FIELD PROJECT REPORTS

By

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CERTIFICATION

This is to certify that all the field projects submitted in this Bound Volume are original works carried out by **Dr Dipankar Maji** during the two field postings of six months, each under the guidance of faculty of National Institute of Epidemiology (ICMR), Chennai and the local supervisor specially nominated for this purpose. This is in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology and has not been submitted earlier by him in part or whole for any other (publication or degree) purpose.

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CONTENTS

SECTION - 1

FIRST

FIELD POSTING

Health Situation Analysis in the District of South-24 Parganas, West Bengal, India, May-2006

1. Introduction

1.1 Background

The public health situation of India is presently going through a critical phase. It is characterized by deficient control of traditional communicable diseases as well as emerging infections, accompanied by marked increase of non-communicable diseases. While mortality & morbidity reduction in diseases like diarrhoea or acute respiratory infection are far from being achieved up to the desired levels, certain old problems are presenting themselves in a more complex and intimidating form; e.g. malaria, multi-drug resistant tuberculosis, insecticide resistance of mosquito vector etc. Paralytic polio, despite relentless eradication attempt since 1995, has shot back again in this year (2006) after a temporary respite. Among the emerging infections are diseases like H.I.V./AIDS, dengue, chikungunya etc. that are posing newer challenges before the health system.

The state of West Bengal is not at all an exception in the above scenario. Outbreaks of acute diarrhoea (mostly cholera) and malaria still prevail as common phenomena in the state. Apart from the generalized burden of diseases, there are ones like kala-azar, arsenicosis, dengue or Japanese encephalitis, that are localized problems but have heavy connotations at specific areas. The need of the time is a well-built public health system with qualified public health personnel who would manage the system in an efficient way. This is particularly important in the face of competing priorities in a resource-limited setting.

South-24 Parganas is the district where I am located for my field assignments of MAE-FETP Course. Having been situated next to the city of Calcutta, the district bears the burden of unplanned urbanization, yet at the same time goes with a number of under-developed villages.

I hope my working in this district in the midst of the public health complexities would enrich me with first-hand experiences and mutually benefit the district health system also.

The following would be a brief description of the health scenario of the district, with the present status and the future goals that would generate links to the selection of subjects for my field projects.

2. Methodology

I have collected information regarding general description of the district from the General Administrative Department and the Zilla Parishad (district board).

To calculate the population projections for the Year 2006, I have applied successive Sample Registration System estimates of population growth rate on the census population of 2001. [No further estimates were available after 2003]. Data on population below poverty line came from the district profile prepared by Zilla Parishad.

For the morbidity & mortality data and programme performance figures of the district I have referred to the district health records. The same were the sources of information about infrastructure and manpower.

I have presented the current status against the millennium development goals by three levels, viz.- the district, the state and the country, and the relevant data I have obtained from various sources like the websites of W.H.O., UNICEF & U.N.D.P., reports of the State Bureau of Health Intelligence, State Human Development Report and different programme reports for the state or national level. I have mentioned the respective sources of these data in the data table itself.

3. Results

3.1 General description

The district of South-24 Parganas is situated at the southern-most part of the state of West Bengal, with Calcutta Metropolis at its north and the Bay of Bengal at the south.

It is composed of 29 development blocks and 7 municipal areas.

13 of these blocks are of riverine topography. They are crisscrossed by a tangle of rivers, making communication difficult.

The climate is tropical, that favours the transmission of diseases like kala-azar. Monsoon is an important season, and is related to most of the water-borne diseases. The district's proximity to the sea also makes it prone to cyclone & tidal flood.

The local economy depends mostly on agriculture and fishery. But with advancing time, commerce & industry areas like export zone, ports and leather complex are coming up – posing additional threats of disease importation.

The municipal areas, by and large inhabited by more well-off people, are under the control of local self governments that are not parts of the state government.

3.2 Population

Population of South-24 Parganas is the second largest district population in the state.

The decennial growth rate (1991-'01) has been higher than the state average (20.48 vs. 17.77).

15.7% of the population belong to urban areas.

Sex ratio is slightly better than the national average (1000:938 vs. 1000:933).

A little more than one third of the district population are below the poverty line. [See Table- 1]

Some clusters of tribal people (1.2%of the population) are there. People of minority religion are also there in good number. These factors have bearing on programme publicity plans in the district.

3.3 Laboratory support

The Health Centres or Rural Hospitals at the block headquarters each have a small laboratory for malaria microscopy and sputum examination for A.F.B. The second tier i.e. the subdivisional/ state general/ district hospitals have labs where routine haematology and blood biochemistry are done. But one can hardly get any help from them for epidemiological work, as they are burdened with patient load. The district hospital houses a voluntary counseling cum testing center for H.I.V., that may help in a small scale in related studies.

The Calcutta School of Tropical Medicine and National Institute of Cholera & Enteric Diseases function as reference centers for the district. They provide support for outbreak investigation. The former has arrangements for serology for common vector borne diseases & leptospirosis, full range of clinical microbiology and biochemistry including arsenic level estimation. It has parasitology (with an active malaria clinic) & entomology departments too. The latter institution has testing facilities for all sorts of enteropathogens and also hepatitis virus isolation. Both the centers are referral labs for H.I.V. testing.

Apart from outbreak investigation, one can go into collaboration with them for other epidemiological studies also, if such studies serve the interest of both sides. In view of the local relevance, an M.A.E.-F.E.T.P. Scholar may choose subjects on diseases like kala-azar, malaria, arsenicosis, leptospirosis, diarrhoeal diseases or intestinal parasites for his field assignments in consultation with them.

3.4 Major public health priorities

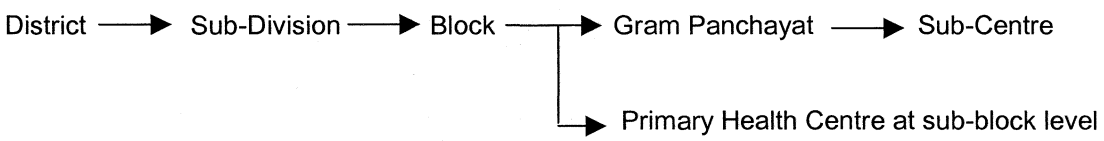
Water-borne diseases, specially acute diarrhoeal diseases are among the principal public health problems of the district. Out of the vector-borne diseases, leishmaniasis is intimidating due to its continuing transmission and risk of perpetuation as dermal leishmaniasis.

Tuberculosis still has a major impact on morbidity & mortality, because of faltering case detection activity until recent times and missing of sputum negative cases by the system. H.I.V., notwithstanding its moderate prevalence, has become an issue owing to its fast rising trend. From the performance perspective, immunization programme is also a public health priority, as coverage evaluation gives estimates below 70% in spite of huge amount of inputs.

[Table- 2 presents further details on diarrhoeal diseases, leishmaniasis & H.I.V./AIDS]

3.5 Organization of the health system in the district

The public health system within the district is laid down through the following levels.



The curative service system above the block level is separate from the public health system. But lower down, the two systems are merged in the framework of Block Health Centres or Rural Hospitals and Primary Health Centres. The Health Workers are at the lowest level of implementation of any community health programme. Two workers are supposed to cater an area with present population of 6000-7000 population (cf.- the norm of 5000).

In recent years the public health structure has been realigned to match the Panchayati Raj system so as to develop better coordination & community participation.

A process of decentralization of responsibilities to the subdivision level is going on; but generally it is not working well due to lack of resources there.

The municipal health system is separate from the state health system in the district. It is mainly dependant on part-time doctors & honorary health workers. There is little interaction between the two systems except in case of special programmes or disease outbreaks.

Rural health in the district is suffering from vacancies in key public health positions. 59% of the posts of Male Health Workers are vacant. None of the blocks except one has any Sanitary Inspector or Malaria Inspector. In 6 of the blocks (19%) there is no Malaria Technician. Posts of Block Computor who are in charge of record keeping & reporting, are lying vacant in 26 blocks (90%). Manpower of the District Epidemiological Squad is also 50% of the sanctioned strength.

3.6 Millennium Development Goals

As per administrative report the district is performing well in measles immunization (88.3%) and also in reduction of infant mortality & under-5 mortality (in comparison to the state or the country). Contraceptive prevalence rate and condom use rate out of contraceptive prevalence are also in a good standard compared to state or national average.

But status in terms of some other indicators of maternal & child health is falling behind; e.g. percentage of pregnant women receiving antenatal care and percentage of skilled attendance at birth.

Performance in control of major public health diseases is showing a mixed picture. Percentage of estimated new smear positive TB cases registered under DOTS is below the desired level. But death rate in tuberculosis and death rate due to malaria are lower than the state and/or national rates.

[See Table- 3 for status with respect to millennium development goals]

4. Discussion

4.1 Strength

The health system in the district has an elaborate deployment spread even up to the islands in the southern part. Though a lot of the posts of Male Health Worker are vacant, most of the Subcentres (92%) are having the Female Health Assistant in position. Posts of Medical Officer in the periphery are all filled up, except in only a few Primary Health Centres.

The district headquarter being in proximity to the City of Calcutta, it is relatively easier for the public health administration to take help & guidance from the referral centers.

NGO-s are numerous in the district, and many of them are functioning harmoniously with the government system.

The district is doing fairly good in certain aspects of Reproductive & Child Health. It is well on the track in measles immunization, reduction of childhood mortality and promotion of birth spacing methods. The system has taken initiatives to control leishmaniasis, tuberculosis & H.I.V., though obvious outcomes are yet to be seen. Block rapid response teams are also in position to manage outbreaks.

4.2 Weekness

Riverine topography and presence of many backward areas (even in non-riverine areas) are important physical barriers.

Huge increase of population (migration being an important factor) offsetting the increase in number of Subcentres is another limiting factor for quality service at the grass-root.

Many of the key positions of public health at the block & district levels are lying vacant since long – compelling the local administration to manage with make-shift arrangements. Activities like malaria control, disease surveillance, insecticidal spray etc. are much hampered.

The district is lagging behind in terms of some vital indicators of maternal health.

Good surveillance data are not available. Such a failure needs to be explored in depth, that is hardly done.

Inadequate urban health structure and its isolation from the general system are also issues of concern.

Capacity building of the people's representatives is another demanding area for actual empowerment of the block/ district health committees.

4.3 Challenges

With the changing health & socio-economic scenario in the outer world, the disease trends and people's expectations are changing in the district too. It is a challenge before the system to adapt to the changes in spite of the financial restrictions.

The urban-rural divide also poses a challenge while formulating strategies or choosing priorities.

The Health System Development Initiative (with external aids) and Integrated Disease Surveillance Programme would open up new opportunities to extend & spearhead our services; but without much input in manpower. So it remains to be seen how we can utilize the material inputs in the best possible way, given the limitations in staffing and organization.

The state has introduced a mechanism of decentralized planning & budgeting. It asks for better use of management information and surveillance data, to make our own action plans realistic.

4.4 Steps towards decision making

Through the process of the present analysis, the following functional characteristics of the public health system stood out.

(a) Priorities of problems are not clear and specific.

(b) Programme monitoring is sometimes superficial and not giving useful inputs for the planning cycle.

(c) Surveillance system in general is not a very live one.

(d) There is need for positive reinforcement for the minds behind the system.

A vision and a mutually supportive technical back-up can go a long way towards instilling dynamism into the system.

5. Conclusion

The situation analysis gives us, in a broad perspective, an idea about the deficiencies & constraints at the levels of input, process and output/ outcome of the whole public health system. This insight again suggest the sort of intervention required at these levels. It builds the optimism that it is possible for the system to improve its outcome

to a significant extent by efficient utilization of the resources within. An M.A.E.-F.E.T.P. Scholar located at the district can be considered among the resources.

Working in the district set-up gives the scholar not only an opportunity to practise his epidemiological skills, but it also gives the experience of organizing studies in a complex real-life situation. On the other hand, the systematic work-up of his studies sets a good example before the other public health personnel. It gives peer inputs in developing a critical and utilization-oriented outlook towards data.

The district system usually do not describe and document outbreaks in a standard framework and sometimes does not even get the laboratory confirmation. Now the core competency of M.A.E. curriculum would address this issue.

On the basis of the situation appraisal followed by a process of rational questioning, I can arrive at potential proposals for my field assignments, that would be feasible as well as useful in the actual background. [Table- 4]

Involvement of the stake-holders in this preparatory exercise would develop better ownership of the future works

MAP OF SOUTH 24 PARGANAS DISTRICT

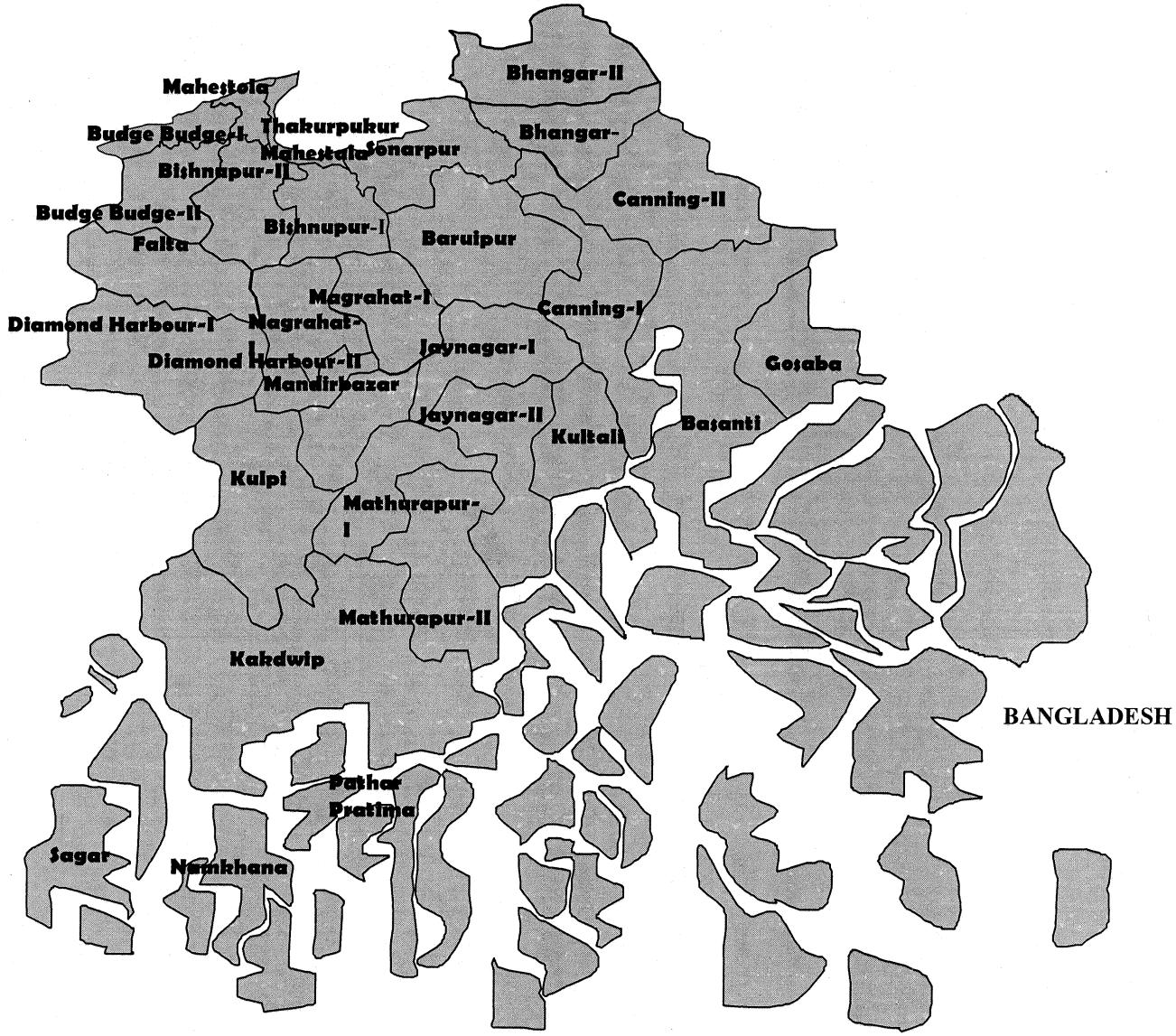


Table-1: Socio-demographic characteristics of South-24 Parganas, West Bengal, India : as in March-2006

Population Group	Population size	Proportion of the total
0 - 4 years of age	704416	9.5%
5 - 14 years of age	1760299	23.7%
15 -29 years of age	2011664	27.1%
30 - 44 years of age	1559355	21.0%
45 - 59 years of age	840850	11.3%
60 years and above	538322	7.3%
Male population	3827317	51.6%
Female population	3587590	48.4%
Above poverty level	828635 families	62.7%
Below poverty level	493294 families	37.3%
General Caste	4945743	66.7%
Scheduled Caste	2380185	32.1%
Scheduled Tribe	88979	1.2%
Other Backward Caste #	-	-
Total population	7414907	100%

Enumeration of Other Backward Caste population is still under process in this district. So, no specific count is available till date. Population other than S.C. and S.T. has been shown here under General Caste

Table- 2 : Key public health priorities in South-24 Parganas, West Bengal in 2006

Public health priority	Key elements	Ongoing prevention & control programmes
Acute diarrhoeal diseases	▪ Morbidity in the district relatively high. Annual Incidence among < 5 yr. children of the district (10 episodes per 100 children) is double the value for the state ▪ Major killer diseases of P.H. importance. Caused 23 deaths in the Year 2005 ▪ 8 – 10 focal outbreaks usually occur in the district in a year	▪ Promotion of O.R.S. ▪ Improvement of drinking water availability and sanitation through Total Sanitaion Campaign of Panchayat ▪ Awareness generation activities ▪ Rapid Response Team at the block level
Leishmaniasis	▪ Population of 36 Gram Panchayats of 9 Blocks are at risk ▪ Active transmission is going on, resulting in 494 cases and 3 deaths in 2005 ▪ Potential of further spread from untreated lymphatic & dermal leishmaniasis cases	▪ Active case search ▪ Diagnostic service & treatment decentralized up to P.H.C. and in some Subcentres also ▪ Insecticidal spray ▪ Improvement of housing & bed net distribution as pilot activities by Panchayat
H.I.V./ AIDS	▪ Fast rising prevalence among married women. (0.45% sero-prevalence in pregnant women in 2003 to 1.0% in 2005) ▪ Prevalence among high risk group is also moderately high. (3.2% among S.T.I. patients in the district in 2005, whereas in the state it is 2.5%) ▪ Frequent migration from/ to high endemic states for occupational purposes	▪ Counseling & testing facilities at district hospital and through community-based centre ▪ Targetted Intervention Projects for high risk groups ▪ Focussed I.E.C. for specific groups ▪ Training to health care providers to enable them to meet the demanding situation ▪ Major involvement of non-government organizations

Table-3 : Indicators of progress for the health-related millennium development goals, South-24 Parganas, West Bengal, India, 2006

