A Situation Analysis:

Neglected Tropical Diseases in Bangladesh

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Ministry of Health & Family Welfare, Government of Bangladesh

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List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
BRAC	Building Resources Across Communities
CBO	Community Based Organization
CDC	Centre for Disease Control
CNTD	Centre for Neglected Tropical Diseases
DCU	Disease Control Unit
DEC	Diethylcarbamazine
GC	Geographic Coverage
DGHS	Directorate General of Health Services
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
IACIB	Institute of Allergy and Clinical Immunology of Bangladesh
ICT	Immuno-chromatographic Test
IEC	Information, Education, Communication
IU	Intervention Unit
JICA	Japan International Cooperation Agency
KA	Kala-azar
LEPRA	Leprosy Relief Association
LF	Lymphatic Filariasis
LFEP	Lymphatic Filariasis Elimination Programme
LLIN	Long Lasting Insecticide-treated Nets
M & E	Monitoring and Evaluation
MDA	Mass Drug Administration
MDG	Millennium Development Goals
Mf	Microfilaria
MOHFW	Ministry of Health and Family Welfare
MM	Morbidity Management
NGO	Non-governmental Organization
NLEP	National Leprosy Elimination Programme
NTD	Neglected Tropical Diseases
PHC	Primary Health Centre
PKD	Post-kala-azar Dermal Leishmaniasis
RTI	Research Triangle Institute
SAG	Sodium Antimony Gluconate
SEARO	South-east Asia Regional Office, WHO
SM	Social Mobilization
STH	Soil-transmitted Helminth
TAS	Transmission Assessment Survey
TC	Treatment Coverage
TV	Television
USAID	United States Agency for International Development
VL	Visceral Leishmaniasis
VLEP	Visceral Leishmaniasis Elimination Programme
WHA	World Health Assembly
WHO	World Health Organization

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We appreciate the tremendous work done by the staff of the NTD control programme in Bangladesh. The work has contributed to significant reduction in the burden of NTDs, saving millions of individuals and their families from the consequences of these diseases and to alleviation of poverty in the country.

Directorate General of Health Services
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Executive Summary

Background: Neglected tropical diseases (NTDs) are a group of 13 diseases caused by parasitic worms, protozoa or bacteria. They impact the poorest of the poor living in developing countries. NTDs are widely prevalent and are a serious public health problem in sub-saharan Africa, Asia and Latin America, affecting more than a billion people. The ill-health and morbidity caused by NTDs range from malnourishment to disfigurement of body parts to blindness. They impair physical growth and mental development of children, economic and social activities of adults and are a cause of pregnancy complications in women. Treatment costs impose appreciable financial burden. From disease burden and Disability-Adjusted Life Years perspective, NTDs are almost on par with malaria and account for one-fourth of the global disease burden caused by HIV/AIDS.

Financial constraints and lack of good diagnostic and control tools frustrated the efforts, if any, of the endemic countries to combat the NTDs, the prevalence of which dates back to ancient times. While population growth, ever increasing scarcity for resources and new disease entities threatened the outlook for NTD control, the advent of better diagnostic tools, treatment options and cost-effective control strategies during the last two decades provided new opportunities to control and even eliminate the NTDs.

The opportunities to control and eliminate the NTDs and the necessity to remove them from poor communities to alleviate the poverty and progress towards millennium development goals attracted the attention of the global health community, and the international organizations developed a road map for the elimination of the NTDs. Bangladesh was among the first countries to respond to the calls by the WHA and WHO, to develop and implement programmes to eliminate NTDs prevailing in the country. The country has started implementing these programmes in 2001. Nevertheless, it is required to consolidate the scattered information on the prevalence of NTDs in the country, progress of the control/elimination programmes and also to identify the generic gaps in the programmes. Such an exercise will also facilitate comparison of the progress and distance to reach the goals. Hence, this situation analysis exercise is initiated in collaboration with the MoHW.

Methods: The information summarized in this document is compiled from the documents, reports and News Letters available with and presentations made by the NTD wing of the MOHFW. Other sources of information include WHO publications and web site, published papers and reports, reports prepared by NGOs and national and international partners of the NTD control programme. Information has also been collected from documents identified by search in Pub Med and Google. Also, various issues related to implementation and progress of the programme has been discussed in the meetings with the NTD programme managers and other experts.

Findings: The major NTDs prevalent in Bangladesh are Lymphatic Filariasis, Kala-azar and Soil Transmitted Helminthiasis, prevalent in 34, 45 and 64 of 64 districts respectively. Bangladesh was able to establish and successfully take forward a vibrant NTD control programme. As in the other parts of the world, in Bangladesh too the NTDs impair the people's capacity very adversely and accentuate poverty. Each disease has pockets of very high prevalence and morbidity.

Responding to 1997 WHA resolution, the Disease Control Unit, Directorate General of Health Services, launched the mass drug administration and morbidity management programmes to eliminate LF as a public health problem. Starting with one district in 2001, the MDA programme has been extended to all 19 well defined endemic districts by 2008. The need for MDA is being assessed in another 15 districts of very low LF prevalence. So far, the progamme delivered 1.5 billion treatments to the endemic population and trained thousands of chronic patients to manage their lymphoedema problem and facilitated thousands of hydrocelectomies. MDA reduced LF infection levels very appreciably in all districts and at least 8 of 19 districts are ready to assess if MDA can be stopped, as the infection fell below the threshold level.

Responding to 2001 WHA resolution, a school based mass drug administration programme was initiated to control STH in 2 districts in 2005, expanded gradually and able to cover all 64 districts by 2008. MDA is implemented at 6 months interval. The programme targets nearly 20 million elementary school children, and teachers play pivotal roles in the implementation of the programme. During the last 3 years, 80% of the children received at least 1 treatment per year.

Bangladesh is committed and has been working in close association with neighbouring countries to eliminate kala-azar. A road map has been developed to achieve elimination and a pilot project has been initiated in one district. The progress is less impressive on account of administrative delays in procurement of diagnostics, medicines and insecticides for vector control.

Conclusion: Bangladesh made impressive gains in the control of LF and STH. Consolidation of good results and sustaining the momentum of the programmes until the final goals are achieved and institution of monitoring and evaluation of the programmes are major challenges. Steps are required to bridge the gap in some areas between the requirements of the programme and current provisions.

Bangladesh

Bangladesh is a vibrant developing country situated in south-Asia. It gained independence and became sovereign in the year 1971. During the last four decades, the country has initiated several steps to ameliorate the socio-economic conditions and living standards of the people.

Bangladesh is bordered by India on western, northern and eastern side. The Bay of Bengal surrounds the southern border and a small strip of land adjoins Myanmar. The total land area is 147,570 sq kms (56,977 sq miles). The climate is tropical with a hot and rainy summer and a dry winter and the temperature ranges from about 26^{o} c in January to 35^{o}c in April. Bangladesh is a low lying country with a wide net work of rivers and rivulets and plenty of rainfall. This makes the country prone to frequent and severe floods, affecting the crops, livelihood and health of the people. The country is also prone to frequent droughts and cyclones. The delta formed by the confluence of three rivers viz., the Ganges, Brahmaputra and Meghna and their tributaries is among the most fertile tracts of the world.

Bangladesh is bestowed with rich culture and heritage. Muslims constitute 89% of the population, Hindus 10% and Buddhists, Christians and others 1%.

Figure 1: Map of Bangladesh

Bangladesh's Neglected Tropical Diseases at a Glance

Parasite	Disease	Aetiologic agent	Distribution	Burden
Bacterial	Leprosy	*Mycobacterium leprae*	New cases reported from 6 divisions	<1/10,000 in all districts 3928 cases in 2008 (DGHS, 2009) 5,239 cases in 2009 (WHO, 2010b)
Protozoa	Visceral leishmaniasis (Kala-azar)	*Leishmania donovani*	45 districts endemic 1 district home for 54% of total cases, 3 districts for 79% of total cases	65 million live in endemic areas 136,500 estimated total cases Annually 5,067 cases (Joshi 2008)
Helminth	Lymphatic filariasis	*Wuchereria bancrofti*	19 districts definitely endemic. Of 19, 5 northern districts highly endemic Status of 15 districts not clear, considered very low endemic	34 million at risk 35 million live in 15 districts
	Soil Transmitted Helminths (Common Intestinal worms)	*Ascaris lumbricoides* (Round worm)	All 64 districts endemic	78 million infected (55% of population)
		Trichuris trichiura (Whip worm)	All 64 districts endemic	66 million infected (46% of population)
		Hook worm	All 64 districts endemic	51 million infected (35% of population) (de Silva et al., 2003; Hotez, 2009)

Note: Endemicity status of various districts for NTDs is summarized in Annexure 1

1. Introduction

1.1 Bangladesh and Neglected Tropical Diseases

Bangladesh is in south Asia, the region known for large population and large number of people affected by communicable diseases. Some of the large disease endemic tracts of the Indian sub-continent became part of the present Bangladesh, when it became independent country in 1971. However, the Government of Bangladesh has been striving to improve the health care delivery and health status of the people. Appreciating the burden of the neglected tropical diseases (NTDs), the government responded to global health initiatives and joined the comity of nations to control and eliminate them. The major NTDs in Bangladesh are as follows:

- Lymphatic filariasis
- Visceral leishmaniasis
- Soil transmitted helminth infections (include hook worm, ascariasis and trichuriasis)

While LF is a cause of disfigurement and considerable morbidity, VL causes deaths also. STHs are very widely prevalent and inflict severe morbidity in children. Marginalized population and poorest of the poor, often with limited accessibility to health care, are more affected by these diseases. This necessitates effective and sustained public health intervention strategies to reduce and eliminate the burden caused by these diseases. Leprosy, once highly endemic, has been successfully eliminated from Bangladesh.

Globally, efforts to control the NTDs have gained momentum during the last decade. Preventive chemotherapy based mass drug administration strategy has been found to be feasible and effective to combat some NTDs. The strategy provides an opportunity to integrate the control of different NTDs, leading to cost-effective outcomes. The disease specific strategies are:

- Community wide Mass administration of DEC+Albendazole to treat and eliminate LF
- School based mass administration to children of Albendazole to treat and control STH

Case detection and treatment and vector control are the mainstay of VL elimination programme. The Ministry of Health and Family Welfare (MoHFW), Government of Bangladesh, in agreement with WHA resolutions and WHO guidelines, resolved to eliminate the NTDs as a public health problem. It engaged, wherever necessary, the non-governmental organizations, international institutions and donors to provide technical and financial support to NTD control programmes.

1.2 The Need for Situation Analysis

In accordance with its resolve to control and eliminate NTDs, the MoHFW initiated intervention programmes to eliminate LF and VL and control STH. These programmes made significant progress during the last decade. And, the next five years are important from the perspectives of target dates set by the WHO and the MoHFW to eliminate the NTDs. Hence, it is imperative and timely to assess the current status of the intervention programmes and consolidate the progress made and identify inadequacies, if any. Also, information on the distribution, burden and the earlier attempts to control NTDs is scattered. In view of this the current situation analysis is initiated with the following objectives:

- To compile the information on the burden and distribution of NTDs
- To document the current status and impact of NTD control operations
- To identify geographical areas and situations that require more efforts to eliminate NTDs
- To understand the further efforts needed to meet the target of NTD elimination
- To understand the post-control surveillance requirements of the NTD control programmes
- To identify the gaps between present and proposed NTD control

2. Administration and Socio-Economic and Health Indicators

2.1 Governance and Administrative Units

Bangladesh is governed by Parliament democracy with 40 ministries. The Ministry of Health & Family Welfare (MOHFW) is one of the largest ministries in the country.

Bangladesh is a unitary state with no provinces. For governance and administrative purpose, the country has been divided into 7 divisions and 7 divisions into 64 districts. The administrative divisions are shown in Table 1. The average population size of the district is about 2.0 million.

Table 1: Administrative Units

Unit	Number	Average Population
Division	7	21,541,200
Zila	64	2,019,500
Uppazila/Thana	507	254,900
Union	4,484	28,800
Mouza	59,990	2,000
Household	25,362,321	4.8 (persons)

2.2 Demographic and Socio-economic and Health Indicators

Bangladesh ranks 8 in population size and its population density is very high. The major economic activity is agriculture. The country's garment and jute industries are well known all over the world.

Bangladesh has been making consistent efforts to improve the health and socio-economic status of the population, leading to improvement in various indicators of human development. The health related MDGs and the status of Bangladesh in relation to MDGs are summarized in Table 2.

