EFFECTS OF ECONOMIC BEHAVIOUR AND PEOPLE MIGRATION ON THE EPIDEMIOLOGY OF MALARIA: A MODEL BASED STUDY

(Dampak Perilaku Ekonomi dan Migrasi Penduduk pada Epidemiologi Malaria: Sebuah Studi Berbasis Model)

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Abstract

The objective of the paper is to study the socio economic behaviour of migrant labourers in the context of the control of the diseases like malaria. The paper, therefore, makes a model and survey-based study in the city of Kolkata, India to drive home the point that low income of people particularly of the migrant workers can be a major hurdle in the malaria control programme. The paper first looks at the economic behaviour pattern theoretically from neo-classical optimization exercise and then tries to test the theoretical result empirically from primary survey. The theoretical model gives the result that low income people is likely to take less rest and discontinue medical treatment. Since migrant workers of less developed countries are usually low-income people, our model suggests that migrant workers will have incomplete treatment and their migration even before complete recovery may contribute to spread of the disease. We have empirically tested the model econometrically by a logit model, and derived the result that migrant workers do take less rest and discontinue treatment because of economic compulsion. Thus the data support the result of the theoretical model and reveals a behaviour pattern, conducive to spread of malaria infection. The paper derives some policy prescriptions on the basis of these studies like insurance support, health surveillance of migrant population as a part of integrated malaria control programme.

Key words: malaria control, malaria epidemiology, economic behaviour, logit model, people migration

Abstrak

Makalah ini merupakan sebuah model dan studi berbasis survei untuk memahami bahwa penghasilan rendah dapat menjadi penghalang besar dalam program pengendalian malaria. Makalah ini meninjau pola perilaku ekonomi secara teoritis dari latihan optimasi neoklasik dan juga secara empiris dari survei primer. Model teoritis itu memberikan hasil bahwa penduduk berpenghasilan rendah kemungkinan besar kurang istirahat dan menghentikan upaya berobat. Karena pekerjaan-pekerjaan migran dari negera-negara sedang berkembang biasanya termasuk kelompok berpenghasilan rendah. Model yang dibuat ini pekerja-pekerja *migran akan kurang sempurna dalam upaya pengobatan, dan kepindahan mereka bahkan sebelum mendapatkan kesembuhan yang sempurna akan membantu penyebaran penyakit. Model ini telah dicoba dilapangan secara ekonometris dengan sebuah model logit. Berdasarkan atas survei.primer di Kalkuta, India dan terbukti bahwa data survei mendukung keberlakuan model yang digunakan.*

Data survei juga mengungkap, bahwa pola perilaku ekonomi mendorong penyebaran malaria. Makalah ini memberikan beberapa resep kebijakan atas dasar studi ini.

Kata kunci: pengendalian malaria, epidemiologi malaria, perilaku ekonomi, model logit, perpindahan penduduk.

INTRODUCTION

Malaria, the world's most prevalent vector-borne disease causes enormous damage to the human society. It is endemic in more than 100 countries. Approximately 41% of the world's population is at risk, and each year over 100 million clinical cases of malaria, 90% of them in Africa, are reported. Worldwide, approximately 2 million deaths per year can be attributed to malaria, half of these in children below 5 years of age. International bodies have long recognized the extent of human suffering caused by malaria (Luthra & Luthra, 2003).

But the cost of malaria is not restricted to this loss of human life only. Its impact on labour productivity and the resultant loss of man-days imposes heavy burden on the society. It needs no lengthy argument to advocate that greater attention should be paid to malaria and to its prevention, early diagnosis and effective treatment. But a vital part of malaria control programme should encompass the socio economic aspect of this disease, without which the success of the programme will be limited. (Chattopadhyay et al, 2004) This is the point that this paper tries to establish with the help of an economic model and its empirical verification.