Indicators	South-24Pgs.	West Bengal	India	Data source
Goal 1 :				
Prevalence of underweight children <5 years of age	16.9% 	18.8% 48.7% (- 2 SD)	 47% (- 2 SD)	ICDS Report, Sept.-'05 (Grade II to IV) NFHS-2 (1998-'99)
Proportion of population below minimum level of energy consumption * Protein plus calorie adequacy status in ever-married women	N.A. N.A.	N.A. 87.1%	21% 87.8%	UN Stat. Divn. (2001) NFHS-2 (1998-'99)
Percentage of children 6-59 months of age who received one dose of Vit.A in the past 6 months	79.86 -	79.54 -	- 45	RCH Performance Report, 2004-'05 UNICEF (2003)
Proportion of infants <6 months who are exclusively breastfed * Proportion of infants <3 months who are exclusively breastfed	N.A. -	N.A. 49%	37% 55%	UNICEF (2003) NFHS-2 (1998-'99)
Goal 4 :				
Under-5 Mortality Rate (per 1000 live births per year)	57.0 (2005-'06) -	- 66.0 (2002)	- 93.0 (2002)	Dist. RCH Report "Health on the March, 2004 -05" of GoWB
Infant Mortality Rate (per 1000 live births per year)	51 -	53 46	68 60	HDR-2004 (UNDP) SRS Estimate, 2003
Measles immunization among children under 1 year	88.3% -	85.6% -	- 67%	RCH Report, 2004-'05 UN Stat. Divn. (2005)

Goal 5 :				
Maternal Mortality Rate	-	266	407	SRS Bulletin, Apr.-'00
Proportion of births attended by skilled health personnel	- 39.0%	51.8% ('02) 56.7%	46.3% ('02) -	"Health on the March, 2004-05" of GoWB. DLHS-RCH, 2003-'04
Contraceptive Prevalence Rate Current use of any modern method	67.3 50.0	66.6 51.5	48.2 -	NFHS-2 (1998-'99) DLHS-RCH, 2003-'04
Percentage of women receiving antenatal care * At least one antenatal check-up (%)	50.58 90.3 -	58.42 94.6 74.9	- - 61.8	RCH Performance Report, 2004-'05 - Do - MICS-2000
Goal 6 : HIV				
HIV prevalence among 15-24 years old pregnant women * Prevalence among women attending antenatal clinic (%)	N.A. 1.0	N.A. 0.90	N.A. 0.88	 Sentinel Surveillance, 2005
Condom use rate of the contraceptive prevalence rate	4% (1998-99)	2.9% (1998-99)	3% (1999)	India – UN Pop. Divn. Others – NFHS(2)
Number of children orphaned by HIV/ AIDS	N.A.	N.A.	N.A.	
Percentage of people using a condom during most recent higher risk sexual encounter	N.A.	N.A.	59 in 2001 (men of 15-24 yrs.)	UN Statistics Division
Percentage of STI clients who are diagnosed and treated according to guidelines * STI cases reported in a year	Approx. 100% 16,840 (2004-05)	Approx. 90% 4,00,177 (2005)	N.A. -	According to Programme Manager RCH Report/ SAPCS
Percentage of HIV-positive women receiving anti-retroviral treatment during pregnancy to prevent mother to child transmission of HIV	N.A. (PPTCT not yet started at district level)	22.2 (2005)	-	SAPCS, West Bengal

N.B. – **(*)** mark indicates that information on actual indicator is not available. Some related information is given

Indicators	South-24Pgs.	West Bengal	India	Data source
Goal 6 : Malaria				
Malaria Death Rate (per lakh populn.)	- 0.07	- 0.22	3 0.09	UN Stat. Divn. (2000) NAMP Report, 2003
Proportion of people with uncomplicated malaria getting correct treatment according to national guidelines, within 24 hours of onset of symptoms	N.A.	N.A.	N.A.	
Percentage of pregnant women who have taken chemoprophylaxis or drug treatment for malaria	N.A.	N.A.	N.A.	
Proportion of households having at least one insecticide-treated bed net	Nil	3.67% in high endemic districts	N.A.	State Malaria Report, 2005
Goal 6 : TB				
Prevalence of tuberculosis * Annual incidence of tuberculosis	N.A. -	N.A. -	287 per lakh 203 per lakh	UN Stat. Divn. (2003) RNTCP
Death rate associated with tuberculosis * Death rate among TB cases within one year of detection	N.A. 2.99%	N.A. 4.16%	31 per lakh -	UN Stat. Divn. (2003) RNTCP Report, 2005
Proportion of tuberculosis cases detected and cured under DOTS	88% -	85.9% -	- 87 per lakh	RNTCP Report, 2005 UN Stat. Divn. (2003)
Percentage of estimated new smear (+) ve TB cases registered under DOTS	69.5%	76%	-	RNTCP Report, 2005
Goal 7 :				
Proportion of population with sustainable access to an improved water source : Urban Rural Total	N.A.	N.A.	96% 82% 86%	UN Stat. Divn. (2002)
Proportion of population with access to improved sanitation : Urban Rural Total	- 33.5% ('05-'06) -	N.A.	58% (2002) 18% (2002) 30% (2002)	South-24Pgs. – Report of Total Sanitation Campaign and India – UN Stat. Divn.
Goal 8 :				
Proportion of population with access to affordable essential drugs on a sustainable basis	N.A.	N.A.	N.A.	

N.B. – **(*)** mark indicates that information on actual indicator is not available. Some related information is given

Table- 4: Potential topics for the various field MAE-FETP assignments: in South-24 Parganas, West Bengal, India, 2006

Assignment	Potential topic
Secondary data analysis	Hepatitis & enteric fever
Surveillance system description and evaluation	Leishmaniasis/ Malaria/ H.I.V.
Programme evaluation	National Malaria Control Programme/ Revised National Tuberculosis Control Programme
Dissertation	Hepatitis B prevalence and rationale of vaccination / Incidence of dog-bite and unmet need of anti-rabies vaccine

1. Introduction

1.1 Background

Enteric fever and viral hepatitis are among the principal communicable diseases in India. Though indigenous cases of food/ water-borne viral hepatitis and enteric fever have become uncommon in the developed countries, they are still abundant in the developing world.[1]

According to the global estimate made by John A. Crump et al, typhoid fever caused 21,650,974 illnesses and 2,16,510 deaths during 2000. They identified south-central Asia & south-east Asia as regions with high incidence (> 100/ 100000 cases per year)[2]. They stressed upon the need for global surveillance of typhoid fever.

India reports not less than 3,40,000 cases of typhoid every year[3]. As per estimates, about 4 million people suffer from acute viral hepatitis in a year in this country[4]. Of the cases of internationally acquired enteric fever in the U.S., 25% can be linked to travel in India alone[1].

Epidemics of viral hepatitis in India are nowadays almost exclusively due to hepatitis E; while in sporadic cases, all types of hepatitis contribute. Non-A non-B hepatitis accounts for a little more than 50% of sporadic cases in the adults and hepatitis B accounts for another 40%. But in the children, hepatitis A contributes the major share of acute hepatitis (50%) and non-A non-B about 30%.[5]

In the state of West Bengal, as polio has greatly diminished, enteric fever and viral hepatitis are now the most important water-borne illnesses, next to diarrhoeal

diseases. Passive (institutional) surveillance is in vogue for these diseases. Yet the reported data are hardly analyzed; nor are they utilized for making decisions at block/ district level.

The present work is an attempt to study the trend of enteric fever and viral hepatitis in a particular district (South-24 Parganas) of West Bengal on the basis of secondary data available at that level.

During the last 5 years, significant progress has taken place in the district in terms of sanitation and supply of safe water. Building of sanitary latrines under the Sanitation Campaign has achieved 33.5% of the target till March-2006 [6]. Safe drinking water has reached 59.5% of the rural population[7]. In this perspective it is worth observing how the occurrences of the water-borne diseases are changing over time.

1.2 Objective

- To determine the time, place and person distribution of the cases of viral hepatitis and enteric fever that attended and were reported from health institutions of South-24 Parganas

- To compare the trend of viral hepatitis and enteric fever with that of another group of water borne infection, namely- diarrhoeal diseases

- To recommend action in regards of viral hepatitis and enteric fever

2. Methodology

2.1 Study design

The study analyzes secondary data of the district level and compares them with those of the state level.

There is no community-based data collection system for enteric fever or viral hepatitis in the state. Data are generated through the Monthly Reports on Communicable Diseases submitted by the Block PHC-s, Rural Hospitals (CHC-like institutions) and the second tier hospitals. The district report compiles the aggregate of cases & deaths. These reports are available since mid-2000. I have utilized them as the data source for the present study.

For the state data on the whole – the reports of the Public Health Branch of State Directorate were the data source.

2.2 Study period

The period under study was 2001 to 2006 (up to April).

2.3 Analysis

2.3.1 Time trend

I calculated the population denominators for the different years by applying population growth rate (Sample Registration System estimates) on 2001 Census population.

I calculated the annual incidence rates for the years from 2001 to 2005. I have used logarithmic graph to compare the trends of different diseases.

I have compared the district and state data on the basis of rates (e.g. case fatality rate) and ratios (e.g. increase in times).

I have estimated the correlation between incidence of diarrhoeal diseases and lack of sanitation. I have considered the unmet need of sanitary latrines as a marker of lack of sanitation and made a mid-year estimate (for each year) by deducting the number

of latrines built under Sanitation Campaign – from the target number for the programme.

I estimated the completeness of reporting by years. The number of reporting units having remained the same, I measured completeness in unit-months i.e. summation of the month-wise number of units that reported case(s). I have used it to assess whether the change in the incidence of a disease over years was an artifact owing to variation in number of units reporting. I graphed the number of cases reported by month in 2004 and 2005. I compared the change in case counts by month over 2004 to 2005 between viral hepatitis and enteric fever. If the changes were due to activeness of reporting, the difference between the same months of the two years would be similar for both the diseases.

2.3.2 Seasonality

To make out the seasonal pattern I have laid down the monthly case counts in a line graph and have drawn the line of moving average of 3 month periods.

I have calculated coeffficient of variation with the monthly numbers of cases to measure the month to month fluctuation in incidence.

To account for time dependency in analysis, I have taken the restriction approach – by comparing the signal of a month with the historical mean plus 1.96 standard deviation. Mean & standard deviation were based on data of three months, surrounding the particular month, in the past years back up to 2001.

2.3.3 Place distribution

The Block PHC-s and Rural Hospitals are all located in different Community Development Blocks. In absence of actual incidence data, I have used the institutional figures as a comparative measure of incidence in the respective blocks. I have calculated annual incidence rates for the blocks by using projected population

(for the respective years) as the denominator. As institution-wise break-up of cases are available since April-2004 only, the analysis by block was limited to last 2 years i.e. 2004-'05 and 2005-'06.

I calculated the median of the annual incidence rates of individual blocks. I have considered the blocks above the median value as endemic blocks and matched the names of such blocks for two successive years. I have described in this way any spatial shift in endemicity.

To study distribution of disease activity by blocks, I have used increasing incidence rate (in 2005-'06 as compared to 2004-'05) as the indicator, so as to account for the differential activeness of reporting across the blocks. Increasing incidence rate would base upon the rates for the same block for two successive years and hence would not be affected by block to block variation in reporting.

I have tallied the distribution of enteric fever & viral hepatitis with that of diarrhoeal diseases.

2.3.4 Person distribution

I have compared aggregate annual incidence rate for the period 2001-2005 between the sexes. I have analyzed mortality by sex in terms of disease-specific mortality rate and case fatality rate, aggregated for the same period.

3. Results

3.1 Time series data :

3.1.1 Annual trend

Annual incidence rate of viral hepatitis in the district has steadily increased over 2001 to 2005 (from 0.9 per 1,00,000 to 7.7 per 1,00,000). Only in 2003 there was a small dip (6.5%). Annual incidence rate of enteric fever has also steadily risen over the

same period (from 19.9 to 97.8 per 1,00,000 population per 1,00,000), interspersed by a fall in 2003 (28.6%), that was offset by rises in subsequent years (Diag.-1).

The rise in incidence rate of hepatitis in 2005 did not actually represent the general trend of the district. Because, it included a sum of 266 cases that was reported from a particular hospital in one single month (Canning Rural Hospital, April-2005). Yet, that report being taken aside as an outlier, the rest of the cases i.e. 294 was still greater than the case count for any other year except 2004.

In case of diarrhoeal diseases, although the annual incidence rate had small increases in 2002 (2.7%) and 2005 (1.8%), there was an over-all decrease during the 5-year period (from 3341.0 to 1887.5 per 1,00,000 population) (Diag.-1).

Incidence rate of viral hepatitis for the first four months of the current year (1.2/ 1,00,000) was less than that in 2005 (4.3/ 1,00,000), but higher in comparison to the other years in the study period. The moving average of monthly incidences also kept a higher level in 2006, with respect to the corresponding months of the previous years except 2005 (Diag.- 2). The same is true for enteric fever also (8.8 per 1,00,000 versus 33.0 per 1,00,000) (Diag.- 3). Incidence Rate of diarrhoeal diseases for Jan.-April was lowest in 2006, out of all the years under study.

The completeness of reporting increased by 1.25 times (69 unit-months versus 55 unit-months) in case of viral hepatitis over 2004 to 2005. Given the average incidence rate in 2004, this increase could have raised the annual incidence rate in 2005 by 1.25 times the rate in 2004 (5.7 x 1.25 = 7.13 per 1,00,000). The completeness of reporting for enteric fever increased by 1.29 times (132 unit-months versus 102 unit-months) over the same period. Given the average incidence in 2004, this increase could have escalated the incidence rate from 29.9 per 1,00,000 in 2004 to 1.29 times i.e. 38.6 per 1,00,000 in 2005.

Changes in the number of cases by the same months over 2004 to 2005 were dissimilar for viral hepatitis and enteric fever (Diag.-4).

Case fatality rate (C.F.R.) shows variable values for viral hepatitis over the years. It reached its highest of 5.9% in 2002 and came down to 0.2% in 2005. C.F.R. for enteric fever declined over 2001 to 2002 and remained at 0 thereafter.

3.1.2 Seasonality

(a) Viral hepatitis :

In the moving average line I found seasonal waves around September to December every year. These correspond to the late monsoon/ post-monsoon/ early winter months (Diag.- 2). There were additional upsurges at times, but those had no time consistency.

From 2001 till 2003 the seasonal wave came in between October & December. But the moving average shows a preponement of the wave to August-September in 2004 & 2005.

I found a transient huge rise in incidence in April-2005 and also a peak in August-2004. These signals crossed the outbreak threshold set at historical mean plus 1.96 standard deviation.

Coefficient of variation of monthly numbers of cases ranged from 94.4 (in 2001) to 34.2 (in 2005), the yearly values coming down year by year.

(b) Enteric fever :

In the line of moving averages one can see seasonal waves in late summer or monsoon months every year (Diag.- 3). They occurred in May-July in 2001 & 2002, and in July-September in 2003. Seasonal rise was deferred to August-September in

2004 & 2005. In the former year it started in August and continued to go up till next January.

The signals of January & August-2005 crossed the outbreak threshold (set at historical mean plus 1.96 standard deviation).

Coefficient of variation of monthly numbers of cases rose from 66.7 in 2001 to 98.1 in 2004 and then came down to 36.8 in the next year.

3.1.3 Relationship with progress in Sanitation Campaign

Out of the final target of sanitary latrines to be built, 33.5% could be set up till 2005-'06. The annual incidence rate of diarrhoea, through 2001-'02 to 2005-'06, had a sustained decline. The over-all decrease was 48.5%. Correlation coefficient for the two variables, viz.- short-fall in the number of sanitary latrines at the mid-year and annual incidence rate of diarrhoea, for the period of 2001-'02 to 2005-'06 is 0.835.

3.2 Place distribution

Out of the 14 blocks that were endemic (incidence rate > median value) for enteric fever in 2004-'05, two blocks ceased to be endemic in 2005-'06. In case of viral hepatitis, all the seven blocks that were endemic in 2004-'05, remained so in the next year too. These seven blocks were common for enteric fever also. They were scattered in the district – 3 in the north, 1 in the middle and 3 in the southern part.

Out of all the blocks in the district 48% (14 of 29) had increasing incidence rate for enteric fever and out of them 29% (four of 14) were so for enteric fever but not for diarrhoeal diseases (Diag.- 4). I determined that 10% of the blocks (three out of 29) had increasing incidence rate of viral hepatitis and out of them 33% (one of three) were so for viral hepatitis but not for diarrhoeal diseases.

3.3 Distribution by sex

Average annual incidence rate for viral fever was 1.15 times in males, compared to females. It was 1.18 times in males in case of enteric fever (Table- 1).

Disease-specific mortality rate was also higher in males – 2.5 times & 2.7 times in case of viral hepatitis and enteric fever respectively.

Case fatality rate was 2.2 times & 2.4 times among the males, in comparison to females, in case of viral hepatitis & enteric fever respectively.

4. Discussion

4.1 Annual trend :

4.1.1 Morbidity

Annual incidence rates of both viral hepatitis and enteric fever have consistently risen through the period from 2001 to 2005, with the single exception of 2003 when there was a temporary fall. The rise has occurred in a comparable manner as is shown in Diag.-1. On the contrary, the annual incidence rate of diarrhoeal diseases has declined over the years.

Due to better completeness of reporting in 2005 (1.25 times as compared to 2004) the annual incidence rate of viral hepatitis would have risen by 1.25 times, given the average number of cases reported per unit in 2004. It comes to 5.7 x 1.25 i.e. 7.13 per 1,00,000, showing an increase of 1.43 per1,00,000 over 2004 to 2005. The increase actually observed was 2.0 per 1,00,000. So, better completeness of reporting contributed 71.5% of the increase in annual incidence rate.

Similarly, the annual incidence rate of enteric fever would have gone up by 1.29 times over 2004 to 2005 due to better completeness of reporting (given the average number of cases per reporting unit in 2004). In absolute numbers the increase would

be from 29.9 to 38.6 i.e. 8.7 per 1,00,000 while the observed increase was 67.9 per 1,00,000. Here improved reporting completeness contributed 12.8% of the observed increase.

Therefore the rise in annual incidence rates cannot be dismissed at this point as due to improved completeness of reporting only. The differences in the number of cases by the same months of the successive years were dissimilar for the two diseases. It indicated that the rise in incidence was not due to improved activeness of reporting either.

Incidence rate of diarrhoeal diseases in South-24 Parganas was positively correlated with lack of sanitation expressed in terms of unmet need of sanitary latrines [Correlation Coefficient = (+) 0.835 for the period 2001-'02 to 2005-'06]. As new sanitary latrines were built up with time under the Sanitation Campaign, the unmet need of sanitary latrines came down. There was an associated decrease in the incidence rate of diarrhoea. Viral hepatitis and enteric fever, though are also water-borne diseases, have shown in contrast a rising trend. The incidence rate of viral hepatitis increased by 8.6 times over 2001 to 2005. For enteric fever the increase was 4.9 times. The decrease in diarrhoeal diseases incidence rate was a fraction of 0.4 times.

