



A Leader's Fight Against Malaria in Kolkata, India

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Abstract

Malaria is an age-old public health problem in Kolkata City, the cultural capital of India. In 2010, a popular political leader, Atin Ghosh, became the Member of the Mayor-in-Council (Health) of Kolkata Municipal Corporation at the behest of the Hon'ble Chief Minister of West Bengal, Ms Mamata Banerjee. Unlike his predecessors, Mr Ghosh took several unprecedented initiatives to fight against malaria and implemented them religiously. As a result of which, the situation improved remarkably. The number of malaria cases here downslided from a dispiriting 96,693 in 2010 to a comfortable 32659 in 2012 through 41,642 in 2011. No death due to malaria occurred in the city after 2010. The extent of decline in the number of *Pf* cases was from 14,226 in 2010 to a mere 3403 in 2012. The World Health Organization and the Directorate of National Vector Borne Disease Control Programme, Government of India, have officially appreciated the achievement of KMC in the field of malaria prevention. Truly, a new era of mosquito control activities so needed to prevent malaria and other mosquito-borne diseases began in KMC area soon after Atin Ghosh had taken over the charge of the health department of KMC as the MMIC. He proved himself to be a trend-setter. Political leaders around the country can learn a lesson from this leader of Kolkata.

Keywords: Kolkata; Malaria; Political will; Atin Ghosh; *Anopheles stephensi*; Source reduction

Introduction

The municipal corporation of an unplanned overcrowded city can achieve a lot in terms of prevention and control of malaria provided there is a strong political will. Atin Ghosh, Member of the Mayor-in-Council (Health) of Kolkata Municipal Corporation (KMC), has, by way of getting himself constantly involved in planning and implementing various strategies needed to wage a real war against this very mosquito-borne ailment, proved this impeccable. My personal feeling is that many political leaders around the country, who have traditionally been keeping themselves aloof from looking after any mosquito-borne disease control programme in their constituencies, will learn a lesson from this leader of Kolkata and change their mindset.

In a country like India, where mosquito control is still considered a lowly task, Atin Ghosh, otherwise a proactive popular leader of Trinamool Congress party, has stood against the detrimental flow and taken various initiatives on his own to change the dispiriting malaria scenario of Kolkata. This man, to me, is a trend-setter. A noble job, which was supposed to be done by the medical fraternity of KMC, has been done by a non-medical political leader. Initiatives taken by him during 2010 to 2012 and the quantum of success achieved by KMC in terms of prevention of malaria are reported in this communication.

Study Area

The city of Kolkata is the cultural capital of India. It is situated by the side of the River Hooghly. The city spreads over an area of 206.2 sq km and is inhabited by 45,67,535 people, as per the Census of 2011. The KMC area is divided into 15 boroughs comprising 144 wards. The city's daily floating population is around 6 million. Quantity of potable water supplied by the KMC per day is 300 Million Gallons (MG). Raw water to the tune of 80 MG is also supplied by KMC per day. Potable water to the tune of 20 MG is supplied by tube-well daily. Frequency of water supply is 8 hours a day for a week (on an average). The city's total daily consumption of water is 296 MG. There are 1236 registered slums and nearly 34% of the city's population live in slum areas. Water storage practice among people in some places is rampant as the water supply in

these areas is far from adequate. Housing complexes, apartments, high rises, shopping malls and other business establishments are coming up at an alarming pace. And the city is fast expanding vertically. Free primary health care facilities to the city-dwellers are provided by the health department of KMC through its 132 ward health units. Malaria is an age-old public health problem in this metropolis.

Climate of Kolkata

Three meteorologically distinct seasons—the summer, rainy and winter—characterise the climate of Kolkata City. The summer season here generally begins early in March and extends at least to the end of May or the beginning of June. There are occasional showers of rain during this period. The rainy season starts in June or July and ends by the middle of October. During this time, water is most plentiful. The winter season commences in November and lasts till February. There is very little or no rain during this period. The average monthly temperature here varies from 19.8°C in January to 30.9°C in May. The variation of the average monthly relative humidity is from 68.1% in January to 83.6% in August. Annual rainfall is 1400-2300 mm.

