



STATUS OF VECTOR BORNE DISEASES AT COMBINED MILITARY HOSPITAL (CMH), DHAKA, BANGLADESH

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ABSTRACT

The study was conducted among the patients of combined military hospital (CMH) Dhaka, Bangladesh during the period of July 2014 to June 2015. Total 37 patients infected with vector borne diseases were detected, among them 16 patients (43.24%) infected with malaria and 21 patients (56.76%) were infected with dengue fever. Patients were admitted into CMH from five different locations. In case of malaria Alikadam (Bandarban) showed highest prevalence and dengue showed highest prevalence in Dhaka Cantonment (61.90%). Detected three *Plasmodium* sp. in the study, *P. falciparum* showed highest prevalence (50%) and mixed infection was observed with *P. falciparum* and *P. vivax* (18.75%). Among the malaria infected patients six (37.50%) of them suffered from secondary infection (pneumonia & ear, nose, throat infection). 25.25% of the observed patient carried malarial infection from abroad during their job at UN mission at Ivory Coast. Dengue showed re-infection in 9 (42.86%) cases. Microscopic examination of blood films, blood culture, rapid detection of parasite antigen, polymerase-chain reaction (PCR) was used for malarial detection in CMH. Ten (62.50%) cases were detected through PCR. Among the 21 dengue patients 06 (29%) were found taken under the blood culture test for detection of pathogen. As no specific drugs for dengue though Napa is used and Chloroquine, mefloquine, quinine, coartem are some effective drugs for malaria.

KEY WORDS: Malaria, Dengue virus, Prevalence, Re-infection, Blood culture, Coartem.

INTRODUCTION

Vector borne diseases usually cause significant health problem to human. About 17% of all the diseases of human are caused by the vector (WHO 2013). Vector are living organism that transmits parasite from one infected person (an animal) to another causing disease. Many of these vectors are bloodsucking insect, which ingest disease producing micro-organism during sucking a blood meal from an infected host (human or animal) and later inject it into a new host. Mosquito are one of the best known disease vectors. Malaria, dengue, yellow fever *etc.* are some of the vital vector borne disease around the world caused by mosquito. Most deadly vector borne disease is malaria. Each year an estimated 300 to 500 million clinical cases of malaria occur, making it one of the most common infectious diseases worldwide. Malaria can be, in certain epidemiological circumstances, a devastating disease with high morbidity and mortality, demanding a rapid, comprehensive response (Bloland, 2001). It was believed once this disease has been confined to the tropical and subtropical countries. At present studies shows that this diseases also spreads in the temperate regions, especially towards the North Pole (WCS 2005). Malaria is an important parasitic disease of human beings, which causes significant morbidity and mortality among troops deployed in the Chittagong Hill Tracts and is still one of the major health problem of the Bangladesh Army (Hussain *et al.*, 1996). Following the 1971, ban of DDT (insecticide) in Bangladesh malaria cases have increased steadily. Malaria is transmitted by the female *Anopheles* mosquito, infecting human and insect alternatively. In

Bangladesh there are 29 (Encyclopedia of flora and Fauna, vol-21) species of *Anopheles* mosquito possibly causative agent of malaria. The soldiers who are deployed in the border areas of our country are remain in the vulnerable situation. It had recognized vital 13 endemic areas (Kurigram, Sherpur, Mymensingh, Netrokona, Sunamgonj, Sylhet, Moulvibazar, Hobigonj, Khagrachari, Rangamati, Chittagong, Bandarban and Cox's Bazar) in Bangladesh close to border of India and Myanmar highly infested with malaria. Even within this region malaria predominantly occurs within the Chittagong hill tracts (Haque *et al.*, 2010). The Chittagong hill tracts consist of three hill districts e.g. Rangamati, Bandarban and Khagrachari. This significant vector borne diseases also came to this land from the abroad. Defence soldiers were engaged in their job at those areas in the world known to highly infest with malaria. Mostly the continent of Africa is highly infested with many vector borne diseases. Most African countries are in at highest risk category in case of the malarial spreading's. Fourteen countries in Africa including Democratic republic of Congo, Kenya, Ivory Coast, Sudan, Uganda, Libya, Mali, central African republic, Mozambique has been recognized as severely infested with malaria (World malaria report 2013). Bangladeshi soldiers have been deployed for decades. It found alarming that the soldiers carry diseases with them. The habitat for the malaria vector has been highly dense forest. The forest and hilly region has been the best place for *Anopheles* spp. General symptoms of malaria include fever and flu-like illness, including shaking chills, headache, muscle aches, and