Data for the whole state indicated a similar trend. During the same 5 year period there was a steady rise in viral hepatitis (1.8 times) as well as in enteric fever (2.4 times). A little drop in the incidence rate of viral hepatitis occurred in 2003 (2%, in comparison with 2002) and a drop in that of enteric fever in 2004 (5.5%, in comparison with 2003). The main difference with South-24 Parganas is that, in the state, the annual incidence rate of diarrhoeal diseases have increased throughout the period under study (32% rise).

In the first four months of 2006 incidence rate has had a 72% fall in hepatitis and a 73% fall in enteric fever in the district – in comparison to 2005; but is still higher than

that in 2001 to 2004. In the state one finds a slight decrease in hepatitis incidence (3%) and a marked diminution in enteric fever incidence (16%) over the same period.

In the blood bank of the District Hospital there was a small decrease in seropositivity of the blood units for Hepatitis B during the last three years (0.53% in 2003 vs. 0.45% in 2005) and about 42% decrease in seropositivity for Hepatitis C (0.74% in 2003 to 0.43% in 2005). If incidence of Hepatitis B or C increased in the general population, the sero-prevalence in the blood donors might or might not increase; but it would not decrease in any case. So, the decline in the above values suggested that Hepatitis B/C was not an important component in the rise in viral hepatitis; rather it could be Hepatitis A and/or E.

There are enough evidences that hepatitis A tends to show cyclical patterns. Developed countries do not see such patterns any more; but epidemic waves may come every 5-20 years in temperate zones[1]. Moreover, increase in reporting of food/water-borne hepatitis, opposed to the decrease in diarrhoeal diseases, is compatible with the experiences in other developing areas. Countries which are in a transitional phase in the development of sanitation, may see a paradoxical rise in clinical cases of Hepatitis A.[8]

The web of transmission of enteric fever, involving cases as well as carriers, is more complex than that of other food/water-borne diseases. The socio-economic factors cause a relatively greater impact here[9]. During the period under study, socioeconomic and demographic changes like increased urbanization, overcrowding, more migration, increased exposure to eating outside and increase in winter season cultivation (requiring surface water irrigation and thus posing the risk of sewage contamination) – have taken place in the district. These could be the possible explanation for the rise in number of enteric fever cases. The global estimate done by Crump et al also reflected a huge rise in typhoid fever incidence in 2000 against the previous estimate dated back in 1984. [2]

The rising trends of hepatitis and enteric fever suggested a risk of outbreaks occurring in the district.

4.1.2 Mortality :

Trends of case fatality rates at the district & state levels match, but not markedly. In South-24 Parganas the C.F.R. for viral hepatitis had an over-all fall (though not a consistent decline) during 2001 to 2005; while it has steadily declined in the state.

Case fatality fate for enteric fever for the district gradually diminished to reach zero in 2003 and then remained constant. C.F.R. for the state has also diminished till 2003 and only slightly increased thereafter (0.06% in 2003 to 0.07% in 2005).

4.2 Seasonal trend :

Textbooks & literature say that in India Hepatitis A is associated with periods of heavy rainfall[10]. In my study in South-24 Parganas I have found at least one peak of viral hepatitis every year, temporally associated with monsoon or immediate post-monsoon months.

Another characteristic is the preponement of the said peak – to month of August in place of September/ October, seen in the later years of the study period. Peak of diarrhoeal diseases has also come forward to July in place of August. The same climatic factors might have caused these changes.

According to literature, enteric fever occurs perennially in this country, though the incidence heightens in July-September[4]. In South-24 Parganas I have found peaks initially in July, but in August in the last two years.

The beginning of monsoon – causing flushing of thickly contaminated soil, favours the transmission of enteric fever. This effect would be subdued with improvement in sanitation. As S.typhi is sensitive to heat & drying[11], the lowered temperature and

constant moisture of the late monsoon months might be more favourable for transmission of the organism. This could be a possible explanation for the change in seasonality in the later years.

The year-wise coefficient of variation (of monthly number of cases) reflects a gradual reduction in month to month variation in incidence of viral hepatitis. The trend is relatively non-stable in case of enteric fever. Changing interplay of numerous epidemiological factors could be the reason.

4.3 Place distribution :

Endemic of enteric fever has involved newer blocks and more number of blocks in 2005 as compared to 2004. But for hepatitis, the endemic blocks remained the same.

Blocks having high number of enteric fever or viral hepatitis did not overlap to a significant extent with blocks having high number of diarrhoea cases. This indicates that different sets of factors influence the endemicity of these diseases.

Blocks endemic for enteric fever were those endemic for viral hepatitis also, plus seven additional blocks.

Level of endemicity of the individual blocks was although not constant, they did not change significantly over 2004-`05 to 2005-`06.

4.4 Distribution by sex :

Over-all ratio of male & female cases of viral hepatitis and enteric fever was approximately 55:45, though there were year to year variations. This was again similar to the sex break-up for cases of diarrhoeal diseases.

Case Fatality Rate for viral hepatitis was almost 3 times in males than that in females. This was in contrast to diarrhoeal diseases where it was about 1.3 times in males.

Data size on sex-wise mortality in enteric fever is too small to make any comment.

4.5 Limitation :

There was no direct scope in this study to check the quality of the diagnoses. I had to take the reported case numbers at their face value. The reporting units did not have investigation facilities of their own. Availability and access to private testing facilities were also limited at the peripheral locations. Therefore the reported cases might be a varying mix of confirmed and suspected cases. So there was a problem of data comparability.

Moreover, enteric fever and viral hepatitis came in the reports as single entities. Separate analysis for typhoid and paratyphoid or for the individual hepatitis viruses was not possible therefore.

Use of institutional figures had its own limitation in comparing incidence by block. Also, there might be difference in activeness of reporting across the institutions.

4.6 Recommendation :

A standardized and uniform surveillance system needs to be in place for enteric fever and viral hepatitis throughout the district. Low cost and easy to do tests for enteric fever and hepatitis B may be provided to the health institutions. The district health administration may utilize the inputs of the upcoming Integrated Disease Surveillance Programme for this purpose. The public health authorities may take up further studies to identify the risk factors for the increase in incidence.

In the short term, the public health managers may gear up surveillance within its present framework, set warning levels and keep the system ready to tackle any outbreak. The reporting units may report the confirmed and suspected cases separately.

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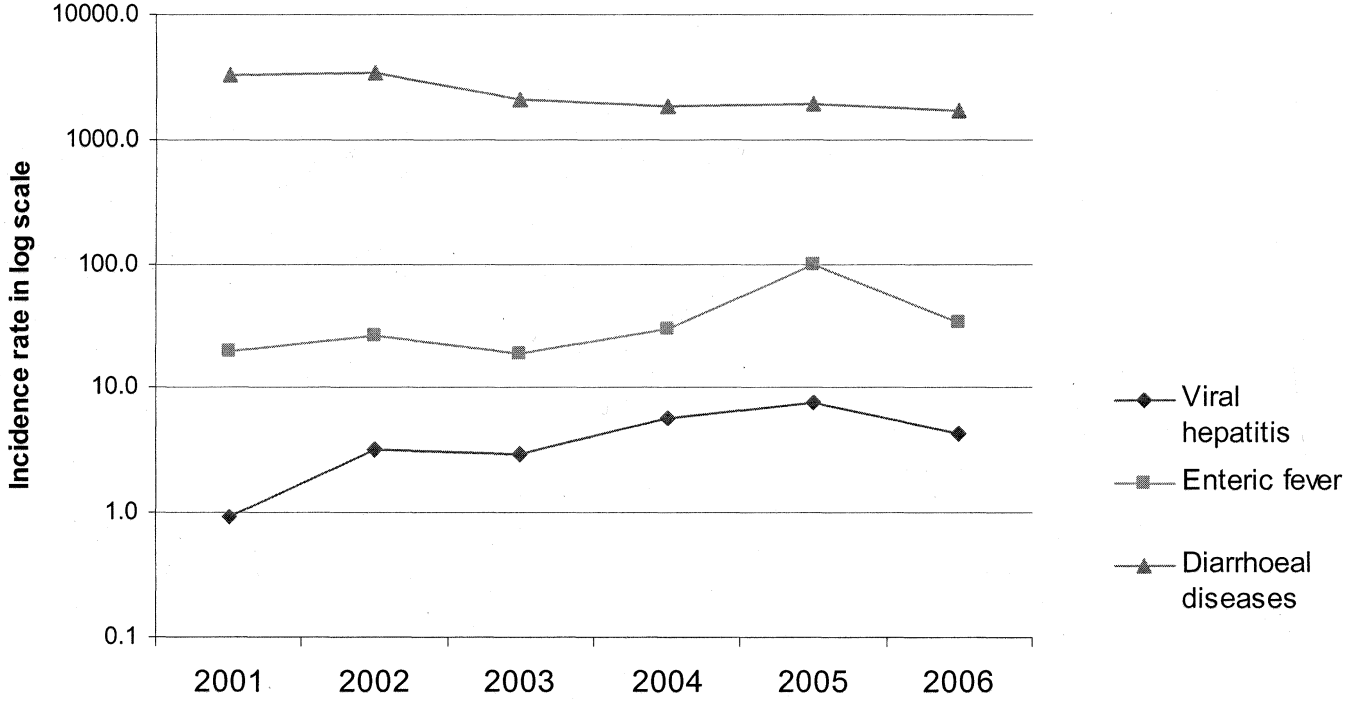
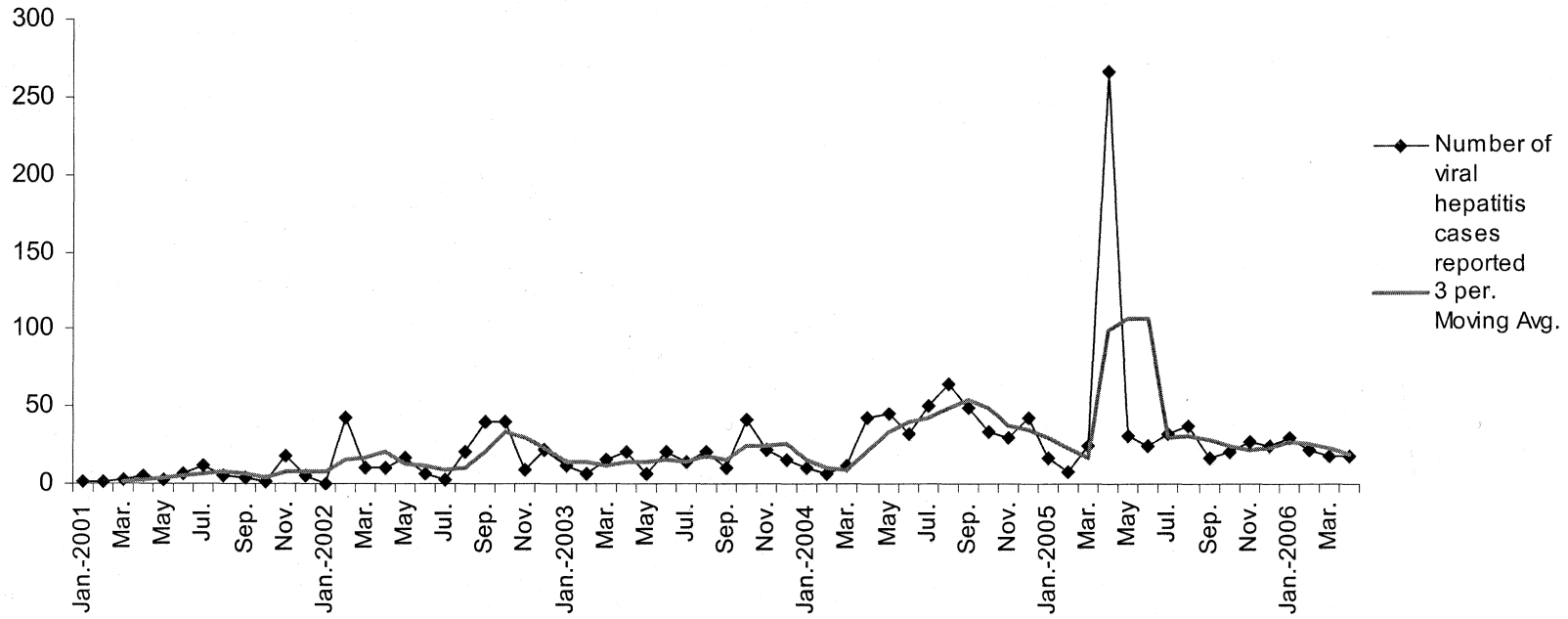
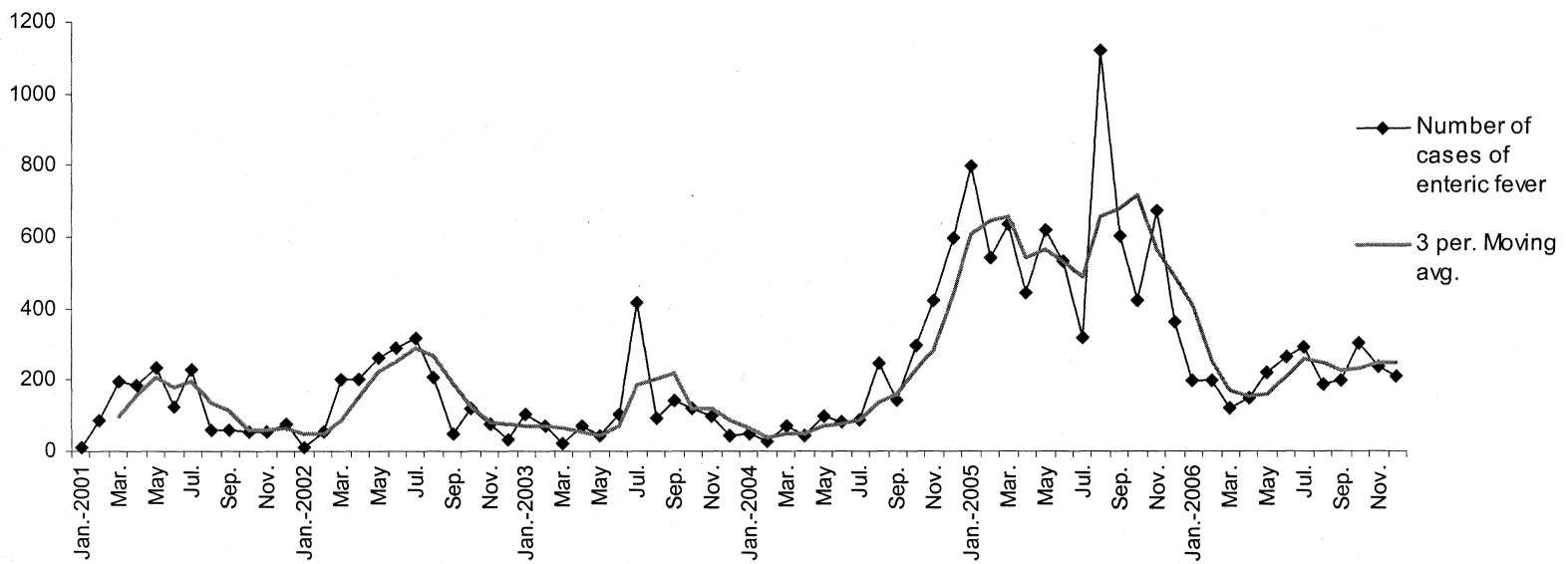
Diag.- 1 : **Annual incidence rates of viral hepatitis, enteric fever and diarrhoeal diseases (as per reports of health institutions), South-24 Parganas District, West Bengal : 2001 to 2006**



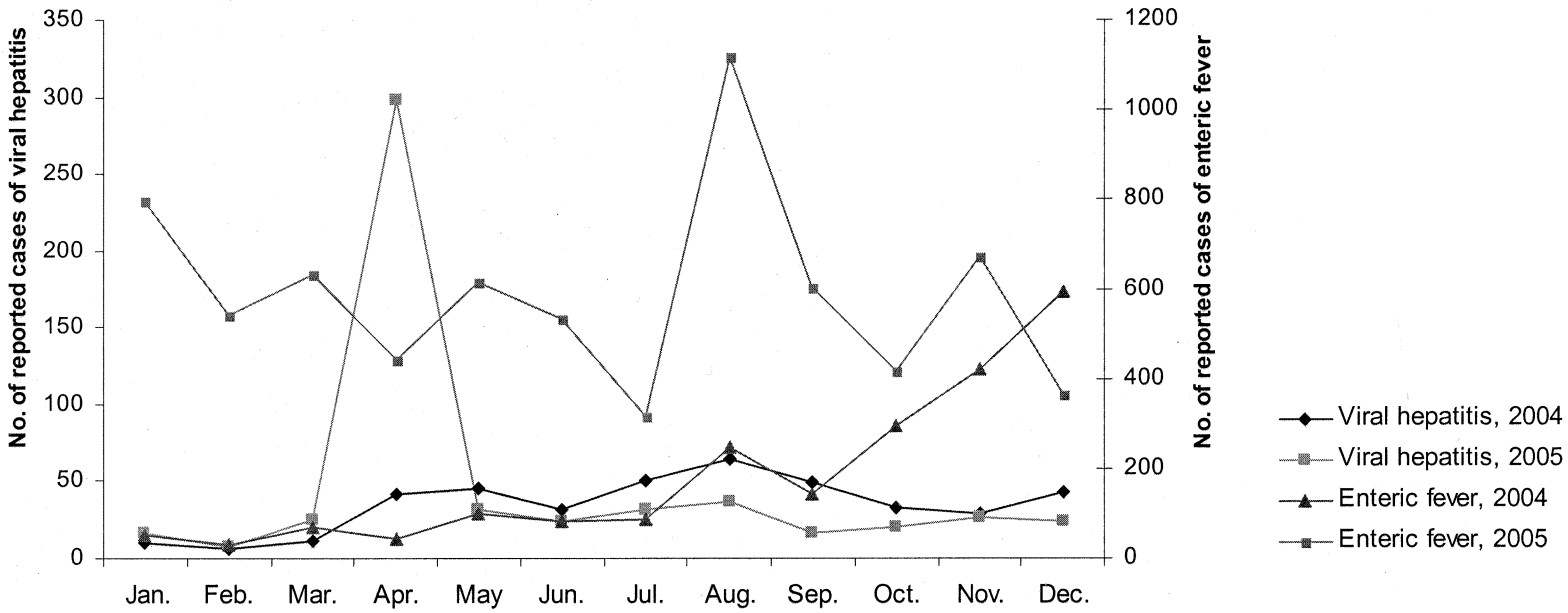
Diag.- 2 : **Number of cases of viral hepatitis (attended in health institutions) by month, South-24 Parganas District, West Bengal, India, 2001 to 2006 (April)**