Antimalaria Initiatives Taken by Atin Ghosh in 2010-2012

After taking over the charge of the health department of KMC as an MMIC in June 2010 at the behest of Ms Mamata Banerjee, Hon'ble Chief Minister of West Bengal, Atin Ghosh took the following unprecedented initiatives to prevent and control malaria and worked

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with clockwork efficiency to implement them taking assistance of some proactive officials of his department.

Listing of high-risk areas

Based on the previous 3 year's data, a list of 52 wards requiring greater antimalaria activities in 2010 was prepared following the advice of Atin Ghosh.

Joint drive for source reduction

A weekly joint drive involving the personnel of health department and some other departments of KMC such as Water Supply, Building, Drainage & Sewerage, Solid Waste Management and Lighting was mounted in each and every KMC ward every year during the period of high malaria transmission between July and November. The progress of such drive was reviewed by Atin Ghosh himself at weekly intervals. The drive proved extremely effective in destroying mosquito breeding sites at various places around the city, including under-construction buildings and hospitals.

Distribution of multicoloured multilingual leaflets

In the field of mass awareness-raising campaigns through leaflets, Atin Ghosh brought in a phenomenal change. Prior to his joining KMC as the MMIC, the health department used to print unattractive leaflets (all in black and white) every year to disseminate information about the do's and don'ts for prevention of malaria. Mosquito control staff of the department used to distribute those leaflets among the people at random. People whose mother tongue was English could not read the leaflets printed in Bengali. Similarly, Bengali-knowing people could not read the leaflet printed in English. Atin Ghosh thought about it very seriously and asked his department to prepare multicoloured leaflets each containing the same messages printed in four different languages—English, Bengali, Hindi and Urdu. This helped people from every sector understand the KMC's messages quite easily. And needless to mention, the initiative was immensely appreciated by numerous people around the city. In all 15, 00,000 leaflets were distributed in 2010-2012 @ 5, 00,000 leaflets per year. Through the leaflets, these three important antimalaria messages, each printed in the chronological order of Bengali, Hindi, Urdu and English languages under the caption "Mosquito is bearer of diseases. Three tips for survival", were disseminated to the people: 1. If you suddenly catch fever, get your blood tested immediately. Malaria clinics of KMC are located very near to your residence. 2. Don't store water in any open container. 3. Use mosquito nets.

Propaganda through TV and Radios

To launch a high-voltage mass awareness campaign against mosquitoes and malaria, a beautiful first-of-its kind Bengali song was written by a noted lyricist of the city (Chandril Bhattacharya) and its music was composed by a well-known music director (Joy Sarkar). Sung by four renowned singers of Kolkata (Lopamudra, Raghav, Rupankar and Shubhamita), the song was recorded in August 2010. A music audio CD and a video CD of the song were released by the Hon'ble Chairman of KMC in September 2010. These CDs were then distributed among different ward councillors of KMC, journalists, local clubs, MPs, MLAs and many other distinguished persons. Secretaries of different puja committees across the city too were given these CDs for playing in their puja pandals during all the four days of the Durga Puja (Hindu festival).

The music audio CD containing the aforesaid song (of 80-second duration) was played on-air for 8 times a day for 1-2 months in every

year during 2010 to 2012 through 9 FM channels. Similarly, a video CD of the song was played on 9-11 popular TV channels for one month in every year during 2010 to 2012, spending a total of \$US534, 188. The health department of KMC had never ever done such a campaign before.

Organising health camps for the poor

To cater to the people's need for an early diagnosis and prompt treatment of malaria, treatment of common minor ailments and their awareness about malaria, Health Camps (12-19) adjacent to slum areas of the city were organised every year in September-October.

