

## APPLICATION OF TECHNOLOGIES FOR DIAGNOSIS, TREATMENT, PREVENTION AND CONTROL OF MALARIA, KALA-AZAR AND FILARIA IN ENDEMIC AREAS OF BANGLADESH

Hamida Khanum\*, Jainal Abedin and Moazzem Hossain  
Parasitology Branch, Department of Zoology, University of Dhaka, Dhaka 1000, Bangladesh.  
\* Corresponding Author Cell phone 01712-039756

**Abstract** :The present study was carried out in 13 Upazillas of 13 endemic districts for Malaria and 15 upozillas of 3 endemic districts for kala-azar in Bangladesh. to assess the current application of techniques for Diagnosis, Treatment, Prevention for malaria and kala-azar by the professionals

**For Malaria**, 300 professionals were interviewed of Upazilla Thana Complexes, they apply **Examination of peripheral blood film (40.8%)** and **Rapid Diagnostic test (38.50%)** for diagnosis of Malaria and also tests CBC and MP in small range. About 85% professionals use Quinine as an appropriate drug for treating Malaria, drugs like Chloroquinine, Pyremethamine, Artemisinin and Malaone are also in use.

**For Kala-azar**, out of 205 professionals interviewed, about 80% practice **rK39 dipstick test** for diagnosis of Kala-azar while, DAT, AT, Bone marrow examination and Spleen puncture are rare. About 73.3% professionals use SAG, 85.7% Miltefosine and 62.9% AmphotericinB as appropriate drug for Kala-azar.

**The filarial cases** have been decreasing for taking some preventive steps on filariasis elimination programs. the reasons for long time continuing filariasis due to lack of some important things. Regarding the site of filaria, in most (31.2%) of the cases the right leg-sided filaria. The cases with the more severe grades of lymphoedema complained of physical problems, such as difficulty in standing and/or walking and discomfort because of the heaviness of the affected limb(s).

Professionals believe in use of mosquito nets, awareness campaign, insecticide spray, early detection and treatment of kala-azar and malaria. These modern technologies are widely used world-wide and Bangladesh for diagnosis, treatment and prevention of malaria and kala-azar, which are safe, have less side-effect and reliable. So, Bangladesh is not behind from the advances in world.

**Key words:** *Diagnosis, treatment, kala-azar, malaria and filaria*

### Introduction

Considerable progress has been made towards three key objectives in tropical infectious diseases in recent years, new approaches to overall clinical management. Inadequate vector control; poor nutrition, sanitation, and drinking water; civil war; and bare bones health budgets continue to present obstacles to preventing and controlling epidemics. Early scientific results include progress in chemotherapy for Malaria, Kala-azar and filaria; in the developing the fundamental knowledge required to develop a vaccine against malaria; and in simple and accurate diagnostic field tests for filaria, malaria and kala-azar. In addition, institution strengthening and training support, awarded exclusively to institutions and scientists of developing endemic countries, has increased rapidly. Over 1 billion people are infected with one or more of the 14 Neglected Tropical Diseases (NTD) defined by WHO are most common and living on less than \$2 a day Those affected are often marginalized and forgotten by Government, left to suffer in silence. NTD are diverse but all cause severe disability or death, bring a major economic burden on endemic countries. NTDs are also known as "poverty-related" or "tropical" diseases, are sometimes fatal and inflict severe and permanent disabilities and deformities on almost 1 billion people around the world, especially among the poorest populations in developing countries<sup>[1,2]</sup>. The neglected diseases impose an enormous economic burden on affected communities due to lost productivity and other issues. While there are some drugs and vaccines for neglected diseases, these interventions do not always reach those who need them - even when the drugs and vaccines are donated.

Drug resistance is most commonly seen in *P. falciparum*. Resistance to chloroquine is most prevalent, while resistances to most other antimalarials like pyrimethamine, quinine, mefloquine, artesim and quinine compounds have also been reported. These developments further justify the cause and urgency for formulating an

effective vaccine against malaria. The vaccine fulfilling this extreme requirement is the type 2 vaccine. This extreme approach to *Malaria Vaccine- Development* does not take into account specifically populations affected by malaria that fall between these extremes, such as individuals in endemic regions at high risk of *P. vivax* infections [3,4].

