Behaviour Pattern of Urban Migrants and Control of Malaria

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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 per cent of the world's population is at risk, and each year over 300 - 500 million clinical cases of malaria, 90 per cent of them in Africa, are reported (www.malaria-ipca.com). The big question is then: what determines the rate of spread and the steady state incidence or prevalence of this disease? Since malaria is primarily spread through vectors, usual attention falls on the control of mosquitoes, particularly the anopheles variety that causes malaria. It is often forgotten that human behaviour pattern can play an important role also in the spread of diseases like malaria.

Worldwide, approximately two million deaths per year can be attributed to malaria, half of these in children below five years of age. International bodies have long recognized the extent of human suffering caused by malaria.[1] 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.[2] This is the point that this article tries to establish with the help of an empirical study in two cities of India.

There is a causal relation between migration and malaria, as established in several studies.[3] Migration, a normal facet of life of mankind can also be an instrument of spread of disease. Among many diseases that trouble 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 into 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.[4] The economic development involves lot of migration and therefore a correlation between course of economic development and the problem of malaria may be found.[5] India witnessed resurgence of malaria in the 1970s and population movement had some contributions to this resurgence. Migration has helped movements of parasites from stable rural malaria areas to unstable urban areas. Then, the

64   DEBABRATA DATTA, SAJAL BHATTACHARYA AND VSHOSHI GHOSH

reverse movement from urban areas back 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.[6] 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.[7] In urban areas slum dwellers, migrant labourers and other marginal people are the potential reservoir of communicable diseases. Reuben[8] finds that in urban areas a major source of malaria infection is usually migrant labourer, working and residing at the construction sites. Biswas,[9] observes that in Kolkata poverty stricken people are an important source of malaria infection.

Methodology

Our survey has been conducted among the migrant workers in general to get an idea about their economic and health care behaviour in two major cities of India namely Kolkata in the state of West Bengal and Lucknow in the state of Uttar Pradesh. Survey was first made in Kolkata among the migrant workers living there and then another survey was conducted in Lucknow in the same pattern. Basic purpose of this survey was to derive information about the behaviour pattern of migrant workers particularly with regard to malaria and to look at their policy implications. The motivation for taking two cities is to verify whether any significant difference exists between the behaviour of the migrant workers of the two cities. Primary data were collected by door-to-door survey and visit to clinics. The data were subjected to simple statistical test.

While working on the data we find a major difference in the nature of migration between the workers of the two cities surveyed. More than 75 per cent of the migrant workers in Kolkata are single migrants who leave their family in their native place. In contrast more than 75 per cent of the migrant workers in Lucknow live with their families. While most of the migrants surveyed in Kolkata are from distant places, usually from neighbouring states, migrants surveyed in Lucknow are from nearby places, usually from the neighbouring districts.

Hypotheses

1. Low income and low educated migrant workers are not aware that mosquito causes malaria.

2. The awareness level of the migrant workers of two cities regarding malaria and its cause is same.

3. The tendency of the migrant workers of both the cities to have treatment of the fever and malaria will be same.

4. Migrant workers are less likely to use mosquito nets and thus susceptible to malaria attack.

5. Migrant workers are less likely to go to government clinic for treatment and more likely to go to quacks.

6. Attitude and behaviour pattern of the Indian migrant workers with regard to treatment of diseases like malaria is same across the country.

Empirical Studies

The empirical study is primarily suited to test the above hypotheses. The surveys therefore focus on the people particularly the migrant workers. To get some generality of our results we have collected sample from two important cities of India - one on the Eastern part and the other on the northern part. Both cities have regular inflow of migrant workers, although there are some location specific variations in the migration pattern of the two cities. While most of the migrants of Kolkata are from neighbouring states, most of the migrants of Lucknow are from the neighbouring districts. The respondents are asked questions as per a set questionnaire and their responses have been subsequently processed. We have given special attention to the cases of malaria and checked the confirmation of malaria infection by authorized medical report. The empirical analysis is made with the help of statistical test and econometric modeling.