Publicity through auto-branding

Flex boards specifying do's and don'ts for prevention of malaria were put up on 4000-5000 hired auto-rickshaws and they plied on different routes covering all the wards of KMC in September-October every year during 2010 to 2012. Messages sent out through auto-branding included these: 1. Get your blood tested immediately if you catch a bout of sudden fever. 2. Don't store water in any open container. 3. Don't take aspirin/ibuprofen type of medicine to get rid of the fever. 4. Sleep under a mosquito net. These messages were propagated in three languages- Bengali, Hindi and Urdu. The campaign proved effective.

Campaign using audio and video mobile vans

A two-month long campaign using 6 audio and video mobile vans was mounted in October 2010. The vans covered all the 52 high-risk malarious wards of the city and the CDs (both audio and video) were played to make people aware of the do's and don'ts for prevention of the disease. The campaign continued till November. Such campaign could not be launched in 2011 and 2012 due to funds crunch.

Distribution of multicoloured booklets among schoolchildren

Schoolchildren constitute the most sensitive part of our society. Hence their awareness about mosquito-borne diseases is very essential. Having realised this, Mr Ghosh caused to publish 3,25,000 multicoloured booklets in four different languages—1,50,000 Bengali, 1,00,000 English, 50,000 Hindi and 25,000 Urdu—at a cost of \$US164,529.9 and distributed them among the students of 701 schools across the city. Neither had any civic body nor any state health authority ever brought out such booklets for school children in India.

Making mosquito control staff to render extra-hour service

Leaves of all mosquito control staff were cancelled. They worked on all holidays, including Durga Puja holidays and Sundays, for a period of three consecutive months—September, October and November. Such arrangement was made only in 2010 since the problem of malaria was grave. The initiative yielded notable impact.

Formation of rapid action teams

As in other big cities of India, in Kolkata too, *Anopheles stephensi* is the main transmitter of malaria [1] and this mosquito breeds mostly in fresh water collections in and around human-dwellings [2] Unless breeding sources of this malaria-bearing species are detected and destroyed, preventing the spread of the disease among the city-dwellers of Kolkata is literally not possible. Regrettably, controlling officials of the health department of KMC had never understood these basic facts. Let me correct myself—these officers had rather never wanted to understand these basic facts. And hence they were highly reluctant to run vector control activities under the control of entomologists. Mr Ghosh made a breakthrough. Vector control was his priority. So, he

gave free hand to entomologists (4 in all) and constituted 4 Rapid Action Teams (RATs) in December 2010 for detection and destruction of mosquito breeding sources by deploying 50 trained field workers through an agency against payment of \$US1,038.4 per year to each worker.

The idea of building an in-house monitoring system for vector control by constituting RATs was absolutely new in India and this initiative was profusely appreciated by the Directorate of the National Vector Borne Disease Control Programme (NVBDCP), the only agency of the Government of India that formulates and monitors vector-borne disease control strategies in different states of the country. These RATs worked in all high-risk malarious wards of KMC under the technical guidance of entomologists. From December 2010 to December 2012, the 4 RATs made house-to-house checks for mosquito larvae in all high-risk wards of the city once a month, @100-200 houses per ward, to estimate the prevalence of the breeding sources of *An. stephensi*. Collection of information was carried on as per the format prescribed by the entomologists. Container index of *An. stephensi* (% of containers positive for *An. stephensi* larvae) was used as a tool for estimating the magnitude of the larval prevalence of this mosquito in the wards brought under scanner.

Establishment of a mosquito research laboratory

Unlike all his predecessors, Mr Ghosh realised the need for studying vector mosquitoes in Kolkata for planning scientific strategies so needed to win the battle against them. Hence he decided to create facilities for entomologist to undertake research on mosquitoes. He discussed the issue with the Mayor, got a go-ahead from him and set up a small research laboratory in August 2010, incurring funds to the tune of \$US 6410.2 from the exchequer of KMC. This is a first-of-its kind laboratory in eastern India. Needless to say, a new era of mosquito control activities ushered in following the establishment of this laboratory. As an entomologist, I feel delighted and honoured when doctors and mosquito control workers from non-KMC organisations come to our laboratory to learn about mosquito identification [3]. Even the harsh critics will not refrain from appreciating the entomologists of KMC who, in the past 3 years, have published their research papers in 3 medical journals of international repute-Transactions of the Royal Society of Tropical Medicine and Hygiene, Dengue Bulletin of the World Health Organisation [4] and the Journal of Vector-borne Diseases [5].