Malaria is one of the major public health problem in Bangladesh. Out of 64 districts, malaria is highly endemic in 13 districts and 10.9 million people are at risk of malaria. Three hill tract districts (Banderban, Khagrachori and Rangamati) and Cox's Bazar districts report more than 80% of the malaria cases and deaths every year. In Bangladesh, Both *falciparum* and *vivax* malaria are prevalent in the country of which the number of *falciparum* cases are 75% of the total cases in recent years due to increasing drug resistance. The first line drug Chloroquinine has been replaced by Artemisinin based Combination therapy. (ACT) for treatment of *falciparum* malaria cases in 2004. *Anopheles dirus*, *An. minimus*, and *An. philippensis* are the principal vectors and all are susceptible to malathion and synthetic pyrethroid. Promotion and use of ITNs/LLINs, selective IRS for containment of outbreaks and intensive IEC for increasing awareness of the people are the main components for the vector control. (World Malaria Report, 2008) Although diagnosis by microscopic examination of blood films remains standard, rapid immuno-chromatographic detection of circulating parasite antigen has entered the clinical practice. These dipstick strip tests are specific, almost as sensitive as thick blood films, and simple to perform. Polymerase chain reaction testing for plasmodium antigen is most sensitive but is a research tool.<sup>[5,11]</sup>

Visceral leishmaniasis is caused by an intracellular protozoan parasite *Leishmania donovani* of reticulo-endothelia system of vertebrates. Kala-azar affects the spleen, liver, bone marrow, etc. and the shin become black. Bangladesh is one of the endemic countries for visceral leishmaniasis in the world, second and largest parasitic killer and also a major impediment to socio-economic development.. In last ten years, a total of 69000 cases were reported in Bangladesh of which 42,780 (62%) cases were from Mymensingh district. In 2008, 73.6% and in 2009, 71.1% of the kala-azar cases of the country were reported from Mymensingh (M&PDC unit DGHS). PKDL is also prevalent there. Bangladesh has 12 endemic districts for kala-azar and prevalent in 46 districts<sup>[6,7]</sup>.

The objectives of the present investigation were to assess the knowledge, attitude and practices of technologies for diagnosis, treatment, prevention control for kala-azar and malaria endemic and intervention areas of Bangladesh by the Formal Health care Providers. *Lymphatic filariasis* (LF) more commonly known as *elephantiasis*, is a painful and profoundly disfiguring disease. The disease is caused by thread-like worms of genus *Wuchereria* and *Brugia*, known as filaria that lodge in the lymphatic system, the network of nodes and vessels that maintain the delicate fluid balance between the tissues and blood and which are an essential component of the body's immune system. As a Neglected disease, it is a devastating obstacle to socio-economic development, because they debilitate, deform, blind and kill. It is easy to understand the significance of death rates and mortality figures. But more difficult to translate chronic disability and illness into a value that is readily understood by public health officials and advocates in relation to their contribution to poverty. Increasing urbanization is occurring gradually in low-income countries, facilitate the spread of filariasis. This is mostly due to inadequate waste disposal and sanitation facilities, which increase the number of breeding sites for the mosquito.

So, filaria is transmitted through mosquitoes. When an infected mosquito takes a blood meal, the parasites are deposited on the person's skin from where they enter through the skin. These larvae then migrate to the lymphatic vessels and develop into adult worms, over a period of 6 to 12 months, causing damage and dilatation of the lymphatic vessels. The filaria live for several years in the human host.

During this period they produce millions of immature micro-filaria (mf) that circulate in the peripheral blood and are ingested by mosquitoes when the latter bite infected humans. The larval forms further develop inside the mosquito before becoming infectious to man. Thus, a cycle of transmission is established. Although lymphatic filariasis, very rarely causes death, it is a major cause of clinical suffering, disability and handicap. More than 1.3 billion people in 83 countries and territories, approximately 18% of the world's population live in areas at risk of infection.