The results of the survey among the migrant workers are reported in Table 1. This study shows although significant majority of the workers is aware that the malaria is a communicable disease and caused by mosquito bite, only four per cent of them use mosquito net in Kolkata. But situation is significantly different in Lucknow.

Results

First hypothesis is rejected. Significant number of workers in both cities are well aware that mosquito causes malaria. This is a redeeming feature so far as the control of malaria is concerned. What is however needed is to ensure that despite this awareness, they are not forced to have a pattern of living that is conducive to spread of malaria.

We have undertaken statistical test to verify whether the second

hypothesis that awareness of migrant workers of both the cities are same, holds or not. The z test carried out in this regard fails to reject the hypothesis of identical awareness level of the workers of two cities.

Third hypothesis assumes identical attitude of the migrant workers of both the cities towards hospital treatment. This hypothesis however is rejected. The result shows that migrant workers in Lucknow are more serious in having treatment than their counterparts in Kolkata.

Fourth hypothesis holds both for Kolkata and Lucknow. Our study shows that the use of mosquito net is not very prevalent in these two cities surveyed. But there is statistically significant difference between the proportion of migrant workers using mosquito nets in Lucknow and Kolkata. Mosquito net use is significantly higher in Lucknow than that in Kolkata. We have statistically tested the hypothesis whether the difference in pattern of mosquito net use is statically significant. Given the large size of our sample, we have applied the normal distribution test. The result shows that the null hypothesis of no difference in the behaviour pattern on mosquito net use is rejected. *This is perhaps because of more single migration in Kolkata compared to more family migration in Lucknow.*

Fifth hypothesis that migrant workers are less likely to go to government clinic for treatment holds for both the cities. Information, waiting time and travelling time play important role behind this behaviour. This is an area, which needs immediate attention of the policy-makers.

Sixth hypothesis does not pass the statistical test. Behaviour pattern of the migrant workers does differ from city to city although a few important behaviour patterns are almost identical. However, our in-depth analysis shows that there is variation in other aspects of migration like accompaniment of family. When this factor is taken into account we find no statistically significant difference in behaviour pattern of the migrants of two cities. This result highlights need for looking into all the aspects of migration. In order to pinpoint this vital aspect, we have delved deep into the reasons for difference in behaviour of the migrant workers of the two cities.

The interesting point that we find out is that single migration and migration with family plays a big role in explaining the difference in behaviour pattern of the migrant workers. While majority of the migrants in Kolkata are single migrants, picture is different in Lucknow. In Lucknow most of the workers migrate with their families. We develop the following economic model to see what may be the impact of incorporating family aspect in the optimizing behaviour of an individual. We make a simple assumption in this model that an individual derives utility not just from his own consumption but also from the consumption of the family. It is a simple too-good framework where we

assume that x is a good like mosquito net or medical treatment from which not only the individual but also the family derives satisfaction and family's satisfaction adds to the utility of the individual. Other standard assumptions like diminishing marginal rate of substitution etc. are maintained.

Economic Model

First we consider the case where family utility is not involved.

$Max\ u = u(x,y)$ subject to budget constraint

$M = p_x x + p_y y$

Let x^* and y^* solve this problem and hence

$$\frac{u_{x^*}}{u_{y^*}} = \frac{p_x}{p_y}$$

Now incorporate family aspect in the utility function.

$u = u(x,y,F(x))$ subject to

$M = p_x x + p_y y$

$u_x,\ u_y,\ F_x > 0.$

Let x^F and y^F solve this problem and hence

$$\frac{u_{x^F} + u_F F_{x^F}}{u_{y^F}} = \frac{p_x}{p_y}$$

Consider x^*. Now at x^*

$$\frac{u_{x^*} + u_F F_{x^*}}{u_{y^*}} > \frac{u_{x^*}}{u_{y^*}} = \frac{p_x}{p_y}$$

So x rises and we get $x^F > x^*$.