Early diagnosis and complete treatment (EDCT)

EDCT is one of the key strategies of the National Malaria Control Programme. To implement this policy, the health department of KMC has so far established 140 malaria clinics in different places across the city. Blood samples of all clinically suspected cases of malaria were examined at these clinics, mainly by microscopy, and the confirmed cases of malaria were treated in accordance with the National Drug Policy on Malaria. Since *Plasmodium falciparum* in Kolkata has grown resistant to chloroquine, all patients of falciparum malaria were treated exclusively with ACT (Artemisinin Combined Therapy) and primaquine after being diagnosed at the clinics of KMC.

Source elimination drive right from January

In Kolkata, uncovered overhead water tanks, seepage water, water tanks built for soaking bricks at construction sites, deserted fountains, basement water tanks and other such sites act as the main breeding sources of *An. stephensi* during the winter season. These sources are called the mother foci of *An. stephensi*. The best way of controlling *An.*

stephensi population in Kolkata is the elimination of its mother foci from the city's environment. After having a series of talks with experts, Mr Ghosh asked his department to undertake a city-wide drive for destruction of the breeding sources of this mosquito right from the beginning of the year against the earlier practice of mounting source elimination drive during the rainy season and the times thereafter. And so did the department from January 2011.

Larvicidal spray

There are 1350 Field Workers in the health department of KMC. Need-based larvicidal spray was done by 6-8 trained field workers in every KMC ward, using the powder and liquid formulations of the toxin of a strain of microbe called *Bacillus thuringiensis israelensis* (i.e. Bti-WP and Bti-12 AS) and the organophosphorous compound Temephos 50% EC, following the guidelines of the Directorate of NVBDCP. Quantities of larvicides used in 2010-2012 are: 11,665 kilograms of Bti-WP (worth \$US296,610), 7,890 litres of Bti-12AS (worth \$US244,455.1) and 7,555 litres of Temephos 50% EC (worth \$US185,646.3).

Fever surveillance

Active fever surveillance was undertaken in all high-risk wards during the peak season of malaria transmission (July-November) every year in 2010-2012. As many as 850 honorary health workers did the job as per the order of the MMIC (Health).

Use of larvivorous fish

Efforts to destroy mosquito larvae by using guppy fish (*Poecilia reticulata*) were made as and when required, especially in places where larvicidal spray was not feasible. To ensure ready availability of guppy fish, in-house fish production facilities by establishing hatcheries in different areas of the city were developed by the department on Mr Ghosh insistence by the MMIC (Health).

Results

In all 3, 55,293 patients visited the KMC-run malaria clinics with complaints of fever during 2010 get their blood tested for malaria. Blood samples drawn from these patients were examined by microscopy. Of them, 96,693 samples were found positive for malaria (Table 1). The Slide Positivity Rate (SPR) was 27.2%. *Falciparum* malaria comprised 27.2% (14,226) of the total number of positive cases. In 2011, the number of malaria cases came down to 41,642 (SPR-17.5%), of which only 4,200 were cases of *falciparum* malaria. In 2012, there was a further decline in the number of malaria cases. The SPR came down to 9.3% (32,659 cases out of 350147 blood samples tested). And the number of Pf cases was only 3,403. In 2010, only one person died of complicated *falciparum* malaria in the city. The death occurred at a hospital and the main cause of the death was delayed hospitalisation of the patient. In 2011 and 2012, no death due to malaria was reported from this city.