Table 2. The Health Related MDGs and the Status of Bangladesh in Relation to the Goals

Goal	MDG 1: Eradicate Extreme Poverty	MDG 4: Reduce Child Mortality	MDG 5: Improve Maternal Health		MDG 6: Combat HIV/AIDS, Malaria and Other Diseases	
	% of children <5 years who are under weight	Under five mortality/1000 live births	Maternal mortality 100,000 live births	% of births attended by skilled workers	% HIV positive 15-24 year age	Incidence of TB / 100,000 population
Year	2008	2007	2008	2009	2006	2009
Bangladesh	41	65	290	24.4	<0.1	100
Global Target	Halve from 1990 level	48	143.5	50	Halt	Halt
Year	2015	2015	2015	2010	2015	2015

Source: Directorate General of Health Services; Bangladesh Bureau of Statistics; Bangladesh Demographic and Health Survey

The important demographic and socio-economic indicators are summarized below.

Table 3: Important Demographic, Health and Socio-economic Indicators

Indicator	Estimates
Population (2001) Population projected (2010) Population density (per sq km) (2008)	124.35 million 149.70 million 980
Ranking in population size	7
Sex ratio (Males per 100 females)	105
% of children of 0-5 in the population % of children of 6-14 years	11.7 22.0
% of urban population	25
Adult literacy rate (15+ years) (%)	59
Population growth rate (%)	1.55
Birth rate	20.54/1000 population
Life expectancy at birth (both sexes)	66.78
Total fertility rate (birth per woman of	2.40 children born per

Indicator	Estimates
15-49 years)	woman
% of BCG vaccination	99
% of OPV vaccination	92.5
% of Vitamin A coverage (0-59 months)	97
% of population using sanitary latrines	62
Per capita income in US $ (2009)	621

Source: Bangladesh Bureau of Statistics; Health Bulletin, Directorate General of Health Services, Bangladesh

3. Health System and Health Care Delivery in Bangladesh

The government of Bangladesh has a progressive health policy. The MOHFW seeks to create conditions whereby the people of Bangladesh have the opportunity to reach and maintain the highest attainable level of health. It is a vision that recognizes health as a fundamental human right and therefore the need to promote health and reduce suffering in the spirit of social justice.

Since independence, Bangladesh has made steady progress in improving health systems and health care delivery, leading to improved health outcomes. The health services consist of both private and public sectors. While both the services provide in-patient and out-patient care, the preventive health care is exclusively managed by the MOHFW. The primary health care system has been strengthened in the recent past and provides valuable services to the rural population. In urban areas, the health care including the PHC system is mandated to the Ministry of Local Government, Rural Development and Cooperatives.

The community clinics, constructed in 2000-01 as part of the PHC services to rural poor, were not utilized for service delivery during the previous governments. The present government, which came to power in 2009, revitalized the community clinics. It proposes to establish 18, 000 community health clinics, one for every 6,000 rural population. Of them, 9,722 have already been started in 2010. Local people play important role in the management of community clinics. An evaluation by WHO showed that with the revitalization of community clinics, the distribution and utilization of health services has become equitable and universal.

The community clinics have upward referral hospitals at the union and upazila level. The upazila health complexes and district hospitals provide curative care at primary and secondary level respectively. Tertiary level curative care is mostly provided at national

and divisional levels through large hospitals, affiliated with teaching institutions. Though there is a wide net work of different levels of hospitals (Table 4), utilization of the services by the population is comparatively low.

Table 4: Number of Hospitals at Various Administrative Levels

Level	No. of Hospitals	No. of Beds
District	62	8,900
Upazila	421	15,958
Union	1312*	-
	87#	-
Ward/village	9,722#	-

*Sub-centres with only OPD facility
Health and Family Welfare centres with only OPD facility

Together in public and private sector, there are 59 Medical college, 13 nursing colleges, 69 nursing institutes, 17 medical assistant training schools and 16 institutes of health technology. In spite of so many institutions, the country is having health workforce shortage.

There is a total of 26,436 Para-medical staff, of which 20,841 are health workers, 4,196 are Assistant Health Inspectors and 1,399 are health inspectors. The population per physician of 2,785 and the population per nurse of 5,782 are among the lowest in the world. While the majority of the population lives in rural areas, majority of health work force live in urban areas and vacancy rates, particularly in remote upazilas, are much higher than those in urban areas.

In Bangladesh, about 3% of GDP is spent on health, out of which the government contribution is 1.1%. The per capita expenditure on health is US $ 12, of which the public health expenditure is US$ 4.

4. The Neglected Tropical Diseases of Bangladesh

4.1 Lymphatic filariasis (LF)

4.1.1 Back ground

LF, commonly known as elephantiasis, is a disfiguring and stigmatizing disease and inflicts severe social and economic burden on the affected communities and countries.

The parasite and life cycle: LF is caused by three nematode parasite species namely *Wuchereria bancrofti*, *Brugia malayi* and *B. timori*. LF is transmitted by mosquitoes.

Culex quinquefasciatus, the tropical house mosquito, is the single most important vector species world-wide and in Bangladesh.

Disease Burden: Globally, 1.3 billion people live in known endemic areas. Nearly 120 million people are infected, 40 million of them with chronic disease manifestations such as lymphoedema/elephantiasis and hydrocele (WHO, 2010a). The disease impairs occupational activities, daily chores and physical activities and educational opportunities and marriage prospects. LF was the second leading cause of disability (WHO, 1995). The productivity of the affected people is reduced by 27% (Ramu et al., 1997)

Distribution: LF is endemic in 81 countries in south-east Asia, sub-Saharan Africa, South America, middle-east and Oceania. India is the largest endemic country. The other countries with large endemic population include Indonesia, Nigeria, Bangladesh and Myanmar (WHO, 2010a).

Clinical manifestations: All infected individuals including children will have their lymphatics damaged due to infection and the damage progresses with age. After a few years, they suffer from acute episodes of adenolymphangitis, the frequency of which ranges from 1-10 per year. Repeated acute disease episodes lead to chronic disease condition. The major chronic disease manifestations include hydrocele in men and lymphoedema/elephantiasis of legs in men and women. Less frequently encountered manifestations include swelling of hands and breasts, chyluria, epididymo-orchitis, lymph scrotum and elephantiasis of penis (Dreyer et al., 2000).

Diagnosis: Clinical examination will reveal the chronic disease manifestations. Examination of blood, collected during the night time (nocturnally periodic form) is the widely used method for diagnosis of infection/microfilaraemia. Antigen detection, using ICT card test, is a highly sensitive method and is being used for diagnosis, mapping and monitoring and evaluation of LF elimination programmes (WHO, 2005).

Control Options: Vector control, detection and treatment of infected people and mass drug administration to the endemic communities are the options available (Sasa, 1976). Vector control for > 5 years will be effective, but, often not feasible in large scale and is not a cost-effective option (Krishnamoorthy et al., 2002). LF is often co-endemic with malaria. In places where insecticide impregnated nets are widely used against malaria, the measures will add benefit to the impact of MDA programmes to eliminate LF. Detection and treatment is also effective, but not widely feasible as detection of all infected people requires screening of millions of people. With the advent of single dose treatment, community-wide mass drug administration has become the most feasible and affordable option (Ottesen et al., 1997). Under MDA, the drugs are distributed by health workers or trained volunteers to all members of the community, at their door steps. The major anti-filarial drug (DEC) is also administered through fortification of salt, a challenging strategy in terms of logistics (Adinarayanan et al., 2007). Cost-effectiveness advantage and feasibility of MDA has led to the formulation of the MDA based global strategy to eliminate LF. The WHA passed a resolution (50.29) in 1997 to eliminate LF as a public

health problem by 2020 and a global programme to eliminate LF was launched in the year 2000 (Ottesen 2000). Currently 53 countries are implementing MDA to eliminate LF (WHO, 2010a).

The recommended drugs for MDA are DEC (6mg/kg body weight) +Albendazole (400 mg) in areas with LF and without onchocerciasis, and ivermectin (15-200 mcg/kg) +Albendazole (400 mg) in areas with LF and onchocerciasis (WHO, 2006a).

4.1.2 Epidemiology and Control in Bangladesh

Prevalence of LF was recorded as early as late 19th century in the parts of India, which are now in Bangladesh. Later investigations revealed LF prevalence in many parts of the country. While *W. bancrofti* was the predominant parasite, *B. malayi* was reported from a few areas of the Chittagong region (Sasa, 1976). Both the parasites are nocturnally periodic type. While *Cx. pipiens fatigans* (now known as *Culex quinquefasciatus*) is the major vector of bancroftian filariasis, details on the vectors of *B. malayi* are scarce, though the potential vectors, *Mansonia* species, were recorded from various parts of Bangladesh (Aslam Khan & Wolfe, 1972).

Many epidemiological investigations had been undertaken to understand the public health importance of LF (Table 5). These investigations revealed that the LF burden is very high in the northern districts of Bangladesh. Night blood surveys in the northern district of Dinajpur revealed prevalence of microfilaraemia up to 16.4% (Wolfe & Aslam Khan, 1972). A multi-district study indicated that LF is prevalent in many parts of the country (Wolfe & Aslam Khan, 1968 & 1971) including some localities of Dhaka (Ahmed et al., 1986). About one-tenth of the sampled population showed chronic disease manifestations (Table 5). More recent information (1995-96) compiled by DGHS, Dhaka, showed presence of people affected with chronic disease in 34 districts. Historically, males always had much higher prevalence (>2times) than females. Hydrocele was a very predominant clinical manifestation (Wolfe & Aslam Khan, 1972).

Table 5: LF Prevalence Recorded in Various Studies in Bangladesh

Place	No.	Prevalence (%) Mf	Prevalence (%) Chronic Disease		Author
Dinajpur	100	13.0			Megaw & Gupta, 1927
Pabna	35	5.7			Megaw & Gupta, 1927
Across 17 districts	4,190	2.8			Wolfe & Aslam Khan (1968, 1971)
Dinajpur district	-	14.0			Wolfe & Aslam Khan (1968, 1971)
Dacca	215	0.9			Wolfe & Aslam Khan (1968, 1971)

Place	No.	Prevalence (%) Mf	Prevalence (%) Chronic Disease		Author
Thakurgaon (Dinajpur district)		9,624	16.8	10.1	Barry et al (1971)
Akcha (Dinajpur district)	602	15.6			Wolfe & Aslam Khan (1972)
Madarganj (Dinajpur district)		841	16.4		Wolfe & Aslam Khan (1972)
Dinajpur district		14.8	9.5		National Institute of Preventive & Social Medicine (quoted in Ahmed et al., 1986)
Rangpur district Preventive &			7.7	7.9	National Institute of Social Medicine (quoted in T. Ahmed et al., 1986)
Mirpur, Dhaka	514	8.2			Ahmed et al., 1986
Expatriates in Malaysia		240	11.3		Omar et al., 2001

Entomological investigations showed that the tropical house mosquito, *Culex quinquefasciatus* is the only vector of bancroftian filariasis in Bangladesh. A study in Ache and Madarganj villages in Dinajpur district, recorded 35 mosquito species (11 species of *Culex*, 10 of *Anopheles*, 8 of *Aedes*, 3 of *Mansonia*, 2 of *Armigeres* and 1 of *Triptoroides*). Filarial infection was found in *Cx. quinquefasciatus* and *Cx. vishnui* complex mosquitoes. The infection and infectivity rates of the former species were 10.5% and 1.1% (n=3,545) and the latter species were 2.1% and 0.04% (n=5,569) respectively (Aslam Khan & Wolfe, 1972). In Mirpur area of Dhaka, *Cx. quinquefasciatus* constituted 84.9% of the total mosquitoes collected. Of the 3439 *Cx. quinquefasciatus* dissected, 43 (1.2%) were found infected with any stage larvae and 7 (0.2%) with infective stage larvae (Ahmed et al., 1986). These studies demonstrated active transmission of LF in the communities.

4.1.3 LF elimination programme

Responding effectively to the WHA resolution 50.29 passed in 1997, which called upon the member states to take necessary steps to eliminate LF as a public health problem, the MoHFW, Bangladesh, launched the MDA based LF elimination programme in 2001. It coincided with the launching of the global programme to eliminate LF in 2000. The

government followed the technical guidelines provided by WHO and framed a policy to eliminate LF by the year 2015.