There is a close relation between low income and incidence of malaria (Wessen, 1972). The disease is mostly prevalent in the less developed countries in the world. There is also a causal relation between migration and malaria, as established in several studies (Pai et al., 1997). Migrations are a normal facet of life of human being but it can cause some health problems. Among the many diseases that plague migrants, malaria occupies an important position. Migration leads not just to mixing of human population but also facilitate new species or strain of pathogen to infiltrate new areas. This aggravates the problem of endemic diseases like malaria. Migrants often are compelled to live in crowded and unsanitary conditions and this contributes to the spread of malaria (Tyagi et al., 2005). The economic development involves lot of migration and therefore a correlation between course of economic development and the problem of malaria may be found (Singh et al., 2004). Intensive importation of malaria by job seekers from abroad is a problem in the Gulf countries. The spread of tourism particularly to the forests often invites malaria of virulent type. Displacement of large groups, as in case of civil war in Afghanistan, Yemen or Somalia, also leads to the emergence of malaria. India witnessed the resurgence of malaria in the 1970s and several types of population movement had some contributions to this resurgence. First, migration has helped movements of parasites from stable rural malaria areas to unstable urban areas. Then, the reverse movement from urban areas backs to rural areas has kept the problem of malaria in rural areas alive. Movement of people of different immunity status moving from one endemic place to another has accelerated the transmission of malarial parasites and their resistant strains. Malaria situation in Kolkata (Erstwhile Calcutta), capital city of West Bengal, India, is found to be increasing.

(Mukhopadhyay et al, 1997; Hati et al., 1998). This is mainly due to rapid and unplanned urbanization, influx of labourers from endemic areas, insecticidal resistance to vectors, existence of chloroquine resistant strains of *Plasmodium falciparum* and poor surveillance Bhattacharya, 2005; Bhattacharya & Santra, 2005). In urban areas slum dwellers, migrant labourers and other marginal people are the potential reservoir of communicable diseses. In Kolkata poverty stricken people are source of malaria infection (Biswas, 2005).

METHODOLOGY

In this paper at the outset we develop a theoretical economic model and does the neo-classical optimization exercise. We have used the findings of two surveys, conducted jointly by the Department of Zoology, Post Graduate Department of Environmental Science & Department of Economics, Asutosh College, Kolkata during March-May, 2004 and September-November 2004, in the city of Kolkata. One survey has been conducted among the migrant workers in general to get an idea about their economic and health care behaviour. Another survey was conducted among the patients having fever which may include malaria fever to study their pattern of rest taking during illness. This second survey, conducted to test the validity of the result of the model has covered cross section of people, which includes low income and migrant workers also. The empirical test is made with the help of logit model, which is used when the dependent variable in the regression represents some qualitative feature (Gujarati, 2003).

In section I of the paper, we present an economic model to explain why problem of low income and migration is so serious a problem in case of malaria. This model clearly drives home the point that the peculiarity in the disease of malaria intermingles with the economic behavior pattern of human being, particularly of the population in the low-income countries in such a manner that migration makes the situation conducive to the transmission of malaria. In section II we present the results of the empirical studies, conducted in Kolkata. In section III we consider the problem of malaria in the city of Kolkata and its surroundings in the context of the observations of the model. The paper concludes with some policy suggestions.

ECONOMIC MODEL

We consider a utility maximizing individual who has suffered an ailment like malaria and decides the duration of treatment in case of a disease, taking into account his overall income requirements over the present and future period. We consider a two period framework where the first period may be referred to as the present and the second period as the future.

Notations

y_1 = Current income.

y_2 = Future income.

w_1 = Current wage.

w_2 = Future wage.

x = Duration of rest during illness.

L_i = Total time avilable in *ith* period. $i = 1, 2$

U = Utility

We have the following equation.

$$y_1 = w_1(L_1 - x)............(1)$$

$$y_2 = w_2 L_2.............(2)$$

$$w_2 = w_2(x) \quad w_2'(x) > 0...........(3)$$

Let us assume a linear relation for simplicity.

$$w_2 = \alpha x...........(4)$$

From (1) we get

$$x = L_1 - \frac{y_1}{w_1}$$

$$w_2 = \alpha\left(L_1 - \frac{y_1}{w_1}\right)........(5)$$

$$y_2 = \alpha\left(L_1L_2 - \frac{y_1L_2}{w_1}\right)\ldots\ldots\ldots\ldots(6)$$

$$U = U(y_1, y_2)\ldots\ldots\ldots\ldots(7)$$

We make the following assumptions, all of which should appear realistic.

1. $L_2 > L_1$
The second period is the future and naturally it consists of much longer time span than the first period.

2. Since $L_2 > L_1$, we make the assumption that $u_2 > u_1$ where u_i represents marginal utility. This implies since future is longer, the individual gets more utility from one unit of money in future than in the present. Both the marginal utilities are positive.

