Short Communication

Situation of Malaria in Kolkata Municipal Corporation area: A Secondary Data Analysis Report 2011

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ABSTRACT

A descriptive study was designed based on secondary data of Kolkata Municipal Corporation (KMC). Objectives: To estimate present status and trend of Malaria in KMC area; to determine time, place, person distribution of Malaria; to identify high-risk areas to mitigate future outbreak, and to recommend control strategies of Malaria. Materials and Methods: Three different sets of data were analyzed and the final estimate was obtained from the address confirmed database. Discussion: All the wards were high risk in boroughs 4 and 5. The Annual Blood Examination Rate (ABER) of KMC area declined to 5.29%. The falciparum percentage (Pf%) of KMC area was 8.91% in 2011. The ABER of Borough 14 was 1 but the Pf% was 14.6. “Sen Factor” may be calculated to plan the activities among the wards when the resources are limited. Conclusion: The ABER of Kolkata needs to be improved and Insecticide Treated Nets/ Long Lasting Insecticidal Nets must be considered to control the situation in addition to other regular vector-control measures and Behavior Change Communication activities. Cumulated ABER can be calculated for urban area to get an estimate of fever cases.

Keywords: ABER, Cumulated ABER, LLIN, Pf%, Sen factor

Introduction

Among the 11 countries of South-East Asia Region, 10 are endemic to malaria. Only the Maldives is free of indigenous malaria transmission since 1984. Two low-incidence countries are in preelimination stage: the Democratic People’s Republic of Korea and Sri Lanka, whereas in the remaining eight countries, Malaria is in Control Phase-Bangladesh, Bhutan, the Democratic Republic of Timor-Leste, India, Indonesia, Myanmar, Nepal, and Thailand. India has reported a slow but steady decline in case numbers over the past decade, falling by 28% between 2000 and 2010, while continuing to examine more than 100 million blood slides each year. The five countries (Sri Lanka, Bhutan, DPR Korea, Thailand, and Nepal) where cases fell by more than half over the past decade, they provided adequate supplies of antimalarials. Two countries in the preelimination stage (DPR Korea and Sri Lanka) actively follow-up all suspected cases and this is reflected in a high Annual Blood Examination Rate (ABER) for Sri Lanka. Kolkata is still considered the most malaria prone district of West Bengal, India. The climatic condition and urban lifestyle maintained the title since the birth of the City. More than a century ago the city provided Sir Ronald Ross an opportunity to establish the transmission cycle of the disease. But the transmission cycle of malaria is still yet to be interrupted permanently here itself. Malaria situation of Kolkata has improved considerably in last decade under the keen supervision of the officials of the Kolkata Municipal Corporation (KMC).
A descriptive study was designed based on secondary data among the resident population (44,86,679) of KMC Area as per 2011 census. The electronic database about malaria up to the ward, dispensary, clinic, and laboratory under the KMC administration were obtained from the municipal surveillance officer, data entry operators, and other staffs of KMC and analyzed between 23rd Jan 2012 and 4th March 2012. The objectives of the study were to estimate the present status and trend over last 3 years of burden of malaria problem in KMC Area; to determine the time, place, person distribution of Malaria in the area; the seasonal trend of the disease; to identify high risk areas to mitigate future outbreak, and to recommend control strategies of Malaria in the area.

The data were analyzed from three different sources: State Bureau of Health Intelligence, Health on the March; (2) Integrated Disease Surveillance Project (IDSP) Cell of KMC which included all the attendees of the malaria clinics; live address confirmed database of 2011 maintained by IDSP KMC. The latter eventually eliminated the floating population who attended the KMC Malaria Clinics from outside the ward area, which was about 20% (total cases 8344/41642).

Discussion

The urban high-risk criteria considers slide positivity rate (SPR) 10% and above during any of the last 3 years. For a single year data in an urban area of population not less than 50,000, SPR should be more than 5% or the ratio of clinical malaria cases to fever cases should be more than one-third as per hospital or dispensary statistics during the last calendar year. (3) Keeping the former criterion in mind it was found that all the wards were high risk in boroughs 4 and 5. Among 141 wards of KMC, 67 (47.5%) wards were found to be high risk of malaria. The boroughs having high risk wards were boroughs 1 to 9 and 12. Moreover, most of the wards of boroughs 1, 2, 6, 7, and 9 were also found to be high risk.