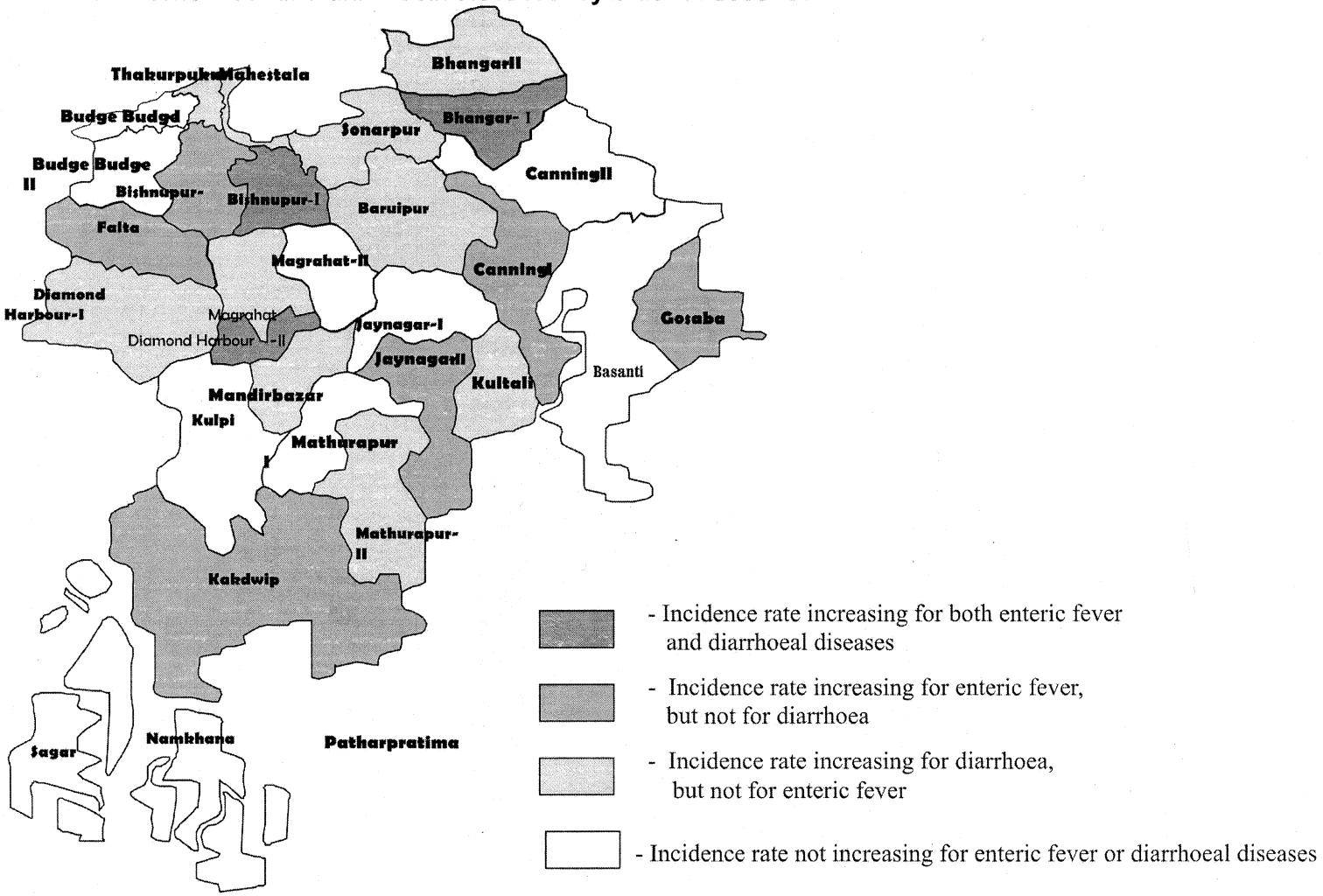
Diag.- 3 : **Number of cases of enteric fever (attended in health institutions) by month, South-24Parganas District, West Bengal, India, 2001 to 2006 (April)**



Diag.- 4 : **Number of institutional cases of viral hepatitis and enteric fever reported by month : comparison between 2004 and 2005, South-24 Parganas District,West bengal, India**



Diag.- 5 : Map of South-24 Parganas District, West Bengal showing distribution of increasing incidence rate for enteric fever and diarrhoeal diseases by block in 2005-'06



SECTION-2

SECOND

FIELD POSTING

Description and evaluation of the malaria surveillance system of a city health administration : Kolkata Municipal Corporation, Kolkata, India, February-2007

Introduction :

Background

Kolkata, the only metropolis in eastern India, is the capital of the state of West Bengal. It is under the governance of Kolkata Municipal Corporation (K.M.C.). Out of the malaria cases reported in 2006 in the state, 45% were from the city of Kolkata alone. Reported incidence in 2006 was 11.6 per 1000 population. Slide positivity rate was 19.9%. Malaria control is one of the top priorities of the health department of K.M.C.

In South-East Asia, vector control through residual spray, epidemic preparedness and surveillance are the key control strategies for malaria in all affected countries[1]. In India also, the Malaria Action Programme that came into force in 1995, has emphasized active and passive surveillance for both rural areas and urban slums. Urban malaria is a specific problem in this country. It has emerged as a serious health issue in several states[1] including West Bengal[2]. Rapid urban growth and labour migration led to some of the epidemics that have occurred with increasing frequency since 1995[1]. The Expert Committee on Malaria appointed by the Ministry of Health and Family Welfare, Govt. of India that submitted its report in 1995, identified 15 major cities and 14 other towns of the country as high risk urban areas[3]. Kolkata as one of those cities has been a priority area under the Urban Malaria Scheme[4].

In Kolkata, the responsibility of public health lies mainly on the corporation and to a less extent on Kolkata Metropolitan Urban Health Organization (K.M.U.H.O.). Abundance of vector breeding sites and continued migration into the city pose a risk

of focal flaring up of malaria incidence, if not in a large scale. Apart from the corporation, different government and semi-government organizations and diverse types of private facilities provide malaria treatment in Kolkata. So malaria data are not available from a single common point.

Given the complexities faced by the public health system and the gravity of the malaria situation of the city, a description & evaluation of the malaria surveillance system of K.M.C. would be relevant to the city and state authorities.

Objectives

1. Describe the system for surveillance of malaria in Kolkata Municipal Corporation

2. Evaluate the system for surveillance of malaria against surveillance system attributes

3. Estimate the representativeness, positive predictive value and timeliness of the system

4. Formulate recommendations for improvement

Methodology :

Project area – The jurisdiction of Kolkata Municipal Corporation

Project period – December, 2006 to February, 2007

A. Methodology for description of the surveillance system

I described the system in terms of type of surveillance, target population, data type, data transmission data analysis, ownership and feedback.

Methods used :

a) Semi-structured interview

(i) At the headquarter level - With the Chief Municipal Health Officer and other concerned officials and the staff of the data management cell

(ii) At lower levels of K.M.C. – With officials and staff at the levels of borough office, ward health unit (W.H.U.) and malaria clinic.

I purposively chose two boroughs for this purpose – one near and another far from the headquarter. I visited two WHU-s and one malaria clinic in each of these boroughs. I also met the honorary health workers in one ward of each of these boroughs.

b) Review of organogram.

c) Review of forms, records and reports, circulars and guidelines.

B. Methodology for evaluation of surveillance system

I considered representativeness, positive predictive value & timeliness as the key attributes of the system and made estimates for them.

By representativeness I meant capture of cases by age-group, sex, place and socioeconomic background – in proportion to their frequencies in the community. In order to estimate positive predictive value of the laboratory diagnosis, I used surrogate indicators i.e. agreement of positive report and agreement of falciparum detection on crosschecking of blood slides. I estimated timeliness in terms of the time taken for information to go from the point of data generation to the point of data use for control activities.

I evaluated the system also against other attributes of a surveillance system, viz.- simplicity, acceptability, sensitivity, flexibility and usefulness.

Methods used :

a) Semi-structured interview

(i) At the headquarter level - With the Chief Municipal Health Officer and other concerned officials and the staff of the data management cell

(ii) At lower levels of K.M.C. – With officials and staff in samples of ward health units (W.H.U.) and malaria clinics. I also met the honorary health workers in a sample of wards

b) Review of map for distribution of malaria clinics

c) Review of forms, records and reports

[For methods in regard to a particular attribute, please refer to Table-1 and 2].

d) Survey of malaria clinic register – for age and sex characteristics of clinic attendees

e) Crosschecking of blood slides by technicians in the same organization.

Sampling :

I sampled 10% of the malaria clinics of K.M.C. by simple random method. I took the fever case entries of those clinics for the month of October-2006 as the sample for estimating representativeness. I based on the same clinics to estimate the time required for data transmission from clinics to the WHU-s. To estimate the positive predictive value of laboratory diagnosis, I took all the slides found to be positive in those clinics in the month of January-2007.

I sampled 10% of the ward health units for determination of simplicity, acceptability, sensitivity and usefulness of the system. At first I purposively selected three boroughs, one from each of the northern, central and southern parts of the city. Out of these, I randomly chose the desired number of WHU-s, according to probability proportionate to size based on the number of WHU-s in those boroughs.

Analysis :

I analyzed the data by range and frequency. I calculated 95% confidence intervals for the proportions. I tested the significance of difference of proportions with chi square test and determined the p value. I used kappa test to determine the significance of disagreement on crosschecking of blood slides.

Results :

Description of the system

The target population of surveillance are all the residents within the jurisdiction area of K.M.C. Malaria clinics, 70 in number – spread over 141 wards in 15 boroughs, are the pivotal points of surveillance. They themselves conduct passive surveillance and serve as the common reporting channel for active surveillance too. The clinics collect blood slides from all fever cases attending there. They define malaria cases by slide positivity for malaria parasite(s) and exclude malaria by single negative report. They record individual case data in a standard register in duplicate, compile them every Saturday and send an aggregate report along with a copy of the register to the borough office on Saturday or Monday.

The ward health units that are responsible for vector control and outbreak response, collect the data of malaria cases by sending messengers to the respective clinics. If the ward does not have a malaria clinic and depends on a clinic in another ward, the

ward health unit of such a ward in most instances collect the data from the borough office on Monday. The ward health units analyze the data pertaining to their wards.

The honorary health workers belonging to different projects associated with the corporation, namely Kolkata Urban Development Project-III, Kolkata Slum Improvement Project and Indian Population Project-VIII, are 30 to 40 in number in each borough. Each of them serve 3000 population, mostly of low and lower middle income group. They carry out active surveillance by collecting blood slides from fever cases in the community at the time of their routine house visit. They are also supposed to perform contact surveillance around falciparum cases. They deposit the slides at the nearest malaria clinic either directly or through the ward health unit. They collect the test reports in reverse channel or by the patient. The clinics report passive and active collection together.

The borough offices send the whole weekly data, without any compilation, to the corporation headquarter on Monday. The data management cell at the headquarter enters the aggregate data into a software and performs analysis on weekly basis. The borough and the headquarter provide feedback to the immediate lower level at the weekly meetings held on Mondays and Tuesdays respectively. Ownership of the data remains with the clinics.

Evaluation of the system

The prevailing reporting system and formats appeared to be simple, according to all concerned. In three (30%) of 10 wards the active surveillance work was not acceptable to the health workers, as they had to go a relatively longer distance to reach a clinic, there being no clinic within their own wards. The workers were supposed to cater 46% of the population. So, population covered with active surveillance in those ten wards was 46% x 7 /10 = 32%. Malaria surveillance not being a priority work for them, the practice of all the health workers was to collect

blood slides – not from all fever cases they came across, but from those who were apparently very sick or unable to come to the clinic due to any reason.

The annual blood examination rate of the whole system was 5.8% in 2006. Active slide collection was 3.8% of total collection. There was no data exchange with the other public health system functioning in the city i.e. K.M.U.H.O. The different government and private medical care facilities were also not routinely engaged in surveillance. Five (50%) of 10 ward health units used to collect data from the health care facilities located in their areas.

The system lacked flexibility in the sense that even when asked for, the malaria clinics and borough offices in 11 (73%) of 15 boroughs could not incorporate in their report the count of malaria cases by ward of residence. On the other hand, the same parts of the system could go into daily reporting mode at the time of dengue emergency in September and October-2006.

I observed 87.8% agreement (95% C.I. 78.3 to 93.7) of result on crosschecking of positive slides (kappa = 0.806; $p< 0.001$) [Table-3]. There was 52.6% agreement (95% C.I. 29.5 to 74.8) for falciparum positivity (kappa = 0.672; $p< 0.001$)[Table-3]. In my sample of clinic attendees, the proportion of female attendees was 25.5% (95% C.I. = 23.7 to 27.3%) and that of the under-5 year children was 4.6% (95%C.I. = 3.8 to 5.5%). These proportions were significantly less than the proportions of the respective population groups in the community ($p < 0.01$).

In three of 15 boroughs, the malaria clinics were located at one side of the borough, thus leaving the other sides more under-served. Also, the number of clinics in a borough was not proportionate to the size of the borough [Table-4] [Diag.-1]; e.g. Borough IV comprising of 10 wards had 11 malaria clinics, while Borough VI and X that consisted of 10 and 12 wards, had only five and two malaria clinics respectively.

Data transmission from a malaria clinic to its respective ward health unit took one to three days in general, depending on the frequency of sending a messenger from the latter to the former. In six (33.3%) of 18 wards the ward health units collected the data through the borough office and the time gap was two to nine days.

The information on falciparum cases were useful to all the ward health units for control activities. However, wards having malaria clinics did not cross-notify cases to each other in two of three boroughs. There was no cross-notification across the boroughs either. Six (60%) of 10 ward health units did not analyze the data of vivax cases. The aggregate report prepared by the clinics did not contain any mention of age, sex or residence of the malaria cases. The data management cell at the headquarter performed clinic-wise analysis by the epidemiological indicators, viz. slide positivity rate and proportions of vivax and falciparum among positive slides. No analysis was available in respect of the malaria status by place. The headquarter had to use the indicators by clinic, instead of indicators by ward or street, to make decisions for action.

Discussion :

The surveillance system was simple. It was acceptable too, to all those who implemented it, excepting a section of health workers who had to depend on malaria clinics far away from their areas of work. The sensitivity of the system was also low, as was evident from the low blood examination rate. Lack of malaria clinics in many of the boroughs was one of the reasons. Capture of data from other health care facilities was also patchy. Active surveillance could have partly compensated for the gaps in the service of the malaria clinics, where such gaps were due to problem of approachability or lack of motivation of the people. However, it did not happen, possibly for the reason that the health workers having belonged to different projects, were not under direct control of the ward medical officers and were not properly oriented to the anti-malaria work of the corporation.

The surveillance data were not representative, mostly due to the non-uniform distribution of the malaria clinics – both within and among the boroughs. It was a skewed distribution, with the northern and central parts of the city having a good density of clinics and other parts like the south and the west having scanty numbers. There was no systematic arrangement to capture data from other facilities, which could have supplemented for the data representativeness. Hence the improper distribution resulted in blind spots for the surveillance system. Networking with private health facilities is an issue where the health authorities may put their attention to. The Global Strategic Plan of Roll Back Malaria has emphasized the engagement of private sector and civil society groups in malaria control effort.[5] In absence of data on incidence of fever in females and under-5 children, I could not measure the exact lack of representativeness for them. However, attendance of females and under-five children was significantly less in the clinics, compared to the males and the population above 5 years respectively.

On crosschecking of slides the agreement for positive reports was high. It indicated that positive predictive value of slide examination was good, whereas the agreement for falciparum positivity was significantly low, pointing towards error in species identification. Here one cannot say which of the technicians – the first or the second examiner – was at fault and how much the positive predictive value was. However, since all of the technicians belonged to the same system, it was clear that some or other among them were on the erring side.

Flexibility of the system was of a mixed nature. While the functionaries were not ready to accept an added routine work, they did not fail to adapt to the changes made in an emergency. The timeliness attribute varied across the wards. Two-third of the ward health units which kept frequent and direct contact with the clinics, got information about cases at shorter intervals. It enabled them to initiate timely response to falciparum cases and to pick up a warning signal early. Other ward health units did not keep such direct contact because of the distance of the clinics

from them. They received information late and thus were in a disadvantageous position for control activities.

One important characteristic of the system was the lack of data analysis. It restricted the very usefulness of the system. The malaria clinics generated a huge amount of individual data and the data went right up to the headquarter level. Yet, none at any level in that channel utilized them at all. Data of vivax malaria not being analyzed by them, many ward health units were at risk of missing outbreaks of vivax malaria, if any, at their early stage. Now-a-days the use of geographical information system has opened up new opportunities of utilizing surveillance data. It enables description of place distribution of disease to finer details and associating disease incidence with distribution of different factors. A study on urban malaria appraisal in Sub-Saharan Africa has shown that display of health facilities and population settlements with G.I.S. was useful for planning of resources and networking between public and private sectors.[6] However the analyses available in K.M.C. were crude and limited. There was no analysis for person or place distribution. Also, there was lack of cross-notification. Therefore the distribution of the disease over place, e.g. by ward or street, was not at all clear. Analysis of disease distribution by clinics did not give a valid reflection of it. Hence the corporation was not in a position to fine-tune its malaria control plan according to the situation. A W.H.O. publication on malaria vector control has also suggested eco-epidemiological stratification of areas before selecting intervention measures.[7] In K.M.C. the limitations in data analysis might have hampered targeted intervention as well as pre-emptive action.

Limitation

I have not calculated sample sizes of ward health units, malaria clinics or blood slides by any standard method. I have instead taken an arbitrary proportion as my sample. However the selection of the sampling units was random to minimize the chance of bias. I could not make a specific estimate of the timeliness of data transmission, as

because there was no written evidence of the frequency of data updating at the ward health units. I had to depend on interviews at various levels for verification. There was no reported outbreak of malaria in the city since last three years. So I had no opportunity to evaluate the timeliness of outbreak reporting.

Conclusion

The surveillance system was simple, but did not properly reflect the malaria status in the city. It failed to provide information inputs adequately and on time to the disease control machinery, so as to take target-specific and timely measures. The positive predictive value of laboratory diagnosis was acceptable, although the identification of species was doubtful.

Recommendation

There should be regular collection and analysis of malaria data from government hospitals, other public organizations and the private sector in all the wards. The system may utilize the upcoming programme on Integrated Disease Surveillance to establish such a network. The authorities may make malaria surveillance a priority job for the honorary health workers. Where the malaria clinic is not in the same ward, the ward health unit may arrange a messenger from the existing staff for deposition of blood slides. Besides, new malaria clinics need to be added on, and on the whole the network of malaria clinics need to be uniformly spread over the corporation area, leaving no blind spot.

The authorities should arrange retraining of the laboratory technicians and ongoing monitoring of the laboratory quality, so as to improve and maintain the standard of laboratory diagnosis of malaria.

All the ward health units should collect data directly from the malaria clinics at a frequency not less than twice a week and preferably as frequently as possible, in

order to keep the information time gap at a shortest optimum. They must analyze the full set of data collected by them. Wards within the same borough should regularly cross-notify cases to one another and boroughs should do the same to the other boroughs.

