CORRELATES OF PERCEIVED MALARIAL EPISODES AND TREATMENT-SEEKING BEHAVIOR IN A MALARIA-ENDEMIC RURAL AREA IN BANGLADESH

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Abstract. Malaria is one of the most serious diseases of developing countries. In Bangladesh the estimated population at risk of malaria was calculated to be 103.7 million. This study, carried out in 1995 in villages of the malaria-endemic south-eastern part of Bangladesh aimed to identify the correlates of perceived malarial episodes and healthcare-seeking behavior. Data were collected from villagers and healthcare providers by interviewing. Seventeen percent of the study population reported an episode of malaria during the two months prior to the survey. Males reported more malarial episodes than females; irregular visitors to the jungle and day laborers reported higher prevalence of illness than their regular counterparts. Ninety-nine percent of those who reported suffering from malaria consulted a village healthcare provider within 21 days of the onset of symptoms. Contact rate was higher for those living in highlands, the economically better-off and those aged 10-14 years. The education of the household head, location of the house, the age of the individual, the duration of treatment and the kind of medication suggested were significantly associated with treatment compliance. There is a need to raise awareness about prevention and appropriate management of malarial episodes.

INTRODUCTION

Malaria is one of the most serious diseases of developing countries. Though preventable and curable, malaria kills thousands of people every year. It is estimated that 1.2 billion people (WHO, 1998a) in Southeast Asia live in malaria-prone areas. In 1995 malaria cases in the region were estimated at 21.9 million with almost 32,000 deaths (WHO,1998b). The vast majority of deaths occur among young children, especially in remote rural areas with poor access to health services. Other high-risk groups include pregnant women, and non-immune travellers, refugees, displaced persons and laborers entering endemic areas (WHO, 1998a). The malaria eradication strategy in the 1950s and 1960s relied heavily on DDT-based insecticide spraying and the use of chloroquine: this strategy became unsustainable after external support was withdrawn. The countries then adopted a control strategy which promoted decentralization through integration of the malaria programs into general heath services: this resulted in increased malaria incidence during the 1970s. Although the overall malaria situation has remained the same for over a decade, its alarming features are the increase in the proportion of *P. falciparum* cases and the development of drug resistance by the parasites and its regional spread (WHO, 1990).

In Bangladesh the estimated population at risk of malaria is 103.7 million. The number of malaria cases increased fivefold between 1988 and 1994 (UNICEF, 2000). One of the Government malaria control strategies includes early diagnosis and treatment of malaria patients following WHO recommendations (DGHS and WHO, 1994). However, the extent to which this strategy was implemented is not known. It is important to understand the risk factors for malaria in order to improve the existing

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malaria control program. Knowledge about the healthcare-seeking behavior of people who think that having malaria and the treatment generally available to them is important when assessing the effectiveness of the existing malaria control program. The present study was carried out in a malaria-endemic area in the southeast part of Bangladesh to determine the correlates of perceived malarial episodes and healthcare-seeking behavior of the people of the region.

METHODOLOGY

Study area

The study was carried out in three villages of Chakaria thana in Cox's Bazar district during 1995 under the auspices of the Chakaria Community Health Project (CCHP) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The study area was about 50 km north of Cox's Bazar: a site hilly in the east and stretching to the Bay of Bengal in the west. The hilly areas of Chakaria contain a part of the National Reserve Forest. The climate of Chakaria is tropical with heavy rainfall during May to September. The climate and location of Chakaria make it a malaria-endemic area. In the healthcare system of the area, village doctors (practitioners of modern medicine mostly without any formal training), are the first-line healthcare providers. There is a 31-bed Government hospital, the Thana Health Complex (THC), and an outdoor facility run by qualified doctors and nurses. Other facilities include many private outdoor units run by doctors.