Table 1: Kolkata Municipal Corporation boroughs showing malaria indicators, Sen Factor, and priority rating for intervention in the year 2011

| Boroughs | API  | SPR | ABER | Pf% | SfR | Sen Factor | Priority rating |
|----------|------|-----|------|-----|-----|------------|----------------|
| 1        | 5.02 | 12.7| 3.95 | 6.4 | 0.322| 0.82       | 0.105          | 7               |
| 2        | 14.16| 13.3| 10.61| 8.7 | 1.227| 1.16       | 0.072          | 11              |
| 3        | 6.17 | 8.5 | 7.29 | 2.2 | 0.134| 0.18       | 0.006          | 15              |
| 4        | 22.5 | 23.9| 9.4  | 15.9| 3.579| 3.81       | 0.270          | 2               |
| 5        | 15.78| 15.9| 9.95 | 10.6| 1.667| 1.68       | 0.113          | 6               |
| 6        | 14.52| 15.3| 9.49 | 9.6 | 1.388| 1.48       | 0.097          | 8               |
| 7        | 13.3 | 18.9| 7.03 | 2.9 | 0.391| 0.56       | 0.012          | 14              |
| 8        | 8.62 | 12.9| 6.68 | 9.5 | 0.818| 1.22       | 0.134          | 5               |
| 9        | 5.06 | 9.5 | 6.29 | 6.9 | 0.347| 0.62       | 0.085          | 9               |
| 10       | 1.11 | 5.1 | 2.18 | 4.1 | 0.045| 0.21       | 0.077          | 10              |
| 11       | 0.22 | 2.5 | 0.89 | 2.3 | 0.005| 0.06       | 0.062          | 13              |
| 12       | 0.48 | 5.6 | 0.86 | 4.7 | 0.023| 0.26       | 0.254          | 4               |
| 13       | 0.27 | 3.5 | 0.78 | 4.5 | 0.012| 0.16       | 0.264          | 3               |
| 14       | 0.17 | 1.7 | 1.01 | 14.6| 0.254| 0.24       | 2.041          | 1               |
| 15       | 0.24 | 1.7 | 1.39 | 3.1 | 0.007| 0.05       | 0.066          | 12              |
| Total    | 7.42 | 14.1| 5.29 | 8.6 | 0.636| 1.2       | 0.139          |                 |

SF = [Pf% ÷ (SPR ÷ SfR)] ÷ ABER

The SF is calculated for all the boroughs and arranged in descending order which gives the priority required for action which can never be obtained from any other single indicator or any other possible combination.

Annual parasite incidence (API) more than 1 considers Borough 1 to 10 as malaria-prone wards. This presumption may underestimate the remaining five boroughs as their ABERs were very low. In these cases, usually SPR is considered as a second option. SPR highlights borough 12 among the last 5. But proportionately lesser falciparum were found there among the positive slides with respect to borough 14. So the development of health care facilities, infrastructure, effective manpower, supervision, monitoring, and surveillance should start from borough 14. It was observed that the wards 126, 129, and 131 were having Pf% > 30% [Figure 1]. All these wards were in the borough 14 (wards 121, 125, 126, 128, 129, 130, 131, and 132). The Pf% was also high among two more wards of the block, 20% to 30% in ward 128 and 10% to 20% in ward 121. According to urban high risk criteria, falciparum % was not taken in account. So this borough 14 escaped the “high-risk net.” It was also seen regarding further investigation and vigilance regarding falciparum. The topmost priority should be the increase in ABER. But many other factors like Pf%, SPR, and slide falciparum rate (SfR) also play crucial role to consider the priority. A unit free composite indicator “Sen factor (SF)” may be calculated to plan the activities among the wards when the resources are limited.

SF = [Pf% ÷ (SPR ÷ SfR)] ÷ ABER

Malaria case detection and the anopheline larvae detection by KMC throughout 2011 were following similar upward trend with the peak detection of anopheline larvae in the monsoon and malaria cases in the postmonsoon season. But the ABER of KMC area shows the most disappointing picture, declining from a considerably good figure of 10.6% in 2005 to 5.29% in 2011. However, the ABER of West Bengal showed a marginal improvement to 6.06% in 2011 from 5.50% in 2005. The falciparum percentage (Pf%) of KMC area though declined to 8.91% in 2011 but yet to decline below 5.74% of 2005, whereas, the overall figure of West Bengal declined to 17.15% (2011) from 21.03% (2005).

The ABER of borough 14 was 1 but the Pf% was 14.6 [Table 1]. The borough seems to need more priority in descending order which gives the priority required for action which can never be obtained from any other single indicator or any other possible combination.

Annual parasite incidence (API) more than 1 considers Borough 1 to 10 as malaria-prone wards. This presumption may underestimate the remaining five boroughs as their ABERs were very low. In these cases, usually SPR is considered as a second option. SPR highlights borough 12 among the last 5. But proportionately lesser falciparum were found there among the positive slides with respect to borough 14. So the development of health care facilities, infrastructure, effective manpower, supervision, monitoring, and surveillance should start from borough 14. It was observed that the wards 126, 129, and 131 were having Pf% > 30% [Figure 1]. All these wards were in the borough 14 (wards 121, 125, 126, 128, 129, 130, 131, and 132). The Pf% was also high among two more wards of the block, 20% to 30% in ward 128 and 10% to 20% in ward 121. According to urban high risk criteria, falciparum % was not taken in account. So this borough 14 escaped the “high-risk net.” It was also seen
that ABERs of all the wards of borough were less than 1 apart from ward 128 (1.70). This potential health hazard could not be addressed adequately with the existing urban high-risk criteria. Probably, this necessitates the utility of SF. Since SF, being a composite indicator, utilizes Pf%, SPR, SfR, and ABER it may highlight the public health priority in falciparum prone urban area more efficiently.

