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Neurological Manifestations in Falciparum Malaria: A Study in Tribal Community of Hill Tracts

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Abstract

The aim of this study is to find out the prevalence and outcome of falciparum malaria with neurological manifestations. A prospective cross-sectional hospital-based study of 318 falciparum malaria patients using simple, direct, standardized questionnaire with history, lab investigations and neurological examination from January 2014 to December 2014. July was the most vulnerable month for falciparum malaria causing the highest hospital admission (48.8%) and death (29.3%). The commonest age group affected was 15- 30 years (49.2%). Prevalence of neurological manifestations was 41.2%. Altered sensorium (48.7%) was the most frequent neurological manifestation, followed by abnormal behavior (19.8%) and convulsions (15.5%). Case fatality rate was very high with neurological manifestations, highest with altered sensorium (31.3%). Perception of neurological manifestations among tribal was very poor. Primary health care providers also failed to diagnose most of the cases (69%) which presented with neurological features. Falciperum malaria with neurological involvement is associated with increased mortality. By documenting different neurological patterns of falciparum malaria and by trained health care personnel, mortality and morbidity rates can be reduced by early diagnosis and management.

CBMJ 2015 January: Vol. 04 No. 01 P: 57-61

Key words: Falciparum malaria, Neurological complications, Mortality.

Introduction

Malaria is not only common in malaria-endemic areas; the disease is seen increasingly in Western countries as a result of people emigrating or traveling from such areas. The Plasmodium falciparum parasite is responsible for almost all the neurological complications associated with malaria. In 2002, an estimated 2.2 billion individuals were exposed to P. falciparum in malaria endemic areas, with 515 million clinical episodes and over 1 million deaths⁴. Over 70% of these infections occurred in children living in sub-Saharan Africa, although P. falciparum can infect humans at any age³. The neurological

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manifestations of malaria include seizures, psychosis, agitation, impaired consciousness and coma; the latter two features are the hallmarks of cerebral malaria. In malaria-endemic areas, neurological features are found in nearly half of children admitted to hospital with falciparum malaria^{2, 6}. In areas where individuals develop severe disease, the proportions of patients who develop cerebral malaria are similar between children and adults. Cerebral malaria occurs in 2.4% of travelers with falciparum malaria, and has been well described². Cerebral malaria is a rapidly evolving neurologic disease. It carries a fatality rate of more than 20% even in urban hospital settings where aggressive medical care is available¹⁰. However, the other neurological complications of falciparum malaria have received relatively little attention.

With neurological complications falciparum malaria causes more mortality and increases burden to society. In developing countries there are not enough qualified healthcare personnel to detect the neurological complications in early stage of disease. With history, investigations and examination the neurological complications can be detected in the early stage. The aim of this study is to find out the pattern of neurological manifestations of falciparum malaria to make early diagnosis of this fatal complication.

Methods

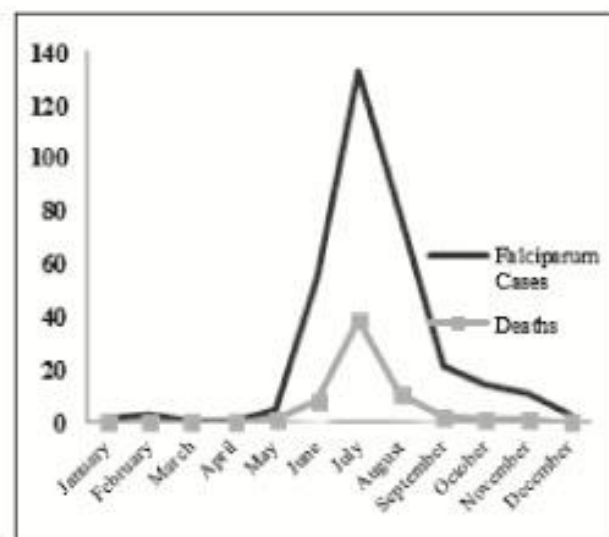
This is a descriptive prospective hospital based cross sectional study done for one year (January 2014 to December 2014) in Rangamati Sadar Hospital among tribal. All patients or their relatives gave their consent to participate in the study. A full detailed history and proper systemic and neurological examination was performed by the authors. The physical symptoms signs were grouped into general, systemic, and neurological. The diagnosis was confirmed with microscopic blood film examination (both thick and thin film) and rapid diagnostic test (RDT). Routine necessary lab tests were done to exclude other alternate diagnosis. Only Plasmodium falciparum cases were included in our study. Plasmodium vivax, ovale, malaria was very few in number and was excluded from the study. Impaired consciousness was diagnosed

if patients had inappropriate or incomprehensible verbal responses and did not respond to verbal commands. Assessment of the patient was delayed for 6 hr after a grand mal seizure to exclude postictal coma. History and examination were recorded on standard forms on admission. Patients were treated with a loading dose of 20mg/kg quinine dihydrochloride infused intravenously over a 4 hr period followed by 10mg/kg over 4hr every eight hrs until oral quinine could be tolerated. Quinine was continued for seven to ten days. Neurological complications were searched thoroughly before and after treatment by central and peripheral nervous system examination. Data collected, tabulated and statistical analysis was performed using software SPSS-16.