Figures concerning Container Index (CI) of *An. stephensi* and the incidence of malaria in 13 high-risk wards were kept noted in every month during 2010-2011. As shown in Table 2, cases of malaria in 13 wards as reported in 2010 downslided considerably in 2011. And, quite interestingly, such decline corroborated with the decline of figures concerning the CI of *An. stephensi*. For an instance, in 2010, the number of malaria cases reported from ward 25 was 4565. The figure came down to 1589 in 2011. Similarly, the number of malaria cases in ward 39 underwent sharp decrease from 3838 in 2010 to 1445 in 2011. Variations of the CI of this vector mosquito in these two wards during 2010 and 2011 were: 0-12.5% in 2010 and 0-4.3% in 2011 in ward 25 and 0-12.5% in 2010 and 0-7.0% in 2011 in ward 39. Clearly, preventing

Year	No of malaria clinics run by KMC	No of patients whose blood samples were tested for malaria	No of patients whose blood samples tested positive	% of blood slides positive for malaria	No and % of Pf cases		Deaths
					No	%	
1996	19	35236	10052	28.5	905	9.0	17
1997	30	102542	30048	29.3	3106	10.3	38
1998	39	161408	55241	34.2	8875	16.0	53
1999	44	278190	105008	37.7	28690	27.3	63
2000	50	223903	67056	29.9	11799	17.6	55
2001	55	232823	57870	24.8	11961	20.6	29
2002	58	222247	53951	24.3	7183	13.3	28
2003	59	230935	49504	21.4	3923	7.9	6
2004	60	234444	56381	24.0	3727	6.6	19
2005	63	332579	56161	16.9	3373	6	3
2006	70	263361	52202	19.8	3940	7.5	1
2007	76	174902	31016	17.7	1751	5.6	0
2008	85	236577	51266	21.7	9335	18.2	4
2009	132	301245	87423	29.0	15926	18.2	1
2010	135	355293	96693	27.2	14226	14.7	1
2011	140	237452	41642	17.5	4200	10.0	0
2012	140	350147	32659	9.3	3403	10.4	0

Table 1: Malaria scenario in Kolkata City (based on the statistics of malaria clinics of KMC).

Ward	No of malaria cases detected in 2010	Variation of container index (%) of <i>Anopheles stephensi</i> in 2010	No of malaria cases detected in 2011	Variation of container index (%) of <i>Anopheles stephensi</i> in 2011
7	1678	0 - 8.9	658	0-2.5
11	1545	0 - 7.0	423	0-3.1
19	1375	0 - 13.2	415	0-7.5
29	1336	0 - 19.3	609	0-5.1
25	4565	0 -12.5	1589	0-4.3
36	1869	0 - 8.6	865	0-4.1
37	2104	0 - 7.8	858	0-3.9
39	3838	0 - 12.5	1445	0-7.0
45	1246	0 - 6.5	519	0-4.5
60	3136	0 - 9.5	874	0-2.5
62	1647	0 - 8.1	811	0-2.8
65	2084	0 - 7.4	1365	0-3.9
66	4860	0 - 17.4	3114	0-5.8

Table 2: Container index (%) of *Anopheles stephensi* and cases of malaria in some wards of KMC.

malaria by reducing the population of its vector mosquito is feasible. Medical men, who are still unwilling to concentrate on vector control, ought to learn a lesson from this information.

Discussion

Malaria is a biblical scourge to the people of Kolkata. Nearly 50% of the 1200 companions of Job Charnock, who was until recently considered to be the founder of Kolkata City, reportedly died of malaria in a span of only one year after their landing in the city back in 1690 [6].

Until the mid-1950 s, the ravages caused by malaria were terrible. Then with the implementation of the National Malaria Eradication Programme (NMEP) based on indoor residual spray with DDT, much relief followed. Unfortunately, in the mid-1970s, as in many other parts of the country, in Kolkata too, malaria swayed back into the scenario and its incidence, more particularly the cases of falciparum malaria, started spiralling up. Officially, the average annual incidence of falciparum malaria was 0.09% (1/1404) in the 1970s. It rose to 4.1% in the 1980s (610/14707). And in the 1990s, the figure shot up to a staggering 18.5% (7820/42118) [7].