tiredness. Nausea, vomiting, and diarrhoea may also occur. Malaria may cause anaemia and jaundice (yellow colouring of the skin and eyes) because of the loss of red blood cells. If not promptly treated, the infection can become severe and may cause kidney failure, seizures, mental confusion, coma, and death. For most people, symptoms begin 10 days to 4 weeks after infection, although a person may feel ill as early as 7 days or as late as 1 year later. Another vital health hazard vector borne disease for Bangladesh is dengue fever. Dengue fever is a mosquito borne tropical disease caused by the Flavivirus. Dengue is transmitted by several species of mosquito genus *Aedes*, particularly *Aedes aegypti*. It has been noted that the dengue pathogen once infected the person would become partial immune of that particular pathogen strain. This mosquito-borne disease caused by the mosquito-borne dengue viruses (DENVs), consisting of four serotypes (DENV 1 to 4), that are members of the flaviviridae family. All four DENV serotypes have emerged from sylvatic strains in the forests of South-East Asia (Tuiskunen and Lundkvist, 2013). Although 29 serotypes has been identified on a molecular investigation by the sequence for partial envelope protein (Afreen *et al.*, 2014). Infection with any one serotype of DENV provides immunity to that serotype for life, but provides no long-term immunity to other serotypes. Thus a person can be infected as many as four times, once with each serotype. That could be noted as the re-infection history. The symptom of dengue includes fever, headache, muscle and joint pain and a characteristic of skin rash that is similar to measles. Dengue virus affects the liver and bone marrow, leads to low blood pressure and reduced number of platelets, which are necessary for effective blood clotting; this increase the risk of bleeding, the major complication of dengue. Some of the case among the dengue fever hemorrhagic strain also noticed though. There is no specific medicine or anti body to treat dengue. For typical dengue fever the treatment is directed toward the relief of the symptoms.

As the number of vector borne diseases are increasing day by day and many people are died in every year by affecting this type of disease. So, we should know about the vector borne disease and be aware from this type of disease. Awareness about the risk factor and history of the diseases would build up potential ability to check it largely. The study was conducted in the CMH (Combined military Hospital) Dhaka to find the vector borne diseases,

diseases profile, risk factor and pathological test used for detecting disease and prescribed medication for the patients.

MATERIALS & METHODS

This study has been done in the Combined Military Hospital (CMH) Dhaka during the period of July 2014 to June 2015. In CMH, medical ward is one of the specialized wards for the medical patients. Medical ward was surveyed for the malaria patients. Medical ward is specialized for medical patients of any kind of acute and chronic illnesses. Mostly any kind of fever or such illness has been referred to the medical ward first. There were 60 patients capacity. The patients were examined by the professional doctor and confirmed about vector borne diseases through laboratory diagnosis. Only the patients confirmed with malaria and dengue were included in this study. A total number of 218 patients were observed of which 37 (16 cases of malaria and 21 cases of dengue) vector borne disease patient were found during this period. Patients were interviewed to some questions for the demographic detail using a questionnaire, studied about the past and present condition of patient, the place where they are affected, pathological inquiry, secondary disease and condition and about responsible pathogen. Visit to the patients with an interval of 7 to 14 days continuously.

RESULTS

Total number of 218 patients was interviewed and 37 were infected with 2 vectors borne disease. Where malaria prevalence was 43.24% (16) and dengue prevalence was 56.76% (21). 56% patients came from Alikadam (Bandarban) part of the hill area. Among the total patient 4 (25.25%) of them carried pathogen from abroad (Table 1). Dengue fever usually spread throughout the country mostly urban and suburban regions. The patients recorded with the dengue fever from four distinct regions in Bangladesh such as, Dhaka Cantonment; CMH Officials; Kaptai (Chittagong) and other places (Uttara, Gazipur and Savar). Majority of the dengue infected patients came from the Dhaka Cantonment. Total 61.90% patient admitted in to the CMH from Dhaka cantonment. Small number of the patients came out side of Dhaka City. Study showed that 03 officials (14%) of the CMH affected by the Dengue fever. One patient, 4.76% of the dengue infected from outside of Dhaka is quite rare for this hospital (Table 1).