The corporation requires to strengthen the data analysis part of its malaria surveillance system with all possible resources. As a long term measure they may connect the boroughs, ward health units and the headquarter in an on-line information system that would provide automated analyses for different levels. The data management cell at the headquarter may use G.I.S. software also – for analysis in finer detail and generation of warning signals based on different determinants.

Pending setting up of the on-line system, the clinics or the borough offices need to sort the malaria cases by place like ward of residence and by person characteristics like age-groups (infants and under-5). The headquarter should incorporate these features into the analysis and provide specific feedback to the programme managers.

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Table 1: **Key attributes of surveillance system for malaria : indicators & study design for evaluation; Kolkata Municipal Corporation, Kolkata, West Bengal, India, 2007**

	Indicators	Data needed	Source of data	Design
Representativeness	Comparison of the time, place and person characteristics of fever cases as per the expected distribution	▪ Distribution of cases of fever attended by age-group, sex & ward ▪ Number of fever cases attended by month	▪ Register of malaria clinic	▪ Random sampling of fever case records for a reference month in a random sample of malaria clinics
		▪ Expected distribution of cases of fever according to population characteristics ▪ Expected fever incidence by month as per programme guideline	▪ Population data of the corporation by age-group and sex	▪ Record review in corporation health office
Timeliness	Median time gap between fever case attending at malaria clinic and reporting of the case to the health office	▪ Date of fever case attending at the clinic ▪ Date of reporting of the case from the clinic to health office	▪ Register of malaria clinic ▪ Receipt copy of report of malaria clinic	▪ Random sampling of positive case records for a reference month in a random sample of malaria clinics
	Range of the time gap between Health Worker contacting a fever case and test report being communicated to the Ward Medical Officer	▪ Frequency of visit of houses by Health Worker ▪ Time elapsed from slide collection by Worker to communication of test report to Medical Officer	▪ Register of Health Workers ▪ Lab. records ▪ Statement of Health Workers & Medical Officer	▪ Review of records ▪ Interview of health personnel
Positive predictive value for laboratory diagnosis	Proportion of malaria positive blood slides that are confirmed through cross checking by an independent observer	▪ Number of slides positive, by species, on crosschecking ▪ Number of slides crosschecked, by species	▪ Laboratory record ▪ Validation survey by independent observe	▪ Sample cross checking of positive slides as per National Anti Malaria Programme guidelines

Table- 2 : **Caertain attributes of surveillance system for malaria, other than the key attributes : Sources of information required for evaluation; Kolkata Municipal Corporation, Kolkata, West Bengal, India; 2007**

Attribute	Source of information
Simplicity	▪ Review of forms & guidelines ▪ Interview with Corporation officials & staff
Acceptability	▪ Interview with Corporation officials & staff ▪ Interview with other stake holders
Flexibility	▪ Review of circulars & reports in connection with past outbreak(s) of some other disease ▪ Review of forms ▪ Interview with Corporation officials & other stake holders
Sensitivity	▪ Review of facility map ▪ Review of records ▪ Interview with Corporation officials & staff
Usefulness	▪ Review of reports & records ▪ Interview with Corporation officials & staff

Table- 3 : Result of internal cross-checking of malaria positive blood slides of corporation malaria clinics, Kolkata, India, 2007

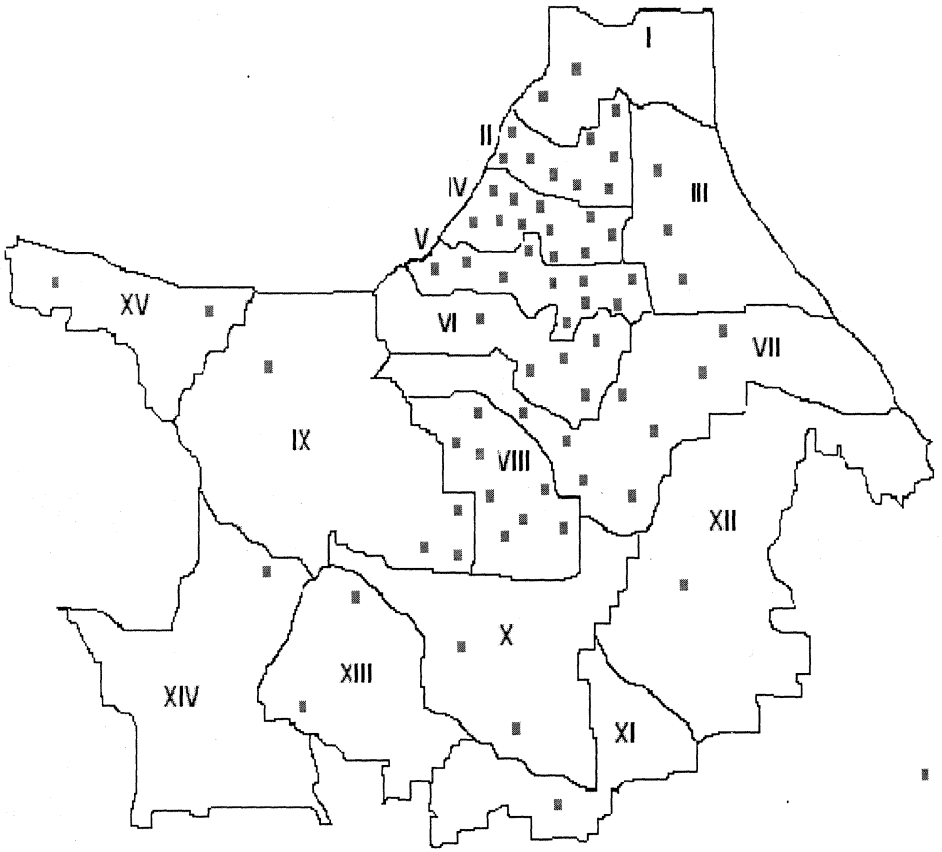
Malaria clinic	# malaria positive slides cross-checked	# slides concordant for positive report	% of Concordance for positive report	# falciparum positive slides crosschecked	# slides concordant for falciparum (+)	% of Concordance for falciparum (+)
A	10	10	100	3	2	66.7
B	4	3	75	0	0	-
C	12	12	100	0	0	-
D	33	30	90.9	11	6	54.5
E	6	2	33.3	2	0	0.0
F	10	9	90.0	2	1	50.0
G	7	6	85.7	1	1	100.0
Total	82	72	87.8	19	10	52.6

N.B. - Total number of blood slides cross-checked were 241, out of which 82 were positive for any malaria parasite and 19 were falciparum positive, according to the first examiner

Table- 4 : Distribution of corporation malaria clinics by borough, Kolkata, India, 2007

Sl. No.	Borough	Number of wards	Number of malaria clinics
1	I	9	2
2	II	9	9
3	III	9	3
4	IV	10	11
5	V	11	10
6	VI	10	5
7	VII	9	9
8	VIII	11	8
9	IX	10	4
10	X	12	2
11	XI	7	1
12	XII	7	1
13	XIII	9	2
14	XIV	9	1
15	XV	9	2
Total		141	70

Diag.- 1 : Distribution of the malaria clinics of Kolkata Municipal Corporation, Kolkata, India, 2007



▪ – Malaria clinic of
Kolkata Municipal Corporation

I, II, ……..XV – Denotes borough number

1. Introduction

1.1. Background :

Control of malaria is a global public health priority, reflected by the joining of a number of international agencies in the anti-malaria initiatives. According to the global strategic plan, four of six Millennium Development Goals cannot be reached without the control of this disease.[1] Presently 350-500 million clinical disease episodes of malaria occur annually in 107 countries or territories.[2] The Asian countries contribute 38% of the estimated global burden of cases and 10% of global malaria deaths.[3] The South-East Asian Region has the highest rates of drug and insecticide resistance in the world.[3] Within this region, India is the country with fourth highest incidence rate (standardized) of malaria.[4] The national programme of India operates under the National Vector-Borne Disease Control Programme. The National Health Policy of 2002 reinforced the commitment to malaria control and set as goals the reduction of malaria mortality by 50% by 2010 and the efficient control of malaria morbidity.[5]

The malaria control programme in India has been focusing only on the rural areas until 1971, when the malaria problem of the urban areas were taken into active consideration by the programme authorities at the national level. The year 1971 saw the approval of the Modified Plan of Operation that contained a proposal to control malaria in the towns and named it as Urban Malaria Scheme. Its main objectives were: (a) to control malaria by reducing the vector population in the urban areas, and (b) to reduce morbidity and mortality through early detection and prompt treatment.[6]

Kolkata is one of the 23 urban areas where the urban malaria scheme was first launched. Kolkata Municipal Corporation (K.M.C.) is responsible for implementing the scheme in the city. Density of population, extreme diversity of socioeconomic condition and unplanned development – all complicate the malaria scenario of the city. Kolkata, harbouring 5.7% of the population of the state (West Bengal), has contributed 45% of all reported malaria cases and 15% of the falciparum cases in the state in 2006. Reported fatalities were relatively few – three in 2005 and one in 2006. However, the annual parasite incidence (annual number of blood slide positive cases per 1000 of mid-year population) remained substantially unchanged from 2002 (11.7 per 1000) to 2006 (11.6 per 1000).

I evaluated the anti-malaria programme of K.M.C. with reference to the unchanging nature of the malaria incidence rate in the city.

1.2. Objectives

(a) Identify the strategical limitations and gaps in implementation of the malaria control programme, due to which the malaria incidence rate is not coming down.

(b) Recommend corrective measures

2. Methodology

I described the programme in terms of programme components, strategies and organization structure. I prepared a logic model of the programme according to inputs, process, output and outcome.

I evaluated the programme by indicators developed against the inputs, process, output and outcome of the different components [Table-1].

I reviewed records, documents, guidelines and formats at the level of public health headquarter, ward health units and malaria clinics. I also interviewed the stake holders at those levels with semi-structured questionnaires.

I sampled the malaria clinics purposively from different parts of the city. I surveyed the clinic registers for one reference month. In order to determine the predictive values, I used surrogate indicators i.e. agreement of result on cross-checking of 10% negative slides and all positive slides of last month by fellow technicians. I utilized all the follow-up data available in the sampled clinics for 2006. In order to determine the lead time from slide collection to delivery of report, I depended on interviewing the laboratory technicians, as no documentation of time was available.

For the community survey, I selected two boroughs by purposive sampling. I sampled wards therein by cluster sampling method and then randomly selected streets in those wards. I conducted the survey by administering a close-ended questionnaire through health workers, after pilot testing and training. In the questionnaire, I have used the term 'recognized alternative protective measures' to indicate the preparations containing scientifically recommended repellents or insecticides[7], door and window screen and closed air-conditioned room.

I collected data on vector control from the ward health units of the same sample of wards as above. A survey of their registers for one reference month provided the performance related data.

For the standard programme indicators I accepted the compiled reported figures as obtained from the headquarter.

I analyzed the data in terms of proportions, mean and range as applicable. I estimated the degree of agreement in blood slide crosschecking by kappa test. I used Epi Info software-version 2006 for analysis of the community survey data.

3. Results

3.1. Description of the programme

Diagramme-1 shows a logic model of the programme.

The components of the Urban Malaria Scheme are : (a) case detection and treatment; (b) information, education and communication; and (c) vector control.

The strategies are : (a) early detection and management to reduce suffering and mortality and prevent further transmission; (b) action against larvae and also adult vector in certain circumstances – to reduce vector density; and (c) community motivation – to prevent vector breeding in households and to curtail man-mosquito contact.

The organization structure consists of the health department headquarter, the borough health offices, the malaria clinics, the ward heath units and the health workers of different projects, namely Kolkata Urban Development Project, Kolkata Slum Improvement Project and Indian Population Project-VIII. The malaria clinics are mainly concerned with the programme component (a), while the ward health units are to implement (b) and (c).

3.2. Evaluation of the programme

3.2.1. Inputs :

There were 70 malaria clinics spread over 141 wards, of which 72 (51.7%) wards had no clinics in them [Table-2]. One clinic served 68,000 population on average. There were 1.5 laboratory technicians per clinic. 27% (three of 11) of the technicians were not formally trained. Seven of seven clinics had at least one well functioning microscope. In three of seven clinics the stand-by microscopes had problem of illumination. Supply of Combipack, the user-friendly drug kits, was up to 25-30% of

the demand in last one year. There was no stock-out of any other item in the clinics during that period.

Each of the community health workers catered 3000 population. In total they served 46% of the population.

There was one entomologist against the desired strength of four. 38 (27%) wards had no ward health unit (W.H.U.). The borough offices looked after those wards. There were three to five field workers in a ward, the median being four. During August-December there were two to three additional (contractual) workers. Out of seven WHU-s two had one first-tier supervisor and four had one second-tier supervisor, the number of supervisors per W.H.U. being 0.8. In each W.H.U. there were one to five bailiffs (median – three). They were originally the superfluous staff of some other department, detailed in the health department to act as supervisors. All the staff in six of six WHU-s, except the bailiffs of two WHU-s, were capable of identifying vector breeding sites. Staff of three WHU-s were not able to identify the larva type. The WHU-s faced no dearth of materials in the last year, except a stock-out of pyrethrum for ten days in one ward. In one of six wards, there was no spare knapsack sprayer, while all spray equipments were available in enough number in the others. Number of torch lights available was 50% of the requirement.

K.M.C. had 38 hoardings for public awareness i.e. 2.5 per borough. Mike publicity, group meetings and health talk by the staff were the other modes of information, education and communication (I.E.C.).

3.2.2. Process :

149 out of 377 (40%; 95% C.I.= 35 to 44%) fever cases got blood tested for malaria. Out of those tested, 86 (58%; 95% C.I.= 50 to 66%) had the test in a corporation clinic. Active slide collection was 3.8% of total slide collection. The lead time from slide collection to delivery of report ranged from 1 hr. to 24 hrs., according to the

laboratory technicians. Two of five clinics did not follow the programme guideline for slide processing. Agreement of negative report on blood slides was 93%. Agreement for a diagnosis of falciparum was 52.6% (kappa= 0.672; p< 0.001) [Table-3]. All the cases who gave blood sample in malaria clinics, received presumptive treatment instantly in a regimen according to the national programme guideline. 90% of the vivax cases took the radical treatment. Falciparum cases were followed up in three of ten clinics. The clinics repeated the same treatment for recrudescence cases and referred them to higher centres in situations of non-response. Three of six WHU-s collected malaria data from private facilities.

The daily duty period of the field workers (vector control) was 6 hours. Time actually spent in the field was 2.5-3 hours in the lean season and 3.5-4 hours in the peak season. Each worker visited 30-40 houses per day. In two of six wards they followed a weekly cycle of house visit. In the rest of the wards the visits were at fortnightly intervals. The bailiffs' participation, in three of six wards, was to help the workers in non-manual works. They did not perform any supervision; nor did they make any search for breeding sites. The WHU-s reported vector breeding status only when demanded from higher levels. Three of six WHU-s could not do any monitoring by larval indices. Three of six WHU-s did not use Bacillus thuringiensis toxin in 2006. Three of 15 boroughs worked on promotion of larvivorous fish. In response to only 50% (38 of 76) of falciparum cases, focal adulticide spraying took place within one week of case detection. The WHU-s spent 16% of manpower in pyrethrum fogging in the last peak season.

Each ward had, on average, six rounds of mike publicity in 2006, each round lasting for three hours. Two of six WHU-s organized group meetings. The I.E.C. messages were on blood testing for malaria, bednet use and vector source reduction.

3.2.3. Output

Annual blood examination rate was 5.8% in 2006. P.falciparum percentage was 7.4. According to the community respondents, fever subsided within fourth day of treatment in 98% of malaria cases. In the weekly visit system the vector control staff visited 21% of the households. The coverage was 35% in case of fortnightly visits. The routine visits were all in the ground floor and not above. One round of focal spray covered 34 households on average. 16% of families (181of 1155) were fully bednet users. In 13% of the rest of the families (126 of 974) the reason of non-use was only lack of motivation and in 81% (786 of 974) the reason was non-financial constraints including lack of space or ventilation. 18% (C.I. 15 to 20%) of the non-user (partial or absolute) families did not also use any protective measure and 8% (C.I. 6 to 10%) used unrecognized measures. 20% (C.I. 18 to 22%) of families had knowledge of both indoor and outdoor breeding sites of malaria vector mosquito.

3.2.4. Outcome

Taking malaria situation of 2002 as the base-line, the annual parasite index was the lowest in 2003, reached the highest value in 2005 and has come back to base-line in 2006 [Diag.-2]. Annual falciparum index declined from the highest level in 2002 to 2005 and has again increased in 2006 [Diag.-2]. Recrudescence occurred in 12 out of 135 (8.9%) cases followed up for one month. Community interview revealed recurrence of malaria within one month in 9.1% of cases. There was no consistent data available for vector density.

4. Discussion

As seen in the Diag.-1, corporation malaria clinics were sparse in certain parts of the city. It jeopardizesd the principle of early detection and treatment; more so in the poorer section of the community, because it had lesser access to private facilities. To be at par with the programme norm i.e. one clinic per 50,000 population[8], K.M.C.

needed to have 95 clinics in its area. Totaling the existing clinics of the corporation and 14 other units run by the government, there were 84 public facilities available in the city for test of malaria. So, the corporation required to set up 11 more malaria clinics at the least. Lack of awareness about blood testing, even where clinics were existing was also an issue. Active slide collection was low, in consideration of the population assigned to the health workers. High value of concordance for negative blood reports and low level of concordance for falciparum diagnosis – together indicated that chances of missing malaria parasites were not high, but there was problem with species identification. It could be a matter of concern for the progamme managers. Because, the control responses were different for different species of the malaria parasite. The stand-by microscopes in the clinics, if they have to be used at any time, would also affect diagnosis, because of their lack of up-keeping. The treatment regimen followed by K.M.C. conformed to the guideline of the national programme. There was dearth in provision of 'combipacks'. Those were better for patient compliance, as compared to the traditional formulation. The dearth might cause treatment default. High rate of clinical cure, as evident from community interview, suggested that early treatment failure was not a problem. However, there was doubt about late treatment failure. The clinics did not routinely follow up the falciparum cases and were not prepared for management of treatment failures. The available data pointed out the chances of late treatment failure to come up.

The human resources of the ward health units was under-utilized. The field workers spent 40-60% of their duty hours actually in the field. The bailiffs, though placed as acting supervisors, performed no actual supervision or technical work in half of the wards. None from the vector control side made regular visits in the upper floors of the buildings. In two-third of the wards the visit of the vector control staff was at an interval of two weeks, whereas the technical recommendation was to repeat the larvicides (which they used) every week[8]. Notwithstanding, the house coverage was patchy. The staff in general made regular visits only in those households which tended to have mosquito breeding spots. Due to selective visit and due to no regular

visit up-stairs, a section of potential breeding spots like household water containers and indoor tanks remained unchecked. The actions required there were mainly inspection of such containers and making behavioral change communication. Most of the bailiffs, with proper re-training, would have been able to carry them out. Short supply of torch lights was a logistical constraint in larval monitoring.