In 1997 the World Health Assembly (WHA) urged its member states to make commitment to the global elimination of Lymphatic Filariasis (LF) as a public health problem (WHA, 1997). LF is the fourth leading cause of permanent disability (WHO, 1998), and is endemic in 80 countries, many of which are among the poorest in the world. 40 million people have clinical manifestations of the disease (including swelling of limbs, hydrocoel and acute adenolymphangitis), 120 million are infected in 80 countries and one billion live are at risk of infection, (Dreyer *et al.* 1997; Ottensson, 2000). Since then, with the formation of Global Alliance for the Elimination of Lymphatic Filariasis (GAELF) and the partnership of many Ministries of Health, NGOs and philanthropic foundations, efforts to eliminate this disease have scaled up in over 38 countries. The prevention part of an elimination program involves the interruption of disease transmission through annual mass drug administration's (MDAs). Treatment activities consist of morbidity control programs designed to alleviate the suffering of individuals who show clinical manifestations of the disease [8,9].

**Materials and method**

**Design of the study:** Cross-sectional study in selected endemic areas of Kala-azar, filaria and malaria. The study was conducted during the period from 2010 – 2012. **Study sites:** 40 Upazillas have been selected, 13 for malaria, 15 for kala-azar and 12 for filaria.

**For Malaria:**The present study was conducted in areas where malaria had been reportedly a problem for many years. The KAP study was conducted among the professionals of 13 Upazillas of Thana Complexes and NGOs are working in the same Upazillas are: Kurigram, Moulvibazar, Cittagong, Khagrachari, Rangamati, Banderban, Cox's Bazar, Sherpur, Mymensingh, Netrokona, Sunamganj, Sylhet and Habiganj.

Available diagnostic techniques for kala-azar in Bangladesh are examination of peripheral blood film, bone-marrow examination, rk39 dipstick test, DAT and AT. In the present observation, it was recorded that 80% of the professionals have knowledge and practice the rk39 dipstick test for diagnosis of kala-azar (Fig. 1).

**For Kala-azar\_**The present study was carried out in 3 districts of Bangladesh comprising 15 upazillas. intervention areas in Bangladesh, among them, under Mymensingh district, following 8 upazillas are found as kala-azar intervention areas ( Narail, Haluaghat, Muktagacha, Gafargaon, Bhaluka, Trishal, Fulbaria and Ishwarganj) and Under Jamalpur district ( Shorishabari, Melandah, Madarganj, Dewanganj, Islampur and Sadar Jamalpur) and under Tangail district (Shakhripur).

**For filaria,** an attempt was made to give each lymphoedema case living in the study area a detailed examination. The gender, age, occupation, and socio-economic characteristics of each case were recorded, and each was asked for their informed consent to participate in the planned morbidity-control programme. The study population areas were Barguna, Chapai Nawabgonj, Dinajpur, Gaibandha, Kurigram, Lalmonirhat, Nilphamari, Patuakhali, Rajshahi, Rangpur and Thakurgaon districts.

**Study Professionals:** Formal health service providers of kala-azar and malaria endemic areas of Bangladesh. Total seven categories of professionals were interviewed from each upazillas, namely UHFPO, RMO, MO, Senior Nurse, SACMO, Medical Assistant of UHC, and Medical Assistant of one of the Union Sub-centers, Health Assistant, Health Inspector, Assistant health Inspector, Different NGOs are working in the selected epidemic/ endemic areas of Bangladesh. NGO Worker and NGO Field workers from the NGOs are working for vector borne disease control and treatment of patients. filaria.