In 1995, besides 18 other cities of India, Kolkata too was declared as a high-risk malarious city by the Directorate of NVBDCP (erstwhile NMEP), Government of India [8] Fifty-two people died of malaria in this city during 1995. In 1996-1997, chloroquine-resistance of *P. falciparum* in the city was first reported by the Directorate of NMEP, [9] but the health officials of KMC, state health authorities, practising physicians of the city did not bothered about it. At some malaria clinics of KMC, treatment of *Pf* cases with quinine tablets was resorted to. But such treatment was inconsistent. Years passed by. Treatment of *Pf* cases at most of the malaria clinics of KMC and the government-run hospitals continued with chloroquine. Resultantly, 318 people died of falciparum malaria in Kolkata during 1996 to 2010. The year-wise break-up is: seventeen in 1996, thirty-eight in 1997, fifty-three in 1998, sixty-three in 1999, fifty-five in 2000, twenty-nine in 2001, twenty-eight in 2002, six in 2003, nineteen in 2004, three in 2005, one in 2006, four in 2008, one in 2009 and one in 2010. In 2009, the health department of KMC tried to obtain ACT (Artemisinin Combined Therapy) from the Directorate of NVBDCP, but failed for some corrigible technical impediments. Finding no other alternative, the health department of KMC procured ACT from the local market and started using it through some of its clinics. But the religious use of ACT in treating cases of falciparum malaria through each and every malaria clinic of KMC began only after Mr Ghosh had become the MMIC (Health). Incidentally, he himself had to stay admitted at a nursing home for a couple of days for treatment after being afflicted with falciparum malaria about 15-16 years back. Perhaps this was why Mr Ghosh put in mammoth efforts to fight against this disease.

For implementing the national guidelines for treatment of falciparum malaria at all city-based hospitals and nursing homes too, Mr Ghosh took a personal initiative. He wrote letters to the health authorities of both the Government of India and the Government of West Bengal urging them to ensure treatment of *Pf* cases with ACT at each and every hospital, nursing homes and other non-KMC health establishments across the city. His endeavour yielded results. Use of ACT began everywhere.

As evident from Table 1, malaria scenario in Kolkata improved remarkably in 2011 and 2012. No death occurred here after 2010.

Pertinently, in 2007, only 31,016 cases of malaria with zero death

were reported from the city against 56,161 cases with 3 deaths in 2005 and 52,202 cases with 1 death. This improvement came as a collateral benefit of the massive antidengue activities carried out by the health department of KMC in 2005 and 2006 following the episode of dengue that occurred here in 2005, involving 3,546 cases with 12 deaths. Situation improved and we all plunged into the realm of inaction. Antivector activities ran haphazardly. As a result, the number of malaria cases again rose to 51,266 in 2008, including 4 deaths.

The anti-malaria plan of KMC, under the guidance of Mr Ghosh, has, to say the least, achieved a sparkling success and lapped up commendable appraisal from the World Health Organization which said in an alert issued to travellers, "Risk of *falciparum* malaria and drug resistance in Kolkata is relatively lower than the other places of the state of West Bengal." [10].

The Directorate of NVBDCP too eventually lauded the KMC's efforts. In an Urban Malaria Review meeting held on 28-29 June in 2012 at the Directorate of NVBDCP, Govt. of India, the KMC's antimalaria programme undertaken in 2010-2011 was profusely appreciated by all the higher officials of the Directorate and other participants from around the country. Mr Ghosh was invited to the meeting to share his experience of steering antimalaria activities.

Pertinently, mosquito control in West Bengal has traditionally been looked after by doctors who know very little about the subject. Tangible initiative to recruit qualified entomologists so needed to plan and implement strategies for mosquito control is still not in sight. Atin Ghosh has shown a path which the other state health departments of the country ought to opt to walk down to improve the threadbare infrastructure. I would like to mention here that I don't have any intention of having a crack at the medical fraternity of India but the true scenario has to be brought to surface somehow or the other.

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