Thus the economic model suggests that in case of inclusion of family aspect in the consumption decision, consumption of family related good rises. The behaviour pattern suggested by our economic model is corroborated when it is observed that migrant workers who live with their families prefer to use bed net. One reason they cite in this regard is the need for protecting the child. This clearly shows that family utility enters as an argument in the individual utility function. In the same manner more seriousness towards medical treatment is observed in case of family migration. This shows that family benefit of medical treatment is incorporated in the individual utility function. This makes family migrants more serious in having medical treatment

in case of fever.

Empirical analysis on the basis of the migration data does support the broad conclusion of the model. We have statistically approached the problem from two sides. First of all we have verified whether the proportion of mosquito net users only among the family migrants or single migrants of the two cities differ significantly or not. We have carried out z test in this regard. The result shows that the hypothesis of no difference in behaviour cannot be rejected. Moreover we have seen whether the role of city with regard to mosquito net use is insignificant or not. Carrying out χ (chi) square test of independence, we find that as we take the total figure, neither city nor family migration appears to be independent from mosquito net use. This non-independence of city, however is an illusive observation as role of family migration is camouflaged here. This becomes obvious as we carry out the χ square test separately with only the number of family and single migrants and find that city plays no role in determining the use of mosquito net. It is rather the high percentage of family migration in Lucknow, which ensures higher mosquito net use in that city.

The above result in the context of our economic model brings to the fore the urgent requirement to study behaviour of a migrant worker in a single set up and in a family set up. This may give many useful insights on behaviour pattern not only in the area of health economics but in other fields as well.

Policy Prescriptions

1. When living space does not permit use of mosquito net or when migrant workers sleep on the pavements, it is no point in advising them to use mosquito net. It is a harsh reality. Use of mosquito net could have solved problem of malaria to a large extent but that solution in the present socio-economic context is nonexistent in many urban areas of India. So solution has to be sought, given the constraint that mosquito net will not be used. Substitute of mosquito net assumes importance in this context.

2. Unwillingness to go to the government clinic and preferring local quack for treatment is a serious issue. However this is not an irrational behaviour. Major problem of government hospitals in India is that they are open only during the prime time of work while local quack is available even in the odd hours. While it may not be possible to have 24×7 services in out-patients department of government clinic, keeping the service open upto late night is an essential requirement.

3. Quarantining the worker and enabling him to take sufficient rest is

important in disease management. Problem is that low income people cannot afford to take rest. Unless income for the nonworking period is ensured, rest taking is a luxury a worker can ill afford. Policy need is therefore insurance support in case of indoor treatment in hospital (needs very large increase in hospital capacity) and surveillance.

4. Timely detection of disease for migrant workers is perhaps one major requirement for control of disease like malaria. Home-to-home survey may not be effective because many of them do not have regular address. Enquiry at the working place is necessary in this case. What is needed is to involve the unions and informal community bodies in this regard.

5. In India health management has been focusing a lot on village level health care. There is programme like DTH *(treatment direct to home)*. Staff support for rural health care at the government level has become more purposeful. Unfortunately urban health care services at the government level particularly for low income people still leaves much to be desired. There is perhaps a misplaced notion that urban people are conscious and can fend for themselves. But this is not totally true. Urban community has their own problems with regard to health care. There should be better realization of these problems at the level of policy-makers.

FOOTNOTES

1 Luthra P.M. and Luthra R., Sequencing of the malarial parasites genome reveals potential drug targets to combat malaria, *Current Science* 84: 5, pp. 623-25, 2003.

2 Chattopadhyay J., Sarkar R.R., Chaki S. & Bhattacharya S., Effects of environmental fluctuations on the occurrence of malignant malaria—a model based study. *Ecological Modelling* (177), pp 179 - 192, 2004. Also see, Bhattacharya Sajal, Mosquito- borne diseases in India with special reference to malaria vectors and their control, *Journal of Asiatic Society*, Vol. LI, No. 2, pp. 101 -111, 2009.