3. When income is low, $\lim_{y_i \to 0} u_i = \infty$, i.e. it is very costly for the individual to stay without income in any period. As income rises and savings take place, the above limiting value of marginal utility tends towards finite magnitude.

Under the above assumptions we get the following result.

Proposition: *i) An individual with low income will always like to have income in both periods, i.e. he will not be willing to take full rest in period 1. ii) He will have zero income in period 1, i.e. take full rest, only when it threatens zero income in all future periods.*

Proof: We consider the utility function

$$U = U(y_1, y_2)\ldots\ldots\ldots\ldots(7)$$

The problem is to maximize U :

subject to the condition given by (6)

We form the following lagrange equation.

$$z = u(y_1, y_2) + \lambda\left(\alpha L_2 L_1 - y_2 - \frac{\alpha L_2 y_1}{w_1}\right)$$

By Kuhn-Tucker condition

$$\frac{\partial z}{\partial y_1} = u_1 - \lambda\frac{\alpha L_2}{w_1} \le 0 \text{ and } y_1\frac{\partial z}{\partial y_1} = 0\ldots\ldots\ldots(8)$$

$$\frac{\partial z}{\partial y_2} = u_2 - \lambda \le 0 \text{ and } y_2\frac{\partial z}{\partial y_2} = 0\ldots\ldots\ldots(9)$$

$$\frac{\partial z}{\partial \lambda} = \alpha L_2 L_1 - y_2 - \frac{\alpha L_2 y_1}{w_1} \ge 0 \text{ and } \lambda\frac{\partial z}{\partial \lambda} = 0\ldots\ldots\ldots(10)$$

As per the above condition, for y_1 to be zero, i.e. for the individual to take full rest as per his optimization behaviour we must get

$$u_1 - \lambda\frac{\alpha L_2}{w_1} < 0\ \ldots\ldots\ldots\ldots(11)$$

But for any low-income individual, $\lim_{y_1 \to 0} u_1 = \infty$ and therefore condition (11) cannot be satisfied. So an individual with low income will never be willing to take rest for the full period unless without full rest the second period income will be zero.

Now we distinguish between two kinds of disease. One type of disease needs full rest and without that the second period income becomes zero i.e. $y_2 = 0$. Our second proposition is as under.

ii) *If the condition for zero income in period 2 is satisfied, condition for zero income in period 1 will also be satisfied.*

Proof:

Since $L_2 > L_1$, we supose $y_2 \ge y_1$

Then $\alpha x L_2 \ge w_1 L_1$.

$\alpha L_2 / w_1 \ge L_1 / x$

But as $x \le L_1$, $L_1/x \ge 1$.

$$\frac{\alpha L_2}{w_1} \ge 1.$$

$\Rightarrow$ If $\lambda > u_2 > u_1$, then $\lambda \frac{\alpha L_2}{w_1} > u_1$

So it is observed that if situation warrants $y_2 = 0$, i.e. $\lambda > u_2$ then $y_1 = 0$, but not the reverse. So the low-income individual will never take full rest whenever there is chance of having first period positive income along with second period positive income.

Malaria is a kind of disease, where prognosis is good under proper chemotherapy. However the disease may remain in a dormant state for some people for some period especially in case of vivax malaria when the full course of treatment is not completed. A few cases of asymptomatic malaria carrier have already been reported in the state of West Bengal (A.K. Mukhopadhyay, National Institute of Communicable Diseases, India personal communication, 2005). Prevalence of *falciparum* infection among asymptomatic individual in Kenya has also been reported recently (John et al., 2005). During this period the patient is a carrier of the parasite and a potential vehicle of spreading the disease. But since the patient does not lose his working capacity completely and the disease allows the patient to carry on some daily activities, the low paid worker, especially the migrant continues his work, as suggested by the result of our model. In many of the cases, the infected patient comes back to his working place. This absence of quarantine becomes one of the primary reasons for the spread of different strains of malarial parasites by the migrant workers in different areas.

As we study the problem of malaria in terms of our economic model, several important observations emerge. In our opinion such model is important because no effective disease control program can be initiated unless it matches with the optimization behaviour of the individuals. The optimization behaviour in the context of malaria implies that the intermittent nature of malaria is a big problem in its control. The affected person will join the work, move from one place to another and also migrate for a long duration. They will in the process transport the parasite to malaria-free areas, or less malaria affected regions; thus reintroducing the disease. Development and other economic activities would create more favorable habitats for Anopheles mosquitoes and consequently, all workers will have increased exposure to the vector in their shanties and slums.