Pyrethrum fogging is a recognized method of indoor space spray [9]. But the way it was done, was in fact an outdoor spray facing the doors and windows of the houses. Considering the endophagic and endophilic nature of the urban malaria vector[9], the very way of fogging was little effective and mostly a misuse of human resource. Moreover, in a good number of occasions the focal spray in response to a falciparum case was too late to effectively cut off the transmission. There were other shortcomings also – in the choice of vector control methods. Use of Bacillus thuringiensis toxin (B.T.I.) was much less than that of fethion or temephos, although the former had the advantage of double duration of action.[8] Trial of larvivorous fish was also limited in a small area.

There was no organized entomological wing at any level. Generation of larval indices was irregular and incomplete and thus failed to provide any warning signal or any useful inputs for activity planning. There was no monitoring by adult vector indices. Also, in absence of monitoring of vector bionomics and sensitivity, it was not possible to fine-tune or revise the vector control policy from time to time.[9,10] Lack of case information from private sector allowed foci of transmission to persist.

Due to non-use or partial use of bednets and concomitant non-use of any other effective protection, about one-fifth of the families were unprotected against mosquitoes. Also, in absence of knowledge about vector breeding, the community was unable to understand its role in malaria control. Awareness generation activities were infrequent, and also unsuited for the variegated condition of the target population. As for example, the reason of not using bednets was not lack of motivation only. Constraints like lack of space, lack of ventilation or sleeping in the

open etc. were also among the principal reasons. So, advice on bednet use would have no appeal to this section of people; yet it was put as a generalized message in I.E.C. Mike propaganda is supposed to have limited role in awareness generation, mainly because it is devoid of two-way communication. However K.M.C. used this mode the most. Number of hoardings was meager, considering the area of the city.

4.1. Limitation

I selected the malaria clinics and the boroughs by purposive sampling, and by that way might have imposed bias in the evaluation. However, the merit was representation of different parts of the city. All the wards in my sample had ward health units. They were likely to be different from wards without a ward health unit, so far vector control and people's awareness were concerned. Hence the true values of the parameters might be worse than the estimates obtained. The data-set on timeliness of focal spray was too small to get a precise estimate.

4.2. Conclusion

The issues that the control programme had to take into account to bring down the malaria incidence rate, were in brief : (a) low sensitivity of case detection, (b) error in malaria species identification, (c) short supply of easy-to-use drug kits, (d) long time-gap and low coverage of vector control activities, (e) limitation in the choice of vector control method and material, (f) lack of entomological back-up, (g) inadequate and inappropriate I.E.C. and (h) the problem of late treatment failure or recrudescence.

4.3. Recommendation

The corporation requires to set up further eleven malaria clinics – to be at par with the programme norm. The priority for new clinics should be the boroughs where clinics are scanty, but slide positivity rates are relatively high and/ or the proportion of slum population is more. Besides, K.M.C. should further popularize its existing clinics. It should utilize the health workers more actively for promoting blood

examination of fever cases. The authority need to arrange re-training of the laboratory technicians, prioritizing those without formal training. They need to arrange qualitative monitoring of the laboratories. Each of the clinics may preferably have more than one microscopes in up-to-the-mark condition. Supply of combipacks should be adequate to treat all adult falciparum cases.

There is scope to improve the output of the vector control staff. The field workers need to spend more hours in the field. It would improve the frequency and / or coverage of house visit. The medical officer of the W.H.U. may arrange proper hands-on training for the bailiffs. Then he may engage them in supervision work and in search for indoor breeding sites, particularly in upper floors. Making behavioral change communication along with the search would give better impact. Focal spray in response to falciparum cases is a priority work. So the lead-time from case detection to spray should be as less as possible and not more than seven days. The programme officers should consider some strategical modification in vector control activities. There should be a shift from pyrethrum fogging to indoor residual spray and also encouragement of alternative anti-larval measures like B.T.I. and larvivorous fish. K.M.C. should engage at least three more entomologists, undertake capacity building of the staff and strengthen entomological monitoring. The authority may consider retention of contractual field workers through the lean season too, so as to spare the skilled workers and let them participate in entomological work.

The programme needs revamping of the I.E.C. component too. I.E.C. activities should increase in frequency. The mode of I.E.C. may switch over from mike publicity to community group meetings, preferably with picture display or slide projection. There should be more stress on inter-personal communication, the health workers being utilized more for this purpose. There may be however television spots and more number of hoardings, the latter in well-off areas. Besides use of bednets, alternative protective measures should also find their place in I.E.C. messages.

5. References

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Diag.- 1 : **Description of Urban Malaria Scheme by a logic model; Kolkata Corporation, India; 2007**

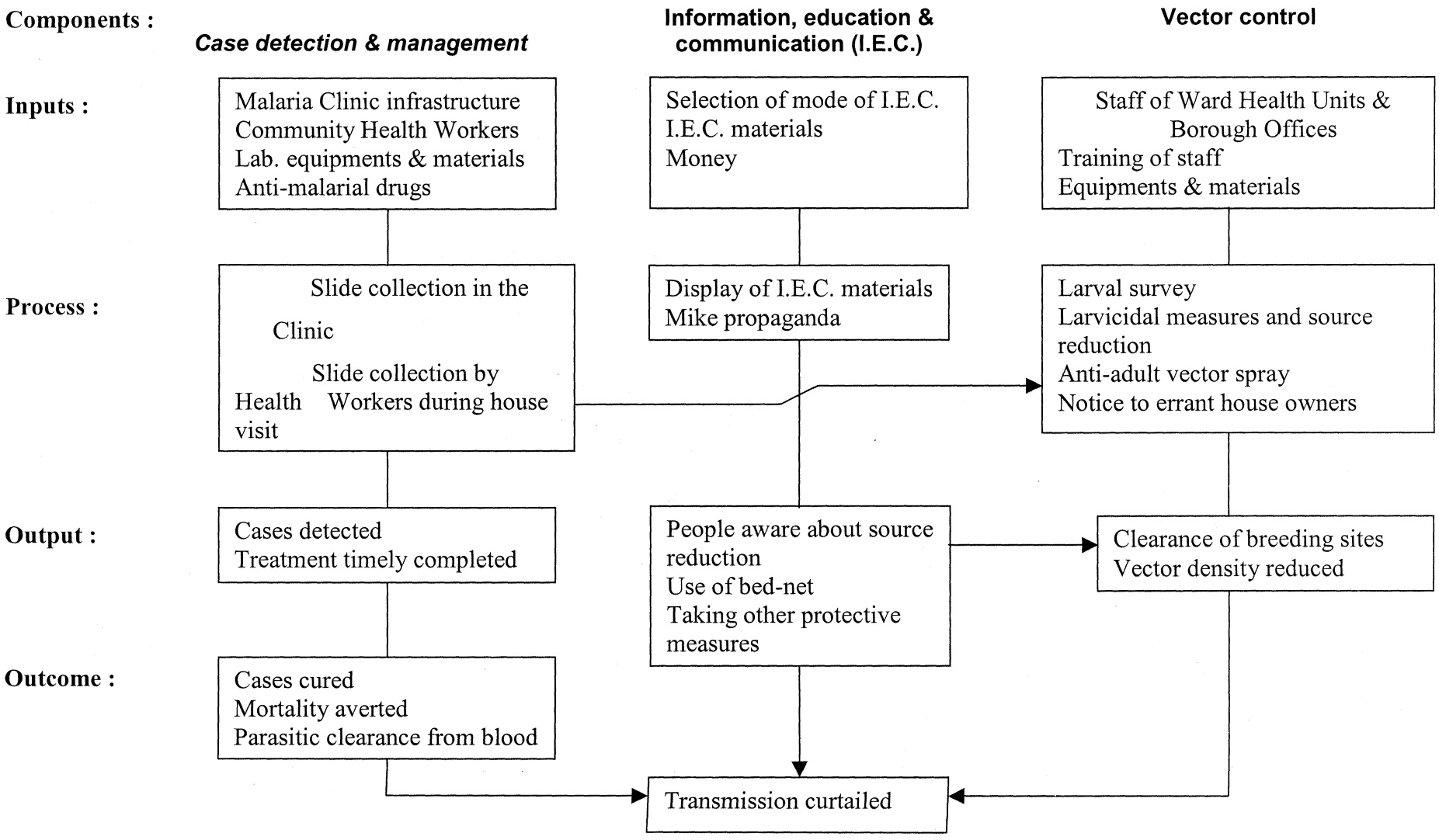


Table 1: From the logic framework to study design for programme evaluation : Urban Malaria Scheme, Kolkata, India; 2007

1.A. Case detection and management :

Levels of the logic model		Indicators	Data needed for the indicator	Source of data	Evaluation design
Input	Malaria clinic	No. of malaria clinics per 50,000 population	Total no. of malaria clinics	Corporation records	Record review
			Total population		
	Staff	No. of lab. technicians per malaria clinic	Total no. of lab. technicians working	Malaria clinic	Survey of clinics
			Total no. of malaria clinics		
		Proportion of lab. technicians formally trained	No. of lab. technicians formally trained	(Do)	(Do)
			Total no. of lab. technicians		
		Proportion of population enjoying the service of health workers	Population served by the health workers of different projects	Corporation records	Record review
			Total population of the corporation area		
	Equip-ments	Proportion of clinics having a spare microscope functioning	No. of clinics having at least two functioning microscopes	Malaria clinics	Visit at clinics
			No. of clinics		
	Lab. materials	Proportion of time during which individual lab. materials were not available in last one year	Summation of no. of weeks of stock-out in the different clinics	Clinic records	Review of clinic records
			No. of reference weeks x no. of clinics		
		Adequacy of supply of combipacks	Quantity of combipacks demanded by the clinics	(Do)	(Do)
			Quantity of combipacks supplied		
Process	Case finding	Proportion of malaria cases detected by the system out of cases occurring	No. of malaria cases detected by the system during the reference period	Community	Community survey
			No. of malaria cases occurring in the reference period		
		Annual blood examination rate	Number of slides examined in reference year	H.M.I.S. record	Record review
			Mid-year population in reference year	Corporn. records	
		Proportion of active collection of slides	Quantity of active collection of slides	Ward health unit	(Do)
			Total no. of slides collected	Malaria clinic	
	Lab. function	Proportion of clinics following proper lab. process	No. of clinics following lab. process as per programme guideline	Malaria clinics	Direct observation in a sample of clinics
			Total no. of clinics		
		Positive predictive value by species	No. of slides agreeing on cross-checking for species	Cross-checking by fellow technician	All positive slides of last 1 month in a sample of clinics
			Total no. of positive slides cross-checked		
		Negative predictive value	Total no. of negative slides agreeing on cross-checking	(Do)	10% of negative slides of last 1 month in a sample of clinics
			Total no. of negative slides cross-checked		
		Time-gap between collection of blood slide and delivery of report	Time of collection of blood slide	Malaria clinic	Direct observation in a sample of clinics
			Time of delivery of report		
	Treat-ment	Proportion of cases given presumptive treatment as per programme guideline	No. of cases given presumptive treatment as per guideline	Clinic records	Record review
			Total no. of cases from whom blood slides were taken		
		Proportion of vivax cases given radical treatment	No. of vivax cases given radical treatment	(Do)	(Do)
			No. of vivax cases detected		

1.A. (contd.)					
Levels of the logic model		**Indicators**	**Data needed for the indicator**	**Source of data**	**Evaluation design**
Output	Case detection	Plasmodium falciparum percentage	No. of slides found positive for P.falciparum	H.M.I.S. record	Record review
			Total no. of positive slides		
		Annual parasite incidence	Total no. of slides found positive in the reference year	H.M.I.S. record	Record review
			Mid-year population of the reference year	Corporation record	
	Treat-ment	Proportion of malaria cases clinically cured within fourth day of treatment	No. of malaria cases in whom fever subsided within fourth day of treatment	Community	Community survey
			No. of malaria cases treated		
Outcome	Case detection	Annual parasite incidence over years	Annual parasite incidence for last 5 years	H.M.I.S. records	Record review
		Annual falciparum incidence over years	Annual falciparum incidence for last 5 years	(Do)	(Do)
	Treat-ment	Recrudescence rate (within 1 month)	No. of falciparum cases where recrudescence occurred within one month	Clinic records	Record review
			Total no. of falciparum cases followed up for one month		
		Recurrence rate (within one month)	No. of malaria cases recurring within one month (as per patient's statement)	Community	Community survey
			Total no. of malaria cases treated		

1.B. Information, education & communication (I.E.C.) :

Levels of the logic model		Indicators	Data needed for the indicator	Source of data	Evaluation design
Input	Materials	Number of hoardings on mosquito-borne diseases per borough	Total no. of hoardings on mosquito-borne diseases No. of boroughs	Corporation records	Record review
	Time	Frequency of mike propaganda in the last year	Total no. of mike propaganda sessions in the last year No. of wards	Borough health office	Record review
	Mode	Types of I.E.C.	Modes chosen for I.E.C.	Borough and headquarter	Interview of concerned personnel
Process	Duration	Average duration of a mike propaganda session	Time when mike propaganda started Time when mike propaganda ended	Ward health unit and borough	Interview of concerned personnel
	Extent	Extent of other I.E.C. activities	No. of wards or boroughs holding other I.E.C. activities Total no. of wards or boroughs	Borough records	Record review in a sample of boroughs
	Message	Coverage of key issues in I.E.C.	Issues covered in I.E.C. message Key issues to be considered in I.E.C.	Ward health unit and headquarter	Interview of concerned personnel
Output	Know-ledge	Proportion of families aware about indoor and outdoor breeding of malaria vector mosquito	No. of families aware of indoor and outdoor types of potential breeding sites of malaria vector No. of families interviewed	Community	Community survey
	Practice	Proportion of families using bed-nets fully	No. of families where all members slept under bed-nets No. of families interviewed	Community	Community survey
		Proportion of bed-net non-user families not taking any alternative protection and Proportion of bed-net non-user families taking unrecognized protective measures	No. of bed-net non-user families not taking any alternative protection and no. taking unrecognized protective measures No. of bed-net non-user families	Community	Community survey

Levels of the logic model		Indicators	Data needed for the indicator	Source of data	Evaluation design
Input	Infra-structure	Proportion of wards having ward health units	No. of wards having ward health units Total no. of wards	Corporation records	Record review
		Average no. of supervisors per ward	No. of first and second tier of supervisors and acting supervisors No. of wards	Ward health units	(Do)
		Average no. of field workers per ward	No. of field workers and contractual field workers No. of wards	(Do)	(Do)
	Training	Proportion of vector control staff trained for identification of larvae	No. of vector control staff trained for identification of larvae Total no. of vector staff	Ward health units	Interview of medical officer
	Logistics	Proportion of time during which individual insecticides were not available in last 1 year	Summation of no. of weeks of stock-out in the different wards No. of reference weeks x no. of wards	(Do)	Review of register
		Availability of spare spray machines	No. of ward health units having spare knapsack sprayers and no. having access to a stand-by fogging machine Total no. of wards health units	(Do)	Interview of concerned personnel
Process	Routine visit by the staff	Proportion of duty hours utilized in field	Hours spent in the field per day Daily duty hours	Ward health unit	Observation and interview of medical officer
		Frequency of house visit	Date when the individual streets were visited Date when the streets were visited for the next time	(Do)	Review of register
	Involvement of supervisors	Proportion of wards where supervisors performed technical work and/ or actual supervision	No. of wards where supervisors performed technical work and/ or actual supervision Total no. of wards	(Do)	Interview of medical officer and review of diaries
	Larval monitoring	Proportion of ward health units doing larval monitoring	No. of ward health units doing larval monitoring Total no. of wards	(Do)	Review of register and report
	Focal spray	Average time-gap between detection of a falciparum case and focal spray	Dates of detection of falciparum cases Dates of focal spray around the cases	Ward health unit Malaria clinic	Review of registers
	Method and material	Proportion of manpower spent in pyrethrum fogging	Manpower utilized for fogging in the reference month Total manpower spent in different spraying operations	Ward health unit	Review of performance report
		Proportion of wards or boroughs promoting larvivorous fish	No. of wards or boroughs promoting larvivorous fish Total no. of wards or boroughs	(Do) and vector control office	Interview of personnel and review of register
		Proportion of wards using Bacillus thuringiensis toxin	No. of wards where B.thuringiensis toxin was used in 2006 Total no. of wards	Ward health unit	Review of register
Output	Routine visit	Coverage of house visit	No. of households where routine visits were made Total no. of households	(Do)	Review of register Review of record
	Focal spray	Average no. of households covered in focal spray	Total no. of households covered by focal spray No. of falciparum cases against which focal spray done	(Do)	Review of register

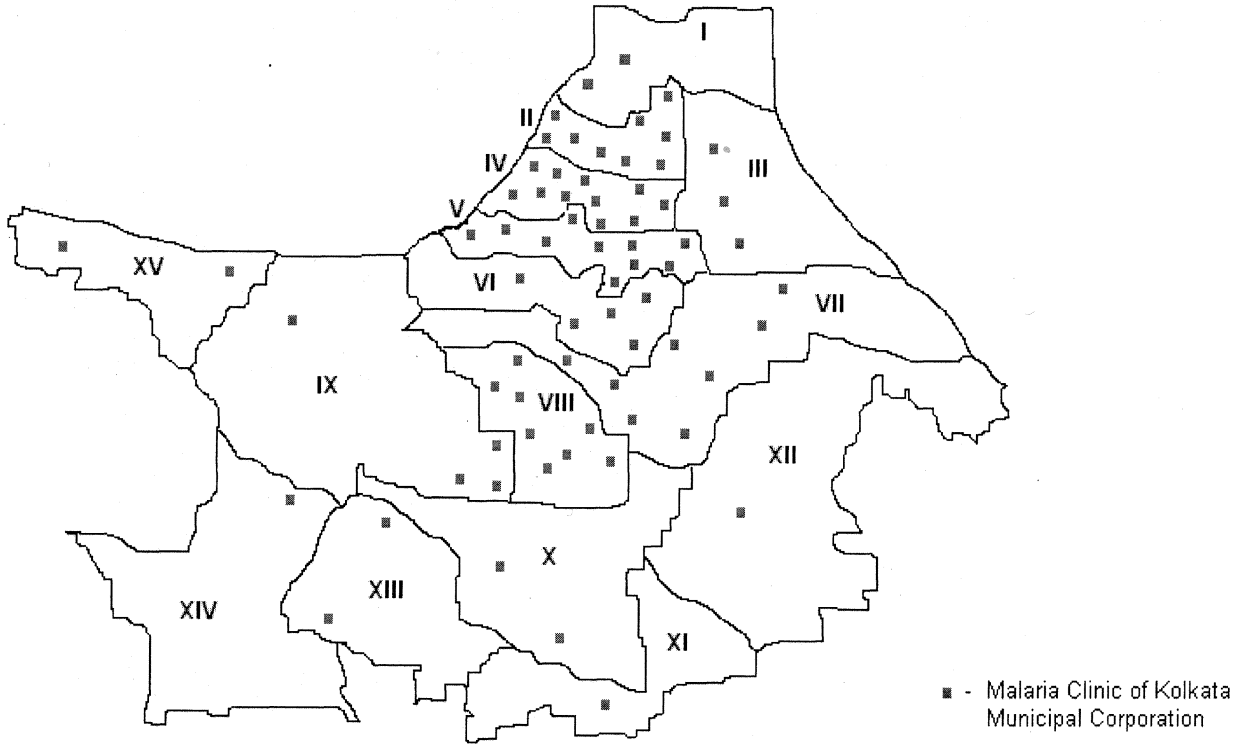
Table- 2 : **Distribution of wards not having any corporation malaria clinic, Kolkata, India, 2007**