The area has been identified as a malaria-endemic area and therefore it is under the government malaria control program (DGHS, 1988). The existing government malaria control strategies include the early diagnosis and treatment of malaria following WHO recommendations. The WHO recommends that the treatment of uncomplicated malaria (*P. falciparum* or *P. vivax)* should be chloroquine (25 mg/kg body weight) for three days followed by a single dose of primaquine (1 mg/kg body weight) on the fourth day. Severe malaria should be treated with parenteral quinine (as the dihydrochloride 10 mg/kg body weight). For a radical cure of *P. vivax* infection a course of primaquine (15 mg/day for 14 days) is prescribed (DGHS and WHO, 1994). In addition, the government malaria control strategy includes social mobilization for malaria control, application of insecticide-treated bed nets (ITBN) program, residual insecticide spray (RIS) in areas where malarial outbreaks occur and the provision of health education by village health volunteers (DGHS and WHO, 1994).

The respondents and method of data collection

Data were collected during June-December 1995 with a cross sectional survey that was conducted by trained personnel using a questionnaire. The interviewers approached the head of every household (usually male) of the three villages. In the absence of the household head, any knowledgeable adult member of the household was interviewed for household information. Information on both the perceived malarial episode among household members aged more than six years during two months preceding the survey and on the curative measures taken was collected. Additional information on age, sex, jungle visits, occupation, location of the house and its ownership and the use of bed nets was also collected during the survey. Information from 4,688 households was available for analysis.

Qualitative information was collected for better understanding of the management of malarial cases. Thirty-eight local healthcare providers (village doctors) were interviewed on specific issues as they were the first line of treatment for the majority of the perceived cases of malaria. These doctors were chosen because they came to the THC for training on the treatment of malaria. The interviews were conducted prior to the training. The resident medical officer (RMO) of the Thana Health Complex (THC) was also interviewed. One child patient was admitted to the THC, during the survey, with complicated malaria: the child's parent was interviewed in an attempt to elicit the child's view of his/her experience.

Variables

Malaria was defined as a case of febrile condition as well as fever, which was reported by the adult family members as 'malaria'. The information was collected retrospectively for the two months preceding the survey.

The independent variables included some household and individual characteristics. Houses were classified by situation: in hilly, high or low plain areas of Chakaria. Number of bed nets per household was categorised thus: households with no bed nets; households that had bed nets. Education status of the household heads indicating completed years of schooling in secular schools was categorised as illiterate, 1-5 years of schooling and more than 5 years of schooling. The occupation of the household heads was determined on the basis of the major income source and was categorised as either poor or better-off households. Households where the household heads were day laborers, rickshaw-pullers and fishermen were considered poor while the others were considered better-off. The individual characteristics used as independent variables included age, gender, educational status, whether the individual worked as a day laborer or not, the frequency of using bed nets, and the frequency of visiting the jungle.

For the treatment-seeking behavior, whether the patient sought treatment or not was used as a dependent variable. For assessment of treatment compliance, compliance with the treatment prescribed was used as a dependent variable. The interviewee was asked about the length of treatment prescribed by the healthcare provider and the duration of their taking the medicine. Based on these two factors, compliance with treatment was assessed.

Method of analysis

Both univariate and multivariate methods of analysis were used to analyze the quantitative data. In case of the factors associated with perceived malarial episodes, the univariate analysis was done using perceived episode of malaria as the dependent variable. All available independent variables were cross-tabulated to examine the association between the dependent and independent variables. A stepwise logistic regression was then carried out with perceived episode of malaria as dependent variable and the independent variables as categorical variables to identify the most important predictors.