EMPIRICAL STUDIES

The empirical study is primarily suited to test the result of the above theoretical model. The surveys therefore focus on the people particularly the migrant workers, who have suffered ailments like fever including malaria fever. The respondents are asked questions as per a set questionnaire and their responses have been subsequently processed. Special attention has been given to the cases of malaria and the confirmation of malaria infection is ensured by checking the authorized medical report. The empirical test is made with the help of logit model. This model is a standard econometric regression model, appropriate for the cases, where the dependent variable in the regression represents some qualitative feature (Gujarati, 2003). For example the response to question about taking rest can be either yes or no and this is statistically captured by assigning value of zero or unity.

The results of the survey among the migrant workers are reported in Table 1. This study shows although 82% of the workers are aware that the malaria is a communicable disease and 76% of them know that mosquito causes malaria, only 4% of them use mosquito net. 96% of them have reported economic factors, like extremely small living space, pavement dwelling and financial inability to afford mosquito net, as reasons for not using the nets.

ECONOMETRIC RESULTS

In order to test the result of our theoretical model, we have conducted a second survey and collected data among people, having fever. The major focus of this survey and the subsequent econometric test is the behaviour, arising out of disability caused by fever. Given the difficulty of finding a large number of patients at a particular point of time of the survey and constraints of conducting the survey for a long period, our sample size consists of 35 respondents, spread over different areas of the city and cross section of occupation and income. The respondents have responded to standard questionnaire. The data are processed in microfit econometric package in terms of a logit model. In this model we have taken the regresand as rest or no rest and therefore it is qualitative in nature for which logit model is appropriate. Taking rest assumes the value 1 and not taking rest takes the value 0. We consider the probability of taking rest (x3) in case of ailments like malaria / fever in relation to income (x1), education level (x2), and nature of employment (x5).

We take into consideration three models 1) all three variables, namely x1, x2 & x5 as independent variables (Table 2C), 2) x1 & x2 as independent variables (Table 2B) and finally 3) only x1 as independent variable (Table 2A). The results given in table 3A, 3B & 3C show that in all the model the probability i.e. odds in favour of taking rest is positively related with income level with less than 5% level of statistical significance. No such statistical significant relation however is established between probability of taking rest and either education level and nature of employment (self employment or otherwise). The empirical result supports the conclusion of our model that low-income people will tend to avoid rest. In case of malaria this behaviour will increase the possibility of discontinuation of treatment and hence play a pivotal role in spread of the disease.

Table 1 . Analysis of behaviour pattern of migrant workers with regard to malaria.

Sl. No.	Category	Number	%age
1	No. of migrant workers	340	100
2	No. of workers, aware of malaria, as a communicable disease	279	82
3	No. of workers, not aware of malaria, as a communicable disease	61	18
4	No. of workers, aware that mosquito causes malaria	212 out of 279	76
5	No. of workers, not aware that mosquito causes malaria	67 out of 279	24
6	No. of workers who reported fever / had fever in the recent past	155	46
7	No. of sick workers who went to Govt. / municipal / private clinic for treatment	65 out of 155	42
8	No. of sick workers who went to quacks or received no treatment	90 out of 155	58
9	No. of workers with confirmed malaria attack	24 out of 65	37
10	Mosquito net users among workers who were aware that mosquito causes malaria	9 out of 212	4
11	Mosquito net users among workers unaware of malaria	0	0
12	Mosquito net users among malaria affected workers	2 out of 24	8
	Mosquito net non-users among malaria affected workers	22 out of 24	92
13	Citing economic reasons, space problem, discomfort for non-use of mosquito net	203 out of 212	96

Table 2A
Logit Maximum Likelihood Estimation.
The estimation method converged after 2 iterations

Dependent variable is X3 (rest)
35 observations used for estimation from 1 to 35

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
X1	3845E-3	.1575E-3	2.4410[.020]

Factor for the calculation of marginal effects = .21331
Maximized value of the log-likelihood function = -20.8965
Akaike Information Criterion = -21.8965 Schwarz Bayesian Criterion = -22.6742
Hannan-Quinn Criterion = -22.1650
Mean of X3 = .54286 Mean of fitted X3 = 1.0000
Goodness of fit = .54286 Pseudo-R-Squared = .13865

Table 2B.
Logit Maximum Likelihood Estimation
The estimation method converged after 5 iterations