Sl. No.	Borough	Number of wards	Number of malaria clinics	Number of wards not having malaria clinics
1	I	9	2	7
2	II	9	9	0
3	III	9	3	6
4	IV	10	11	0
5	V	11	10	2
6	VI	10	5	5
7	VII	9	9	0
8	VIII	11	8	3
9	IX	10	4	6
10	X	12	2	10
11	XI	7	1	6
12	XII	7	1	6
13	XIII	9	2	7
14	XIV	9	1	8
15	XV	9	2	7
Total		141	70	73

Table- 3 : **Result of cross-checking of malaria negative slides and falciparum poitive slides of corporation malaria clinics, Kolkata, India, 2007**

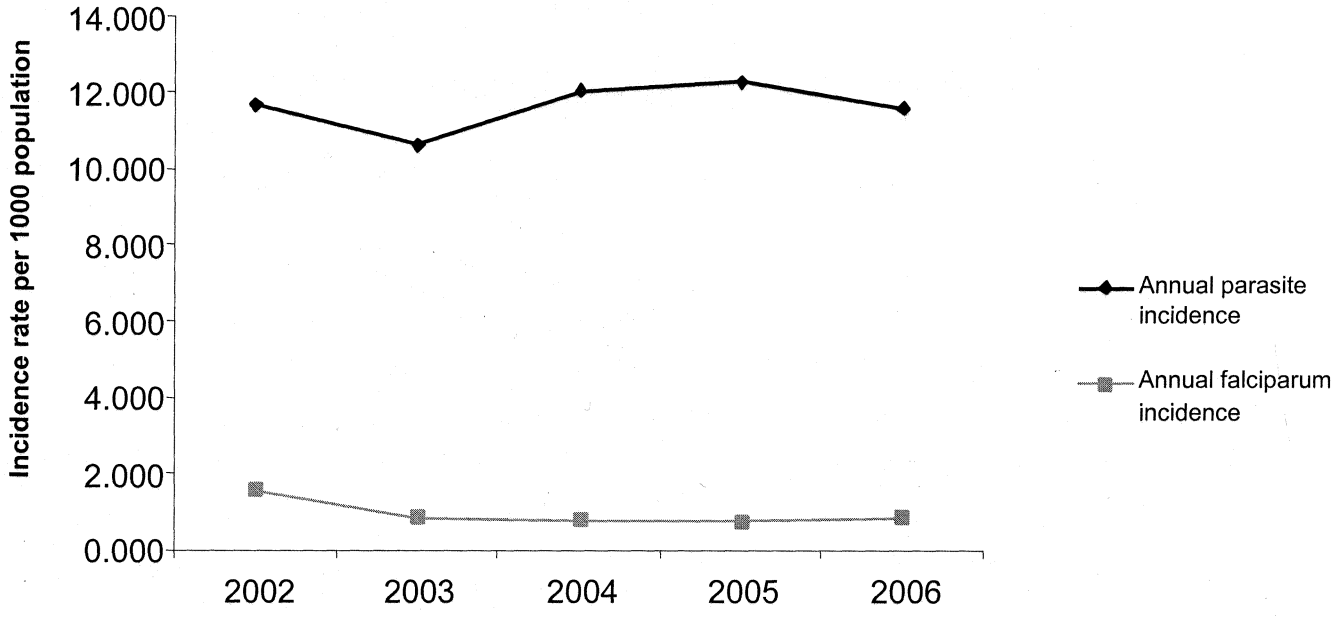
Malaria clinic	# malaria negative slides cross-checked	# slides concordant for malaria negative	% of concordance for malaria negative	# falciparum positive slides cross-checked	# slides concordant for falciparum	% of concordance for falciparum
A	22	20	90.9	3	2	66.7
B	27	26	96.3	0	0	-
C	18	18	100.0	0	0	-
D	26	22	84.6	11	6	54.5
E	24	23	95.8	2	0	0.0
F	26	24	92.3	2	1	50.0
G	16	15	93.75	1	1	100.0
Total	159	148	93.1	19	10	52.6

Diag.- 2 : **Distribution of Corporation Malaria Clinics in the city, Kolkata, India, 2007**



N.B. The numbers from I to XV denote the number of the respective borough (zone)

Diag.-3 : Annual malaria parasite incidence rate and annual falciparum incidence rate of Kolkata, India; 2002 to 2006



Master of Applied Epidemiology (MAE) – Indian Field Epidemiology Training Programme

Scientific paper critique form

General information:

Title of the paper: *Cassia occidentalis* poisoning as the probable cause of hepatomyoencephalopathy in children in western Uttar Pradesh

Authors: **V.M. Vashistha, Amod Kumar, T. Jacob John and N.C. Nayak**

References: **Indian Journal of Medical Research; Vol. 125, June 2007, pp 756-762**

Reviewer: **Dipankar Maji, MAE-FETP Scholar, National Institute of Epidemiology, Chennai, India**

Date: **8th January, 2008**

General narrative comments:

The paper is useful, revealing and an interesting reading. The background of the study is curious. The authors have well built up their logic in the paper. The references drawn from the field of pathology, phytochemistry and veterinary sciences are relevant, and speak of the effective hard work done by the authors. The investigators could have tried a dose response analysis. It might be helpful to determine causality. The language of the article is lucid, except at a few points. Mention of potential biases and measures taken to minimize them could further consolidate the paper. The paper builds a solid stepping stone for further research on the issue

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree) [1]					Explanations [2]
		1	2	3	4	5	
Overall assessment of the paper	The background introduces a specific question and spells out objectives on the basis of a description of general and specific issues.				√		In case description inconsistent features mentioned, without any purpose. Age description complex. In objectives, repetition of points
	The methods section provides sufficient information on design, sampling, definitions, data collection, laboratory methods and data analysis.				√		Case definition not precise. No sample size calculation for case-control study
	The results section reports sound scientific data that meet the objectives. There are enough details and adequate statistical information.				√		Test of proportion should have been shown in Table-I.
	The discussion section interprets the results to build a case on the basis of the data presented and the literature.				√		Case well built. However, dose response analysis would be better. No stratified analysis done for cassia ingestion and pica
	The limitations are described and analysed so that their impact on the capacity to conclude are well understood.			√			The point of dose-response relationship not raised. Bias not discussed. However ,a control giving history of cassia intake suggests that bias might not be a major problem
	The paper suggests next steps in terms of intervention and gathering additional evidence on the basis of the evidence presented.					√	Specific intervention recommended. Toxicological studies suggest to establish causality

[1] Tick appropriate box.
[2] Provide explanation to justify your grading of each of the items.

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree) [1]					Explanations [2]
		1	2	3	4	5	
Methods	The design is adequate to meet the objectives.				√		Dose-response not considered
	The population is well defined and relevant to the objectives.					√	Study background well determined
	Definitions are specified, sound and based upon standardized criteria when available.			√			Case definition not precise
	Sampling methods are statistically sound and adapted.				√		Logic behind the reference period not mentioned
	The sample size was estimated beforehand appropriately and is adequate.			√			No sample size estimation. However all cases in the reference period recruited
	The design is exempt from bias.		√				Bias not at all discussed
	The data that were collected are well described and relevant.					√	Huge variety of data acceptable, considering the uncertain aetiology
	The data was collected with methods ensuring sufficient quality.			√			No mention of quality assurance
	The analysis is thought beforehand and appropriate.				√		Yes, but not stratified analysis
	The indicators generated are appropriate and well calculated.					√	Parents' knowledge and awareness determined
	The statistical tests are appropriate and well computed.				√		Yes, but too many decimals for age and different units used for age
	Appropriate attention has been given to human subject protection.				√		No mention of it. However, no human subject issue seems to be apparent here

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree) [1]					Explanations [2]
		1	2	3	4	5	
Writing	The content is well distributed in the relevant chapters and sections.					√	I.M.R.D. format followed
	The language is simple and clear. The word count is < 3000.				√		Issue of Chandipura virus and the chronology of events not very lucid. Word count more, but worth
	The writing is sequential, going from one point to the next.					√	Building of the case was nice
	The active voice is used throughout.				√		Passive voice used, but caused no difficulty in understanding
	The vocabulary is precise, consistent and standardized.					√	
Tables and figures	There are no more than five relevant and useful tables and or figures.					√	Two tables and one photograph; useful
	The choice of graph or table to display information is judicious.					√	
	The tables are clear, exact and the totals add up.				√		Tests of proportion missing in Table I
	The graphs are effective, appropriate, understandable and they have a low ink-to-data ratio.				√		No graph shown. The photograph was useful

SECTION – 3

OUTBREAK

INVESTIGATION

Investigation of an outbreak of measles at Ahartore Village, Purulia District, West Bengal, India, September-2006

1. Introduction :

1.1 Background

Measles is a principal cause of childhood mortality & morbidity, leading to 7% of all deaths in < 5 year children worldwide. It caused 30 million cases and 0.6 million deaths globally in 2004.[1] In May 2005, the 58th World Health Assembly adopted the WHO/UNICEF Global Immunization Vision and Strategy, that called on countries to reduce global measles deaths by 90% by 2010 compared to 2000 estimates.[1] In the same year the Regional Technical Consultative Group for Vaccine Preventable Diseases in W.H.O. South East Asia Region endorsed the goal for the countries in the region.[2] The Government of India, in 2005, developed a multi-year strategic plan with the aim of reducing measles mortality by two-thirds by 2010 compared to 2000 estimates.[2] In India routine measles vaccine coverage is in the tune of 59%,[3] and outbreaks are common, though most are under-reported.[2] The plan developed by the Government of India includes, as one of the strategies, "collection of good quality epidemiological data through active surveillance and outbreak investigation and using them to guide further action".[2]

The state of West Bengal, India is ahead of the national average in measles immunization coverage (67.4%). Yet with improvement in surveillance, more and more outbreaks have been coming into notice.

In the district of Purulia, West Bengal two outbreaks of measles were reported by the health system – one in March, 2005 and another in February, 2006. Both the outbreaks were investigated by MAE-FETP Scholars.

In the 2nd week of September, 2006 the medical officer in charge of Kashipur Block (an area different from those of the previous outbreaks) of the same district notified

an outbreak of measles to the district public health officer. The cases were located in one particular part (Mandalpara) of Ahartore Village of the said block. The number of cases reported was 18. The author, an MAE-FETP Scholar, investigated the outbreak with the objectives as stated below.

1.2 Objectives

a) To confirm the outbreak, along with laboratory tests

b) To determine the local epidemiology of measles

c) To estimate measles vaccine efficacy

d) To recommend actions for measles control

2. Methodology :

Confirmation of outbreak : To know the normal expectancy of measles in the area, I referred to the monthly reports of the local Health Subcentre for the past 5 years. I compared them against the reports of other Subcentres to determine unusually low reporting, if any.

Laboratory confirmation : For serological confirmation I took blood samples from cases with onset of rash in past 3-28 days and without history of measles vaccination in past 2 weeks. For virus isolation nasopharyngeal swabs and urine samples were collected from cases having onset within past 3 days & 7 days respectively. All samples were sent to National Institute of Virology, Pune, India in cold chain (2^0-4^0C).

Identification of cases : As the earliest case reported till then had its onset on 21st August-2006, I fixed the reference period for case search from 24th July i.e. 28 days (2 generation periods) prior to the former date.

Case definition – Any case of fever with rash along with cough or coryza or conjunctivitis, occurring in Ahartore Village in the period starting from 24th July-2006. I considered date of appearance of rash as the date of onset. I did not include immunization in recent past as an exclusion criterion (so as to increase the sensitivity of the definition).

Case search – I undertook active search by house to house visit. Cases who were residents of the area during the reference period but were not present at the time of search, were also included.

Line-listing – Along with identification particulars, I recorded date of onset, symptoms, complications, date of measles vaccination (if vaccinated), evidence of vaccination, date of last megadose of vitamine A and outcome.

Descriptive epidemiology :

I described the population of 9 months-10 years by smaller age-groups and gender – on the basis of the census done for the analytical study (see below). For the age-groups below 9 months and >10 yrs.-20 yrs. I got the population denominators from the village survey data of the health worker.

I enumerated the children of the houses having case(s) – in order to calculate the secondary attack rate among household contacts. I excluded individuals above 10 years of age from the denominator, as very few of them were attacked with measles. I did not consider immunization status or previous history of measles in determining the denominator.

During the case search I enquired the guardians of the cases, some other villagers & opinion leaders about population movement, movement of the cases during 3 weeks before & 4 days after the disease onset and also any other relevant antecedent in or around the village.

I grouped the cases, as per their date of onset, into periods of 3 days to construct an epidemic curve.

I described the distribution of the cases over place with a spot map of households.

Analytical study :

I estimated the vaccine efficacy by an analytical study.

Study design – Retrospective cohort study.

Study subjects – Any child in the age-group of 9 months-10 years, who resided in the area on any day during the reference period (24th July-19th September, 2006)and was staying there at the time of the study (18th-19th September,2006). Cases who fulfilled the above criteria except the last one, were also included. As the children below 9 months of age were beyond the scope of routine measles vaccination, I excluded them from the study.

History of immunization – For the children up to 5 years of age I referred to immunization cards, and to the child register of the Health Subcentre in absence of a card. I did not consider mother's statement for this age-group. For the older children, in absence of immunization card, I accepted mother's statement as the evidence, as there was no entry for those children in the child register.

Immunization in recent past was not an exclusion criterion for study subjects, as it could underestimate vaccine efficacy.

Attack rates – I calculated attack rates among the immunized & unimmunized children in the different age and sex groups. I estimated an adjusted attack rate for the age-groups above 3 yrs. by adjusting for the immunized proportion of children, with respect to the immunized proportion among >1-3 years. Similarly I adjusted the attack rate among females against the immunized proportion among males.

Vaccine efficacy – I calculated the over-all efficacy proportion by using the formula : vaccine efficacy = (attack rate among the unimmunized – attack rate among the immunized)/ attack rate among unimmunized

Modeling of susceptibles :

I began with the 2001 Census population of the area under the concerned Health Subcentre.

I applied Sample Registration System estimates of population growth rate & birth rate (rural), available for the state, to find the mid-year population & birth cohort size of the respective years.

I obtained the number of vaccinees by year from the annual reports of the Subcentre.

As vaccine efficacy estimation for the children up to 5 years produced undefined value, I applied the standard vaccine efficacy of 85%[2,4] to calculate the expected number of immune children among those vaccinated.

Case management : Almost all the children in 9 month-3 year age-group in the area had received a megadose of vitamine A (as a district-wide special campaign) during 22-24 August, 2006. As a part of outbreak response I advised another dose for the cases in that age-group as well as two consecutive doses for the cases who were not covered in the special campaign. Cases having any eye sign of vitamine A deficiency were to receive another dose after 2 weeks. I suggested one dose of vitamine A for the non-cases also in the age-group of 9 months-10 years.

3. Results :

Notification : Number of measles cases in the area shoot up from 31st August-2006. The local health worker noticed it on 10th September. The outbreak notification reached the district level on 14th September. So the time elapsed before notification was 2 weeks.

Confirmation of outbreak : From the monthly reports of the Health Subcentre for the last five years I found that number of measles cases reported in a month varied from zero to five. So, 18 cases in one month were beyond the normal expectancy. I was informed by the local health personnel that there was no major migration of population, nor was there any change in the surveillance definition they had used.

Laboratory confirmation : Four out of five (80%) serum samples tested were positive for measles IgM antibody. Measles virus could be isolated from the throat swabs and urine samples. The implicated strain was D-2.

Identification of cases : I found 22 cases (till 19th September-'06) who fit to the case definition.

There was no death due to measles. The attack rate was 1.02% among the population of 0-20 years. Among the children of 0-10 years the attack rate was 16.5%

Descriptive epidemiology :

The index case developed rash on 26th July-2006. According to the history given by the case-patient, she used to go to school in another village named Beko, where she had noticed similar illness and she had played with several children there. The index case was followed by single cases apart from each other by 3-10 days. But each of them occurred within the generation time from one or another previous case. After 29th August there was a sharp rise in incidence. It occurred after 12 days of a religious festival held in the village where people of all age-groups attended. In between 30th August and 14th September there were four generations of cases. The time gap between the 1st & 3rd of them and between the 2nd & 4th of them were nine days each. No more cases occurred after 14th September, till 19th Sept.-2006 [Diag.-1].

From the block health office, I got the information that 10 cases of suspected measles had occurred at Beko in the last 2 weeks of July-2006.

Age of the cases ranged from 10 months to 16 years. The median and the mean ages were 5 years & 5.5 years respectively. Only two cases out of the 22 were beyond the age of 10 years. 15 of 22 cases (68.2%) were immunized earlier. According to the local health workers, none in the area had received any supplemental dose of measles vaccine.

Attack rate was highest in the age-group of >1-3 years, closely followed by >3-5 years and >8-10 years [Table- 1]. Attack rate among females was a little lower than that among the males [Table- 1]. Secondary attack rate among the household contacts up to 10 yrs. of age was 60.9%.

Cough and conjunctivitis were present in 18 cases (82%) and 17 cases (77%) respectively. One case (4.5%) developed bronchopneumonia. Diarrhoea, with mild or no dehydration, occurred in five cases (23%). One case (4.5%) had symptoms suggestive of otitis media. I found short-lasting keratitis in one case, 16 year old.

I observed that the outbreak was limited within Mandalpara, a part of the village of Ahartore. Among the 74 houses in Mandalpara, only 13 houses contained all the cases, number of cases in those houses ranging from 1 to 3 per house. Most of the cases were clustered in either of two particular portions of Mandalpara. [Diag.- 2].

Analytical study :

The cohort had 113 children. Immunized proportion was 84%. Out of 95 children enumerated as immunized, 40 (42%) could produce immunization cards. I could verify further 24 (25%) from the child register. I considered the rest 31 (33%; all > 5 years) as immunized, according to their mothers' statement.

Among the immunized and unimmunized, attack rates were 15.8% and 27.8% respectively [Table- 2], the vaccine efficacy being 43% [95% C.I. (-)37 to 76%].

If we accepted mother's statement as an evidence of vaccination for children of any age, some of the unimmunized children would be re-classified as immunized. The attack rates among the immunized and unimmunized would change to 15.0% & 38.5% respectively. We would obtain a vaccine efficacy estimate for the best case scenario i.e. 61% (95% C.I. 11 to 83%).