The ABER should be the most important indicator which is required to be improved throughout KMC area [Figure 2]. It was observed that in among 141 wards there was no “KMC malaria clinic” in 10 wards due to geographical or technical reasons. There were six large densely populated wards which had two malaria clinics each. Among 131 wards (137 malaria clinics) of KMC area only 22.1% (29/131) had ABER more than 10%, whereas 55% (72/131) had ABER less than 5% [Figure 2]. It was also observed that a narrow strip in the map had better ABER.

Regarding the vector control activities, the antilarval measures were taken extensively performing surveillance of mosquito breeding places, larva identification and larva destruction by Bacillus thuringiensis israelensis of 250g/10 L concentration (spray dosage 0.5g/sq. meter) and Temephos of 2.5mL/10 L concentration (spray dosage 0.005mL/ sq. meter) using Knapsack machine. Antiadult mosquito measures were only taken focally in the incident falciparum cases. The neighborhood of a falciparum case was managed by active fever case detection, diagnosis, and treatment of the surrounding 20 to 25 houses. Also fogging was done throughout the surrounding 50 to 100 houses with λ Cyfluthrin 10% (spray dosage 25mg/ sq. meter) using hand fogging machine. Such control measures were also initiated time to time by rapid response teams whenever an outbreak was anticipated. Also several behavior change communication measures were already adopted and implemented by KMC.

In 22.1% wards with ABER>10%, the effort should be sustained and continued to control the entomological factors where-ever the Anopheles, mainly *Anopheles stephensi* breeding sites are detected, whereas in remaining 77.9% wards prioritization according to SF will automatically detect more falciparum if present in the community initiating strategic planning and stringent vector control in the locality. SF alone does not suggest anything currently as further research is necessary to build and standardize a scale. At present, SF should be calculated for all the adjacent well-defined regions where falciparum cases are found and prioritized according to decreasing order for efficient utilization of resources. Currently, 7 government and 74 reporting units other than KMC malaria clinics report to KMC IDSP surveillance system. Among these reports, the residents of specific ward of KMC area were not mentioned. So the further picture of malaria indicators of KMC ward area was not precisely addressed.

Upon completion of an active, complete door-to-door fever-case search in the ward 60 (population 41,782) of borough 6 in April 2012, it was found that the ratio of the residents seeking health service from KMC to those seeking health services other than KMC was 9:17; and 139 fever cases were registered by KMC from the same Ward. From the ratio total 402 fever cases in the community were
estimated among which 263 had been estimated to be seen in private or non-KMC clinic. This total estimated 402 fever cases in the month of April 2012 were approximately 1% of total population which further establishes the fact that monthly 1% of the population should have fever in a community. This fact again necessitates that if the low ABER boroughs are given priority to increase the ABER then actual future path may be much brighter.

**Conclusion and Recommendation**

API reduction should be targeted and priority should be given to borough 4. SPR reduction should be targeted and priority should be given to boroughs 4, 5. ABER of Kolkata needs to be improved by proper administrative planning and individually each borough should reach the target of 10%. The priority of action may follow the order according to SF. But it is very difficult to regularize the ABER in a megacity where a large part of the population seeks advice from private clinics and hospitals. Also a considerable section of the target population is also not available to the KMC surveillance workers due to fixed timings of field visits. This problem may be solved somehow by insisting all the private hospitals, clinics, and laboratories to submit L forms (IDSP) to KMC surveillance system. However, there is chance of duplication, which can be prevented by providing exact current residential address mentioning the ward number (for residents of KMC area), Aadhar card number, and contact number (preferably mobile) of all the patients seeking laboratory service in public or private facilities. This may enable to calculate “cumulated ABER” of individual ward which will be more precise to assess the current situation.

Cumulated ABER = \[(Slides examined by KMC in current year + Slides examined by non-KMC facilities without repetition) ÷ population of the ward at the beginning of the year\] × 100%

ABER is an indicator for operational efficacy of a system. But also it indirectly provides a rough estimate of annual fever cases of KMC area and will strengthen the Integrated Disease Surveillance Program.

ITN or LLIN must be considered an important public health intervention in addition to other regular vector control and BCC measures currently in practice in KMC. Drug resistance trials and studies are needed to be performed at regular interval to control the disease in future days.

**References**

1. World Malaria Report 2011. WHO; 7.6:66
2. Health on the march 2010-2011, West Bengal. State bureau of health intelligence, directorate of health services, government of West Bengal; 8.1.3:102
3. Integrated Disease Surveillance Project, Medical Officers Manual, 2nd Edition, February 2006; Government of India, National Institute of Communicable Diseases, Directorate General of Health Services; 22, Sham Nath Marg, Delhi- 110054.
4. Mandal B, Biswas B, Banerjee A, Mukherjee TK, Nandi J, Biswas D. Breeding propensity of Anopheles stephensi in chlorinated and rainwater containers in Kolkata City, India. J Vector Borne Dis 2011;48:58-60.