Retrospective information on the contact with healthcare providers was collected from interviewees on the day of interview. If healthcare provider was contacted, the number of days between symptom-onset and contact with the healthcare provider was recorded. The time taken to be cured of malaria was also recorded. Analysis of this type of data poses two problems: some episodes were continuing on the day of the interview while others had resolved prior to interview. Some of the cases might have been cured without assistance from a healthcare provider. Since straightforward analysis of this kind of data may produce misleading results and the analysis of contact with healthcare provider should use the available information fully, a discrete life-table technique of data analysis (Alison, 1982) was used. The life-table analysis was performed by creating data files – one for each day of duration – in the following manner. There were 678 cases of perceived malarial episodes. Of these, those who were cured or for whom a contact was made on the first day were excluded on the second day. The process continued for 21 days until all the patients had contacted a healthcare provider. The number of episodes obtained on each day and the corresponding cumulative life-table contact rates were calculated (Kirkwood, 1988). The data files, one for each day, indicated whether a contact was made on that day along with other independent variables. Finally all the observations in the 21 files were pooled to perform a logistic regression analysis of contact with any healthcare provider as a dichotomized dependent variable. The above exercise resulted in 2,664 records. All the independent variables included in this analysis were treated as categorical variables.

In relation to compliance with the treatment prescribed, only information from those who sought treatment was collected and

univariate analysis was conducted using compliance with treatment as a dependent variable.

The information on management practices obtained during the interviews was analysed manually to gain an understanding of the situation from the healthcare providers' and patients' point of view.

RESULTS

Background characteristics

In the study villages, information on 2,102 males and 1,986 females was collected by interview. Approximately 32% of interviewees were between 7-14 years old, 22% were 15-25 years of age, 18% were between 25-34 years of age, 12% were between 35-44 years of age and 16% above the age of 45 years. Fifty-five percent of the study population lived in hilly areas, 18% in highlands and 27% in low-lying areas, which are subject to monsoon flooding. Ten percent of the population lived in households that did not own any mosquito nets. Regular use of bed nets was reported for 65% of the study population. Approximately 17% of the study population reported an attack of malaria during the two months preceding the survey. Among those who reported suffering from malaria, 54% still had fever on the day of the interview. The proportion of reported cases of malaria was highest among the 25-34 year old population.

Perceived episodes of malaria and their correlates

Household characteristics: According to the univariate analysis (Table 1), economic status of the household as defined by the occupation of household head was significantly associated with the proportion of perceived cases of malaria. Households with lower economic status reported a higher proportion of febrile attacks than the better-off households. The households with an illiterate household head reported a higher proportion of perceived malarial episodes compared with the households with educated household heads. However the location of the household and the number of bed nets available in the household was not significantly associated with the perceived episodes of malaria.

Table 1
Perceived malarial episodes two months preceding the survey by various household characteristics.

Variables	Number	Perceived malarial episodes (%)	p-value
Location of the house			
Hilly	2,251	17.6	
High	722	15.5	
Low	1,115	15.3	0.162
No.of bed net owned			
None	418	17.0	
Some	3,670	16.6	0.835
Education of household head			
0	2,777	17.6	
1-5 years	696	15.7	
6+ years	615	13.5	0.037
Economic status of household head			
Poor	1,022	20.7	
Better off	3,066	15.3	0.000

Table 2
Perceived episodes of malaria during two months preceding the survey by various individual characteristics.

Variables	Number	Perceived malarial prevalence (%)	p-value
Age in years			
6-14	1,294	14.8	
15-24	888	16.0	
25-34	762	20.1	
35-44	486	18.5	
45+	658	15.8	0.02
Sex			
Male	2,102	19.9	
Female	1,986	13.1	0.000
Education			
0 years	2,435	17.0	
1-5 years	1,149	17.3	
5+ years	504	13.1	0.07
Use of bed net			
Regular	2,647	15.8	
Irregular	753	18.7	
Never	688	17.4	0.14
Visit to the jungle			
Never	1,537	11.8	
Irregular	450	23.6	
Regular	2,101	18.7	0.000
Individual occupation			
Day labor	391	28.6	
Others	3,697	15.4	0.000

Individual characteristics: According to Table 2 the individual characteristics that were significantly associated with perceived episodes of malaria at the 5% level of significance were age, sex, jungle visits and occupation. The perceived malarial episodes were lowest in the age group 6-14 and highest in the age group 25-34 years. Males were more likely to report malaria than females. In case of jungle visits, those who visited the jungle irregularly had the highest proportion of perceived malarial episodes compared with those who visited the jungle regularly and those who never visited the jungle. In the occupational category, a significantly higher proportion of those who worked as day laborers reported suffering from malaria compared with those who were not day laborers. Education and use of bed nets were not significantly associated with perceived episodes of malaria.

