Original Research Article

Evaluation of Malaria Surveillance System in Hooghly district of West Bengal - India

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Abstract
Background: Malaria is endemic in 109 countries worldwide leading to approximately 1 million deaths. In 2009, West Bengal reported 89443 malaria cases including 24453 falciparum malaria. Hooghly district had ABER in the range of 3.9% to 6.4% in the last 5 years.
Objectives: Present study was conducted to describe the performances of different components of 'Early diagnosis and treatment' arm of National Anti-malaria Programme in terms of input, process and output and outcome.
Material and Methods: Present study was conducted in Hooghly district of West Bengal. Data was collected from 190 households by using cluster sampling. Medical officers, laboratory technicians and health workers were interviewed and records were reviewed. Data was analyzed by using Epi Info.
Results: out of 15 Medical Officers 66.6% were trained in malaria. Overall API of Pandua block was 0.149/1000 population, ABER was 8.8% and PF was17.4percent.
Conclusions: Inadequate manpower for the implementation of the programme. Private healthcare facilities not reporting malaria cases to block.
Recommendations: Reorientation training program on malaria for all the doctors and health workers. RDK usage in the field areas by the ANM has to be promoted. Laboratory services are to be revamped to increase the timeliness of blood slide examination.

Key words: ABER, Cluster sampling, Malaria Surveillance, Programme Evaluation, RDK

Introduction

Malaria is endemic in 109 countries worldwide. 3 billion people were at risk of infection in malarious countries and territories and around 250 million cases occur annually, leading to approximately 1 million deaths. In 2004, *Plasmodium falciparum(Pf)* was among the leading causes of death worldwide from a single infectious agent[1]. In 2007, India reported a total 14,76,562 cases of malaria and 1,173 malarial deaths[1,2].

National Anti-Malaria Programme' (NAMP) of the Indian 'National Vector Borne Disease Control Programme' (NVBDCP) aims to (1) ensure community access to early diagnosis and prompt treatment, (2) conduct selective vector control, (3) promote community use of bed nets (especially insecticide treated), and (4) build capacity for community participation in prevention and control through capacity building with a network of community health services[2].

In West Bengal total number of confirmed malaria cases was 89,443 and out of these 24,453 were falciparum malaria cases in the year 2009. The Annual blood examination rate was 5.4% of the population and 104 deaths were due to malaria[3]. During 2009, Hooghly reported 187 cases of malaria and out of them 28 cases were due to *Plasmodium falciparum*. In the year 2009 API was 0.04 and 14.97% cases were of Pf[3].

In the 'National Anti- Malaria Programme', the minimum prescribed ABER (Annual Blood Examination Rate) is 10 percent of the population in a year. ABER is an index of operational efficiency. The annual parasite incidence (API) depends upon the annual blood collection and examination rates. So, a sufficient number of blood slides must be systematically obtained and examined to work out accurately API[4].

Hooghly district had ABER in the range of 3.9 (2005) to 6.4(2010) in the last 5 years. So, it is always less than the NAMP target of 10 percent[3]. Even though NAMP is functioning in Hooghly district for quite a long time, the annual blood examination rate (ABER) of the district was much below the recommended target of 10% over the last 5 years and the malaria cases are consistently occurring.

Objectives
Present study was conducted with the following objectives,
1. To describe the performances of different components of 'Early diagnosis and treatment' arm in terms of input, process and output and outcome.
2. To identify the achievements and gaps in the 'Early diagnosis and treatment' arm of the programme.

Material and Methods
Study population: Hooghly district has a population of 55, 47,635. Hooghly district has one district hospital,

three sub-divisional hospitals, one state general hospital, 17 block primary health centers and 61 primary health centers. Each block primary health center (BPHC) has about four primary health centers and each primary health center has six sub-centers under their control. On an average each BPHC caters nearly 200,000 populations. Each BPHC has four medical officers, one laboratory technician, one block sanitary inspector, one block primary health nurse and/or one public health nurse, four health assistants (male) and (female) each. Each PHC has one medical officer, one male and one female health supervisor and four each health assistants (male and female). Each Sub-center has one male and one female health assistant.

Sampling and sample size: The block with the highest endemicity of malaria was selected based on API. In a block there were nearly 140 villages. One village was considered as a cluster. By adopting the right size software calculated sample size was of 190 households and 19 clusters, (Estimated proportion of bed net availability 50%, Confidence coefficient-95%, and Confidence interval 10%, Rate of homogeneity 1and design effect as 1.90).

It was assumed that the proportion of bed net availability in the community is 50%, and precision about that assumption as 10%. The confidence interval was 95% assuming a rate of homogeneity of 0.1.

In the selected villages the first house was chosen by throwing a pen and subsequent houses was chosen on the basis of the main door of the house located nearest to the main door of the previous house. One household member aged above 20 years was the respondent of the house.