**Results and Observation**

In the present investigation, it was observed that about 40.8% of the professionals have knowledge and practice for Examination of Peripheral blood film as the single most important blood test for diagnosis of Malaria and which is also recommended by malaria elimination program (Fig. 3). Professionals (38.5%) also recommended Rapid Diagnostic Test for malaria diagnosis. Fig. 4 showed the drugs are in practice for the treatment of malaria in Bangladesh. To assess the attitude and knowledge of the professionals regarding the prevention of Kala-azar from the community, it was observed that the professionals believe the use of mosquito nets, awareness campaign, Insecticide spray inside the house and its surroundings, Ensure that no crack and crevices remain on muddy wall and early detection and treatment of kala-azar cases etc as preventive measures for Kala-azar elimination (Fig. 1 and 2).

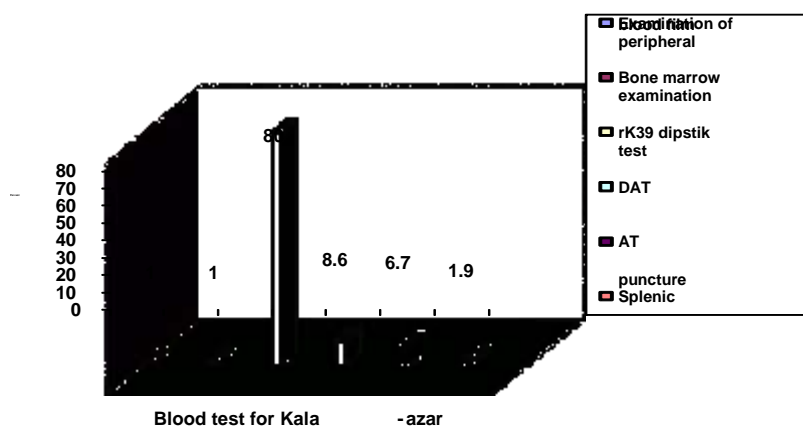


Fig: 1. The knowledge of professionals about the most important blood test for Kala-azar.

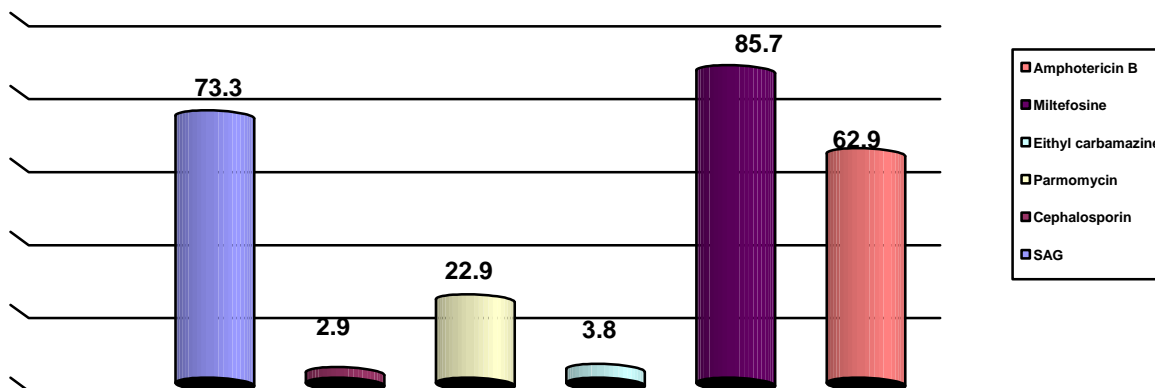


Fig. 2. Percentage of professionals and their knowledge regarding the drug are used for treatment of Kala-azar.

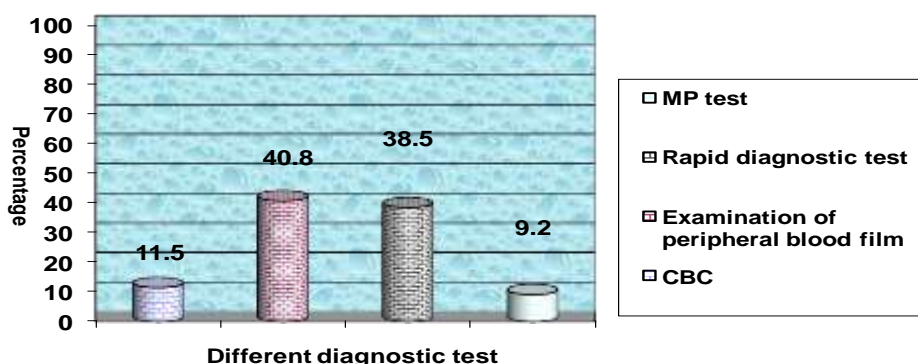


Fig.3. Distribution of respondents according to their knowledge about most important Blood test for malaria.