3 Pai. M., Zachariah A., Rose W. Samuel S. Verghese S. & Joseph A., Malaria and Migrant Labourers, *Economic & Political Weekly*, Apr. 19-26, Issue pp.839-842, 1997. Also see, Singh N., Chand S.K., Mishra A.K. & Nagpal A.C., Migration malaria associated with forest economy in communities of rural, semi-ruler and bordering areas of East Delhi, *Journal of Vector-Borne Diseases"*, 42, .pp 30-35, 2005.

4 Tyagi P. Roy A. & Malhotra M.S, Knowledge, awareness and practices towards malaria in communities of rural, semi rural and bordering areas of East Delhi. *Journal of Vector-Borne Disease.* 42. pp 30-35, 2005.

70   DEBABRATA DATTA, SAJAL BHATTACHARYA AND VSHOSHI GHOSH

5 Singh et. al., *op. cit*, 2004.

6. Mukhopadhyay A.K. Karmakar P. Hati A.K. & Dey P., Recent epidemiological status of malaria in Calcutta Municipal Corporation, West Bengal, *Indian Journal of Malariology*, 34 pp. 188-196, 1997. Also see, Hati A.K., Mondal B., Mitra N.K., Mukhopadhyay A.K. & Mukherji H, Malaria in Calcutta-Recent Character, *Science and Culture*. July-August, pp. 150-156, 1998. Also see, Chatterjee K.K. & Hati A.K., Studies on some ecological and behavioural aspects of Anopheles Stephens of Calcutta. In Monograph, *"Studies on Some Vectors of Public Health Importance"* A.K.Hati ed. Department of Medical Entomology, Calcutta School of Tropical Medicine. Government of West Bengal, pp 86-102, 1995.

7 Bhattacharya Sajal, *op. cit*, 2009. Also see Bhattacharya Sajal & Santra Subhash Chandra, *op. cit.,* 2005.

8 Reuben R., Malaria in India—is an ecofriendly solution possible? *Journal of Bombay Natural History Society,* 100 (2&3): 544 - 552, 2003.

9 Biswas T., Socio economic aspect of vector borne and water borne diseses. In: *Perspectives in Environmental health -vector and water borne diseases.* Eds. Mukhopadhyay A.K. & Dey A.K. Published by *Originals*, New Delhi-110052 India, pp 235-243, 2005.

APPENDIX

TABLE 1 ANALYSIS OF BEHAVIOUR PATTERN OF MIGRANT WORKERS WITH REGARD TO MALARIA.

Sl. No.	Category	Kolkata Number	Kolkata %age	Lucknow Number	Lucknow %age
1	No. of migrant workers	340	100	192	100
2	No. of workers, aware of malaria, as a communicable disease	279	82	169	88
3	No. of workers, not aware of malaria, as a communicable disease	61	18	23	12
4	No. of workers, aware that mosquito causes malaria	212 out of 279	76	141 out of 169	89
5	No. of workers, not aware that mosquito causes malaria	67 out of 279	24	28	11
6	No. of workers who reported fever / had fever in the recent past	155	46	71	37
7	No. of sick workers who went to Govt. / municipal / private clinic for treatment	65 out of 155	42	49 out of 71	69
8	No. of sick workers who went to quacks or received no treatment	90 out of 155	58	22 out of 71	31
9	No. of workers with confirmed malaria attack	24 out of 65	37	10 out of 49	21
10	Mosquito net users among workers who were aware that mosquito causes malaria	9 out of 212	4	37 out of 141	26
11	Mosquito net users among workers unaware of malaria	0000			
12	Mosquito net users among malaria affected workers	2 out of 24	8	2 out of 10	20
	Mosquito net non-users among malaria affected workers	22 out of 24	92	8 out of 10	80
13	Citing economic reason like space problems for non using bed net	179 out of 203	88	87 Out of 104	84
14	Citing non-economic reason like discomfort of net use for non using bed net	24 out of 203	12	17 out of 104	16

TABLE 2. STATISTICAL ANALYSIS OF BEHAVIOUR PATTERN OF MIGRANT WORKERS OF KOLKATA & LUCKNOW

A) Statistical test of equality of proportion of workers, aware of malaria as a communicable disease Hypothesized difference (D): 0, Significance level (%): 5

Sample size	%age	Test statistic (z)	Conclusion
n1=192	p1=88	1.82 (critical value 1.96)	Null hypothesis of equality of
n2=340	p2=82	p value- 0.263	proportion cannot be rejected at .05 percent level.