Prioritization of districts: The programme designated 'district' as the intervention unit for the coordination and implementation of MDA. To utilize the scarce resources judiciously, prioritization of districts for implementation of MDA had become necessary. Such prioritization has been done either using the historical evidence (Table 5) or after generating epidemiological evidence. The latter is mainly the prevalence of antigenaemia (Ag), estimated from ICT card test of the sample population, in accordance with WHO guidelines. The Ag surveys were carried out in 2002-2004. These evidences lead to classification of the 64 districts into three categories.

(a) Non-endemic districts: Of the 64 districts in the country, 30 districts were declared non-endemic, 13 based on historical evidence (no or low number of clinical cases) and 17 on the basis of Ag prevalence, which was <1.0%.

(b) Very low-endemic districts: Fifteen districts showed ≥1.0% Ag prevalence, which is the criteria to start the MDA (WHO, 2005), in the surveys carried out in 2002-04. To initiate MDA in these 15 districts, the programme felt it necessary to generate more epidemiological evidence. Hence, microfilaria (Mf) surveys were carried out twice in this set of districts. In the surveys carried out during 2002-04, 22 sites in 13 districts were evaluated and in the surveys during 2009-2010, 30 sites in 15 districts were evaluated. In each site and in each survey 500 people were sampled. Only 2 sites in 1 district of the 2002-04 survey showed microfilaraemia (0.60% and 0.40%) and all other sites in both the surveys showed no people with Mf (Annexure 2). Thus, this group of districts appear to have very few Mf carriers, while showing ≥1.0% antigenaemia prevalence (in all age groups). This posed a challenge to programme manager whether to implement MDA, following the criterion of ≥1.0% Ag rate, or not, considering ≤1.0% (almost 0%) Mf rate, the criterion for exclusion of districts from MDA (WHO, 2005).

(c) Endemic districts: Nineteen districts were declared endemic based on historical and/or empirical evidence i.e. the presence of considerable number of people affected with clinical disease and/or high prevalence of microfilaraemia observed in earlier epidemiological surveys respectively.

Classification of various districts with reference to endemicity is summarized in Annexure 2 and Map 1.

MDA programme: To begin with and gain experience, the MDA programme was initiated in 2001 in one of the 19 endemic districts, Panchgarh, located in the highly endemic northern region. The salient features of the programme are (a) district has been chosen as the intervention unit (b) MDA will be implemented in the month of November every year (c) combination regimen of DEC+albendazole was used (d) trained health workers and volunteers and boy scouts and girls distributed the drugs door to door and in

schools, mosques, cinema theatres, shopping complexes and bus stations (e) the duration of the programme is 10 days and 1 volunteer distribute drugs to nearly 1000 people (f) social mobilization constituted an important component and the IEC was imparted using films, bill boards, leaflets, audio cassettes and posters and banners and (g) community based morbidity management has also been initiated.

The implementation of the programme in the district was smooth and without any problems. Encouraged by the feasibility of the MDA strategy in Panchgarh district, the government extended the programme to all the 19 endemic districts in a phased manner. By 2008, the programme has been in place in all 19 districts. By the end of 2010, all districts received at least 3 MDAs and 12 received ≥6 MDAs. The programme is unique in that there was no 'MDA holiday' in any district, once it started the activity. Thus, the district Panchgarh that started MDA in 2001, received 10 MDAs by 2010 (Table 6).

By the end of 2009, a total of 148,357,808 treatments were given to a population of 35,060,360 (Table 7). On average, a person in the targeted population received 4.23 treatments. Close to 22 million population living in 12 intervention units has received ≥6 rounds of treatment by the end of 2010 and are eligible for assessment to stop MDA (Table 6).

Table 6: Status of MDA in 19 Endemic Districts

District	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Barisal division											
Barguna					x	x	x	x	x	x	6
Barisal								x	x	x	3
Jhalokati								x	x	x	3
Patuakhali					x	x	x	x	x	x	6
Pirojpur							x	x	x	x	4
Khulna division											
Chuadanga							x	x	x	x	4
Kushtia							x	x	x	x	4
Meherpur				x	x	x	x	x	x	x	7
Rajashahi division											
CNababganj				x	x	x	x	x	x	x	7

District	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Pabna							x	x	x	x	4
Rajashahi					x	x	x	x	x	x	6
Sirajganj						x	x	x	x	x	5
Rangpu division											
Dinajpur					x	x	x	x	x	x	6
Kurigram				x	x	x	x	x	x	x	7
Lalmonirhat		x	x	x	x	x	x	x	x	x	9
Nilphamari		x	x	x	x	x	x	x	x	x	9
Panchagarh	x	x	x	x	x	x	x	x	x	x	10
Rangpur					x	x	x	x	x	x	6
Thakurgaon					x	x	x	x	x	x	6
Total	**1**	**3**	**3**	**6**	**12**	**13**	**17**	**19**	**19**	**19**	112

X: indicates implementation of the MDA programme:
MDA was implemented in vulnerable areas in Dhaka in 2009. It was subsequently stopped on the recommendation of RPRG. Many areas in Dhaka showed <1.0% Mf rate.

Table 7: Progress of MDA Programme to Eliminate LF

Year	Population at Risk	No. of IUs Targeted	Population Targeted	No. Treated	TC %	GC %	% Targeted
Endemic Districts							
2001	30,100,571	1	846,880	808,770	96	5	3
2002	30,514,157	3	3,901,280	3,661,102	94	16	13
2003	30,933,445	3	3,896,295	3,622,518	93	16	13
2004	31,358,485	6	8,339,233	7,737,013	93	32	27
2005	31,789,365	12	20,160,304	18,425,375	91	63	63
2006	32,226,166	13	24,067193	22,189,349	92	68	74
2007	32,668,968	16	30,952,707	28,320,039	91	84	95

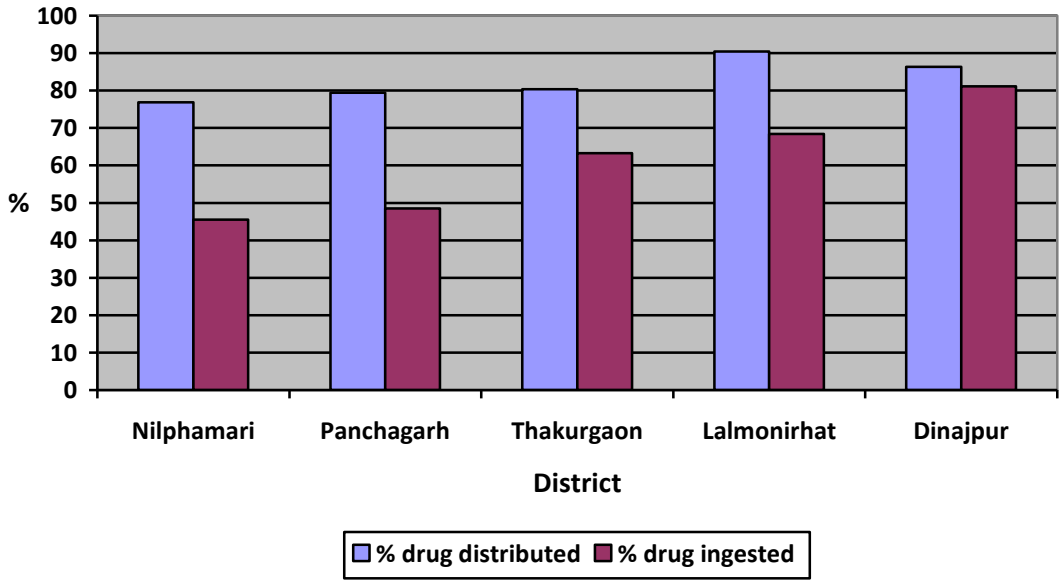
Year	Population at Risk	No. of IUs Targeted	Population Targeted	No. Treated	TC %	GC %	% Targeted
2008	34,240,881	19	34,240,881	30,952,172	90	100	100
2009	35,060,360	19	35,060,360	32,641,470	93	100	100
2010		19				100	100
				148,357,808			
Very low endemic districts							
2010	34, 31,036	15	---Efforts being made to determine the necessity or otherwise of MDA---				

Source: National programme to eliminate LF, Dhaka

Treatment coverage: The programme realizes that the treatment coverage and the proportion of people who ingest drugs is an important determinant of the outcome of the MDA programme. The treatment coverage reported by the district (IU) level programme managers ranged from 90 to 96% during different years (Table 7). This level, however, is widely considered as overestimate and represents more of the proportion of the population, to which the drugs were distributed. Therefore, the programme personnel and some NGOs undertook independent surveys, following WHO guidelines (WHO, 2005), to assess the treatment coverage. The surveys carried out by the programme personnel in 2008 and 2009 revealed a coverage of 79% and 86% (= ingestion of drugs) respectively.

To supplement the information to the programme, a bilateral partner (JICA) also carried out the treatment coverage survey, using WHO guidelines, of the MDA implemented in November 2010 in 5 districts of the highly endemic northern region. Under the survey, a total of 956-975 people were sampled per district. The survey highlighted that the programme is able to distribute the drug to 77% to 90% of the population, a very impressive achievement. Of the total population, 43% to 81% of the people ingested the drugs (Figure 2). Good treatment coverage in 3 of the 5 districts was attributed to the good leadership of the IU level programme personnel. The survey also identified some operational issues for further improvement of the MDA programme. These include better communication and coordination among national, district and PHC level programme personnel, more strengthening of district level programme management and preparation, improvement of IEC activities and directly observed treatment to improve the compliance with treatment.

Figure 2: Drug Distribution and People's Compliance Rate with Treatment Observed in an Independent Evaluation



Source: National programme to eliminate LF, Dhaka

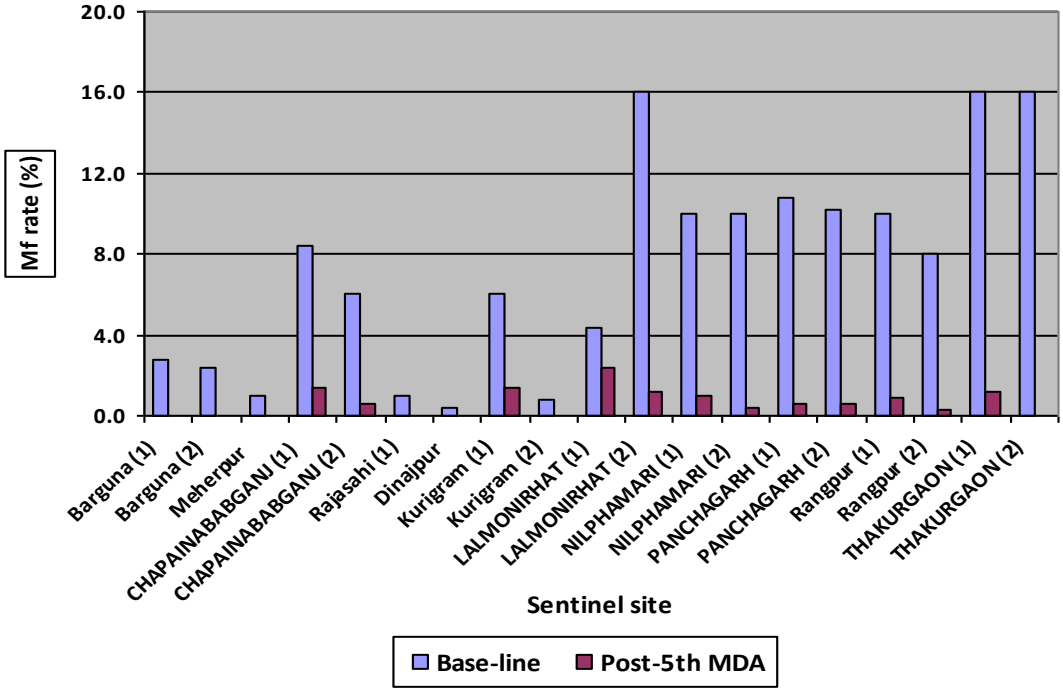
The treatment coverage surveys suggest that, while the drug distribution and people's compliance with treatment are good in some districts, they need to be strengthened in the other districts.

Monitoring and evaluation (M & E): M & E of the LF elimination programme is built and relies more on Mf surveys, probably because the Ag surveys through ICT card test is expensive and the rationale for such surveys is less clear. Also, historically the programme has been using the Mf surveys.