Results

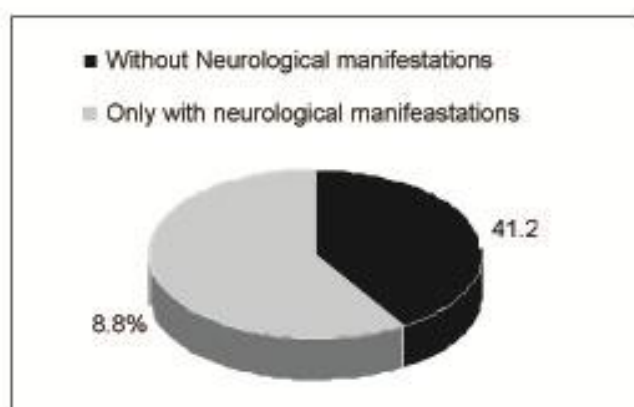
Total 318 patients of falciparum malaria admitted during the one year period with total death of 63 patients (19.8%). Diagnosis was confirmed by blood film examination and RDT test. Highest admission rate was during the month of July (n=133, 41.8%) with highest death rate (n=39, 29.3%) in the same month. The incidence of the cases started to increase from the month of June (n=54) with highest number of cases admitted in the month of July. (Figure-1)

Figure-1: Number of admission and death in falciparum malaria by month.



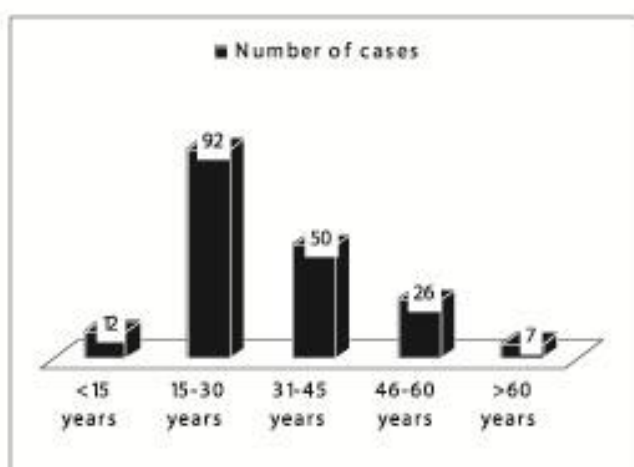
Our study revealed that of the total 318 case 187 cases presented with neurological manifestations on admission giving the prevalence of neurological manifestations in falciparum malaria 58.8%. (Figure-2)

Figure-2: Number of cases of falciparum malaria with neurological manifestation.



We also found the commonest age group admitted with neurological manifestation were 15-30 years (n=92, 49.2%). Extreme age groups <15 years (31%) and >60 years (11%) had less neurological findings. (Figure-3)

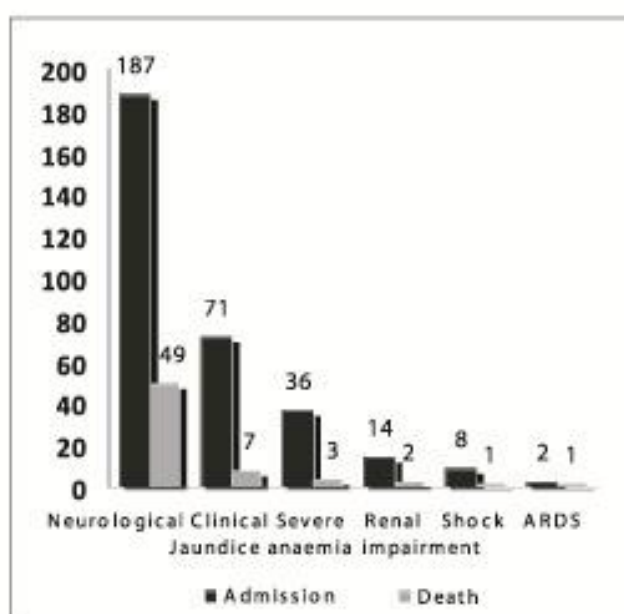
Figure-3: Age group effected with neurological manifestations.



Six different forms of initial presentation on admission were found in 318 falciparum malaria patients. Neurological manifestations was the commonest form (n=187, 58.8%). 71 cases presented with jaundice (22.3%) which was alarming for changing trend. Other less common forms were severe anemia (11.3%),

renal impairment (4.4%), shock (2.5%) and ARDS (0.6%). Number of death (n=49, 26.2%) was very high in patients with neurological complications. In comparison, patients with non neurological manifestations had less mortality (n=14, 4.4%). (Figure-4)

Figure-4: Initial presentation at admission of falciparum malaria.