Table 3
Results of logistic regression to observe the effects of different independent variables on perceived episodes of malaria.

Independent variables	Coefficient	Odds ratio
Sex	χ^2=15.7471[a]	
Male	0.3541	1.42
Female	Reference	-
Day laborer	χ^2=16.9942[a]	
Yes	0.5215	1.68
No	Reference	-
Visits to jungle	χ^2=26.4645[a]	
Never	Reference	-
Irregular	0.6312	1.88
Regular	0.4380	1.55
Constant	-2.1884[a]	
-2log likelihood	3,591.348	
Chi-square	88.145[a]	

[a]p<0.001

The stepwise logistic regression analysis conducted to find out the main correlates of malaria revealed that gender, jungle visits and occupation were significantly associated with the perceived episodes of malaria. Males had 1.42 times greater odds of suffering from malaria than females. Day laborers had 1.68 times greater odds of suffering from malaria compared with the others. Compared with those who never visited the jungle, those who made irregular visits and those who made regular visits to the jungle had 1.88 and 1.55 times greater odds of suffering from malaria respectively (Table 3).

Management practices

Among those who suffered from malaria during two months preceding the survey approximately 3% tried home remedy, which included drinking juice of *batuk* leaves, sponging the body, taking tablets and resting.

Ninety-nine percent of those who reported suffering from malaria consulted a local healthcare provider for the illness within 21 days of onset (Table 4). Most of the respondents could not name the drug prescribed by the healthcare provider but could remember whether they were prescribed tablets, syrups or injections. Among those who consulted the healthcare provider for treatment, about 8% did not remember what kind of medicine they were prescribed; 73% were given oral medicine and the rest were given injections with or without oral medicine.

In case of the treatment regime suggested by the healthcare providers, 46% were prescribed seven days treatment, 27% were prescribed treatment for 8-14 days and 27% were prescribed treatment for more than 15 days.

Variations in contacting the healthcare providers

According to Table 4, among those who reported suffering from malaria approximately 66% had contacted a healthcare provider by the 3rd day and about 74% had contacted a healthcare provider by the fourth day after the onset of fever.

According to the univariate analysis (Table 5), location of the house, economic status and education of the household head and age and occupation of the individual were associated with the probability of consulting a healthcare provider. People from highland areas were more likely to contact a village doctor than those from other areas. People from better-off households or with a better-educated household head were more likely to contact a healthcare pro-

Table 4
Rate of contact with healthcare providers by days since onset of illness among people with perceived episodes of malaria.

No. of days since onset	No. of episodes	No. of patients		No. of contacts with healthcare providers	Contact rate (%)	Cumulative contact rate (life-table)
		Didn't seek treatment	Cured without treatment			
0	678	1	-	160	23.6	23.6
1	517	6	2	130	25.1	43.0
2	379	11	-	148	39.1	65.6
3	220	2	1	51	23.2	73.6
4	166	2	2	45	27.1	80.9
5	117	1	-	12	10.3	82.8
6	104	5	2	17	16.3	85.7
7	80	2	-	15	18.8	88.4
8	63	-	-	2	3.2	88.8
9	61	4	1	20	32.8	92.6
10	36	-	-	1	2.8	92.8
11	35	-	-	3	8.6	93.5
12	32	-	-	0	0	93.5
13	32	-	-	0	0	93.5
14	32	1	1	7	21.9	94.9
15	23	-	-	3	13.0	95.6
16	20	-	-	0	0	95.6
17	20	-	-	1	5.0	95.8
18	19	-	-	1	5.3	96.0
19	18	3	-	3	16.7	96.8
20	12	3	3	6	50.0	98.9
	2,664	41	16	625	23.4	

vider than those from poorer households or whose household head was less educated. The probability of contacting a healthcare provider generally decreases up to the age group 35-44. However, in the age group 45 years and above, the probability of contacting a healthcare provider shows an increase. Those who were day laborers contacted the healthcare provider less often than those from other professions.