TABLE 1: Malaria and dengue patients from multiple locations in Bangladesh

Location	Malaria				Dengue			
	Alikadam, Bandarban	Abroad(Cote d'Ivoire)	Kaptai, Chittagong	Dhaka Cantonment	Dhaka Cantonment	CMH Officials	Kaptai, Chittagong	Others
Prevalence (%)	56%	25.25%	12.5%	6.25%	61.90%	14%	4.76%	19.34%

In this study patients carried malaria from local and abroad principally infected with three *Plasmodium* species (*P. malariae*, *P. falciparum* and *P. vivax*). Among the local patients infection through *P. falciparum* showed higher

prevalence (50%), except one foreign patient with this pathogen (Table 2). The majority of suspected cases, more than 70% were *P. falciparum* (Alam *et al.*, 2010). Mixed infection (18.75%) was found in three cases (Table 2).

TABLE 2: Frequency of different malarial pathogen causing diseases

Malaria Pathogen	Number of affected patients	Prevalence %
<i>P. falciparum</i>	08	50%
<i>P. malariae</i>	01	6.25%
<i>P. vivax</i>	04	25%
Mixed infection- <i>P. falciparum</i> & <i>P. vivax</i>	03	18.75%

Among malaria infection 06 of them 37.50% suffered from the secondary infection. The patients with *P. vivax* and *P. malarae* were detected to have secondary infection. Secondary infections were fatal and cause acute throat and ear complications. Two patients (12.5%) infected with

Klebsiella pneumoniae. Patient suffered from *K. pneumonia* took long time to recover than other. In our study we find, 9 (42.86%) patients were re-infected among 21 dengue patients (Table 3).

TABLE 3: Re-infection history

	Single infection	Re-infection
Number of patients	12	9
Prevalence (%)	57.14	42.86

Among the re-infected patients there were not any significant health hazard observed. Five re-infected patients took moderate time to recover. Not any case of Dengue hemorrhagic fevers (DHF), Dengue shock syndrome (DSS) or any severe health condition had been

observed. Most of the dengue fever patient recovers without any major complications. The number of malarial and dengue cases in Bangladesh fluctuates seasonally. The intensity of both malaria and dengue found high on the monsoon and post monsoon months (Fig. 1).

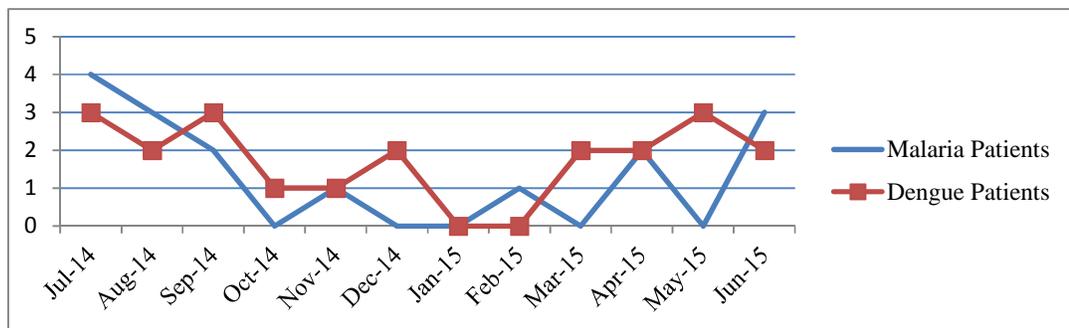


FIGURE 1: Monthly variation of both malaria and dengue infection in CMH.

Detection of these two diseases requires some pathological process to follow. For the detection the pathological lab of CMH follows certain procedure as prescribed by the doctors. In case of malaria, direct microscopic examination of intracellular parasites on stained blood films has been done for definitive diagnosis. Simple light microscopic examination of Giemsa stained blood films has been the useful method for definitive malaria diagnosis in CMH. The rapid detection of parasite antigens rapid immune-chromatographic techniques is used. Blood Culture in Anaerobic condition can be useful in

confirming a diagnosis in the asymptomatic malaria. Detection of parasite genetic material through polymerase-chain reaction (PCR) has been done for the diagnosis of malaria, as well as the diagnosis and surveillance of drug resistance in malaria. In the survey 10 (62.50%) resistant malarial patients were detected using this method. Specific primers have been developed for each of the four species of human malaria. Among the 21 dengue patients 06 (29%) were found taken under the blood culture test for detection of pathogen found in our study (Fig. 2).