In almost all 19 endemic districts, at least 2 sentinel sites have been fixed for M & E purpose. While one spot-check site has been included in some low endemic districts, two spot-check sites were always included in highly endemic districts, though their evaluation is less regular. M & E activity was intensive in highly endemic northern districts of Panchgarh and Thakurgaon. In the former, since the inception of the programme in 2001, Mf surveys were carried out in sentinel sites every alternate year and in the latter every year during 2006-2009.

Man-power has always been a constraint for M & E activity. Mf surveys were carried out by the experienced technicians from the programme with the support of technical staff from other health departments. Mostly, 500 people per sentinel or spot-check site were sampled, though at times up to 1000 people were sampled to confirm the low prevalence of Mf. From each sampled person, 20 cmm of blood was collected between 8.00 and 11.00 PM. The blood smears were stained and examined by the technical staff of the programme.

Figure 3: Impact of 5 Rounds of MDA on Mf Prevalence in Sentinel Sites of 6 Districts



Source: National programme to eliminate LF, Dhaka

From M & E of the sentinel and spot-check sites, it is apparent that the MDA programme exerted tremendous impact on Mf prevalence. Data from 11 districts show that following 5 rounds of MDA, the Mf rate declined by 45% to 100%. The fall was ≥90% in 16 out of 19 sentinel sites monitored in 11 districts (Figure 3).

Six districts by 2009 and 12 districts by 2010 completed 6 rounds of MDA. Of these 12 districts, the sentinel as well as spot check sites in 8 districts showed <1.0% microfilaraemia. Out of 8 districts, in 3 districts <1.0% microfilaraemia was observed in the surveys carried out post-5th or post-6th MDA and in the other 5 districts it was observed post-4th MDA (surveys were not carried out post 5th or post-6th MDA) (Table 8) (Diagram below).

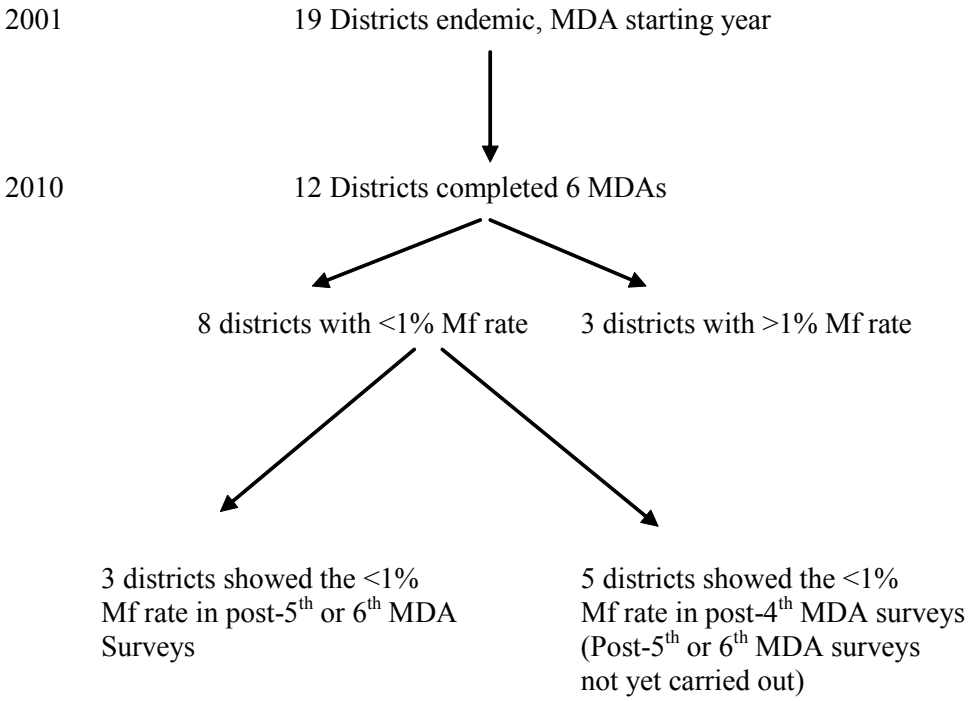


Table 8: Details of Mf Surveys Carried out in Sentinel (SS) and Spot-check (SC) Sites of the Endemic Districts

District	MDAs by 2010	Site	Base-line	Post-MDA 1	Post- MDA 2	Post- MDA 3	Post- MDA 4	Post- MDA 5	Post- MDA 6	Post- MDA 7	Post- MDA 8
Barguna	6	SS	2.8,2.4				0.0,0.0				
		SC					0.0,0.0				
Barisal	3	SS	0.6								
		SC									
Jhalokati	3	SS	0.0,0.4								
		SC									
Pathuakhali	6	SS	2.0,3.2			0.8,0.2	0.0,0.0				
		SC					0.0,0.0				
Pirojpur	4	SS	2.2,2.0	0.0,1.0							
		SC									
Chuadanga	4	SS									
		SC	0.0,0.8								
Kushtia	4	SS	0.2,0.2	0.0,0.0							

District	MDAs by 2010	Site	Base-line	Post-MDA 1	Post- MDA 2	Post- MDA 3	Post- MDA 4	Post- MDA 5	Post- MDA 6	Post- MDA 7	Post- MDA 8
		SC									
Meherpur	7	SS	1.0,0.0				0.0,0.0	0.0,0.0			
		SC									
CNababganj	7	SS	8.4,6.0		1.4			1.4,0.6			
		SC			2.8			0.0			
Pabna	4	SS	2.4,0.0								
		SC									
Rajashahi	6	SS	1.0,0.0	0.4,0.2			0.0,0.0				
		SC					0.0				
Sirajganj	5	SS	1.2,0.0								
		SC									
Dinajpur	6	SS	4.8,0.4	1.4,0.6			0.1,0.0				
		SC					0.0				
Kurigram	7	SS	6.0,0.8		2.2,0.0		1.4,0.0				
		SC					0.0,0.0				
Lamonirhat	9	SS	4.4,16.0					2.4,1.2	1.8,0.8		
		SC						1.6,0.4	1.4,0.6		
Nilphamari	8	SS	10.0,10.0				1.0,0.4	3.2,0.2		0.0	
		SC								0.6,0.2	
Panchgarh	10	SS	10.8,10.2		2.2,2.4			0.6,0.6	0.0,0.8	0.0,0.0	0.0,0.8
		SC							0.4,0.2	0.6,1.0	1.2
Rangapur	6	SS	10.0,8.0				0.9,0.3				
		SC					0.5,0.0				
Thakurgaon	6	SS	16.0,16.0	0.6,0.4	0.4,0.2	1.4,1.4	1.2,0.0				
		SC			4.0,0.6	2.0,108	0.4,0.0				

Rates shown in shaded cells reflect reduction of microfilaraemia to a level (≤1.0) at which TAS can be carried out
Source: National programme to eliminate LF, Dhaka
SS: Sentinel site; SC: Spot-check site

It may be observed that, some northern districts with high base-line Mf rate (Lalmonirhat and Panchgarh), continue to show >1.0% Mf prevalence, despite 9-10 rounds of MDA. In addition to high base-line prevalence, poor treatment coverage may also be the reason for Mf prevalence of >1.0%. Also, some adjoining pockets of a neighbouring country are without MDA, making the districts vulnerable to re-introduction of LF through cross-border movement of people.

Transmission Assessment Surveys (TASs): As considerable progress has been made with MDA, a systematic and well planned TAS activity has become imperative. At least 8 districts now and other districts in the coming years require implementing TASs (Table 8). The programme is aware of it and gearing up to intensify the TASs. It is in the process of estimating and mobilizing the human and financial resources required for TASs.

In the past (prior to LFEP) Mf surveys were carried out to understand the epidemiological situation, particularly the prevalence of LF. The implications of these MF surveys were less serious. Hence, the quality of the surveys was not a serious issue. However, the impending TASs have significant implications in terms of stopping or continuing MDA. So, the programme is concerned about ensuring the quality of the surveys. Steps are being taken to identify the personnel for surveys, sensitize and train them.

The programme is currently preparing to implement TASs in 5 districts with the support of CNTD, Liverpool, which made the ICT cards available.

Social mobilization (SM) activities: As people's knowledge of the benefits of the treatment is poor, SM and communication for behavioural impact are considered crucial for effective implementation of the programme. Development of good SM activity requires highly skilled people and its implementation is expensive. With limited resources at its disposal, the programme is able to allocate only a small portion of the money for SM activities. This led to, during different years, implementation of only sub-optimum SM activity. For example, TV messages could not be broadcast during peak viewership time.

IEC is the important component of the SM activity. Messages on MDA and morbidity management are spread through distribution of pamphlets and leaflets, display of limited number of posters, paper advertisement, radio and television broadcast of messages and documentaries, slide shows in cinema theatres. The importance and achievements of the programme are disseminated to the partners and stakeholders through meetings and publication of newsletters.

As the SM activity is essential but expensive, the support of donors is always appreciated. Every year, the JICA volunteers significantly contribute to the SM activities in the five northern districts where they work. They visit as many households as possible, distribute pamphlets and handouts, display banners and posters and festoons at hospitals, interact with health workers, make mike announcements in the streets and religious places, distribute education material to them, maintain telephone contact and send SMS messages to health workers. In 2010 alone, they distributed 40,000 leaflets, 3750 hand

outs, displayed 1600 posters in the hospitals, mike announcements in 4490 religious places. 385 health workers were sent SMS messages and 227 were contacted over mobile phone.

The support extended by USAID to IEC campaign in 2009 was found to be very effective. The films prepared under the aid attracted thousands of viewers in villages, where it was screened, and was said to have significant impact.

Morbidity management: It has been the objective of the programme to have morbidity management as a strong component of the LFEP. As part of preparation for MDA, health workers visit all the households to prepare registers with Name, age and gender details. During these visits, efforts are also made to identify the people with clinical manifestations, through physical observation and/or making enquiry with household members. The data are used to estimate the disease burden (Table 9).

Table 9: Number of People Identified with Chronic LF in Different Districts in 2009 and 2008

District	2009			2008		
	No. Affected Lower Limb Swelling	Upper Limb Swelling	Scrotal Swelling	No. Affected Lower Limb Swelling	Upper Limb Swelling	Scrotal Swelling
Barguna	828	97	1127	929	169	1223
Barisal	332	75	189	358	7	191
Jhalokati	970	148	619	1172	311	1003
Patuakhali	24	13	11	66	71	159
Pirojpur	260	6	164	265	27	158
Chuadanga	70	18	54	60	9	40
Kushtia	82	28	114	33	7	83
Meherpur	29	14	28	29	1	7
CNababganj	772	83	1296	821	-	1313
Pabna	131	3	14	144	3	9
Rajashahi	291	99	255	478	53	157
Sirajganj	32	17	57	44	26	31
Dinajpur	1307	252	2223	2203	39	3329

District	2009			2008		
	No. Affected Lower Limb Swelling	Upper Limb Swelling	Scrotal Swelling	No. Affected Lower Limb Swelling	Upper Limb Swelling	Scrotal Swelling
Kurigram	816	163	1160	843	143	685
Lalmonirhat	2793	229	2067	3672	-	3114
Nilphamari	2689	236	2130	4611	265	7620
Panchagarh	1430	183	2557	1034	112	2318
Rangpur	4555	1837	6137	5354	2006	6579
Thakurgaon	2498	604	4600	2859	683	5225

Source: National programme to eliminate LF, Dhaka

In a unique initiative, the Bangladesh programme, in collaboration with an NGO – Institute of Allergy and Clinical Immunology of Bangladesh (IACIB) – and utilizing a grant from the Government of Japan and Bangladesh, was able to establish an exclusive Filaria hospital. It was established in 2001 and located in Syedpur, Nilphamari district, a part of highly endemic northern region. The hospital is able to provide support and train thousands of affected people every year. Since 2003, a total of 39,576 filariasis patients received medical treatment including hydrocelectomy at an affordable cost at the hospital. The patients from different parts of the country visit the hospital to seek treatment and the hospital has constraints in meeting the demand for services. To meet the growing demand, the hospital has used a second grant of US$85,848 in 2009 from the Japanese government to renovate the current building and add additional space. This hospital also receive grant from Govt of Bangladesh through Filariasis Elimination Programme.

There are 6 regional health facilities, 64 district level and 517 health centre level facilities with skilled staff, who can train the patients with chronic disease on morbidity management. The services provided by government hospitals and Filaria hospital are summarized in Table 10.

