0.5	0.9	0	0	0	0	0	0	0
Jan-00	0	5	0	0.6	0	2.7	7.6	0	8.8	0	0	0	9.01	0	2.3	0	0	9.01	0	2.3	0	0.5	1.1	0	0	0	0	0	0	0

U: Urban, R: Rural

Form I. Socio Economic Details

Form II. Mosquito Collection Details.

Form III. Mosquito Dissection Details.

Form IV. Mass Blood Survey Details.

Form V. Reports.

Form VI. Lymphatic Filariasis Database — Spectrum.

ACKNOWLEDGMENTS

The authors are grateful to the Director, Indian Institute of Chemical Technology, Hyderabad, India, for his support. We are also thankful to the Ministry of Information Technology, Government of India, for their financial support.

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