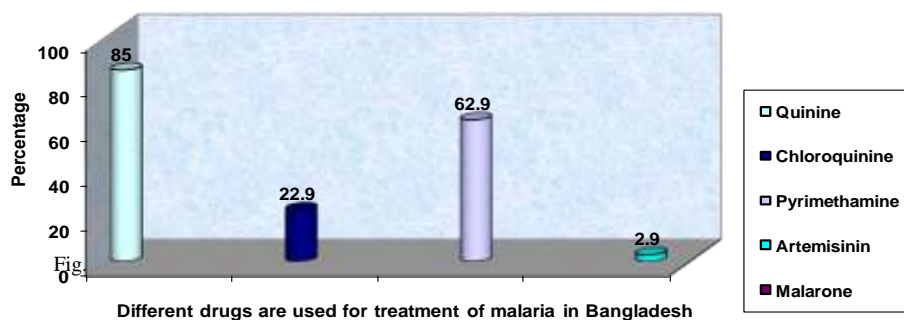


Table 1: Number of Filaria patient according to districts in Bangladesh.

District	Suffering from		Total
	Filariasis	Hydrocele	
Barguna	37	8	45
Chapai Nawabgonj	99	9	108
Dinajpur	32	8	40
Gaibandha	2	37	39
Kurigram	38	13	51
Lalmonirhat	26	30	56
Nilphamari	66	50	116
Patuakhali	4	0	4
Rajshahi	6	40	46
Rangpur	1	0	1
Thakurgaon	28	30	58
<b>Total</b>	<b>339</b>	<b>225</b>	<b>564</b>
Percentage	60.1%	39.9%	100%

**Table 2: Affected Part of body due to filariasis.**

	No. of patients	Percentage
Left hand	3	.5
<b>Right Leg</b>	<b>176</b>	<b>31.2</b>
Left leg	151	26.8
Brest	3	0.5
Left Scrotum	86	15.2
Right Scrotum	131	23.2
Both leg	10	1.8
Both Scrotum	4	.7
Total	564	100.0

**Table 3: What support required to follow the following practices**

Type of supports	Soap washing	Physiotherapy	Elevation of Limb	Torniquet	Operation of attacked part	Hydrocele operation	Total
Training	6	4	0	0	0	1	11
Giving transport cost	10	10	6	6	1	1	34
Giving other cost	10	4	3	1	5	2	25
<b>Motivation</b>	<b>21</b>	<b>15</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>8</b>	<b>47</b>
Ensure treatment at home	8	6	0	0	0	0	14
Strengthening monitoring	2	1	0	0	0	0	3
No idea	507	524	555	554	558	552	3250
Total	564	564	564	564	564	564	3384

Overall, 564 lymphoedema were detected in the study area. Here it is seen that most (60.1%) of the patients were operated for Filariasis, followed by Hydrocele (39.9%). The morbidity control techniques are mentioned in Table 8. Regarding the site of filaria, in most (31.2%) of the cases the right leg-sided filaria. The result of the present observation describes the association of Lymphatic Filariasis with the present illness. Here it is seen that only 0.5% of the patients suffered from Brest case (Table 1, 2, and 3).

