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Article

Prevalence of malaria disease under the Savar upazila of Dhaka district in Bangladesh

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Abstract: Malaria is a major public health concern in Bangladesh. The aim of this study was to determine the prevalence of malaria parasites from blood sample. The blood samples were collected from patients of different hospitals at Savar upazila. Malaria prevalence survey was conducted in six malaria endemic areas at Savar upazila of Bangladesh. The microscopic examinations were employed for the diagnosis of malaria infection. The overall prevalence of malaria was found to be 23.48% from 115 blood samples. The highest malaria prevalence was observed at Islamnagar area (30.76%) than other five areas of Savar upazila. According to gender wise distribution, it was observed that male (30.90%) had higher positivity compare to their counterparts (16.67%). As regard to age, the peoples whose ages between 21 to 25 years (88.88%) were mostly suffering from malaria. The seasonal influence of outbreak of this disease was higher in rainy season (37.5%), followed by summer (28%), autumn (16.67%) and spring season (12.5%). Effective control program, accurate information on the incidence and prevalence of malaria is required to minimize and eradicate malaria from Bangladesh.

Keywords: malaria infection; prevalence; *Plasmodium falciparum*; rainy season.

1. Introduction

Malaria parasites are micro-organisms that belong to the genus *Plasmodium*. There are more than 100 species of *Plasmodium*, which can infect many animal species such as reptiles, birds, and various mammals. In addition there is one species that naturally infects macaques which has recently been recognized to be a cause of zoonotic malaria in humans. This disease is endemic throughout most of the tropics. Of the approximately 3.4

billion people worldwide who are exposed annually, 1.2 billion are at high risk; the World Health Organization (WHO) states that there were 198 million cases of symptomatic malaria in 2013 (WHO, 2014). Malaria is caused by infection with one or more of four species of *Plasmodium* (i.e., *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*) that can infect humans. The morbidity and mortality burden caused by malaria are responsible for nearly 3% of the world's Disability-adjusted life year (DALYs) (Benet *et al*., 1991). Even though Africa accounts for 90% of the mortality burden for malaria, South-east Asia still suffers considerable mortality and morbidity. Malaria is a major public health problem in Bangladesh. It is transmitted via the bite of a female *Anopheles* spp. mosquito, which occurs mainly between dusk and dawn. Other comparatively rare mechanisms for transmission include congenitally acquired disease, blood transfusion, sharing of contaminated needles, and organ transplantation (Filler *et al*., 2003; Owusu-Ofori *et al*., 2013). Of the 11 countries of the World Health Organization South East Asian Regional Office, ten countries including Bangladesh is malaria endemic. Due to the frequent use of DDT by the Malaria Eradication program of the then Government of East Pakistan, malaria was mostly under control before 1971 (Sharma, 1996). After the independence of Bangladesh from Pakistan, DDT was banned in 1985 and the number of malaria cases began to increase. Since the incidence of malaria in the eastern regions was low and there was a lack of adequate funds and programs, no control efforts maintained in the malaria endemic areas of Bangladesh. Without these control efforts, malaria cases started to increase and became epidemic in the 1990s (Sharma, 1996; WHO, 1997). In the late 1990s, more than 500 deaths were reported with 70,000 laboratory-confirmed cases and 900,000 clinical cases of malaria in Bangladesh (Wijeyaratne *et al*., 2004).

The number of malaria cases in Bangladesh fluctuates seasonally. The majority of these cases occur in the thirteen districts close to and/or bordering India and Myanmar. These thirteen districts, out of the 64 administrative districts of Bangladesh, are recognized as malaria endemic. Ninety eight percent of the malaria case reports come from these thirteen districts. Three out of these thirteen districts, Bandarban, Khagrachari and Rangamati, collectively known as the Chittagong Hill Tracts (CHT) districts, report the highest incidence of malaria within the country. These thirteen districts are difficult to reach due to the hilly terrain and therefore have inadequate passive surveillance and information systems resulting in poor reporting of malaria cases by the Ministry of Health, Government of Bangladesh (Mahmood *et al*., 2000; Rahman *et al*., 2002).

However, malaria remains a global health problem, and public efforts today focus on controlling it. In addition, a worldwide effort is under way to develop a vaccine that protects people against the disease. The objectives of this study were to determine the prevalence of malaria parasite from blood sample and to detect seasonal variation, age variation, and geographical distribution of malaria parasite.

2. Materials and Methods

The study was carried out in the Department of Microbiology, Gono Bishwabidyalay, Savar, Dhaka. It was conducted during the period from 23rd June 2011 to 3rd March 2012 at Savar upazila of Dhaka, Bangladesh.

2.1. Study subject

The study subject consisted of 115 people admitted to different hospitals such as Savar Bazar, Dhamrai, hamayatpur, and others area at Savar in Dhaka. They were selected randomly without the prior knowledge of their clinical history.

2.2. Sample collection

The method of sample collection employed was venepuncture technique. The puncture site was cleaned with 70% alcohol and venepuncture made with the aid of 21G needle attached 5 ml syringe. After collection blood was transferred into sterile test tube and carried to laboratory for microscopic examination. The collected blood samples were analyzed within 1 to 2 hour of collection. Thick and thin film were prepared according to the technique outlined by Cheesebrough *et al.* (2004) & described by Epidi *et al.* (2008).