Table 10: In-patient Services Provided to the Affected by Government Hospitals and Filaria Hospital

Year	Government hospital		Year	Filaria Hospital	
	Lymphoedema	Hydroelectomy		Lymphoedema	Hydroelectomy
2003-04	476	272	2003	893	31
2004-05	1799	200	2004	1475	185
2005-06	4054	443	2005	2581	442
2006-07	7908	9884	2006	3040	165
2007-08	2015	273	2007	3947	109
2008			2008	83	285
2009	947	556	2009	89	213

Source: National programme to eliminate LF, Dhaka

Training activities: Training and refresher courses every year for the health personnel has been an integral part of the programme. Every year, hundreds of personnel are trained on morbidity management and thousands of volunteers and health personnel on MDA programme (Table 11).

In 2008 and 2009 a total of 1090 and 880 sessions were held respectively to train the staff on MDA and 14 and 6 sessions were for training on morbidity management.

Table 11: Details of Training Imparted on MDA and Morbidity Management at Various Levels of Programme during 2008 and 2009

Programme Level	No. of Personnel Trained			
	2008		2009	
	MDA	MM	MDA	MM
National	-	-	200	-
Provincial	-	-	-	-
District	1400	420	362	61
Sub-district	32,250		35007*	

MM: Morbidity management programme
*Includes 24,610 volunteers, 520 doctors, 3,310 formal and non-formal leaders and Imama and RMPs, 1510 SACMO, /MA/FWX and nurses.
Also trained were 350 medical technologists on Mf surveys
Source: National programme to eliminate LF, Dhaka

Partners: The PELF attracted the attention of various national and international stakeholders and it has established partnerships with many organizations. The programme

continues to receive technical and financial support from the WHO. GSK has been donating, through the WHO, the Albendazole tablets required for the programme.

In support of Bangladesh's commitment, the U.S. Agency for International Development's (USAID's) NTD Control Program began providing support since 2008. This support is channelled through RTI international to the national NTD program. In 2009, RTI has worked with the national program to produce locally the information, education and communications materials in support of the MDA campaign. These materials include an informational video, television and radio spots, mobile film projections, and program flyers, promoting compliance with the MDA and educational information on preventing NTD infections.

CNTD, Liverpool, has supported MDA programme in 3 districts until 2008. It is now supporting the programme to undertake TASs in 5 districts. Under the support, ICT cards and training will be provided.

JICA has deputed four JOCVs and one coordinator to support the programme in highly endemic northern districts. The volunteers closely interact with people, implement intensive IEC activities, motivate the health workers and train the people affected with chronic disease in managing their condition. JICA also donated 60 million DEC tablets in 2005, 40 million in 2006.

LEPRA Bangladesh participated in social mobilization in few districts up to 2008 and is expected to expand their activities.

Bill and Melinda Gates foundation provided DEC tablets during 2001-04.

4.1.4 Challenges

- The hitherto low priority activity, M& E and surveillance will be an important activity for the next five years. Their implementation requires programme attention and reorientation, without diluting the needs of the MDA programme.
- Precise determination of endemicity in 15 districts - considered to be very low endemic - and implementation of MDA as soon as possible, if necessary, is required as further delay may prolong the time line of the programme.
- Sustainability and improvement of MDA in terms of treatment coverage is required in the districts, where implementation of the programme is less effective and in the northern districts, where Mf levels are >1%, despite 9-10 rounds of MDA.
- Improvement in quality of data collection, good record maintenance and timely analysis and dissemination of results will facilitate quantification of hard work done by the programme, robust decision making on stopping the MDA and advocacy for the programme.
- The national and international partners should be engaged until the final goal is achieved.

- Mechanisms need to be developed to work with the neighbouring countries to thwart the introduction of infection through border areas.

4.2 Soil Transmitted Helminth (STH) Infections

4.2.1 Background

The STHs cause significant morbidity in many communities and impair growth and development of children.

The parasite and life cycle: The major STHs that impact humans include round worm (*Ascaris lumbricoides*), whip worm (*Trichuris trichiura*) and hook worm (*Ancylostoma duodenale* and *Necator americanus*). The adult parasites live in the intestine. Their eggs are shed into the environment along with faeces. When humans come into contact with contaminated soil, vegetation and water, the eggs/larvae gain entry into the body. They undergo development and finally develop into adult worms. The worms might feed on food from the human host or attach themselves to the intestinal lining and live off the blood of the host.

Disease burden: Globally, an estimated 4.5 billion individuals are at risk of infection and 807 million were infected with round worm, 604 million with whip worm and 576 million with hook worm (Bethony et al., 2006, Lammie et al., 2006, Hotez et al., 2008). It is estimated that 450 million children fall ill and 44 million pregnant women get affected due to infection with STH. The disease burden is estimated at 4.7-39.0 million DALYs. Children are disproportionately affected by STH infection and a considerable proportion of them were found with heavy infection, leading to impairment of growth, cognition and education. Hook worm and whip worm infection also cause iron deficiency anaemia (Bethony et al., 2006, Smith and Brooker, 2010).

Distribution: Endemicity levels are particularly high in Africa, Asia and Latin America. Almost all low-income countries are severely affected by the disease. Very high prevalence and intense infections are more common in impoverished areas, characterized by poor sanitary conditions and water resources and overcrowding.

Clinical manifestations: STH cause a range of clinical manifestations and morbid conditions. These include malabsorption of nutrients, disturbed nutritional equilibrium, abdominal pain, intestinal bleeding, loss of appetite, impaired physical and cognitive development and anemia. Pregnant women with anemia, which is mainly caused by hook worm infection in low-income countries, are three and half-times more likely to die during child birth than women with no anemia (Brooker et al., 2008). The severity of the disease is determined more by the worm burden (Anderson and May, 1991; Albonico et al., 1999).

Diagnosis: Kato-katz technique is widely used to diagnose the helminthiasis. The technique envisages microscopic examination of fixed quantity of faecal material and

enables estimation of number of eggs, an indicator of the adult worm burden (Montresor et al., 1998).

Control options: Preventive chemotherapy is the strategy recommended by the WHO to reduce the transmission of STH and the morbidity. As the prevalence of STH is high in developing countries, treatment of the entire at risk population at regular intervals throughout their lives is the ideal option. The drugs recommended by WHO for preventive chemotherapy are Albendazole, Mebendazole, Levamisole and Pyrantel (WHO, 2006a). The burden and impact of STH is disproportionately high in school-age children. Intervention targeting the children would substantially reduce the burden of infection in community, including in those of treated as well as untreated. Various efforts to treat the children led to emergence of school based MDA strategies and programmes. In the year 2001, WHA passed a resolution urging nations to implement regular deworming of at least 75% of all at risk school-age children. Deworming is recommended at yearly interval. However, in highly infected communities, treatment is recommended at 6 months interval. Pre-school age children, since they start crawling, are also at risk of infection. Treatment will benefit these children also (WHO, 2006a).

The outcome of the MDA programmes will be optimum if supported by improvement in sanitation, particularly use of latrines. Behavioral change in terms of soap washing of hands before eating food and after using toilet will be very useful (WHO, 2006a).

4.2.2 Epidemiology and control in Bangladesh

Historically, the prevalence of STHs in Bangladesh is among the highest in the world. Studies carried out in various parts of the country showed very high prevalence (Table 12).

Table 12: Prevalence of STH Observed in Various Studies

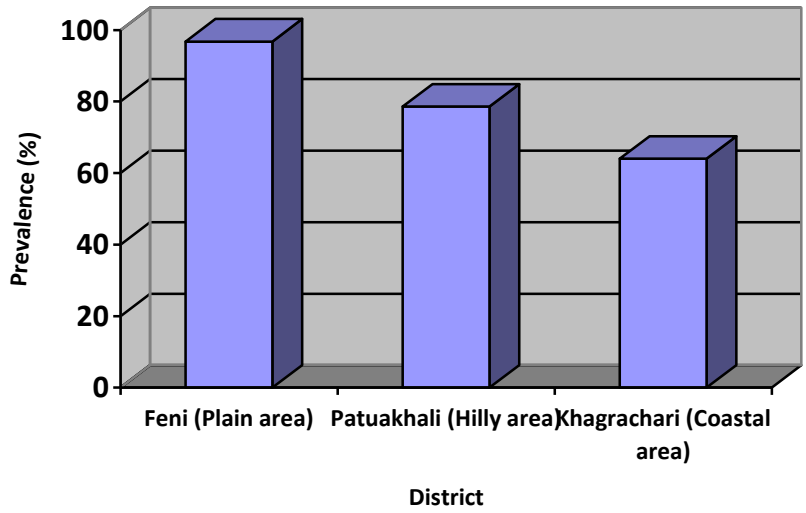
Place	No. Sampled	Age Group	Prevalence (%)			Author
			Ascaris Lumbricoides	Trichurus Trichurus	Hookworm	
Dhaka	933	University students	39	11		Muttalib et al., 1975
	203	0.5-15	68	56	53	Martin et al., 1983
Barisal			48	66	43	Islam et al., 1984
Dhaka	343	<6				Stanton et al., 1989
Dhaka	880		89			Hall et al., 1992
UAE			33			Ibrahim et al., 1993
	1402	2-6	71	44	10	Rousham & Mascie-Taylor, 1994

Place	No. Sampled	Age Group	Prevalence (%)			Author
			Ascaris Lumbricoides	Trichurus Trichurus	Hookworm	
	1765		64-95			Hall et al., 1999
	123	2-5	78	65	4	Northrop-Clewes et al., 2001
		All	55	46	35	de Silva et al., 2003
Nasirnagar	1480		----------90----------			Anonymous, 2009
All parts	8140		20	3		Khatun & Nahar, 2006
Nasirnagar	1480		----------81----------			Anonymous, 2009
Dhaka	251		----------47----------			Thomas et al., 2010

4.2.3 STH control programme

Responding positively to the WHA resolution 54.19 passed in 2001, Bangladesh has been making consistent efforts towards establishing a national STH control programme. To begin with, a study was carried out in the year 2005, with the support of the WHO, in three districts viz., Feni, Khagrachari and Patuakali, representing plain, hilly and coastal area, to understand the prevalence of STH infection and impact of intervention measures. In each district 5 schools were selected. From the schools in the 3 districts, 285, 250 and 257 (total = 792) children were examined for STH infection. Stool samples were collected and examined using Kato-katz technique. The survey revealed that, overall, 79.8% of children were infected, 43.6% and 16.2% had moderate to heavy intensity of round worm and whip worm infection respectively. The district-wise infection rates are given in Figure 4 (DGHS, 2008, 2009).

Figure 4: Prevalence of STH Infection in Three Districts in 2005



Source: National STH Control Programme, Dhaka

The school children were treated with three rounds of MDA at six months interval. Further evaluation showed that, after three rounds of MDA, the STH prevalence declined from 79.8% to 20.2% (DGHS, 2008, 2009).

Following the study and encouraging results, efforts have been made to develop a national programme. As a first step, on a pilot scale, a school-based MDA programme was implemented in 2005 in three districts. During 2006-07, the programme was extended to 16 districts and by May 2008 to 24 districts. A national programme was formulated, approved and included in the National Guideline and Strategy for Prevention, Control and Elimination of Parasitic Diseases in Bangladesh in September 2008. The salient features of the programme are:

- MDA to elementary school children (1-5 classes or 5-12 age-group) will be initiated in all 64 endemic districts.
- As envisaged by WHO, priority will be given to cover 75% to 100% of the school-age children.
- On account of high endemicity, MDA activity will be carried out twice a year.
- Every year, school based MDA programme will be implemented for a week starting on 2 May and 1 November, designated as National De-worming Week.
- MDA for Filariasis is also implemented on 1 November every year, so efforts are made to integrate MDA activity for STH control and LF elimination programme.
- Albendazole (400 mg) and/or Mebendazole (500 mg) will be used in the MDA programme.
- The programme will be implemented in close collaboration with the Department of Primary Education.

- Teachers, in collaboration with health service personnel, will supervise, implement and participate in the MDA programme.
- Efforts will be made to provide adequate sanitary facilities and health education on behavioural change in all schools.

MDA programme: The first national deworming day was observed on 1 November 2008. Subsequently the programme was implemented every six months. From 2011 onwards, the duration of the de-worming programme is extended to one week, from the duration of one day so far (National de-worming Day). The most recent MDA was implemented over a period of one week, starting from 1 November 2010.

The entire programme is coordinated by the Disease Control Unit of the DGHS. District and upa-zila level programme managers were made responsible to coordinate the programme. All schools run by the Government, Community, NGOs, private managements and kinder garden schools and Madrasas took part in the programme.