#### DISCUSSION

During the 'Malaria Eradication program' through DDT spraying controlled all the transmission of vector borne diseases like malaria, kala-azar, filarial and dengue. In 1970s kala-azar re-emerged sporadically. During 1981-85 only 8 upazillas reported kala-azar which increased to 105 upazillas in 2008. The current estimated total cases are 45000. Annually average 10,000 cases are treated by control program but the cases treated by private clinics, practitioners and NGOs are not always reported. [10,11,12 and 13] reported an entomological surveillance on vector in a malaria endemic areas of Bangladesh [3,4]. Akhter *et al* (2000) also assessed the effectiveness of different drug regimen according to the nature of malaria cases in some selected areas of Bangladesh. Akhter *et al*, (2001) worked on effectiveness and impact of Deltamethrin impregnated bed nets on malaria transmission in some rural areas of Bangladesh [15, 28]. Chloroquinine resistant *P vivax* is now being encountered, and *P falciparum* continues to develop resistance to newly introduced drugs. The two most important groups of drugs for malaria treatment are still based on quinine or artemisinin. A separate combination, atovaquone plus proguanil (Malarone), is active against malaria around the world. In complicated severe malaria, parenteral administration of artemether and artesunate is as effective as intravenous quinine or quinidine, active against quinine resistant parasites, and often easier to use. Chemoprophylaxis may soon be advanced if Malarone, primaquine, or Tafenaquine (a new 8-aminoquinoline) become licensed for this indication. Malarone or primaquine are taken daily, but Tafenaquine will probably need to be taken only once a week. In contrast to current drugs which target the

blood stage of infection these drugs act on the liver stage so will probably require just a few days of treatment after departure from a malarious area.

Insecticide impregnated bed nets appreciably reduce mortality in children in Africa, and major efforts are under way to widely deploy them in endemic regions. Despite a firm immunological rationale and tremendous effort and promise, a licensed vaccine is not anticipated in the next five years. Publication of the DNA sequence of chromosomes 2 and 3 of *P. falciparum* has raised hopes that sequencing of the entire genome will lead to new, clinically useful directions in vaccine development as well as in diagnosis, treatment, and overall control of malaria. The WHO's new Roll Back Malaria campaign is aimed at expanding prevention and treatment to substantially reduce morbidity and mortality in the next five to 10 years [11]. Although a number of separate epidemiological studies have been carried out, there is no specific data or report on the basic knowledge and practice of the professionals who are handling at Kala-azar and the Malaria patients in the endemic/ epidemic areas. The present study has been done to understand the basic concept and knowledge about the diseases such as Kala-azar and Malaria, these diseases are creating an extra load on the rural public health of Bangladesh which is growing due to over population. Thus leading to an economic loss of the country [6,15 and 16].

According to the World Malaria Report [17] half of the world's population is at risk of malaria. The World malaria report 2009 describes the global distribution of cases and deaths, how WHO-recommended control strategies have been adopted and implemented in endemic countries, alleviate the burden of disease [11]. The WHO *Guidelines for the treatment of malaria* provides evidence-based and up-to-date recommendations for countries on malaria diagnosis and treatment which help countries formulate their policies and strategies. It is expected that, the finding of the present study will contribute to future planning for development of knowledge, needs for training of the professionals for prevention and control of kala-azar and malaria in endemic areas of Bangladesh [29].

Lymphatic Filariasis is the second leading cause of disability worldwide and is primarily a disease of the poorest of the poor.

Despite this, there is limited socio-cultural research into the burden of disability associated with LF. In depth qualitative research exploring disability from the client, family, community and service provider perspectives is limited. There is a need to find out the level of disability at various stages of the disease (ie: acute vs chronic) and following different intervention methods. This information is vital for public health planners for cost rehabilitation needs within LF endemic communities. There is also a need for research on LF for identification of measurable and operationally feasible indicators for assessing the impact of interventions, availability of affordable quality diagnostics to measure progress of interventions, development of easily-applicable tools for assessing when to end interventions and cost-effective and sustainable simple strategies for management of Lymphatic Filariasis and impact on morbidity control in endemic area of Bangladesh<sup>[18]</sup>.