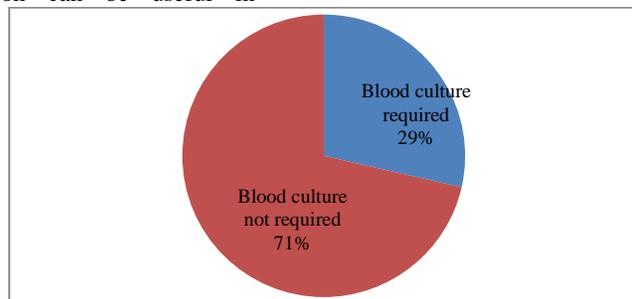


FIGURE 2: Blood culture required for dengue virus isolation

This study found the comparatively modern medication of Coartem contains a combination of artemether and lumefantrine. Artemether and lumefantrine has been

successful to treat acute and uncomplicated falciparum malaria. Chloroquine can be used for preventing malaria from *P. vivax* and *P. malariae* (Fig. 3).

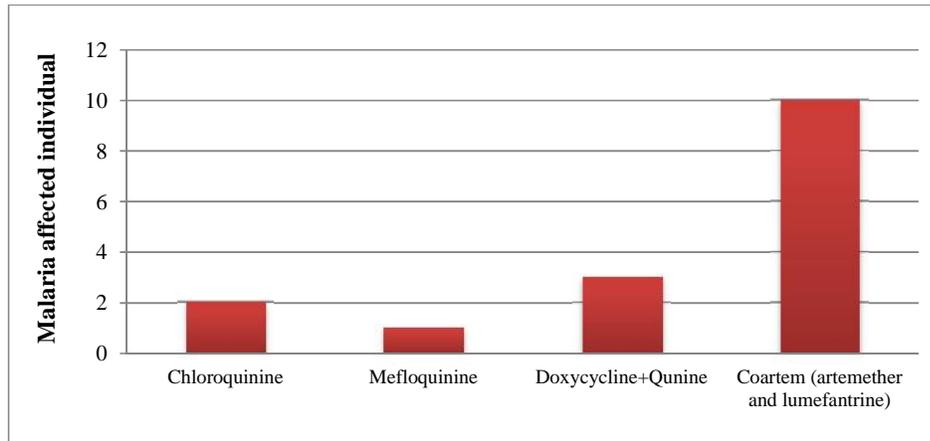


FIGURE 3: Medication for the malaria patients

Many areas of the world have widespread strains of chloroquine-resistant *P. falciparum*, so other antimalarials, such as mefloquine is used which is recommended by the Infectious Disease Society of America for malaria prophylaxis as a first or second line agent, depending on resistance patterns in the malaria (Hill, 2011). In Bangladesh the mefloquine has been branded with the name Eflon (Mefloquine 250mg/tablet) by ACI Limited. 11 patients 68.75% were prescribed to take drug Coartem during the sufferings, rest were treated with Chloroquinine, Doxycycline, Mefloquinine (Fig. 3). As there has been not any specific medicine for dengue though the doctors recommended; Napa, Napa Suppository, Doxycycline (tetracycline), Fexol 120mg (Fexofenadine 120 Mg Tab), Ceftron injection (*Ceftriaxone 500mg (I/M)* with 1% Lidocaine). These drugs have ceased the temperature of the patient's body.

DISCUSSION

Malaria has been a major health burden on the remote south-eastern region of Bangladesh. In the hills of Chittagong people has been deprived of proper knowledge of malaria. Thus the infection rate remained high from that region. Lack of preventive measures and high potential breeding ground for the vector made people infected. Defense people have to stay in the jungle, suitable place for the vector-*Anopheles* spp. Wet and humid condition is favourable for the propagation of *Anopheles* mosquito (Eckhoff, 2011). Stagnant water in the monsoon creates better breeding ground for *Aedes* sp. Unplanned and weak drainage system as well as filling up fresh water canals made places for immobile water. Besides household stagnant water container turned the situation worst. Comparatively dry winter and early summer provides less opportunity of *Aedes* to breed.