The results from stepwise regression analysis (Table 6) show that location of the house, economic status of household head and age of the individual were significantly associated with contacting the village healthcare provider. Compared with people living in hilly areas, the odds of contacting healthcare providers were about 2.4 times and 1.2 times higher among people living in high and low lying areas respectively. Compared with the poor households, the individuals from better-off households had 1.5 times greater odds of contacting the healthcare provider. The odds of contacting the healthcare provider generally decreased with an increase in age. The variables were dummy coded for the analysis.

Variation in compliance with the prescription

As Chakaria is a malaria-endemic zone where infection from *P. falciparum* is predominant (DGHS, 1988), a healthcare practitioner at Chakaria could empirically treat a case of malaria as *P. falciparum* infection. In case of our study, we do not have enough information to understand either what kind of infection was suspected or to link it with the treatment suggested. However, we have information on the duration of treatment suggested and related compliance.

Table 5
Univariate analysis for the determinants of contacting the healthcare provider.

Independent variable	No. of days exposed	Consultation with the physician (%)	p-value
Location of the house			
Hilly	1,750	20.4	
High	284	39.1	
Low	630	24.0	0.000
Education of household head			
0	2,019	21.6	
1-5	420	23.8	
6+	202	34.7	0.000
Economic status of household head			
Poor	1,036	17.7	
Better-off	1,628	26.8	0.000
Age category (years)			
6-14	622	27.8	
15-24	496	25.4	
25-34	657	21.5	
35-44	435	18.6	
45+	454	21.6	0.004
Sex			
Male	1,594	24.2	
Female	1,070	21.8	0.147
Day laborer			
Yes	568	18.0	
No	2,096	24.5	0.004

Table 6
Result of stepwise logistic regression analysis to observe the effects of different independent variables on the probability of contacting a healthcare provider.

Independent variables	Coefficient	Odds ratio
Location of the house	χ^2=38.7187[b]	
Hilly	Reference	-
High	0.8591	2.36
Low	0.1962	1.21
Economic status of household head	χ^2=16.3649[b]	
Poor	Reference	-
Better-off	0.4161	1.52
Age category (years)	χ^2=11.9798[a]	
6-14	0.3220	1.39
15-24	0.1251	1.13
25-34	0.0500	1.05
35-44	-0.1846	0.83
45+	Reference	-
Constant	-1.7194[b]	
-2log likelihood	2,770.852	
Model chi-square	76.566[b]	

[a]$p<0.05$, [b]$p<0.001$

Forty-seven percent of the study population complied with the treatment prescribed by the doctor; 2% continued medication for longer than prescribed; and 51% of the population did not complete the course of treatment prescribed. When the compliance was stratified by different variables (Table 7), education of household head, location of the house, age, duration of treatment suggested and kind of medication suggested were significantly associated with compliance. With higher educational status of household head, the proportion of treatment compliance increased. The location of the house was associated with treatment compliance. People living in the hilly and low-lying areas were more likely to comply with the treatment prescribed than those who lived in the high areas. Younger people were more likely to comply with treatment. The highest rate of treatment compliance was found among 6-14 year-olds, followed by people of 45 years or older. There was no significant gender or occupational difference in terms of treatment compliance The rate of compliance fell significantly when the duration of treatment increased from a week or less to more than a week. People were more likely to comply with the course of treatment when injections were prescribed than when oral medicine was prescribed.

Healthcare providers' perspectives

Village healthcare providers(village doctors): 38 private village healthcare providers were interviewed. When asked about the symptoms of malaria the majority of the village healthcare providers mentioned high fever, with chills and rigors followed by profuse sweating, malaise, fatigue, and headache. Very few mentioned anemia, incoherence, confusion and unconsciousness. To diagnose malaria almost half of them mentioned using blood slides report, some mentioned checking the patient's physical symptoms. Very few respondents mentioned using both the methods to detect malaria.