For countries with national program [19 and 20] an important requirement was to have information on spatial spread and status of the risk of final infection, which would facilitate an appropriate planning for control/elimination. Lymphatic filariasis distribution map has been created for India, based on the historical data available in 2000,<sup>[21 22a,b]</sup> Filariasis is one of the national public health problems. It is the burden of the family and the society. This will form a basis for dissemination of knowledge on prevention and control of filariasis and that area of ignorance will stimulate more research for further study. The consequences of filariasis are many. A large number of affected persons exhibit physical and mental disabilities, an impaired ability to work and a compromised quality of life<sup>[23, 24]</sup>.

More recently with the advent extremely effective-dose. 2008. yearly regimen (selecting among Albendazole and either Ivermectin or DEC-diethylcarbamazine) an initiative being launched through the WHO to utilize a strategy of yearly mass treatment to "all risk" population to eliminate lymphatic filariasis as a public health problem by decreasing Mf in the population thereby interrupting transmission and preventing infection. However successful control of lymphatic filariasis depend in large measure, both in urban and rural, on community wide awareness, understanding and support for the control program<sup>[25, 26, 27]</sup>.

## References

- [1] D.Mondal SP Singh, N Kumar, A,Joshi S Sundar, P,Das, H, Siddhivinayak A Kroeger and M Boelaert; Visceral Leishmaniasis Elimination Programme in India, Bangladesh, and Nepal: Reshaping the Case Finding/Case Management Strategy. 2007. *Plos Neglected Tropical Diseases* 3(1):e355.
- [2] D.Mondal M S Alam, Z. Karim, R Haque, , M, Boelaert and A Kroeger., Present situation of vector control in Bangladesh: a wake up call 2008.*Health Policy*, 87:369-376.
- [3] AE, Harith, AH Kolk,J, Leewenbure, J Mugai, R Huigen E Jelsma T and PA Kagar. Improvement of a direct agglutination test for field studies of visceral leishmaniasis. *J. Clin. microbiol.* 26(7):1321-1325.
- [4] A. Oshi, JP Narain,CPrasittisuk, R Bhatia, H Galib, A Jorge, MR Bajaran and A Kroeger.Can visceral leishmaniasis be eliminated from Asia? 2008 *J. Vector Borne Dis.* 45:105-111.
- [5] D Jima, G Tesfaye , W Deressa, A Woyessa, D Kebedi and D Alamirew, 2005. Baseline survey for the implementation of insecticide treated mosquito nets in malaria control in Ethiopia. *Ethiopian J health Dev* 2005, 19:16-23.
- [6] R. Haque K Kurkjian, Vaz Le, M Begum, T Akter, Cetre-sossah CB, Ahluwuala IB, Dotson E, Secor WE, Breiman R F and Maguire JH; 2005. Risk factors of kala-azar in Bangladesh. *Emerg Infect Dis*, 11:655-62.
- [7] H. Khnum, , M. Akhter, and M. Bangali., Occurrence of malarial parasite infection in haluaghat, Bangladesh. *Bangladesh* 2008. *J. of Zool.* 36(2): 296-300.
- [8] R. K Shenoy,.., K Sandhya,.., T. K Suma,.. & V Kumaraswami,.. A preliminary study of filariasis related acute adenolymphangitis with special reference to precipitating factors and treatment modalities. 1995.*Southeast Asian Journal of Tropical Medicine and Public Health*, 26, 301-305.
- [9] R. K., ShenoyT. K., Suma, K Rajan., & V Kumaraswami,.. Prevention of acute adenolymphangitis in brugian filariasis: comparison of the efficacy of ivermectin and diethylcarbamazine, each combined with local treatment of the affected limb. (1998) *Annals of Tropical Medicine and Parasitology*, 92, 587-594.
- [10] S Akhter., H Khanum., and S.Chowdhury, 2000. Assessment of different drugs regimen according to the nature of malaria cases in some selected areas of Bangladesh. *JOPSOM.* 19(1): 86-92.
