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A rapid assessment of mosquito breeding, vector control measures and treatment seeking behaviour in selected slums of Surat, Gujarat, India, during post-flood period

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Surat faced the most devastating flood on 7 August 2006. This flood preceded by heavy rains in the catchment areas of Ukai Dam, and consequent massive releases of water from the dam from 6 August through 11 August 2006, inundated the city, and slums were the worst hit. Studies have reported increased mosquito breeding and epidemics of malaria as an aftermath of floods in Mandla[1], subsequent to heavy downpours and floods. Over half of Cotonou (Benin) suffers every year from several months of flooding, allowing mosquito larvae breeding and leading to an increase in malaria transmission[2]. Malaria is historically associated with reduced flooding and embankment construction in the flood plains of Bengal. The west and south land of the Jamuna River was highly malarious in 1916 but is not so today[3]. There is substantial evidence of reporting of increased malaria transmission in urban areas of Asia subsequent to clogging of storm water drainages[4,5]. On the contrary, no malaria outbreak was reported, two years later, in Tsunami hit areas of Asia[6].

Surat City has witnessed a rising distribution of falciparum malaria in the recent past, as brought out in a study in 1995 in the villages of Buhari PHC of Surat district, which had revealed a high prevalence of *Plasmodium falciparum* malaria[7].

This rapid operational study was conducted among 124 slum households selected by continuous sampling method, spread over a one week period from 18 September through 25 September 2006. These slum areas are the prime catchment areas of the Surat Municipal Institute of Medical Education and Research (SMIMER), and also serve as the field practice area of SMIMER. The pre-tested, semi-structured and prompted questionnaire was prepared in lines with the objectives of the study, viz. rapid assessment of vector control measures, mosquito breeding and treatment seeking behaviour among households with current fever cases or fever cases during the last fortnight, in the studied households. The respondents were either head of the household or knowledgeable person in the household.

Out of 124 fever cases, 73 (58.9%) were males while 51(41.1%) were females. Age distribution of fever cases is as follows: children <15 yr of age—36 (29%); 15–25 yr—31 (25%); 25–35 yr—28 (22.6%); 35–45 yr—18 (14.5%); 45–55 yr—10 (8.1%); and >55 yr—1 (0.8%). Breeding habitats of mosquitoes were observed mainly in the small water collections outside houses, and uncovered water vessels, inside the houses. Since we had to assess other components of the study related to water-borne diseases, the de-

tails of the species of mosquito have not been explored. This study had revealed that 62.9% of the respondents had reported of mosquito nuisance in their locality. Further, entomological survey revealed that 16.1 and 19.4% households had intradomestic and peridomestic mosquito breeding, respectively. It was also observed that a miniscule 8 (6.5%) of the respondents had reported of the use of personal protective measures against mosquito bites. The indoor residual spraying (IRS) component in the surveyed houses was 82.3%. Although, IRS is not a malaria control strategy in urban settings, it was carried out as a special measure in the post-flood period in Surat City, in selected areas.

The use of mosquito nets and screening of doors and windows play a crucial role in malaria control. While this study was being carried out, the Vector Borne Diseases Control Department of Surat Municipal Corporation had facilitated the arrangements for treating of mosquito nets with insecticides through an NGO. It was alarming to note that 99.2% of the households did not use mosquito nets to prevent mosquito bites and mosquito borne diseases. After the transformation of the erstwhile 'plague city' into the second cleanest city of India, the denizens of Surat do not feel the need for mosquito net use, and the general population of the city hardly uses mosquito nets. Upon further enquiry, it was revealed that 86.3% of these respondents were of the opinion that mosquito net/screening is not required in Surat City due to their perceived effective mosquito control measures being undertaken by the Surat Municipal Corporation.

Mosquito net use is an operationally feasible strategy for malaria prevention and control[8]. It has been shown that insecticide-treated nets (ITNs) are effective in reducing malaria mortality and morbidity[9]. However, the actual use of mosquito nets is a prelude to the use of insecticide-treated nets. The sustained pyrethroid susceptibility of malaria vectors in Tanzania is an encouraging instance of successful malaria control with ITNs[10], particularly with pyrethroids[11]. It is encouraging to note that an earlier rural Surat study among 1200 households of 80 villages had revealed that about 79% of the respondents were willing to buy insecticide-treated mosquito nets (ITNs) and the mean willingness to pay was Rs. 57[12]. However, this rural willingness is not observable among the residents of Surat City as they do not much perceive the threat of vector borne diseases.

The intensified surveillance measures of the Surat Municipal Corporation in Surat City, had demonstrated the rise in malaria incidence during the months of August and September 2006. The Vector Borne Diseases Control Department of Surat Municipal Corporation had collected 2,76,574 blood slide samples (38% of the annual collection) out of which 5627 were positive for malaria (45% of the annual positive cases). About 2446 *P. falciparum* cases were detected during this period which were 50% of the annual *P. falciparum* cases. Each *P. falciparum* case was given antimalarial drugs in the presence of primary health worker and each positive case was followed in the next domiciliary visit. Intradomestic and peridomestic entomological surveillance of each of the positive case was done and coupled with indoor space spraying of around 50 houses in the vicinity of a positive case.

Despite the post-flood situation and current epidemic of leptospirosis in Surat City, only 41 (33.1%) of the fever cases turned up to health facility for seeking treatment on the same day of fever (Table 1). More than two-third (71.8%) of the fever cases sought

Table 1. Time of seeking treatment after commencement of symptom of fever

Time of seeking treatment	Frequency (%)
Same day	41 (33.1)
Next day	49 (39.5)
Later than 2-days	34 (27.4)
Total	124 (100)

treatment at private practitioners, despite an impressive health infrastructure of the Surat Municipal Corporation like the Urban Health Centres and the SMIMER, and also the government health care services available in the hospitals affiliated to the government medical college. Treatment of fever cases at a public facility is very crucial especially in the context of malaria transmission, prevention and control. Fever cases confirmed as malaria, are more likely to receive Primaquine, known for its gametocidal action and prevention of relapse in *P. vivax* cases, at public facility.

The findings of this study clearly document the absolute dependence of the population of Surat City on the Municipal Corporation for vector control measures even in the post-disaster situations such as post-flood periods as the people are not taking any significant vector control measures at individual level. Therefore, it is of paramount importance that in any situation, there should not be any lapses in the vector control measures by the corporation, otherwise there are bound to be disastrous results. The study also focuses on the need to change the treatment seeking behaviour pattern of fever cases among the slum dwellers.

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