More than 19 million children studying 1-5 standard, or aged 5/6-10/11 were targeted during the 5 rounds of MDA programmes in 2008-2010. The treatment coverage reported, compiled on the basis of reports submitted by the IUs, ranged from 94% to 98% (Table 13). These treatment coverage figures are considered to be higher and based on the number of tablets distributed.

Table 13: Details of MDA Programme and Reported Coverage

Month	Year	No. of Districts	No. of Schools	No. of Students Targeted	Treated	Treatment Coverage
November	2008	64	92,270	15,743,159	15,482,778	94
May	2009	64	92,270	19,303,404	19,101,496	98
November	2009	64	92,274	19,303,404	18,782,212	97
May	2010	64	92,289	19,837,612	19,440,860	98

Source: National STH Control Programme, Dhaka

Treatment coverage survey: An independent treatment coverage survey was carried out by the programme in collaboration with CDC, Atlanta. The survey was carried out in 2 (Lakshmipur & Munshiganj) of the 12 districts, which have been receiving Mebendazole provided by Johnson and Johnson. Two upazilas were randomly selected from each district for the survey. The objectives of the survey were (a) to estimate the treatment coverage and (b) identify opportunities for strengthening monitoring capacity and data use within the STH control programme. The survey included children for treatment coverage, households for assessing the source of drinking water, availability and type of latrines and school survey for availability and use of latrines, availability of hand wash arrangement and source of drinking water.

The survey showed that, as expected, the treatment coverage is 17-19% less than the reported coverage (Table 14). Notably, 85% of school attending children in Munshiganj and 86% in Lakshmipur received at least one treatment in a year. 82% of schools in Munshiganj and 87% in Lakshmipur have hand washing facility.

Table 14: Reported and Survey Coverage under School MDA Programme in two Districts in 2009

District	Distribution Date	School Attending			Children (6-14)		Non-school Children	
		N	RC	SC	N	SC	N	SC
Munshiganj	May	285	69	52	357	46	21	10
	November	291	71	54	365	47	23	9
Lakshmipur	May	266	83	64	368	51	44	11
	November	268	97	68	369	55	44	9

RC: Reported coverage
SC: Survey coverage
Source: Report of the Process Evaluation of Bangladesh's STH Treatment Monitoring System, Children without Worms

Impact of the programme: An indication of the impact of the school-based MDA programme is available from a study carried out by Haque and Mondal (Dr. Dinesh Mondal, personal communication, 2011). The study was carried out in Trishal upazila in Mymensingh district after 4 rounds of MDA. The study population included students studying III-V standard (8-10 year age-group) in 15 public primary schools of 13 unions of the upazila. The overall prevalence in the children of *A. lumbricoides*, *T. trichiura*, hook worm and *Strongyloides stercoralis* was 32.0%, 6.1%, 0.6% and 0.2% respectively. The prevalence varied widely across different unions and the highest prevalence of *A. lumbricoides* and *T. trichiura* recorded was 44% and 25% respectively. However, the overall prevalence was much less than that reported by many studies including the one conducted by the National programme (Figure 4). These lower rates are obviously due to the impact of the school based MDA programme against the STHs (Dr. Dinesh Mondal, personal communication, 2011).

Advocacy: The DCU involved all stakeholders of the programme through advocacy. The most important stakeholder is the Department of Primary School Education, as the programme is implemented through schools. The department allowed the teachers to be trained on the programme and encouraged them to actively participate in the programme. Also sensitized were the local bodies, responsible for health and education in urban areas. Community leaders, NGOs, CBOs, Local government institutions and health and education sector worked together.

IEC: An IEC campaign was launched to promote knowledge and educate on risk factors and prevention of STH. As part of this, posters were printed and displayed in all schools.

The campaign focused on use of sanitary latrines, wash hands before eating and after use of toilet, wash fruits and vegetables thoroughly before eating, cut nails regularly, use foot-ware and take de-worming tablets.

The importance of the programme is propagated through docudrama, TV spot, Radio jingles, News papers, for 2-3 weeks prior to National de-worming day. In rural areas, film shows were organized. The print and electronic media personnel were also sensitized.

Training: Of the approximate number of 500 teachers per upazila, the programme was able to train 40 teachers per upazila on the MDA programme. The 40 trained teachers imparted training to other teachers in their respective schools. Each school is given one training manual. It is opined, by the programme and teachers, that good training of more teachers and distribution of more manuals have the potential to improve the programme substantially.

Partnership: A lot of partners extend direct or indirect support to STH control programme. The partners and their area of support are listed in the Table.

Table 15: List of Partners and their Support to the Programme

Partner	Area of Support
BRAC, Dhaka	Social mobilization
CARE, Bangladesh	Social mobilization
Centre for Disease Control, USA	Advocacy & Monitoring & Evaluation
Children without Worm, USA	Donation of Mebendazole for 13 districts
City Corporation, Dhaka, Barisal, Khulna, Rajashahi, Chittagong & Sylhet	Drug distribution
Department of Public Health Engineering	Sanitation improvement
Institute of Public Health Nutrition	Nutrition promotion
Institute of Allergy and Clinical Immunology of Bangladesh	Research & Social mobilization
Johnson and Johnson, USA	Donation of Mebendazole tablets
LEPRA, Bangladesh	Social Mobilization
Local Government Engineering Department, Dhaka	Sanitation improvement
National Institute of Preventive and Social Medicine, Dhaka	Research & Policy
NGO Forum for DWSS, Dhaka	Improvement of sanitation & drinking water supply
Save the Children, USA	Advocacy, drug distribution & Vitamin A & Iron supplementation programme in Meherpur district
United Nations Children Emergency Fund	Advocacy, Policy
USAID	Social mobilization, Advocacy
World Food Programme	Advocacy, De-worming & Distribution of Biscuits

Source: National STH Control Programme, Dhaka

4.2.4 Challenges

- Improvement of treatment coverage from the present levels is required to have an optimum impact of the MDA programme.

- Development of a strategy to treat the children who are not going to school and also the children of 13-14 years, most of who are in high schools (not in elementary schools).
- Teachers are important partners and exhibited enthusiasm in the programme. More robust training of the teachers is needed.
- Training and IEC campaign require considerable strengthening.
- The monitoring and evaluation system needs to be established.
- Development of a good reporting system and data management is a major issue.

4.3 Visceral leishmaniasis (VL)

4.3.1 Background

VL, commonly called as Kala-azar (KA), is a systemic disease caused by protozoan parasite, *Leishmania donovani* complex and transmitted by sand flies

Parasite and life cycle: VL is transmitted by the bite of female sand flies. The sand flies inject the infective stage, promastigotes, during the blood meal. Promastigotes at the site of wound are phagocytized by macrophages and transform into amastigotes. Amastigotes multiply in infected cells. Sand flies become infected when ingest blood with macrophages infected with amastigotes. Within the sand fly, the parasites amastigotes develop into promastigotes, which multiply and migrate to proboscis.

Burden: Although VL occurs in 88 countries, >90% of the cases are in India, Bangladesh, Nepal, Sudan and Brazil. Globally, an estimated 350 million are at risk (Desjeux, 1992), there are 2.5 million cases of VL and annually 500,000 new cases occur (WHO, 2009b). In south-east Asia, 147 million people in 109 districts are at risk of infection (WHO, 2009a).

Distribution: VL is endemic in 88 countries in Asia, east and North Africa, Latin America and Europe. . – *L. donovani sensu strict* is prevalent in the Indian sub-continent and East Africa and *L. infantum* in Europe, North Africa and Latin America (Lukes et al. 2007; Mauricio et al., 2000). The disease is confined to four countries, India, Bangladesh, Nepal and Bhutan in the Indian sub-continent. In Bangladesh, 45 districts are endemic. Nearly 54% of the total cases are reported from one district, Mymensingh. Three other districts – Pabna, Tangail and Jamalpur account for 25% of the cases.

Clinical manifestations: The major clinical manifestations include fever, anemia, hepatomegaly, splenomegaly and loss of body weight. Often, mortality rate is very high, at times reach 80-100%, if untreated (Ahluwalia et al., 2003).

Diagnosis: A person from an endemic area and affected with fever lasting >2 weeks and with splenomegaly is suspected of infection with VL. Patients with these symptoms should be screened by rK39, which is a rapid immunodiagnostic method (WHO, 2008a). DAT (not currently in use in Bangladesh) is also a sensitive diagnostic method.

Confirmation of kala-azar can be done by examination of spleen / bone marrow aspiration and is a gold standard method.

Control options: Mostly, combination of vector control, robust detection and treatment of cases and treatment of post-kala-azar dermal leishmaniasis (PKDL) cases are essential to achieve the control and elimination of VL. The malaria vector control operations of 1960s, which used indoor residual spray of DDT as the main control option, had resulted in very appreciable control of sand flies, leading to almost total control of VL. This suggests that vector control is a very effective tool. However, with the withdrawal of the control operations, VL staged a resurgence, from the residual infection in PKDL cases. Insecticide resistance, particularly to DDT, has also emerged as a major problem. Parasite resistance to drugs and poor compliance of people with treatment on account of its prolonged duration and costs are the limitations of the treatment strategy. Hence, an integrated control/elimination strategy is recommended by WHO for the elimination of LF (WHO, 2009a)

4.3.2 Epidemiology and control in Bangladesh

VL was first described in 1824 in Jessore district, Bengal, which is now in Bangladesh. An epidemic that occurred in Jessore during 1824-27 reportedly caused 75,000 deaths. The disease gradually spread to the other parts of Bengal (Sanyal, 1985). Several VL epidemics were reported between 1820s and 1940s.

Historically, Rajashahi, Dinajpur and Jessore were the most affected districts. The malaria control programme of 1950s and 1960s, using indoor residual spray of DDT, almost eliminated KA from the Indian sub-continent. However, within few years of cessation of malaria control operations, KA returned, possibly from the residual infection in Post-kala-azar Dermal Leishmania cases (PKDL) cases. Sporadic cases have been reported in 1970s and by 1980 cases were reported from at least 7 districts. The most affected districts in 1980s are Sirajganj, Pabna, Mymensingh, Rajashahi and Tangail. During 1993 to 2009, cases are reported from many districts (Tables 16 and 17).

Table 16: Prevalence/Incidence of Cases Reported from Various Studies

	VL Prevalence	PKDL Prevalence	VL Incidence	Reference
	3.6%	0.35%	85/10,000(2004)	Rahman 2010
			45/10,000(2007)	-do-
Trishal, Mymensingh		6.2/10,000		Mondal et al., 2010
			109/10,000	Hirve et al., 2010
Fulbaria,			2/100	Ahluwalia et al., 2003

	VL Prevalence	PKDL Prevalence	VL Incidence	Reference
Mymensingh				
Nodipar		7.3/1,000		ICDDRB, 2007
Madhyopara		5.0/1,000		-do-
Lakshmipur		3.2/1,000		-do-
Brahminbari		5.3/1,000		-do-
Mymensingh			300/10,000	Bern & Chowdhury, 2006
Trishal, Mymensingh	4.4 (sero-positivity)			Chowdhury et al., 1993
Shajadpur	6.75 (-do-)			-do-
Teknaf (non-endemic)	0.34 (-do-)			-do-
Trishal, Mymensingh	27.8/10,000			DGHS, Bangladesh, 2009
Fulbaria, Mymensingh	15.5/10,000			-do-
Gafargaon, Mymensingh	7.0/10,000			-do-
Bhaluka, Mymensingh	7.3/10,000			-do-
Muktaghacha, Mymensingh	7.1/10,000			-do-
Sadar, Gazipur	6.3/10,000			-do-
Madarganj, Jamalpur	3.3/10,000			-do-
Godagiri, Rajashahi	3.3/10,000			-do-

Currently 139 upazilas in 45 districts are endemic for VL (Annexure 1) and 65 million are at risk (Joshi et al., 2008). Nearly 54% of the cases are from Mymensingh district. Three other districts, Pabna, Tangail and Jamalpur, account for another 25% cases. On an average 10,000 cases are detected and treated annually. Eight upa-zilas of the county, 5 of them in Mymensingh district, are hyper endemic with >2.5 cases per 10,000

population (Table 16, Annexure 4). The endemicity levels in moderate and low endemic districts is summarized in Annexure 5.