- [11] World Health Organization. 2010. Basic Malaria Microscopy. Part 1. Learner's Guide 2<sup>nd</sup> Edition, Geneva, Switzerland.
- [12a] S Akhter, A., Nehar H Khanum., and S.Chowdhury, 2000. An entomological surveillance for vectors in a malaria endemic area of Bangladesh. *JOPSOM.* 19(2): 32-39.
- [13] A M, Bangali A H Mahmood and M Rahman, ; 2000. The malaria situation in Bangladesh. *Mekong Malaria Forum* 6: 16-23.
- [14] S. Akhter, H.Khanum, and S. Chowdhury, 2001. Impact of Deltamethrin impregnated bed nets on malaria transmission in some rural areas of Bangladesh. *JOPSOM.* 19(1): 33-42.
- [15] Been C, Hightower A, Chawdhury R, Ali M, Amann J, WAagasuma Y, Haque R, Kurkjian K, Vaz Le, Begum M, Akter T, Ctere-sossah CB, Ahluwalia IB, Dotson E, Secor WE, Breiman RF and Maguire JH; 2005. Risk factors of kala -azar in Bangladesh. *Emerg Infect Dis*, 11:655-62.
- [16] S Brooker, S Clarke , JK Njagi , S B Polac, Mugo, B Estamble E Muchele , P MAagnussen and J, Cox 2004 . Spatial clustering of malaria and associated risk factors during an epidemic in a highland area of western Kenya. *Trop MedInt Health* 9:757-766.
- [17] World Health Organization. 2008. World Malaria Report. WHO , Press. Geneva, Switzerland.WHO/HTM/GMP/2008.1.
- [18] ABM Rahman, , H Khanum,.., M Chowdhury., and R,Farhana, Current status and endemicity of filariasis in Thakurgaon northern part of Bangladesh. *Bangladesh J. Zool.* 36(1): 111-116
- [19] WHO (1998), *World Health Report 1998*, Life in the 21<sup>st</sup> century, A vision for all. Report of the Director General .
- [20] WHO (1999), Health Situation in the South East Asia Region, 1994 – 1997. Regional office for SEAR, New Delhi.
- [21a] WHO (2004), Regional Strategic Plan for Elimination of Lymphatic Filariasis (2004-2007), SEAR, New Delhi
- [22a] WHO (2005), Monitoring and epidemiological assessment of the programme to eliminate lymphatic filariasis at implementation unit level, Geneva.
- [21b] World Health Organization. 2004. The World Health Report 2004. Changing History. Geneva, Switzerland.
- [22b] World Health Organization. 2005. South-East Asia Regional Office: Communicable diseases; Kala-azar status in SEA Region(online) . [http://www.searo.who.int/en/Section10/Section2163.htm]
- [23] Ramaiah, K. D., Ramu, K., Vijay Kumar, K. N. & Guyatt, H. (1996). Epidemiology of acute filarial episodes caused by *Wuchereria bancrofti* infection in two rural villages in Tamil Nadu, South India. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 90, 639-643.
- [24] Schellekens, S. M., Ananthakrishnan, S., Stolk, W. A., Habbema, J. D. F. & Ravi, R. (2005). Physicians' management of filarial lymphoedema and hydrocoele in Pondicherry, India. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 99, 75-7
- [25] WHO (2003), Training module on community home-based prevention of disability due to lymphatic filariasis, Geneva.
- [26] Pani, S. P., Yuvaraj, J., Vanamail, P., Danda, V., Michael, E., Grenfell, B. T. & Bundy, D. A. P. (1995). Episodic adenolymphangitis and lymphoedema patients with bancroftian filariasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 89, 72-74.
- [27] E. A Ottesen.. The Global Programme to Eliminate Lymphatic Filariasis. (2000). *Tropical Medicine and InternationalHealth*, 5, 591-594.
- [28] S M Ahmed, S Haque, U Haque and A, Hossain .. Knowledge on the transmission, prevention and treatment of malaria among tow endemic population of Bangladesh and their health-seeking behaviour. 2009 *Malarial Journal* 2009, 8:173]
- [29] MPDC UNIT, 1963-97, Fact Sheet of Malaria Cases Detected in Bangladesh. Malaria and Parasitic Disease Control Unit, Directorate General of Health Services, Mohakhali, Dhaka 1963-1997. (unpub.)