The soldiers in defense forces in Bangladesh have been serving for UN (United Nations) peace keeping operation. Principally the soldiers have been on the African countries. The whole continent of Africa has been known for the high risk continent of malaria. Democratic republic of Congo, Kenya, Cote d'Ivoire, Sudan, Uganda, Libya,

Mali and Central African Republic has been on that list (Kleinschmidt *et al.*, 2001). Malaria risk is related to environmental factors affecting these vectors including altitude, forest, household density, cultivation practices, urbanization, and distance from water bodies. People living around the densest forest were at a significantly higher risk of being infected compared to whom live outside the forest. People living in higher altitude areas had much higher chance of malaria infection (Haque *et al.*, 2010). Around the capital city patients from Gazipur and Saver got admitted into CMH with dengue infection. Those who engaged in the treatment of the patients often been affected by the pathogen. The condition of the CMH in some places found untidy. This would jeopardize the officials. Number of the victim may increase if the situation would not change soon.

Human infecting *Plasmodium* sp. is *P. malariae*, *P. ovale*, *P. falciparum*, *P. vivax* and *P. knowlesi* (Kamareddine 2012). Previous study also showed in Bangladesh that *P. falciparum* infection has been much more than other (Hussain *et al.*, 2003). The majority of suspected cases, more than 70% were *P. falciparum* (Alam *et al.*, 2010). Previous study also showed that mixed species infections are common and under certain condition in South-East Asia (Imwong *et al.*, 2011). The appropriate reason behind this has not yet been known. The mixed infection may occur simultaneously or one after another pathogenic invasion. Body may remain vulnerable but in this study we did not found any major changes or complications than single infection. The most severe sequel of Dengue infection described has been Dengue hemorrhagic fever (DHF) and Dengue shock syndrome (DSS). Involvement of the central nervous system (CNS) is usually in the form of Encephalopathy (Hendarto and Hadinegoro, 1992). Neurological manifestation during dengue infections is common. Direct involvement of the CNS has been manifested as meningoencephalitis (Sudhir *et al.*, 2010), though we were not found any hemorrhagic fever.

In case of diagnosis advantages include differentiation between species, quantification of the parasite density, and ability to distinguish clinically important asexual parasite

stages from gametocytes which may persist without causing symptoms. Multiple experimental tests have been developed targeting a variety of antigens. The Rapid diagnostic test RDT yielded rapid and highly sensitive diagnosis of *P. falciparum* infection (WHO, 2001). Detection of parasite genetic material through polymerase-chain reaction (PCR) has been done for the diagnosis of malaria, as well as the diagnosis and surveillance of drug resistance in malaria. One important use of this new technology is in detecting mixed infections or differentiating between infecting species when microscopic examination is inconclusive (WHO, 2001). In addition, improved PCR techniques could prove useful for conducting molecular epidemiological investigations of malaria clusters or epidemics. Blood test (platelet count) is the diagnostic process of the dengue infected patients. Some blood infections can be mild, thus pathogen couldn't be found. Though fever occurs to them but the pathogen remains untraced. In this condition, virus test-IgM count, blood culture is necessary. Blood culture has been a microbiological culture for detection of the pathogen (WHO 2009). Blood culture has been performed when such symptom was running, chills, confusion, decreased urine, fever, nausea, rapid breathing and rapid heartbeat. Blood cultures are performed when a doctor suspects one may have a blood infection.

In Asia, overall mortality rates due to malaria have declined. However, progress is now threatened as a result of the emergence of drug-resistant forms of parasites and new epidemics, which reflect climate change, population movements, or breakdown in control measures (Pandey *et al.*, 2004). The problem of multi-drug resistant falciparum malaria is spreading. Falciparum malaria resistant to chloroquine and sulfadoxinepyrimethamine (SP) is widespread, and mefloquine and quinine resistance has also been reported (Misra, 1996). Doxycycline is an antibiotic that is used in the treatment of a number of types of infections caused by bacteria and protozoa. It is useful for the treatment of malaria when Doxycycline is used with quinine for the prevention of malaria. Quinine is highly effective but poorly tolerated in prolonged dosage and is always supplemented by additional treatment, usually with oral Doxycycline (Laloo *et al.*, 2016). Chloroquine and quinine were effective drugs till 2001, but lately, the effect of chloroquine is fading (Melmane *et al.*, 2014). The place of these drugs has been compensated by Coartem.

CONCLUSION

Lack of resources and proper knowledge we can't build strong control programs of such vector borne diseases. In addition, malaria parasites are increasingly resistant to antimalarial drugs, presenting one more barrier to malaria control on that continent. Authorities have to be more careful to them because handling such patients has been difficult.

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