The younger age-groups, people in mud houses, those not using nets, those with malnutrition, sleeping on floor are at higher risk of VL. Risk of infection is higher during rainy season (Rukunuzzaman and Rahman, 2008; Bern and Chowdhury, 2006, Chowdhury et al., 1993) and in those living close to the cases (Bern et al., 2007, 2005). Young adults (>20 years) have higher prevalence. Female patients are prone to more prolonged illness (Ahluwalia et al., 2007, Ahluwalia et al., 2003).

Table 17: Reported Number of Cases and Deaths due to KA

Year	No. Reported KA Cases	Deaths
1999	5,799	23
2000	7,640	24
2001	4,283	6
2002	8,110	36
2003	6,113	27
2004	5,920	23
2005	6,892	16
2006	9,379	23
2007	4,498	16
2008	4,861	18
2009	4,293	13

Source: Directorate General of Health Services, Dhaka

4.3.3 VL elimination programme (VLEP)

Under the auspices of the WHO-SEARO, a regional VL elimination strategy was endorsed in 2005. The health ministers of Bangladesh, India and Nepal signed a Memorandum of Understanding to enhance inter-country and cross-border collaboration. The objectives of the VLEP is to reduce the incidence of cases to <1 per 10,000 population at the sub-district level and reduce the case fatality rate and treatment of PKDL and prevention and treatment of VL HIV-TB co-infections. The strategy recommended for KA elimination is (a) early diagnosis and treatment (b) integrated vector management (c) effective surveillance system (d) social mobilization and partnerships (5) operational research (WHO, 2009a).

The M0HFW resolved to eliminate VL by 2015 and instituted the VLEP in 2007. It constituted a national steering committee headed by the Honourable Minister of Health and Family Planning and a technical working group formed to provide all necessary support to the programme. A strategic plan and pilot district level operational plans have been developed in 2005. High priority has been given for capacity building at all levels and different categories of health workers (doctors, medical technologists, sprayers and field workers) were trained. In 2009 alone, 468 doctors, 1988 field workers and 80 medical technologist were trained. National guidelines and a training module and SOPs for vector control, with emphasis on spraying technique and methods, have been developed. Modules were developed also on diagnostic procedures. A booklet has been brought out for health workers. Also developed were patient registers, treatment cards, laboratory registers, laboratory advice forms, patient referral forms and IEC material have been developed (WHO, 2009b). The elimination programme was initiated on a pilot scale in Trishal upazila, Mymensingh district in 2006.

In a significant development, some important steps have been taken to take forward the VLEP. Earlier, the treatment of kala-azar primarily depended on Sodium Antimony Gluconate injection (SAG), with which side effects, drug resistance and compliance with treatment have become major problems. Miltefosine, which is the first oral drug for VL, has been registered for use in 2008. A more sensitive diagnostic tool, rk39 has been recommended and is being used in the pilot project. Disease burden studies, mapping of the disease and entomological spot checks have been carried out as preparatory activities. By 2009, the elimination of KA has been intensified in 6 districts (Gazipur, Tangail, Jamalpur, Mymensingh, Rajshahi and Sirajganj) and it is proposed to accelerate in other districts.

The progress of the VLEP is less impressive, compared to the other programmes. This was due to procedural delays in procurement of insecticides, diagnostics and other materials. The locally manufactured and procured drug Miltefosine was found to be poorly effective. Due to lack of insecticides, the vector control, an important component of the programme, could not be implemented (WHO, 2009b).

Operational research: There are several operational issues in VLEP (Chappuis et al., 2007). However, the programme is supported by excellent research work within the country and region, which provided valuable inputs. These studies addressed the issues of disease knowledge, burden estimation, surveillance, costs of treatment and vector control etc..

People's knowledge of disease is poor, only 30% in Bangladesh identified fever as the important symptom of the disease, probably contributing to delay in seeking treatment. Only 21% are aware of sand fly involvement in transmission (Mondal, 2009).

The true burden of VL remains a subject of discussion. It is acknowledged that the kala-azar surveillance system in Bangladesh and also in other countries of the sub-continent is weak. The number of cases reported by the programme is mostly based on passive

surveillance system and ranged from 9,379 in 2006 to 4,263 in 2009 (Table 17). A multi-site study showed that active surveillance can contribute to detection of 49.28% (37.48-61.08 95% CI) more cases and the incidence of infection is 27.0 (21-33 95% CI). The detection of new cases through active surveillance is higher in districts with less well developed health services. On average, a health worker needs to visit 267 houses and spend 3-4 days to detect a new KA case (Mondal et al., 2009). In another study, house to house screening increased the detection of new cases by 60% (Hirve et al., 2010). Recent studies estimated VL burden at 21 cases/10,000 population in Indian sub-continent (Bangladesh, India and Nepal). Extrapolation of this incidence suggests that there are an estimated 420,000 cases per 200 million at risk population in the subcontinent (Joshi et al., 2008). Detection of one case costs US $ 172 (Hirve et al., 2010). While detection and diagnosis of PKDL cases also involves a lot of resources, it was shown that case detection by well trained village volunteers is feasible and very robust. They detected 6.2 cases per 10,000 population (Mondal et al., 2010). KA elimination has been shown to be a good investment (Adhikari et al., 2010).

Efforts are being made to develop a new diagnostic tool, rk28 (Dr. Dinesh Mondal, personal communication). Prior to treatment, patients average 7 visits to 6 different providers, with at least one visit to sub-district hospital. Median direct expenditure for one VL patient on treatment was US$87, and median income lost was $40. Median total expenditure was 1.2 times annual per capita income of the study population (Anoopa Sharma et al., 2006). The public health-care sector was preferred for treatment. Delays between onset of symptoms and diagnosis as well as start of the treatment were high. Reported non-adherence to treatment was particularly high in the more under-served districts and was mainly due to lack of resources (Mondal et al., 2009).

Mondal et al. (2008) highlighted that there was no vector-control activity in the nine most kala-azar-endemic districts of Bangladesh and attributed this to inadequate human resources, lack of logistics, and unavailability of funds for vector control. This may hinder achieving KA elimination by 2015.

The Indoor residual spray (IRS) and Long lasting insecticide treated nets (LLINs) were shown to reduce sand-fly density significantly (Joshi et al., 2009). The dipping programme, supported by communities and public health staff is feasible and well accepted and achieved a coverage of 98.2% and 96.2% of the nets. The LLINs were able to reduce sand fly densities by about 60% for a period of 18 months (Mondal et al., 2010). The use of IRS and LLIN costs US $5.9 and US $4.5 respectively and cheaper than the environmental management of vectors, which costs US$ 8.7 (Das et al., 2008).

The above studies suggest the excellent collaboration between the research community and the programme.

4.3.4 Challenges

- Mobilization of financial and human resources required to intensify and expand the programme to all endemic districts.

- Timely procurement of quality drugs, diagnostics, insecticides and spraying machines is a major issue for the programme
- Improving the case detection and treatment
- Phasing out of SAG for treatment and its replacement with Miltefosine and use of rk39 for diagnosis
- Institution of vector control
- Development and implementation of Behvioural Change Communication

4.4 Leprosy

Bangladesh had achieved elimination of leprosy by 1998 and the number of cases has been reduced to <1.0 per 10,000 population in the country. Currently, the National Leprosy Elimination Programme (NLEP) is working on achieving the target of <1.0 case per 10,000 population at district level. The disease has been declining at a very slow pace and the Grade 2 deformity stand at 12%, which needs to be reduced to <5.0%. Many NGOs continue to show interest in NLEP. The profile of the newly detected cases is shown in the Table.

Table 18: The Profile of the Newly Detected Leprosy Cases in Different Divisions of Bangladesh during 2008 and September 2009

Division	Year	No. of MB Cases	No. of PB Cases	Total	Prevalence / 10,000 Population
Barisal	2008	13	-	13	0.01
	2009	15	1	16	0.01
Chittagong	2008	378	197	575	0.20
	2009	260	208	468	0.20
Dhaka	2008	522	525	1,047	0.22
	2009	477	693	1,170	0.26
Khulna	2008	83	15	98	0.06
	2009	39	14	53	0.04
Rajshahi	2008	978	820	1,798	0.52
	2009	747	1,176	1,923	0.56
Sylhet	2008	294	103	397	0.50
	2009	179	125	304	0.27
Total	2008	2,268	1,660	3,928	0.27
	2009	1,717	2,217	3,934	0.29

Source: Directorate of Health Services, Dhaka

5. Gap Assessment

Human resources: Mobilize adequate human resources required for implementation and monitoring and evaluation of the programmes. Improve their skills and sensitize them with regard to importance of various activities undertaken. Ensure continuity and availability of the experienced personnel for optimum implementation of the programme.

Financial resources: Estimate the financial resources required for optimum implementation of various components of the programme and ensure their timely transfer to the end points. Draw the plans to mobilize additional resources wherever required.

Procurement: Improve the system of procurement of drugs, diagnostics, and insecticides to minimize the delays in the implementation of the programme

Monitoring and evaluation and surveillance: As the programmes mature, draw comprehensive plans to have in built Monitoring and evaluation and surveillance system. Identify, reorient and train the personnel required for the system.

Data management: Improve the data management and report and writing system. It is vital for decision making on the programme activities, account the volume of work done and efforts put in and dissemination of results to the stakeholders.

Behavioural Change Communication: Develop mechanisms, including resource mobilization, to develop and implement an optimum BCC package.

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Annexure 1: NTD Status of Various Districts

Division	District	LF	VL	STH	Leprosy
Barisal	Barguna	x	x	x	
	Barisal	x		x	
	Bhola		x	x	
	Jhalokati	x		x	
	Patuakhali	x	x	x	
	Pirojpur	x		x	
	Total	5+0	3	6	x
Chittagong	Bnadarban	-		x	
	Brhmanabaria			x	
	Chandpur		x	x	
	Chittagong			x	x
	Comilla		x	x	
	Cox's Bazar			x	
	Feni	-		x	
	Khagrachari			x	x
	Lakshmipur	-		x	
	Noakhali			x	
	Rangamati			x	x
	Total	0+3	2	11	3
Dhaka	Dhaka	-	x	x	x
	Faridpur		x	x	
	Gazipur	-	x	x	
	Gopalganj	-	x	x	
	Jamalpur	-	x	x	
	Kishoreganj		x	x	
	Madaripur		x	x	
	Manikganj		x	x	
	Munshiganj	-	x	x	
	Myemensingh		x	x	
	Narayanganj	-	x	x	
	Narasingdi	-	x	x	

Division	District	LF	VL	STH	Leprosy
	Netrakona		x	x	
	Rajbari		x	x	
	Shariatpur			x	
	Sherpur		x	x	
	Tangail		x	x	
	Total	0+7	16	17	1
Khulna	Bagerhat	-		x	
	Chuadanga	x	x	x	
	Jessore		x	x	
	Jhenaidah	-	x	x	
	Khulna		x	x	
	Kushtia	x	x	x	
	Magura		x	x	
	Meherpur	x	x	x	
	Narail	-	x	x	
	Sakhira			x	
	Total	3+3	8	10	x

Division	District	LF	VL	STH	Leprosy
Rajashahi	Bogra	-	x	x	
	CNababganj	x	x	x	
	Jaipurhat		x	x	x
	Pabna	x	x	x	
	Naogaon		x	x	
	Natore		x	x	
	Rajashahi	x	x	x	
	Sirajganj	x	x	x	
	Total	4+1	8	8	1
Rangpur	Dinajpur	x	x	x	x
	Gaibandha		x	x	x
	Kurigram	x	x	x	
	Lalmonirhat	x	x	x	x
	Nilphamari	x	x	x	x
	Panchagarh	x	x	x	
	Rangpur	x	x	x	x
	Thakurgaon	x	x	x	
	Total	7+0	8	8	3
Sylhet	Habibganj	-		x	
	Maulvibazar			x	
	Sunamganj			x	
	Sylhet			x	
	Total	0+1	0	4	x
	Grand total	19+15	45	64	10+

X indicates endemic for the infection
- Very low endemic
Source: National Programme to Eliminate LF; Directorate General of Health Services, Dhaka; WHO, Bangladesh