The majority of the respondents thought that the treatment regime should be different for different age groups and pregnant women. However, when it came to writing the correct dose and regimen of treatment, some could write the correct treatment for adults and children

Table 7
Variation in compliance with the prescription.

Variable	Number	Compliance with the prescribed course of medication		p-value
		Completed prescribed treatment	Incomplete treatment	
Education of household head				
0	446	39.9	60.1	
1-5	101	50.5	49.5	
6+	80	65.0	35.0	0.000
Economic status of household head				
Poor	185	41.6	58.4	
Better-off	442	46.2	53.8	0.170
Location of the house				
Hilly	360	46.1	53.9	
High	111	27.9	72.1	
Low	156	53.8	46.2	0.000
Age category (years)				
6-14	174	54.6	45.4	
15-24	130	38.5	61.5	
25-34	141	36.9	63.1	
35-44	83	44.6	55.4	
45+	99	47.5	52.5	0.013
Sex				
Male	392	45.9	54.1	
Female	235	43.0	57.0	0.507
Day laborer				
Yes	107	42.1	57.9	
No	520	45.4	54.6	0.594
Duration of suggested treatment				
1-7 days	221	72.4	27.6	
8-14 days	129	31.8	68.2	
15+ days	138	22.5	77.5	0.000
Types of medication				
Do not remember	53	58.5	41.5	
Oral (tablet, syrups)	444	41.2	58.8	
Injections and/or oral medicine	130	51.5	48.5	0.013

but very few could write the treatment regimen for pregnant women. A few of them stated that they did not treat pregnant women, usually referring them to a doctor or to the THC.

Of local treatment-seeking patterns in cases of malaria, the respondents said that majority of the patients sought advice from them first. Some patients went for a blood test first and then visited the respondents when malaria was suspected. Very few mentioned that the patients first sought help from doctors.

The majority of the healthcare providers thought that malaria was a great health problem and they had some ideas about preventing malaria. Primarily they thought that increased use of bed nets and cleaning the surrounding area to destroy mosquito habitats could prevent malarial episodes. Some thought that DDT-spraying should be used in addition to bed nets. Only a few favored the use of mass

chemoprophylaxis.

Resident Medical Officer (RMO), Thana Health Complex (THC), Chakaria

The RMO had been working for over three years in the THC and also had experience of working in malaria-endemic areas for more than seven years. From his experience of treating patients who come for the treatment of malaria in the THC, he told us that the majority of the malarial episodes came to the hospital with treatment failure malaria (TFM). He defined TFM as patients who had been treated with antimalarials but who were not cured of their symptoms. In his opinion the high prevalence of TFM were due to incomplete doses of antimalarials. The patients first approached the local healthcare practitioners and often received incorrect doses of antimalarials. In some cases the patients stop taking drugs as soon as the fever subsides. Sometimes the side-effects of antimalarials alarm the local healthcare practitioners as well as the patients and treatment is discontinued. As a result, the patients become TFM cases. Episodes of TFM are currently treated with quinine, which is an affordable drug. However, the RMO expressed concern about the future cost of treatment of malaria if patients become resistant to quinine and more expensive drugs have to be used: this concern arose from the fact that village healthcare providers use a single dose of quinine followed by chloroquine to treat malaria. Resistance to quinine is a genuine concern.

The RMO stated that most of the patients have a blood test as soon as they develop fever. Usually 20-50% of febrile episodes that come to the hospital for treatment are eventually diagnosed as malaria. He believed that his patients comply with the treatment because they have consulted him after the local healthcare practitioners have failed to produce a cure.

In his opinion middle-aged men who work outdoors are more likely to suffer from malaria. Pregnant women are usually referred to the THC for treatment when malaria is suspected. These women have two options: either to go for aggressive treatment with quinine sulphate which may lead to abortion or to go for milder treatment with choloroquine which might not cause abortion but which could endanger the lives of both mother and child if malaria is not cured. Usually multiparous women and women from educated families agree to quinine treatment while primagravidae and less educated women chose to go without treatment.