Dependent variable is X3
35 observations used for estimation from 1 to 35

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
X1	.0011059	.4444E-3	2.4887[.018]
X2	-.89881	.47374	-1.8973[.067]

Factor for the calculation of marginal effects = .22512
Maximized value of the log-likelihood function = -18.6606
Akaike Information Criterion = -20.6606 Schwarz Bayesian Criterion = -22.2159
Hannan-Quinn Criterion = -21.1975
Mean of X3 = .54286 Mean of fitted X3 = .60000
Goodness of fit = .71429 Pesaran-Timmermann test statistic = -.98382[.325]
Pseudo-R-Squared = .23081

Table 2C.
Logit Maximum Likelihood Estimation Maximum Likelihood
Estimation Method converged after 5 iterations

Dependent variable is X3
35 observations used for estimation from 1 to 35

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
X1	.0010390	4532E-3.	2.2928[.029]
X2	-.94698	.48886	-1.9371[.062]
X5	.84709	1.0583	.80039[.429]

Factor for the calculation of marginal effects = .22249
Maximized value of the log-likelihood function = -18.3307
Akaike Information Criterion = -21.3307 Schwarz Bayesian Criterion = -23.6637
Hannan-Quinn Criterion = -22.1360
Mean of X3 = .54286 Mean of fitted X3 = .62857
Goodness of fit = .74286 Pesaran-Timmermann test statistic = -.67177[.502]
Pseudo-R-Squared = .24441

DISCUSSION

Relook at the emergence of malaria in India and Kolkata

Malaria was nearly eradicated from India in the early 1960s but the disease has re-emerged as a major public health problem. Early set backs in malaria eradication programme was noticed in the late 1960s when malaria cases in urban areas started to multiply, and upsurge of malaria was widespread. The impact was mainly on vivax malaria. The *Plasmodium falciparum* containment programme (PfCP) was launched in 1977 to contain the spread of falciparum malaria but it could not fully prevent the general spread of the disease. P. falciparum showed a steady upward trend during the late 1970s and thereafter (Hati, 2001). Table 3 gives an idea about the occurrence of malaria in India, West Bengal and Kolkata in the 1990s. The figures show that although the incidence of malaria all over India showed ups and down during the 1990s, there has very significant increase of malaria incidence, both total and P.falciparum in West Bengal and Kolkata. This justifies our selection of Kolkata as the location of our survey.

Development works in various sectors to improve the national economy under successive 5-year plans facilitated rising trend of malaria. Malaria at one time a rural disease, diversified under the pressure of developments into various ecotypes. These ecotypes have been identified as forest malaria, urban malaria, rural malaria, industrial malaria, border malaria and migration malaria. (Pattanayak et al., 1994). Among them the migration malaria cut across boundaries of various epidemiological types. Further, malaria in the 1990s has returned in India with new features, not witnessed during the 1950s, the pre-eradication days. These features are resistance to insecticides, pronounced exophilic vector behaviour, gradual rise *of Plasmodium falciparum* malaria and resistance in *P. falciparum* to chloroquine and other anti-malarial drugs. The spread of the disease was amply helped by urbanization and industrialization as well as extensive vector breeding grounds created principally by the water resource development projects and various construction works.

There has been a rising trend of malaria in the city of Kolkata since the late 1970s and malaria is reported to have spread to different areas hitherto less affected. One of the factors contributing to the reemergence of malaria is human migration on a large scale. In the early seventies, Calcutta Metropolitan Development Authority undertook a massive city improvement programme. This led to influx of migrant labour in large number from the neighboring malaria endemic states. Bangladesh is also not far away and is malaria endemic.

Table 3. Yearly incidence of malaria in India, West Bengal and Kolkata

Year	India			West Bengal			Kolkata		
	Total	*P.falciparum*	Death	Total	*P.falciparum*	Death	Total	*P.falciparum*	Death
1990	2020000	750000	353	27531	3690	4	13624	352	0
1991	2117460	690000	421	40452	7771	13	15606	708	0
1992	2130000	880000	422	28179	7858	43	17969	728	0
1993	2210000	850000	354	46138	8723	37	19084	1802	4
1994	2510000	990000	1422	74293	15379	52	18298	2283	7
1995	2930000	1140000	1151	91014	17226	87	36804	5725	52
1996	3035588	1179561	1010	80127	15629	55	44602	6467	17
1997	2660557	1007366	879	79881	11480	74	34514	5684	38
1998	2098356	914584	653	132088	25156	77	88402	16464	53
1999	1865874	882412	853	197259	57245	155	132367	37789	79

Source: Hati (2001)

During mid 70s, the construction of Metro railway works begun, which also contributed to, increased migration of construction workers and mosquitogenic spots in the city of Kolkata (Chatterjee & Hati, 1995). This kind of migration has affected the human transmission mechanism of the disease and there is reason to believe in terms of our economic model that this substantial increase in migration has played an important role in the resurgence of malaria since the late seventies in Kolkata.