B) Statistical test of equality of proportion of workers, undergoing medical treatment in fever. Hypothesized difference (D): 0, Significance level (%): 5

Sample size	%age	Test statistic (z)	Conclusion
n1=155	p1=41	-3.91 (critical value 1.96)	Null hypothesis of equality of
n2=71	p2=69	p value < 0.0001	proportion is rejected at .05 percent level.

C) Statistical test of equality of proportion of workers, aware of malaria using mosquito net Hypothesized difference (D): 0, Significance level (%): 5

Sample size	%age	Test statistic (z)	Conclusion
n1=212	p1=042	-5.98 (critical value 1.96)	Null hypothesis of equality of
n2=141	p2=245	p value < 0.0001	proportion is rejected at .05 percent level.

Table 2 contd...

D) Statistical test of equality of proportion of family migrants, aware of malaria using mosquito net Hypothesized difference (D): 0, Significance level (%): 1

Sample size	%age	Test statistic (z)	Conclusion
n1=20	p1=14	-2.55 (critical value 2.57)	Null hypothesis of equality of
n2=68	p2=456	p value -0.011	proportion cannot be rejected at .05 percent level but can be rejected at .01 percent level

E) Statistical test of equality of proportion of workers, aware of malaria using mosquito net Hypothesized difference (D): 0, Significance level (%): 1

Sample size	%age	Test statistic (z)	Conclusion
n1=192	p1=042	2.43 (critical value 2.57)	Null hypothesis of equality of
n2=83	p2=.06	p value = 0.015	proportion cannot be rejected at .05 percent level but can be rejected at .01 percent level

74   DEBABRATA DATTA, SAJAL BHATTACHARYA AND VSHOSHI GHOSH

TABLE 3 TEST OF INDEPENDENCE (CHI-SQUARE) BETWEEN MOSQUITO NET
USE AND PLACE OF RESIDENCE OF MIGRANT WORKERS OF KOLKATA &
LUCKNOW

I) Both family and single migrants are considered.

Chi-square (Observed value)	36.151
Chi-square (Critical value)	9.488
DF	4
p-value	< 0.0001
alpha	0.05

Test interpretation:

HO: The rows (cities) and the columns (mosquito net users among both family and single migrants) of the table are independent.

Ha: There is a link between the rows and the columns of the table.

As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis HO, and accept the alternative hypothesis Ha.

II) *Only family migrants of two cities are considered.*

Chi-square (Observed value)	0.706
Chi-square (Critical value)	9.488
DF	4
p-value •	0.951
alpha	0.05

Test interpretation:

HO: The rows of cities and the columns of mosquito net users of the table are independent. Ha: There is a link between the rows and the columns of the table.

As the computed p-value is greater than the significance level alpha=0.05, one should accept the null hypothesis HO.

BEHAVIOUR PATTERN OF URBAN MIGRANTS   75

Ill) *Only single migrants oftw>o cities are considered.*

Chi-square (Observed value)	7.059
Chi-square (Critical value)	9.488
DF	4
p-value	0.131
alpha	0.05

Test interpretation:

HO: The rows of cities and the columns of mosquito net users of the table are independent.

Ha: There is a link between the rows and the columns of the table.

As the computed p-value is greater than the significance level alpha=0.05, one should accept the null hypothesis HO.

Note: Part I) of table shows link between city and mosquito net use and it may appear that cities are important but if we look at part II) and III) of the table where we consider family and single migrants separately, we find that city is not important. What matters is the nature of migration-single or family.