On preventing malaria, the RMO stated that there was no effective method of malaria control although mass chemoprophylaxis might be more useful than promoting the use of bed nets. The RMO thought that those whose livelihoods demanded visiting the jungle might use bed nets when staying overnight in the jungle; the RMO felt that nets provide no daytime protection. Promotion of bed nets may be futile.

When the RMO was asked whether the patients would get better facilities if they came to the THC for treatment, he said that there was no X-ray provision at the THC and neither blood glucose estimation nor a continuous supply of oxygen and that the treatment provided by the village healthcare practitioners was the same as that of the THC. However, he emphasized that his clinical expertise and experience would help patients to respond to medical emergencies caused by malaria.

Caretakers' perspectives

The father of a patient admitted to the THC: The patient was a 17-year-old boy who had a febrile attack 10 days prior to admission. As the patient was semi-conscious, the interview was conducted with his father who was attending to his son full-time. The father and son work as carpenters in Chakaria town and the locality. According to his father, the boy had visited the hilly areas to take supplies to a resident: the boy came down with malaria one week later.

The father stated that his elder son also used to visit the jungle regularly to find bamboo to sell in the local market. He had suffered many times from malaria and had always

consulted the doctor at the THC. Now he worked in the town as a carpenter like his father. Although business in the jungle was very profitable, he had decided to change his profession because he valued his health. When the patient had a malarial attack, he was taken to the village healthcare provider who gave him an injection followed by some tablets. The father reflected that the injection seemed very effective as the boy started to feel better immediately. However within an hour he fainted and neither the village healthcare provider nor the parents knew what to do. Then some spiritual healers were contacted for help but the boy did not improve and was transferred to the THC. From the description of the injection given to the patient, the RMO identified it as the Benaquine (chloroquine) injection often used by local healthcare practitioners.

When the father was asked about the patient's treatment in the THC, he said that only the first dose of quinine injection was supplied by the hospital–the rest of the doses had to be bought by the family. His elder son made daily visits and bought medicine and food for the patient. As all three earning members of the family were daily wagers, the boy's illness was seriously reducing their total earnings. They were spending about 150-200 *taka* (1US$ = 50 taka) a day, to meet all the expenses.

On the mode of transmission of malaria, both the father and his elder son knew that malaria occurs due to mosquito bites. Only mosquitos from the jungle cause malaria. They owned four bed nets and said that the women and children used the nets regularly. The male family members seldom used the bed nets: the father said that they were careless about using bed nets.

DISCUSSION

Factors associated with malarial episodes

It is evident from the findings that the prevalence of malaria has socio-economic determinants. Males are more susceptible because of their increased exposure during jungle visits where mosquitos are in abundance. In Chakaria, males who do not have a steady income often gather wood and bamboo from the nearby forest in order to make a living: their occasional forays to the jungle expose them to malaria. Those who need to visit the jungle regularly on the other hand may develop a degree of immunity to the parasite and suffer from fewer malarial episodes. Similar observations about jungle-related occupation and malaria were made in other studies (Fungladda and Sornmani, 1986; Lansang *et al*, 1997). Periodic population movement into potential transmission sites in endemic areas has also been a major factor in the active transmission of malaria because it increases the probability of exposure of the migrant population to malaria vectors (Sornmani *et al*, 1983; Butraporn *et al*, 1986). Women were less likely to suffer from malaria than men. This was probably due to the fact that men were more likely to be involved with forest related activities or occupations where visits to the forest are required. Furthermore, women and children are more likely to use bed nets than adult males. Various studies have indicated that the there is a relationship between the utilization of mosquito nets and malaria (Butraporn *et al*, 1986; Fungladda and Sornmani, 1986; Fungladda *et al*, 1989).

