Research Article

Study of diagnostic methods used in admitted malaria cases at tertiary care centre

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ABSTRACT

Background: Malaria is one of the most important vector borne diseases causing significant morbidity and mortality. With change in epidemiology, genetic perturbations and vector characteristic along with *P. Falciparum*, *P. Vivax* cases also presents with complicated malaria leading to increased mortality. The objective was to study diagnostic methods used in admitted malaria cases at tertiary care centre.

Methods: Retrospective record based descriptive study. The data was collected from the bed tickets in the record room of SCBMC, Cuttack, over 3 calendar years i.e. 2010, 2011 and 2012, using predesigned and pretested formats. The data thus collected were analysed using statistical software.

Results: Out of total 8282 cases, in 5565 (67.2%) cases malaria test was done. In 294 (3.5%) cases test was done and in 2423 (29%) data was not available. Out of 5565 cases, in 3775 cases the test result was negative (67.84%). From the rest in 980 cases it was *Plasmodium falciparum* positive (17.61 %), in 163 cases it was *Plasmodium vivax* positive (2.93%), in 598 cases it was mixed positive (10.75 %) and in 49 tickets the details of the plasmodium species was not mentioned even though it was mentioned as MP positive. ICT was the commonest used modality of testing being used in 5375 out of 5565 cases (96.5%).

Conclusions: Majority were positive for falciparum, followed by mixed for both Pf and Pv and remaining were positive only for *P vivax*. Antigen tests (such as ICT/RDK) were the main modalities of lab confirmation of parasite rather than the gold standard of slide test.

Keywords: Malaria, Tertiary care center, Mortality

INTRODUCTION

Malaria is one of the major public health problems of the country. It is a protozoal disease infection with parasites of the genus *Plasmodium* and transmitted to man by certain species of infected female anopheline mosquito.¹ *Plasmodium vivax* is the most widely distributed human malaria parasite with an at risk population of 2.5 billion persons. According to the World Malaria Report 2012, globally an estimated 3.3 billion people were at risk of

malaria in 2011, with populations living in sub-Saharan Africa having the highest risk of acquiring malaria: approximately 80% of cases and 90% of deaths are estimated to occur in the WHO African Region, with children under five years of age and pregnant women most severely affected.²

According to official data of NVBDCP, about 95% population in the country resides in malaria endemic areas and 80% of malaria reported in the country is confined to areas consisting 20% of population residing

in tribal, hilly, difficult and inaccessible areas. There are two types of parasites of human malaria, *Plasmodium vivax* (Pv), *P. falciparum* (Pf), which are commonly reported from India.³ There are six primary vectors of malaria in India: *An. culicifacies*, *An. stephensi*, *An. fluviatilis*, *An. minimus*, *An. dirus* and *An. epiroticus*.⁴ On this background an attempt has been made to undertake three year retrospective record based analysis of malaria cases admitted to S.C.B. Medical College, Cuttack.

METHODS

The present study was record based retrospective & descriptive study. The study was conducted at Medical record section of S. C. B. Medical College & Hospital, Cuttack. In this study an attempt has been made to review the bed head tickets of those patients admitted to Medicine and Paediatrics department during the period between 1st January 2010 and 31st December 2012. Duration of study was 12 months (1st October 2013 to 30th September 2014). The sampling process was a total enumeration sampling i.e. all bed tickets filed in the central record room and available on retrieval as well and pertaining to reference period of the study. All death tickets in the reference period were screened.

All the bed head tickets of indoor patients admitted to Medicine and Paediatrics department during the same period will be screened & those cases found to be positive for malaria will be considered for the present study. Where no final diagnosis was clearly mentioned, the provisional and final diagnosis was assumed as same. The bed tickets with the diagnosis clinical malaria thoroughly be studied, reviewed & necessary data & information collected in predesigned schedule. The schedule was designed to collect necessary & relevant information from the bed head tickets of malaria patients as per study objectives. The results were analysed using MS Excel v2007 and SPSS v11 software.