2.3. Laboratory analysis

A drop of each blood sample was placed in the middle of a grease free slide and made thin and thick film by using another slide. Then the slide kept for air dry and fixed with methanol and all films were stained with Giemsa stain. After staining it was washed thoroughly and air dried for eventual examination under the microscope using immersion oil at 100X magnification to observe for malaria parasites. Presence of ring forms

plasmodium and Trophozoites of Plasmodium indicate positive results. A blood smear was negative if no parasite seen after 10 min of search or examination under microscope.

2.4. Data Analysis

Prevalence of *Plasmodium* was calculated as the proportion of sampled persons with a positive result divided by the number of persons who provided blood samples. All point estimates were weighted, with empirically estimated standard errors used to account for prevalence. The data generated from this study were presented using descriptive study.

3. Results and Discussion

A total of 115 blood samples from different hospitals at several locations of Savar upazila were enrolled in the study. With Microscopic examination there were identified 27 (23.48%) positive isolates of malaria infection from 115 patients who had provided a blood samples and results were shown in the following tables. Islam *et al.* (2013) reported that Bangladesh is one of the four major malaria-endemic countries in South-East Asia having approximately 34% of its population at risk of malaria.

3.1. Prevalence of malaria by sex

As regards the gender type of population, a total of 115 samples were collected from patients to be tested. Of them 55 males and 60 were females. It is observed that among 55 male samples 17 were positive (30.90%) and of 60 female samples 10 were positive (Table 1). Prevalence of malaria infection was higher in male than female. Males are more exposed to the risk of acquiring malaria because of the outdoor life they lead. On the other hand, Haque *et al*. (2009) reported the prevalence of malaria in males and females was 3.96% and 3.98% respectively, in Bangladesh.

Table 1. Distribution of malaria parasite according to gender of the patients.

Sex	No. of samples tested (%)	No. of positive (%)	No. of Negative (%)
Males	55	17 (30.90%)	38 (69.10%)
Females	60	10 (16.67%)	50 (83.33%)
Total	115	27 (23.48%)	88 (76.52%)

3.2. Area distribution of malaria

The magnitude of distribution of prevalence of malaria, a total of 115 blood samples were collected from selective areas of Savar district like Islamnagar, Hamaitpur, Savar Bazar, Ganda, Amin Bazar, Dhamrai. The maximum positive samples were isolated from Islamnagar. It showed the highest prevalence found in Islamnagar (30.76%) than Hamaitpur, Savar Bazar, Ganda, Amin Bazar and Dhamrai were 25%, 25%, 16.67%, 20% and 18.18%, respectively (Table 2). Haque *et al*. (2009) reported that the overall weighted malaria prevalence rate was 3.97% in thirteen malaria endemic districts of Bangladesh. Whereas Islam *et al.* (2013) observed that the prevalence of malaria ranging between 3.1% and 36% from 13 districts of Bangladesh. Malaria is not equally distributed in all malaria endemic districts of Bangladesh. Prevalence of malaria in five south-eastern districts is significantly higher than the eight north-eastern districts. Chittagong Hill Tracts (CHT) districts have the highest prevalence than the other endemic districts. (Haque *et al.*, 2009). We have found a much higher prevalence of malaria than would be expected by investigating the national passive surveillance information (Wijeyaratne *et al.*, 2004).

3.3. Prevalence of malaria according to age

As regard to age, from 115 samples, 27 (23.48%) had malaria parasite in their blood. The age group 21-25 years recorded the highest prevalence rate of 88.2% (Table 3). This finding is not agreed with findings of Haque *et al*. (2009) who observed the prevalence of malaria was significantly higher in children.

Table 2. Distribution of malaria parasite according to area.

Experimental area	No. of sample tested	No. of positive (%)	No. of Negative (%)
Islamnagar	26	8 (30.76%)	18 (69.23%)
Hamaitpur	12	3 (25%)	9 (75%)
Savar Bazar	28	7 (25%)	21 (75%)
Ganda	18	3 (16.67%)	15 (83.33%)
Amin Bazar	20	4(20%)	16 (80%)
Dhamrai	11	2 (18.18%)	9 (81.82%)

Table 3. Prevalence of malaria parasite in patient according to age.

Age group (Years)	No. of sample tested	No. of positive sample	% of positive sample
1-5	12	7	58.33%
6-10	20	4	20%
11-15	28	3	10.71%
16-20	26	3	11.53%
21-25	9	8	88.88%
26-30	20	2	10.00%

3.4. Prevalence of malaria in different seasons

The study was also concerned with investigation of malaria prevalence according to seasonal influence. All the samples were collected during four seasons such as summer, rainy season, autumn and spring. 25 samples were collected in summer, 32 in rainy season, 35 in spring and 13 in autumn (Table 4). It was observed that prevalence of malaria was highest in rainy season. These findings are in close agreement with the result of Eisele *et al.,* 2007. Good rainfall, relative humidity of 60% and temperature between 20 °C to 30 °C favour the spread of malaria because in this season, water remain constant at the water bodies and the stayed water is the suitable habitat for the reproduction of malaria parasite.

Table 4. Prevalence of malaria in different seasons.

Seasons	No of sample tested	No. of positive sample	% of positive sample
Summer	25	7	28%
Rainy	32	12	37.5%
Spring	40	5	12.5%
Autumn	18	3	16.67%

4. Conclusions

In order to implement an effective malaria control program in Bangladesh, accurate information on the incidence and prevalence of malaria is required. In this study, malaria prevalence survey was conducted to provide the baseline parasitological information for population living in the malaria endemic districts of Bangladesh. These data will also be a massive help of global initiatives of malaria mapping in Bangladesh.

Conflict of interest

None to declare.

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