An enquiry into the nature of migration in Kolkata reveals that many of the immigrants from the other states work in the large informal sector of the city, which accounts for nearly fifty percent of the earners of the city. The proportion of migrants among the workers in the informal sector constitutes more than 50% of the total workers and in some occupations like that of rickshaw puller or porter the immigrants exceed 60% (Dasgupta, B. 1988, Dasgupta P. et al 2006). The earning of most of them is extremely low. So they match the typical low-income worker in our model for whom it is not possible to skip income by taking rest. Table 1 presents the summary of the findings of our survey with regard to the behaviour pattern of the migrant workers in Kolkata. Poor living conditions and poor health seeking behaviour of migrant workers make them vulnerable to malaria. Tyagi et al. (2005) are of the similar opinion regarding the migration related malaria of the low-income group.

Although we are emphasizing migration, our model shows that the problem remains for any low-income worker. As the infected low-income worker does not take rest, his recovery is delayed and during this period he remains a possible vehicle of the spread of disease.

POLICY PRESCRIPTIONS AND CONCLUSIONS

What are the policy prescriptions in view of the findings in our model and empirical study? First of all, poverty and the low income, coupled with migration are the fertile ground for malaria. When an individual is infected, it is just not enough to begin the treatment; it is essential that the treatment be completed. But that may also need some income support during this period. Some insurance scheme may be necessary to extend such income support program. *The insurance companies should design insurance scheme for poor people that provides compensation for income loss for at least two weeks.*

It is also necessary that proper surveillance be made on the infected person. The intermittent nature of the disease of malaria requires that it should be doubly ensured that the person is fully cured and it does not recur. Identifying and understanding the nature of possible movement of the diseased person will improve prevention measures and malaria control programs. Particular attention should be paid to find out the pattern of mosquito net use by these high-risk people. As our survey in Kolkata showed that 92% of the malaria-affected migrant people did not use the mosquito net at all (Table 1), it would be obvious that just the use of mosquito net could make signal contribution to the control of malaria. So a prime element in the malaria eradication program should be that government popularizes the use of mosquito net among the target groups through prolonged campaign as well as free or subsidized sale of mosquito net. It is also necessary that its use be monitored, as habit formation is a major requirement in popularizing the use of mosquito net. It can be mentioned in this regard that use of insecticide treated mosquito net has been proved very effective in control of malaria in Africa (Curtis et al., 2004) and so efforts can be made to introduce such mosquito nets in the endemic areas in India particularly among the high-risk migrant workers.

As migration is observed to help in spread of malaria and also in creating situations, conducive to drug resistance, there is urgent need for developing an information base about migration, especially for the low-income migrants. Information on migrant workers should be part of a surveillance-based early warning system.

Such a system would include data on migration patterns, dimensions, demography (age/sex structure), seasonality, geographic as well as behavioral, social and economic factors, health care needs and facilities, and pattern of drug use and compliance of medical instruction.

Malaria control has become a complex enterprise, and its management requires decentralization and approaches based on local transmission involving multi-sectoral action and community participation. In the present scenario of malaria, it is feasible to control malaria at the appropriate level if we succeed in bringing out a change in the perception (Tyagi et al., 2005), approach and practice at large. Urban malaria is a man-made problem and its control, if not eradication is possible through making people more aware about malaria and creating suitable situation for treatment of malaria-affected persons and vector control. The aspect of migration and economic behaviour would add a new dimension in the study of epidemiology on malaria and hence should receive more attention.

ACKNOWLEDGMENT: The authors acknowledge gratefully the support and inspiration, received from Dr. Debabrata Chaudhuri, Principal, Asutosh College, (University of Calcutta). The authors thank Ms Chandrani Dutta, Technical Assistant, PG Department of Environmental Sciences, Asutosh College for her technical assistance in preparing the manuscript.

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