Treatment-seeking behavior

In Chakaria very few people relied solely on home remedies or self-prescription of antimalarials. The common symptoms of malaria were well known and it was common knowledge that jungle visits and mosquito bites can cause malaria. Whenever they felt they had malaria, the people usually sought treatment from village healthcare providers. Care outside home (*ie* hospital) is only sought when the symptoms worsen. At present, little is known about the behavioral risk factors that favor the occurrence of complications and the increased severity of malarial episodes. However, results of studies of the treatment-seeking pattern of populations in endemic communities have led to speculation that delay in seeking treatment

probably plays a role (Fungladda and Sornmani, 1986; Rauyajin, 1988; Fungladda *et al,* 1991). The delay in seeking treatment from healthcare providers depends on many different factors. One of the major factors could be the economic status of the family. Treatment-seeking includes the doctor's fees, transportation cost and loss of income for the day for both the patient and his/her attendant plus the cost of the prescribed medication. Therefore better-off households are more likely to seek treatment. The distance to the healthcare facility or difficult terrain could cause the delaying of treatment. This was evident in our analysis, where the probability of contacting a healthcare provider was lower in case of people living in the less accessible hilly areas. Village healthcare providers' lack of knowledge about the full spectrum of malarial symptoms and the different tiers of treatment that people may encounter could also cause delay in reaching an appropriate treatment facility. In our analysis no gender difference was seen in the treatment-seeking pattern although males had malaria more often than females: similar observations were made in another study (Sawyer, 1993). This situation poses a number of potential problems: there might be undiagnosed episodes of malaria among the females and the higher risk of malaria faced by pregnant women are compounded by their lack of treatment options. Other studies in Bangladesh have indicated the prevailing disadvantage faced by the women in terms of health status and mortality (Bhuiya 1989; Bhuiya *et al,* 1986; Bhuiya and Streatfield 1991; D'Souza and Chen, 1980) as well as the gender discrimination faced by females in seeking healthcare in terms of lower hospital admission (Chen *et al,* 1981) and purchase of drugs (Hossain *et al,* 1982).

Predisposition to drug-resistant malaria

Non-compliance with full treatment with antimalarials was found to be a major predisposing factor for drug resistance (Arasu, 1992). In our study we had information about malarial episodes and healthcare-seeking behavior from household heads only: in the majority of cases, prescribed drugs could not be named. However the existing trend in complying with treatment prescribed was evident from the study result, which showed that non-compliance arose during longer courses of treatment, especially if treatment was for more than fourteen days. It could be that patients recover from the initial symptoms and then presume that they do not need to complete their treatment. Proper dosage and duration of treatment is important in the recovery from malaria. Preference for treatment from village doctors and with traditional cures could contribute to a delay in diagnosis, which could affect compliance with antimalarials and enhance the chance of drug resistance. Improper dosage of antimalarials could also enhance the chance of drug resistance. For children and pregnant women, a delay in diagnosis as well as improper dosage of antimalarials could have fatal consequences. The positive association between the household heads' education and compliance with treatment was an interesting finding, which could indicate a greater awareness of and therefore greater emphasis on health in those households.

When designing an effective malaria control program, it is important to ensure that proper diagnosis and treatment is accessible and available to the population. In the global strategy for the prevention and treatment of malaria, the WHO has endorsed the provision of early diagnosis and treatment as one of the main strategies (UNICEF, 2000). Decentralizing the treatment of malaria with village healthcare providers and the THC has made it more accessible to the population. However the lack of knowledge among the village healthcare providers about correctly diagnosing malaria and planning appropriate treatment, especially for children and pregnant women, could seriously jeopardize the effectiveness of the malaria control program. The community should be made aware of the preventive measures that they can use, such as the regular use of insecticide-treated bed nets, especially in the case of male day laborers. The comunity should know the importance of seeking immediate treatment from appropriate facility and understand the importance of abiding by the treatment provided. Policy

makers, healthcare providers and the community should work in co-operation to deal with these issues: only then could a public health problem like malaria be handled with confidence.

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