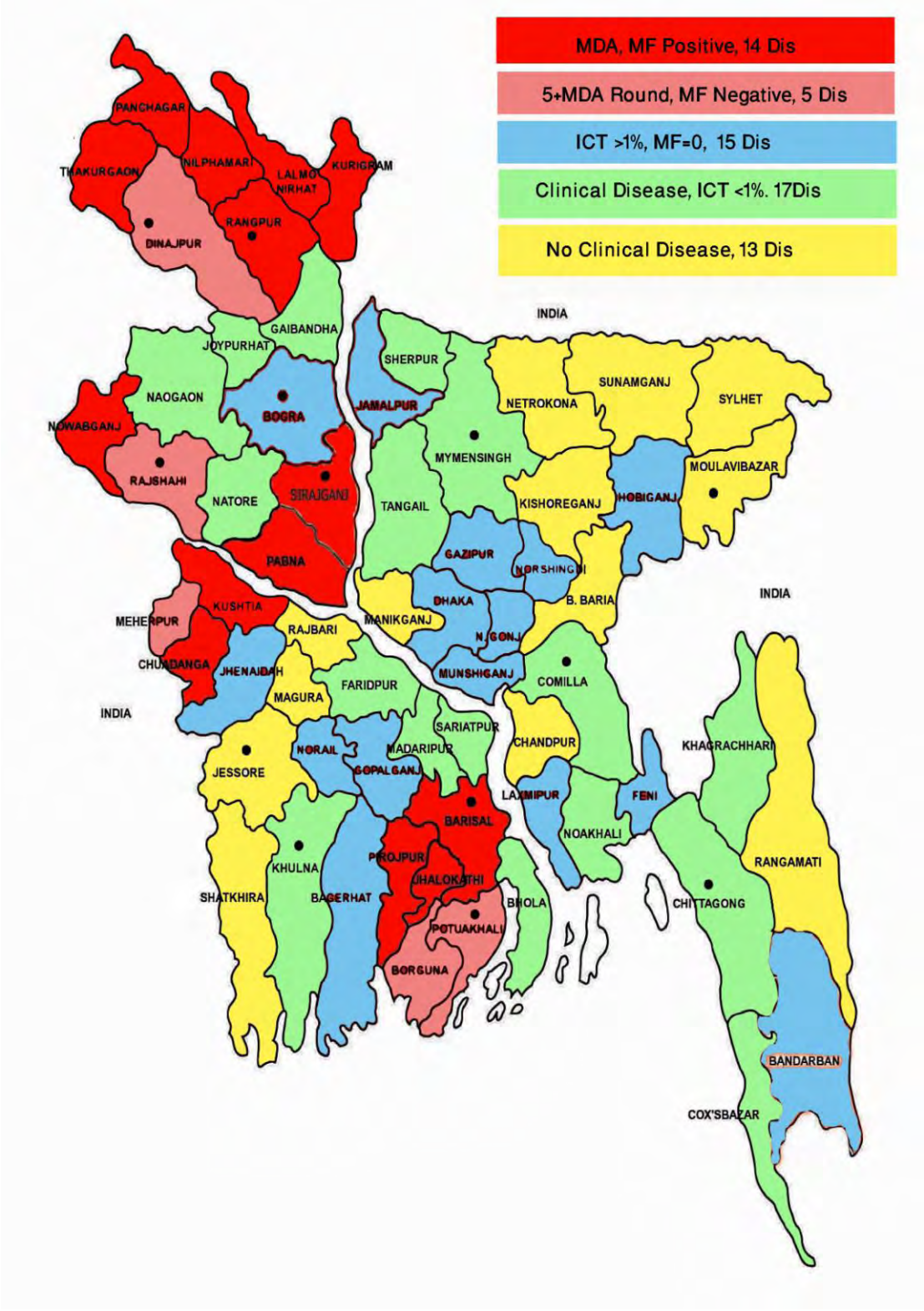
Annexure 2: LF Status of Various Districts

Division	District	Non-endemic		Very low endemic			Endemic
		No clinical disease	Ag <1.0%	Ag>1.0%	Mf rate 0% 2002-04	Mf rate 0% 2006-07	High clinical disease/Mf rate
Barisal	Barguna						x
	Barisal						x
	Bhola		x				
	Jhalokati						x
	Patuakhali						x
	Pirojpur						x
	Total	1					5
Chittagong	Bnadarban			x	x	x	
	Brhmanabaria	x					
	Chandpur	x					
	Chittagong		x				
	Comilla		x				
	Cox's Bazar		x				
	Feni			x	x	x	
	Khagrachari		x				
	Lakshmipur			x	x	x	
	Noakhali		x				
	Rangamati	x					
	Total	8		3			0
Dhaka	Dhaka			x	x	x	
	Faridpur		x				
	Gazipur			x	x	x	
	Gopalganj			x	x	x	
	Jamalpur			x	x	x	
	Kishoreganj	x					
	Madaripur		x				
	Manikganj	x					
	Munshiganj			x	x	x	
	Myemensingh		x				
	Narayanganj			x	x	x	
	Narasingdi			x	x	x	
	Netrakona	x					
	Rajbari	x					
	Shariatpur		x				
	Sherpur		x				
	Tangail		x				

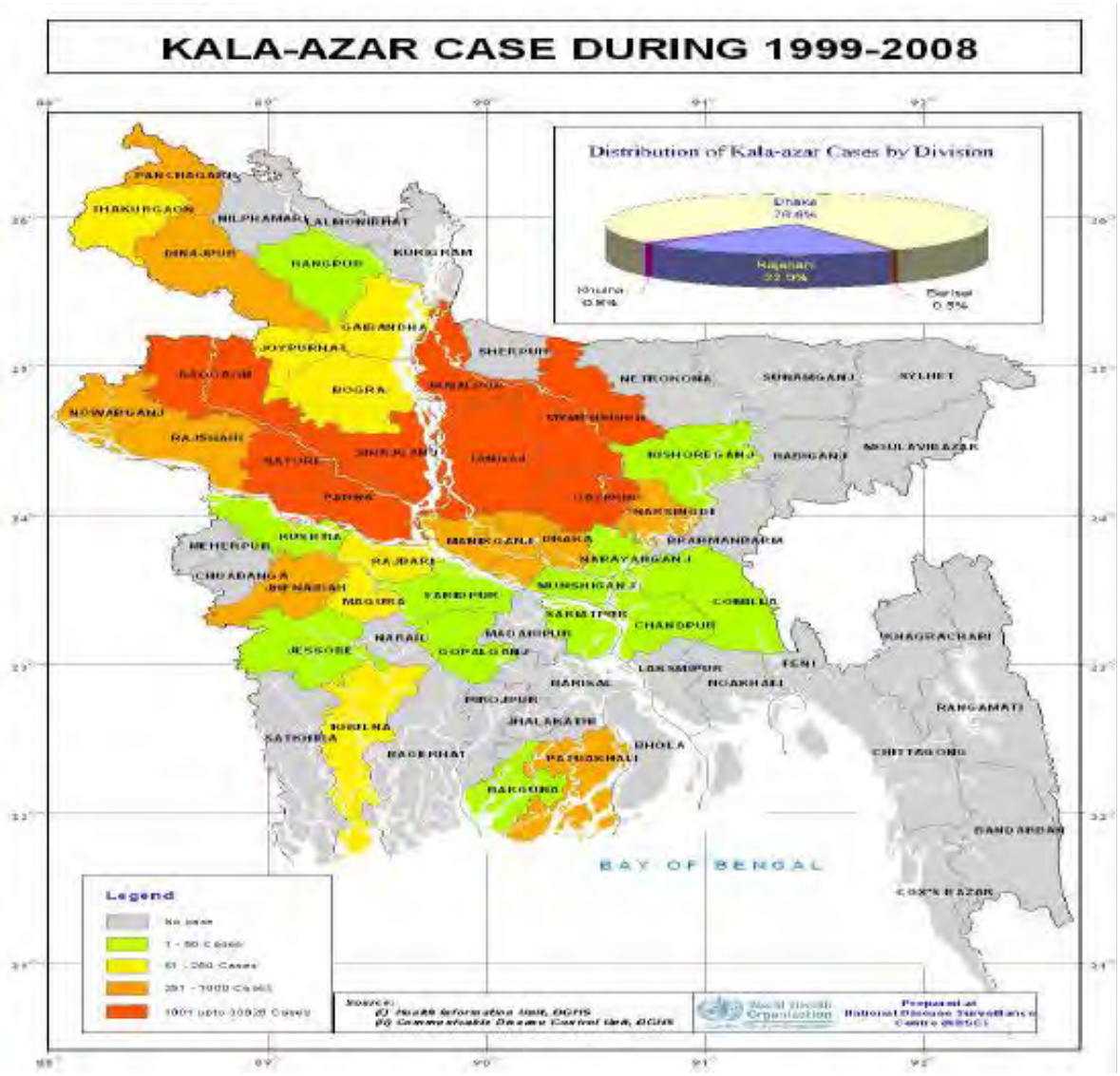
Division	District	Non-endemic		Very low endemic			Endemic
		No clinical disease	Ag <1.0%	Ag>1.0%	Mf rate 0% 2002-04	Mf rate 0% 2006-07	High clinical disease/Mf rate
	Total	10		7			
Khulna	Bagerhat			x	x	x	
	Chuadanga						x
	Jessore	x					
	Jhenaidah			x	x	x	
	Khulna		x				
	Kushtia						x
	Magura	x					
	Meherpur						x
	Narail			x	x	x	
	Sakhira	x					
	Total	4		3			3

Division	District	Non-endemic		Very low endemic			Endemic
		No clinical disease	Ag <1.0%	Ag>1.0%	Mf rate 0% 2002-04	Mf rate 0% 2006-07	High clinical disease/Mf rate
Rajashahi	Bogra			x	x	x	
	CNababganj						x
	Jaipurhat		x				
	Pabna						x
	Naogaon		x				
	Natore		x				
	Rajashahi						x
	Sirajganj						x
	Total	3		1			4
Rangpur	Dinajpur						x
	Gaibandha		x				
	Kurigram						x
	Lalmonirhat						x
	Nilphamari						x
	Panchagarh						x
	Rangpur						x
	Thakurgaon						x
	Total	1					7
Sylhet	Habibganj			x	x	x	
	Maulvibazar	x					
	Sunamganj	x					
	Sylhet	x					
	Total	3		1			0
Grand Total		30		15			19

Annexure 3: Map of Bangladesh Showing Current Status of LF in Different Districts



Annexure 4: Map of Bangladesh Showing VL Endemicity Levels in Different Districts



Annexure 5: Prevalence of kala-azar (no. of cases/10,000 population in upa-zilas of moderate and high endemic districts

Division	District	Upa-zila	Prevalence
Moderately Endemic Districts			
Dhaka	Tangail	Nagarpur	1.70
		Madhupur	1.31
		Shakhipur	1.58
Rajshahi	Pabna	Chatmohar	2.06
		Bera	1.63
		Faridpur	1.95
		Bhangura	1.98
	Noagoan	Badalghachi	1.15
		Porsha	1.67
	Sirajganj	Raiganj	1.63
		Chouhali	1.33
	Panchgarh	Debiganj	2.19
Low Endemic Districts			
Dhaka	Mymensingh	Nandail	0.24
		Dhobaura	0.13
		Fulpur	0.01
		Sadar	0.02
	Tangail	Mirzapur	0.07
		Basail	0.05
		Gopalpur	0.68
	Jamalpur	Sadar	0.22

Division	District	Upa-zila	Prevalence
		Melandah	0.28
		Sharishabari	0.51
	Manikganj	Daulatpur	0.95
		Shaturia	0.33
		Shibalay	0.06
		Ghior	0.06
	Rajbari	Pangsha	0.05
	Dhaka	Dhamrai	0.05
	Gajipur	Sripur	1.06
		Kaliakair	0.93
Khulna	Jhenaidah	Kotchandpur	0.07
		Maheshpur	0.03
		Kaliganj	0.16
Rajshahi	Pabna	Iswardi	0.06
		Atgharia	0.13
		Shanthia	0.39
		Sujanagar	0.87
		Sadar	0.27
	Naogaon	Manda	0.08
		Neyamatpur	0.81
		Patnitala	0.17
		Shapahar	0.31
		Mohadevpur	0.58
		Dhamoirhat	0.05

Division	District	Upa-zila	Prevalence
	Sirajganj	Sadar	0.28
		Kajipur	0.07
		Tarash	0.05
		Shahjadpur	0.28
		Ullapara	0.31
		Kamarkhand	0.21
		Belkuchi	0.26
	Rajshahi	Puthia	0.19
	CNawabganj	Sadar	0.65
		Gomastapur	0.04
	Bogra	Sonatala	0.10
		Dhunat	0.05
Rangpur	Dinajpur	Prbatipur	0.05
		Fulbari	0.06
		Nababganj	0.26
	Thakurgaon	Balidanga	0.26