All the PHCs and BPHCs were included for facility survey and personnel interview within those 19 clusters. The records of BPHC were reviewed and all medical officers, laboratory technicians and health workers belonging to BPHCs, PHCs and sub centers were interviewed.

Data collection and survey: The records and reporting formats from the CMOH, Deputy CMOH-II, BMOH, and ACMOH were reviewed by using the data abstraction form to extract the data required to evaluate the indicators of three arms of the programme in terms of input, process, output, outcome and impact. Medical officers and health workers were interviewed at different levels using a questionnaire for collecting the data to assess treatment modality and vector control as per guideline. The population survey was done by using a questionnaire to assess the awareness regarding malaria and of pattern of usage of personal protective measures such as bed net

Data analysis Data was entered and analyzed by using Epi Info. The input, process, output and outcome indicators were calculated. The point estimate and 95%

confidence interval was calculated from the community based survey.

Results
Input: Out of the sanctioned posts for medical officers (MOs) in Pandua Block 100% (15/15) posts were occupied and of them only 66.6% (10/15) were trained in malaria. There was one Block sanitary inspectors 100% (1/1), 51Health assistant female100% (51/51), 8Health assistant male 15.7% (8/51) and 4 laboratory technicians 100% (4/4) were in position. Block sanitary inspector (1/1), Health assistant female 60% (30/50), Health assistant male 62.5% (5/8) and laboratory technicians 0% (0/4) were trained in malaria. There were 100% functional microscopes and adequate slides and stains. All the 6 surveyed PHC's and one BPHC had adequate anti-malarial drug stock. All the FTDs (3/3) were in position and were functional. One malaria clinic were in position and functional. One Block Public Health nurse(1/1), one public health nurse(1/1), 12 health supervisor female 100% (12/12) were in position and trained (Table 1).

No of laboratory technicians were 4 out of 4(100%). None of them underwent any in-service training because they have never been called for the same. None of them are facing difficulty in reporting formats. Due to time constraints and heavy work load blood slides are not examined in the same day. All of them reported that the qualities of the slides received from ANM are very poor. Apart from Malaria they also do HIV test, sputum for AFB, routine blood, urine and stool examination etc.

Process: Proportion of fever cases detected against total fever cases were 88% (27145/30812*100). Number of health facilities conducted mass surveys against total visited was 43% (22/51*100), proportion of health assistant female having correct knowledge of anti-malarial treatment against total interviewed was 58.8% (30/51*100). Number of blood smears examined was 100% (27145/27145) against received, proportion of positive blood smears cross checked against total was 21.8% (10/46*100) and proportion of negative blood slides cross checked against total was 5% (1355/27099*100). Overall annual blood examination rate (ABER) was 8.8% (27145/308118*100). Slide positivity rate (SPR) was 0.17% (46/27145*100) and slide falciparum rate (SFR) was 0.03% (8/27145*100) (Table 2).

Output: The proportion of fever cases treated against total was 88% (27145/30812*100) and 100% (46) of positive malaria cases got radical treatment. Among the 46 positive cases 8 cases were due to plasmodium falciparum (Table 3).

Outcome: Overall API of Pandua block for the year 2010 was 0.149/1000{(46/308118)*1000}, ABER 8.8/100(27145/308118*100) and the PF % 17.39 (8/46*100). CFR was 0, slide positivity rate 0.17% (46/27145*100), slide falciparum rate was 0.03%

(8/27145*100) and annual falciparum incidence was 0.025 per 1000 (8/308118*1000) (Table 3).

Table 1: Input indicators for early case detection and prompt treatment of Malaria under NAMP in Hooghly district of West Bengal - India 2010

Input indicators	Definition	n/N	%
Proportion of MOs present	No. of MOs present against sanctioned	15/15	100
Proportion of MOs trained	No of MOs trained against total	10/15	66
proportion of sanitary inspectors present	No of sanitary inspectors present against sanctioned	1/1	100
Proportion of sanitary inspectors trained	No of sanitary inspectors trained against total	1/1	100
Proportion of HW's present	No of HW's present against sanctioned	52/52	100
Proportion of HW's trained	No of HW's trained against total	31/52	60
Proportion of lab. techs present	No of lab. techs present against sanctioned	4/5	80
Proportion of lab. techs trained	No of lab. techs trained against sanctioned	0/5	0
Proportion of health centers having trained lab. Techs	No of health centers with trained lab. Techs against total	2/7	28
Proportion of functional microscopes present	No of functional microscopes against sanctioned	3/3	100
Proportion of health centers having functional microscopes	No of health centers with functional microscopes against total	3/7	42
Proportion of health centers having adequate slides & stains	No of health centers having adequate slide & stains against total surveyed	3/7	42
Proportion of health facilities having adequate anti-malarial stock	No of health facilities with adequate anti-malarial stock against total	3/7	43