The limitation of study was sample drawn was based on availability of medical records for the Departments of Medicine and Paediatrics in the Central Records Room at SCB Medical College. Due to lack of systematic filing of Medical records all IPD records were not available.

RESULTS

Table 1 shows that the bed tickets have been the sole source of information for all the data (secondary) collected and conclusions derived in this study. The analysis of all the 8282 tickets showed that in only 5565 (67.2%) tickets there were details of the malaria test done. Of the rest in 294 tickets (3.5 %) the malaria test could not be done during the inpatient stay of the patient. In the rest 2423 (29%) tickets regarding the malaria tests done data was not available. Out of 8282 malaria cases, there was mortality in 2028 cases (24.5%).

Table 1: Malaria tests.

Malaria test	Fatal outcome	Non-fatal outcome	Total
Done	930	4635	5565
Not done	294	0	294
Data not available	804	1619	2423
Total	2028	6254	8282

It is pertinent to note that at SCBMCH, Cuttack, during the treatment of the patient, it is a standard practice to hand over investigation reports to the patient attendants, which has led to the loss of information from the bed tickets.

Table 2: Malaria test status.

Test result	Fatal outcome	Non-fatal outcome	Total (%)
Negative	665	3110	3775 (67.84)
Positive Pf	150	830	980 (17.61)
Positive Pv	19	144	163 (2.93)
Positive mixed	80	518	598 (10.75)
Positive no details	16	33	49 (0.87)
Total	930	4635	5565 (100%)
Data not available	1098	1619	2717
Grand total	2028	6254	8282

Table 2 shows that out of the 5565 tickets, in which the malaria test results were recorded (irrespective of the place and time where the tests were done) in 3775 tickets the test result was negative (67.84%). From the rest in 980 cases it was *Plasmodium falciparum* positive (17.61 %), in 163 cases it was *Plasmodium vivax* positive (2.93 %), in 598 cases it was mixed positive (10.75%) and in 49 tickets the details of the plasmodium species was not mentioned even though it was mentioned as MP positive, hence it was categorized as positive with no details.

An interesting observation is the fact that among the cases that met with fatal outcome, in 930 tickets the details of the malaria test was found. Of these, in 665 (71.5 %), the test result was negative, whereas in the rest 150 (16.1%) it was Pf positive, in 19 (2%) it was Pv positive, in 80 (8.6%) it was mixed positive and in the rest 16 (1.7%) it was positive with no details.

The analysis of Table 3 shows that mainly three different types of tests were used, either in single or in combination, i.e. ICT (RDK) or slide or QBC to confirm clinical malaria.

Table 3: Modality of tests.

Test type	Result	Fatal outcome	Non-fatal outcome	Total
ICT	Negative	623	3056	3679
	Pf Positive	127	786	913
	Pv Positive	13	134	147
	Mixed Positive	78	515	593
	Positive No Details	12	28	40
	Total	853	4522	5375
Slide	Negative	236	190	426
	Pf Positive	15	39	54
	Pv Positive	3	4	7
	Mixed Positive	5	4	9
	Positive No Details	1	1	2
	Total	260	238	498
QBC	Negative	19	41	60
	Pf Positive	24	24	48
	Pv Positive	4	8	12
	Mixed Positive	2	3	5
	Positive No Details	1	3	4
	Total	50	79	129

ICT or RDK was the commonest used modality of testing being used in 5375 out of 5565 cases (96.5%) for which data on malaria test was available, either single or in combination. It was the dominant testing method used by clinicians both for the cases with fatal outcome as well as non-fatal cases. In 498 out of 5565 cases (8.9%) slide was the modality of testing either in single or in combination with other tests. QBC was the least preferred option and was used only in 129 out of 5565 cases (2.3%) of cases.

DISCUSSION

The analysis of all the 8282 tickets showed that in only 5565 (67.2%) tickets there were details of the malaria test done. Of the rest in 294 tickets (3.5%) the malaria test could not be done during the inpatient stay of the patient. In the rest 2423 (29%) tickets regarding the malaria tests done data was not available.