Immunized proportions among the male & female children (up to 10 yrs.) were 87.5% and 80.7% respectively, and attack rates among the two groups were almost same (17.9% and 17.5%). However the attack rate in the female, when adjusted for immunized proportion against the male, came down to 16%. Secondary attack rate among the children up to 10 yrs. of age in the affected households was 60.9%.

Though the attack rate in the >8-10 yr. age-group was higher than that in the >5-8 yr. age-group (vide Table- 1), after adjusting the rate for immunized proportion of population as per the >1-3 yr. group, the attack rates for the two age-groups came close to each other (6.8% and 5.6%, p = 0.5).

Other studies :

Modelling of accumulation of susceptibles indicated that within 5 years from 2001, the mass of susceptibles attained the size of 85% of the birth cohort of the population served by the concerned subcentre [Table- 3].

On my visit to two immunization sessions (in the area served by the same P.H.C.) I observed that towards the end of the sessions (4 to $4^1/_2$ hours from beginning) the ice-packs in the vaccine carriers were all melted.

Case management :

95% of the cases received two doses of vitamine A in oil, either on two successive days, or one dose in the special campaign and another during the investigation. None required the 3rd dose.

4. Discussion

The global strategy of WHO/ UNICEF asked for 90% measles vaccine coverage.[2] In Mandalpara of Ahartore Village the measles coverage was close to that level. Nevertheless, a measles outbreak affecting one-sixth of the below 10 year population occurred in that area. Apparently it may be surprising. However, it does not appear to be so, when one takes into view :

(a) that unvaccinated never-infected children were accruing over the years, and

(b) that persons who were vaccinated but non-immune, due to low vaccine efficacy, added to the above mass.

On account of such cumulation, a big mass of susceptible population, 85% of an annual birth cohort, formed in the concerned village within 5 years of time. The herd immunity came below the level that was required to prevent sustained transmission of the virus. As the estimated vaccine efficacy was lower than that assumed for modeling[2], the herd immunity might be even lower than that determined by the model.

It appears that sporadic cases and small outbreaks of measles had been occurring in one or other of the connected villages. One of the health workers reported a case clustering at Beko Village, about 2 kms. away from Mandalpara, occurring in the month of July. Also, a village opinion leader spoke about 5-6 cases occurring in the month of June at another village $1^1/_2$ kms. away. It suggested that viral transmission was going on in a lower tune in the neighbouring areas. When population movement

brought in the disease agent to Mandalpara, it got a sufficient concentration of susceptibles to create successive generations of transmission in the same village. The village festival held at that juncture might have facilitated the spread.

Hence we can say that both vaccine failure and failure to vaccinate contributed to bring about the outbreak. Studies done in other countries have also indicated sub-optimal vaccine efficacy in some occasions.[5,6] In an outbreak in Jhalda-I Block of Purulia District in 2005, the investigator estimated the vaccine efficacy as 64%. In an outbreak in another administrative block of the same district in 2006, the vaccine efficacy estimate was over-all 86%, but 65% in the 9 months-2 years age-group.

Melted ice-packs at the immunization sites pointed out the need to review the immunization process. Particular attention needs to be given to evaluation of the cold chain system.[2]

As there was no provision of 'second opportunity vaccination' in the immunization schedule, the system could not catch up the older children initially missed; nor could it make a second attempt to protect the subjects of vaccine failure. Thus it failed to cut down the size of the susceptible population already accumulated. We may view this scenario vis-à-vis the strategic plan formulated by WHO/ UNICEF, that includes, apart from others, routine immunization coverage higher than 90% and also second opportunity doses.

One notable feature of this outbreak was zero fatality. In the developing countries case fatality generally ranges from 1 to 5%.[1] In the previous two outbreaks in the district of Purulia (referred to above), case fatality was 4%. An important difference in the setting of those outbreaks was low vaccination coverage in the affected community – 43% in one and 60% in another, as opposed to 84% in the present outbreak. This characteristic might be a reason of the difference in case fatality. Earlier studies have also shown that fatality ratio in measles might be less among the immunized section of cases.[5,7,8]

Previous studies have observed that otitis media, as a complication of measles, affects 5-15% of cases.[1] But I observed otitis media in lesser proportion of cases. Bronchopneumonia also occurred in smaller fraction of cases, as opposed to 5-10% seen in other places.[1,9] Diarrhoea occurred in a comparatively higher proportion of cases[9], but all episodes were mild. The doses of vitamine A, given in the 3rd week of August and during the investigation of the outbreak, might have played a protective role.[1,10]

It was appreciable that the peripheral units in Purulia District reported measles outbreaks. However the time elapsed before notification was long in the present outbreak. It indicated that timeliness of surveillance required improvement.

4.1 Limitation

Determination of vaccination status, in the more than 5 year age-group, depended on mother's version in absence of documentary evidence. But mother's version was prone to non-differential misclassification. It could reduce the estimate of vaccine efficacy. Moreover, there might be recall bias too. The probability was higher for the mothers of diseased children to give wrong positive history of vaccination. They might have done so to avoid unpleasant situation in front of the health staff. This bias would lower the vaccine efficacy estimate. On the other hand, there might be interviewer bias which could inflate the said estimate. The two types of bias might have minimized each other to some extent. Apart from that, I have made an estimate taking the best case scenario. This estimate was also less than the standard value of 85%.

Because of a small sample size, the estimates were of low precision. Also, my study could not ascertain the cause of low vaccine efficacy. However, I could indicate a probable deficiency in the cold chain.

4.2 Conclusion

Investigation of the outbreak pointed out that despite good reported coverage, a portion of the birth cohorts remained unimmunized. In addition to it there were subjects of vaccine failure. Both the factors played their part to give rise to the outbreak. Vaccine efficacy was only 43.2%. Breach in the cold chain could be a reason of the vaccine failure. Vitamin A coverage was good in the area and it might have been protective against complications and death. Timeliness of outbreak notification was deficient.

4.3 Recommendation

I shared my findings and inferences with the medical officer in charge of the block, the concerned staff as well as with the district chief of Public Health & the district programme officer. In the context of the present outbreak my recommendations were: to keep track of the outbreak; to administer supplemental dose of vitamine A to new cases if any; and not to defer routine doses of measles vaccine when they were due. I also suggested keeping an activated watch in other villages connected with the incriminated ones.

In view of the impression gathered from the investigation, I put forward the following to prevent or control further outbreaks :

Strengthening of routine immunization programme – by (a) revising the target according to actual annual birth cohort, (b) further improving the coverage in number and in timeliness and also (c) a thorough evaluation of the immunization process, with special emphasis on cold chain management.

The programme officers at the block & district level may, in addition arrange catch up drives with measles vaccine & vitamine A in oil – preferably in late winter i.e. before the seasonal rise of measles cases.

The measles surveillance system needs to be geared up so as to detect and report outbreaks early. As a part of case management, health personnel should promptly administer the recommended doses of vitamine A to the cases.

At the level of policy making one may consider second opportunity vaccination in outbreak areas, particularly where routine coverage has attained a level around or above 80%. However, programme management need to ensure that it does not hamper routine immunization in other areas.

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Table- 1 : Incidence of measles by age-group and sex at Ahartore Village, District- Purulia, West Bengal during 24 July-19 September, 2006

Age/ Sex group	Number of cases	Population	Attack rate (%)
0 - 1 yr.	1	9	11.1
>1 - 3 yrs.	6	22	27.3
>3 - 5 yrs.	7	28	25.0
>5 - 8 yrs.	2	43	4.7
>8 - 10 yrs.	4	19	21.1
>10 - 15 yrs.	1	49	2.0
>15 - 20 yrs.	1	45	2.2
Male	11	100	11.0
Female	11	115	9.6
Total	22	215	10.2

Diag.-1 : Incidence of measles cases by date of onset, Ahartore Village, Purulia District, West Bengal : 24 July-19 September, 2006

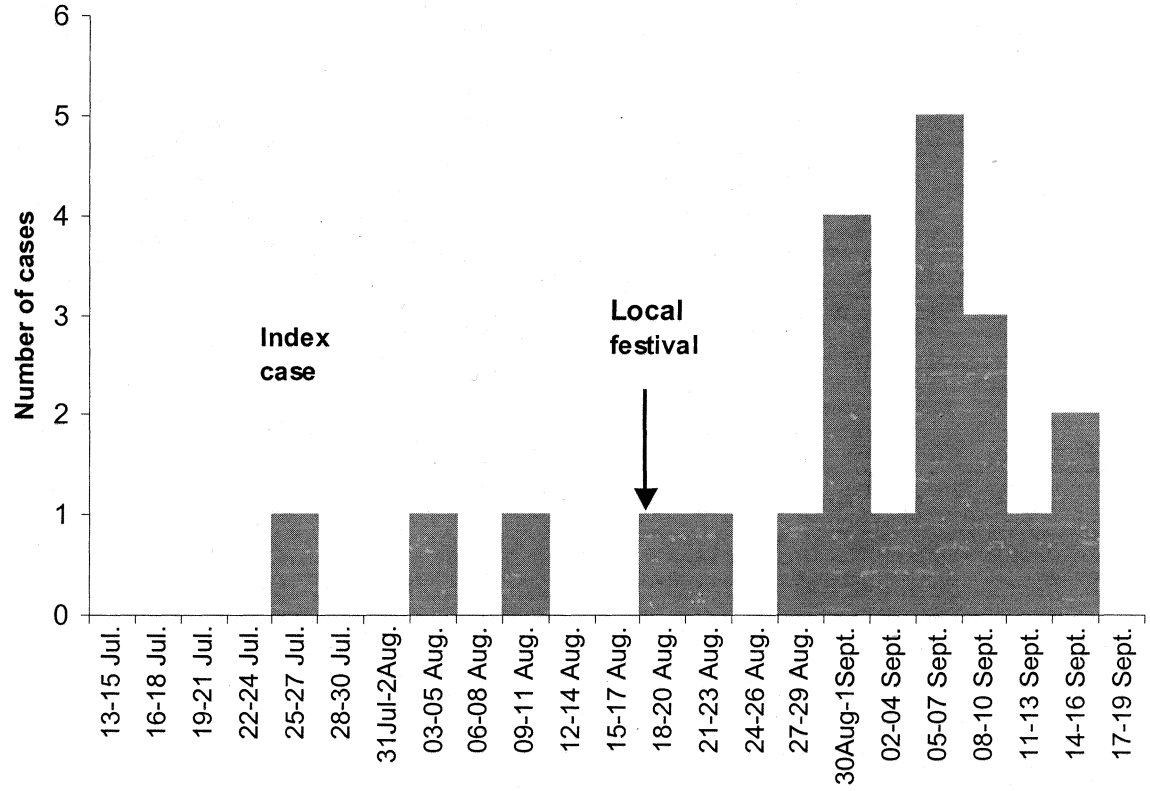


Table- 2 : Attack rate of measles by age-group and immunization status during a measles outbreak, Ahartore Village, Purulia District, West Bengal, India, 24 July-19 September, 2006

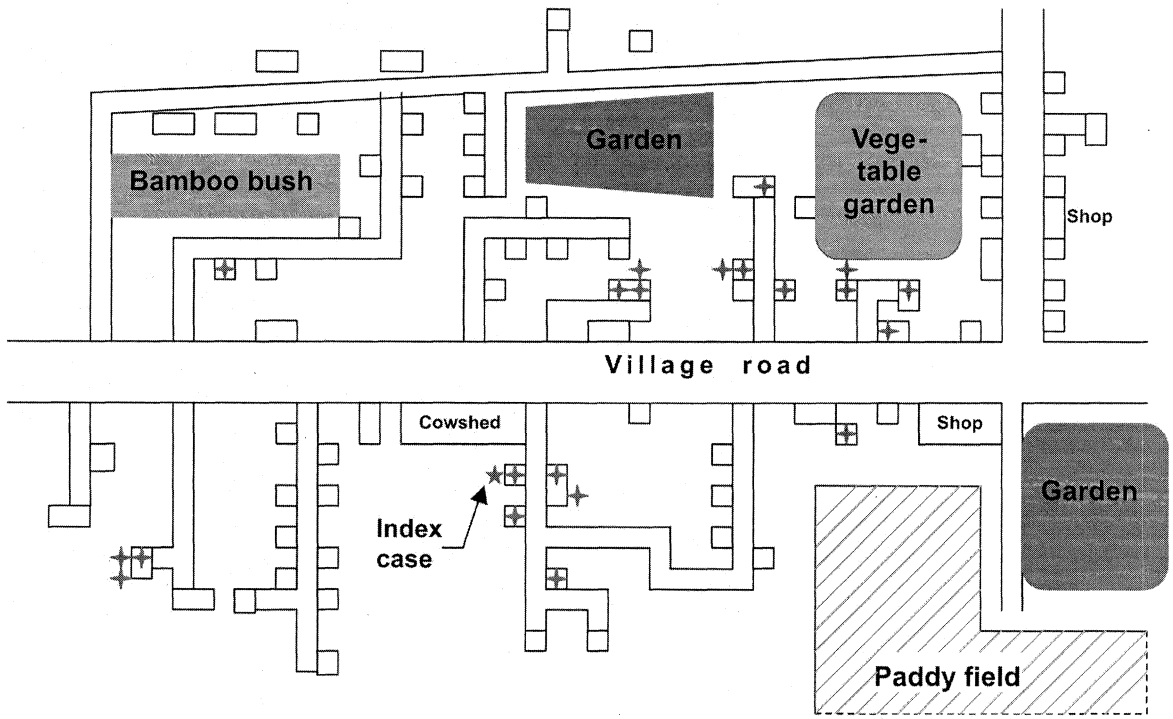
	Immunized			Unimmunized			
	Population	Case	Attack Rate(%)	Population	Case	Attack Rate (%)	Relative risk
9 mo.- 1 yr.	1	1	100.0	0	0	Undefined	Undefined
>1 - 3 yrs.	19	6	31.6	3	0	0.0	Undefined
>3 - 5 yrs.	25	7	28.0	3	0	0.0	Undefined
>5 - 8 yrs.	39	1	2.6	4	1	25.0	0.10
>8 - 10 yrs.	11	0	0.0	8	4	50.0	0.00
Total	95	15	15.8	18	5	27.8	0.568

N.B. Vaccine efficacy = 1 – relative risk = 0.432 i.e. 43%

Table- 3 : Cumulation of susceptibles for measles infection in Ahartore Subcentre area, Purulia District, West Bengal, India over 2001 to 2005

Year	Population	Birth cohort	Vaccinated	85% vaccine efficacy	Susceptible	Cumulation of susceptibles
2001	4004	86	86	73	13	13
2002	4079	86	86	73	13	26
2003	4157	86	82	70	16	42
2004	4235	85	85	72	13	55
2005	4315	86	80	68	18	73

Diag.- 2 : Spot map of the measles outbreak at Mandalpara, Ahartore Village, Purulia District, West Bengal, India, 24 July-19 September, 2006



SECTION – 4

PAPER

PRESENTATIONS

Malaria surveillance in Kolkata does not detect clusters and cannot identify areas for targeted intervention-Kolkata, India, May-2007

Background: The Indian national programme defines Kolkata as a high risk area for malaria. We described and evaluated malaria surveillance in the city to identify weaknesses and propose recommendations.

Methods: We reviewed the formats and interviewed the officials and the data management staff. We reviewed the distribution of malaria clinics. We randomly sampled 10% (7/ 70) of malaria clinics and 10% (10/ 103) of ward-level public health units (WPHUs) to interview the personnel and review records. We sampled households by cluster method to conduct a survey of fever cases. We evaluated the surveillance system for representativeness, sensitivity and usefulness by uniformity and coverage of surveillance and utility of the analysis done.

Results: Malaria clinics examined blood slides for self-reported fever cases. They also received blood slides collected by health workers in the community. They sent individual case reports and weekly aggregate to the headquarters. Five (33%) of 15 boroughs (zones) concentrated 67% of the 70 malaria clinics. Out of the fever cases who tested blood for malaria, 57.7% (86/ 146; 95% C.I.= 49.8 to 65.6%) availed the service of malaria clinics. The rest went to other health facilities. Five (50%) of 10 WPHUs collected data generated in private sector and government hospitals. Six (60%) of 10 WPHUs analyzed only falciparum data and hence missed clusters of vivax cases. The headquarter analyzed the data for slide positivity rate and falciparum percentage by clinics, but not by ward or street.

Conclusion: Surveillance over-represented selected areas where malaria clinics were more numerous. Sensitivity was hampered due to lack of involvement of private sector and government hospitals. Due to deficiencies in analysis the system was unable to detect clusters of vivax cases and identify areas for targeted intervention. We recommended redistribution of malaria clinics, further involvement of other health care

organizations and data analysis by place. Based on our inputs, the city authorities directed all WPHUs to collect data from the health facilities of other agencies. They directed the malaria clinics to compile and report cases by wards.

N.B. This paper appeared as an oral presentation in the 4th TEPHINET Bi-Regional Conference held at Taipei, Taiwan during 26th-30th of November, 2007

Simple analysis of routine surveillance data detects a rising trend of enteric fever in a district of West Bengal : A finding that is relevant for the local public health managers; South-24 Parganas, West Bengal, India, September-2007

Authors : Maji Dipankar, Ramkrishnan R., Sen T., Brahma. A, Gupte M.D.

Introduction :

Incidence of diarrhoeal diseases declined by 48.8% in South-24 Parganas during 2001-2006. Enteric fever is another disease-group with faeco-oral transmission. We analyzed surveillance data of government hospitals to determine the trend of enteric fever.

Methodology :

We made projection(s) for midyear populations. We projected the incidence for remaining months of 2007. We compared the variation in incidence with that of viral hepatitis to determine any change in activeness of reporting.

Result:

Notwithstanding decreases in 2003 and 2006, annual incidence rate of enteric fever increased over-all by 1.72 times from 2001 to 2006 and by 2.83 times in 2007 (projected). Improved completeness of reporting could account for 75.6% of the rise over 2006 to 2007 (projected). Variation in incidence by month between 2004-'05 and 2005-'06 were dissimilar for enteric fever and viral hepatitis. Nineteen of 29 block hospitals reported enteric fever. They didn't have own laboratory facility.

Discussion:

Enteric fever was in rising trend in the district unlike diarrhoeal diseases. The rise was neither due to increased activeness of reporting nor only due to better reporting completeness.

Estimation of incidence rates with only institutional cases was a limitation in the analysis. Also, the suspected and confirmed cases were not segregated.

On the basis of the analysis we recommended provision of investigation facility, improvement of quality of reporting and analysis of available data, by utilizing the inputs of Integrated Disease Surveillance Programme. A study should be there to identify the causes of the rise of enteric fever.

N.B. This paper appeared as an oral presentation in the National Conference on Emerging Issues in Public Health (AMCCON-2008) held at Trivandrum, Kerala, India during 10th-13th of January, 2008.