Table 2: Process indicators for early case detection and prompt treatment of Malaria under NAMP in Hooghly district of West Bengal - India 2010

Process indicators	Definition	n/N	%
Proportion of fever cases detected	No of fever cases detected against total	27145/30812	88.10
Proportion of health facilities conducting mass surveys	No of health facilities conducted mass surveys against total	23/51	45
proportion of health personnel having correct knowledge of anti-malaria treatment	No of health personnel having correct knowledge of anti-malarial treatment against total interviewed	41/66	62
Proportion of blood smears examined	Number of blood smears examined against received	27145/27145	100
Proportion of malaria cases identified	No of malaria cases identified against total fever cases	46/30812*100	0.15
SPR(Slide positivity rate)	(Total No. of blood smears found positive for malaria Parasite ÷ Total No. of blood smears examined) X100	46/27145*100	0.17
SFR(Slide falciparum rate)	(Total No. of blood smears found Positive for *P.falciparum* ÷ Total No. of blood smears examined) X 100	8/27145*100	0.03
ABER(Annual blood examination rate)	{(Number of blood smears examined in a year) ÷ Total Population} X 100	27145/308118 *100	8.81

Tables. 3: Output and Outcome indicators for early case detection and prompt treatment of Malaria under NAMP in Hooghly district of West Bengal - India 2010

Output indicators	Definition	n/N	%
Proportion of fever cases treated	No of fever cases treated against total no of fever cases	27145/30812	88
Proportion of positive malaria cases treated	No of positive malaria cases treated against total no of positive malaria cases	46/46	100
API	Total no. of blood smears positive for malaria Parasite in a year ÷ Total Population X 1000	(46/308118)*1000	0.15 per 1000
PF%	Total no. of blood smears positive for Pf malaria parasite ÷Total no. of positive blood smears X 100	(8/46)*100	17.39
ABER	Total no. of blood smears examined ÷ Total Population X 100	(27145/308118)*100	8.8
CFR	Total no. of deaths due to malaria ÷ Total malaria cases X 100	0/46	0
SPR	Total no. of blood smears found positive for malaria Parasite ÷ Total no. of blood smears examined) X100	(46/27145)*100	0.17
SFR	Total no. of blood smears found positive for falciparum malaria Parasite ÷ Total no. of blood smears examined) X100	(8/27145)*100	0.03

Discussion

During evaluation it was found that there was inadequate manpower for the implementation of the programme. There was no ASHA in the block and only 15.6% male health assistants were available. All the Health assistants (female) were available but only 60% of them were trained. Eighty percent of the sub-centers did not have adequate manpower as per norm. Regarding medical officers 100% sanctioned posts were filled up but only 66% of the medical officers were trained in malaria.

As only 60% of Health assistants were trained, so a substantial number of staffs have limited knowledge of the case definition, diagnosis and treatment of malaria as per norm.

The target of annual blood examination rate (ABER) should be more than 10% as per the program. ABER during the year 2010 is only 8.8% in the block though the ABER has increased almost doubly from 4.77 in 2009 to 8.8 in 2010. To get accurate API, ABER has to be increased to minimum 10%. So, case detection rate has to be increased in all the health centers.

API of Pandua block has an API (0.15 per 1000) which is more than twice the API of Hooghly district (0.07) in the year 2010. It indicates that the endemicity is high in Pandua block in comparison to rest of the district. Due to high transmission Pandua has the highest number of case (46 cases-38 *P. vivax* and 8 *P.falciparum)* in the district.

There is a rise in API in Pandua block, which indicates that the active case detection should be strengthened. The predominant species is *Plasmodium vivax* which is completely curable.

More than eighty percent of ANM cannot identify high risk areas. About half of the ANM do not maintain any record regarding death due to malaria. About 94% of the ANM do not maintain record for API, ABER and PF%. Forty four percent of ANM has no idea about chloroquine resistant malaria. About 64% of the ANM s has apprehension in blood slide collection.

Medical officers do not pay monthly visit in three fourth of the sub centers and 52% of the sub centers reported that they do not get any support or cooperation from medical officers.

All private healthcare facilities are not reporting malaria cases to the block. This leads to underestimation of the disease burden. So, they should be identified and involved in the programme.

Recommendations

1. In order to effectively prevent and control malaria in rural areas of Hooghly district, we recommend a reorientation training program on malaria for all the doctors and health workers so that they remain updated with the early case detection and the new treatment modalities.
2. RDK usage in the field areas by the ANM has to be promoted.

3. Laboratory services are to be revamped to increase the timeliness of blood slide examination.
4. Monitoring and supervision of malaria activities should also be strengthened at all the levels.
5. IEC activities should be strengthened in target areas where there is poor knowledge regarding signs and symptoms of malaria and malaria control activities.

Conflict of Interest: None

Source of Support: Nil

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