However even though the number of patients in whom the malaria test could not be done is only 3.5% still it is interesting to note that in each of these bed tickets the treating physician has written that malaria test could not be done and all the patients met with a fatal outcome. It is certainly desirable for a tertiary care institution like SCBMCH, Cuttack, to be able to provide basic diagnostic

facilities to malaria patients at all times and to all patients.

Out of the 5565 tickets, in which the malaria test results were recorded (irrespective of the place and time where the tests were done) in 3775 tickets the test result was negative (67.84%). From the rest in 980 cases it was *Plasmodium falciparum* positive (17.61%), in 163 cases it was *Plasmodium vivax* positive (2.93%), in 598 cases it was mixed positive (10.75%). So that in this study from the lab confirmed cases majority were positive for falciparum, followed by mixed for both Pf and Pv and remaining were positive only for *P. vivax*. At South Canara district of Karnataka Madhu Muddaih et al found that *P. vivax* was the major parasite species (52.54%), followed by *P. falciparum* (33.75%) and mixed infections (13.69%).⁵ This is opposite to present study.

Dhangadamajhi G et al at central coast India (Odisha) showed that malaria prevalence including single infections by *P. falciparum* (26.5%), *P. vivax* (3.3%), *P. malariae* (4.5%), and (9.1%) of all the mixed infection.⁶ Similarly, by Emiliana Tjitra et al at Papua, Indonesia showed that among patients admitted with slide-confirmed malaria, 64% of patients had Pf, 24% Pv, and 10.5% mixed infections.⁷ In both these studies the *P. Falciparum* infection is more common than other infections as in our study.

ICT or RDK was the commonest used modality of testing being used in 5375 out of 5565 cases (96.5%) for which data on malaria test was available, either single or in combination. In 498 out of 5565 cases (8.9%) slide was the modality of testing either in single or in combination with other tests. QBC was the least preferred option and was used only in 129 out of 5565 cases (2.3%). M. A. Beg et al at a tertiary care hospital in Karachi, Pakistan found that thin blood smear was the most common method employed in diagnosing both *P. vivax* and *P. falciparum* species (89%).⁸ QBC was the modality of test in 25.6% in cases while ICT was the least preferred option for diagnosis of malaria cases (1.2%) which is opposite to present study as ICT was the most preferred modality of test. Dhangadamaji G et al at Odisha showed that malaria prevalence was 81.4% and 43.4% by PCR and microscopy respectively.⁶

At Ahmedabad Vyas Sheetal et al showed that all fatal malaria cases (100%) were subjected to blood smear examination.⁹ Rapid Diagnostic Test was performed in 6 out of 32 (19%) cases. While the trend of dominant use of ICTs/ RDKs is a major programmatic success in terms of NVBDCP policy, yet, slide being the gold standard of diagnostic modality, in a tertiary care centre like SCBMCH, with highly experienced pathology and microbiology staff, the use of slides for confirming a case of clinical malaria should be the dominant testing modality. According to World Health Malaria report, Light microscopy (LM), the mainstay of malaria

diagnosis in epidemiologic studies, exhibits limited sensitivity for detecting low level infections.¹⁰

CONCLUSION

From the lab confirmed cases majority were positive for falciparum, followed by mixed for both Pf and Pv and remaining were positive only for P vivax. No other form of malaria parasite like Plasmodium ovale or Plasmodium malariae was noted in this study. Antigen tests (such as ICT/RDK) were the main modalities of lab confirmation of parasite rather than the gold standard of slide test. This could be due to non-availability of blood smear examination facilities in 24X7 manners at all the treating units even at a tertiary level health care institution. Lab confirmation should be done at a tertiary level health institute. Setting up of 24X7 functional labs at the IPD level should be done so that necessary lab investigations can be carried out immediately after admission of a case. A proper system of record keeping is necessary especially at a tertiary level health institute.

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