Of the total 187 patients with neurological manifestations which altered sensorium or coma (n=91, 48.7%) was the commonest form of neurological presentation. 37 (19.8%) presented with altered behavior. 29 patients (15.5%) had convulsion before or after admission. Others presented with delirium, headache, involuntary movements, dysarthria, hemiparesis and neck stiffness. Only 1 Patient presented with hiccuph. (Figure-5)

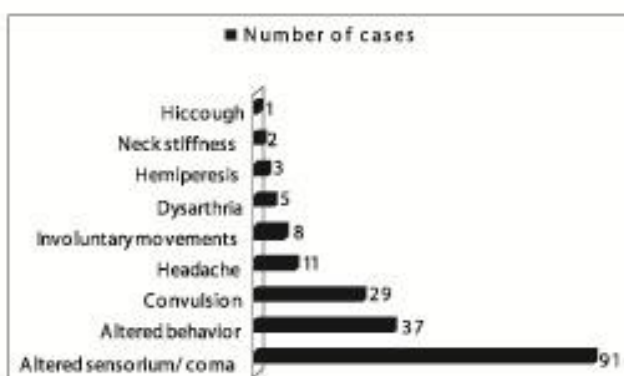


Figure-5: Neurological manifestations in falciparum malaria.

The death rate in cases presented with neurological manifestations was high. Case fatality rate was highest in patients admitted with altered sensorium or coma. Altered behavior (27%), convulsion (24.1%), headache (18.1%), involuntary movements (12.5%) also had high mortality rate. No death recorded in patients presenting with dysarthria, hemiparesis, neck stiffness and hiccough. (Table-1)

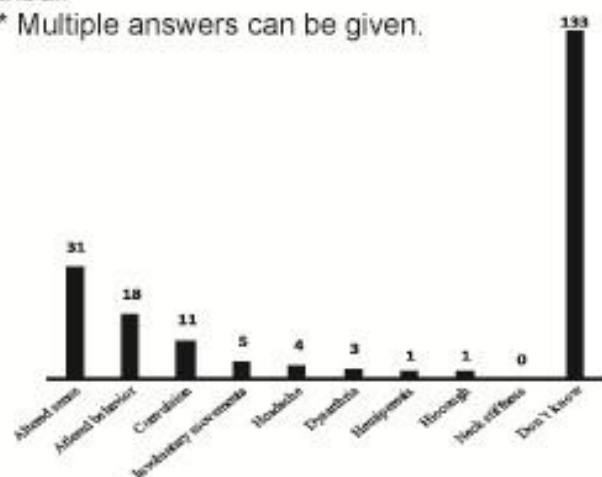
Table-1: Case fatality rate in falciparum malaria with neurological manifestation.

Neurological manifestations:	Cases	Death	Case fatality rate: %
Altered sensorium/ Coma	91	29	31.9
Altered behavior	37	10	27
Convulsion	29	7	24.1
Headache	11	2	18.1
Involuntary movements	8	1	12.5
Dysarthria	5	0	0
Hemiparesis	3	0	0
Neck stiffness	2	0	0
Hiccough	1	0	0

To find out the cause of delayed admission to the hospital, we investigated about the perception of neurological manifestations of falciparum malaria among tribal. Most of them (n=133, 71.1%) had a no idea about neurological manifestations. Only 31 patients or his relative (16.6%) answered 'altered sensorium' which was the highest. (Figure- 6)

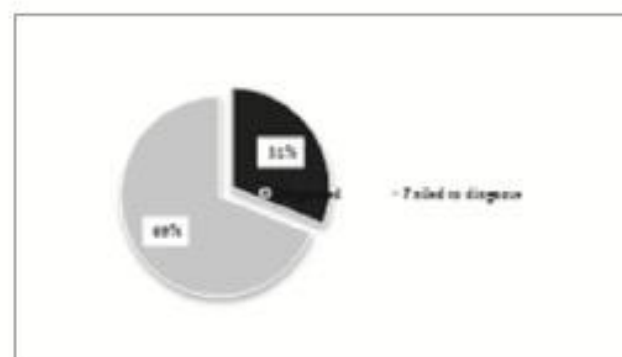
Figure-6: Perception about Neurological manifestations of falciparum malaria among tribal.

* Multiple answers can be given.



Our study also reveals the poor diagnostic approach and skill by the primary health care personnel. Only 58 cases (31%) diagnosed correctly when initially presented to them with neurological manifestations. 69% (n=129) failed to diagnose and treated initially with antibiotics or referred to sadar hospital diagnosing as meningitis, stroke or conversion disorder. (Figure-7)

Figure-7: Diagnosed by primary health care personnel at first visit with neurological findings.



Discussion

Neurological manifestations are commonly found among patients with falciparum malaria and the relative frequency of neurological manifestations in patients with falciparum malaria in this study is found to be 58.8%. This can be adopted as a measure of prevalence of neurological manifestations among patients with falciparum malaria in this geographic area. Significant proportion of patients with falciparum malaria presented with one or more neurological manifestations. Taking all the overlapping features together, neurological manifestations in decreasing order were altered sensorium other than altered behavior, convulsions, headache, involuntary movements, dysarthria, hemiparesis, neck stiffness and hiccough. Similar manifestations were seen in other studies^{5, 6, 10}. According to WHO (2000), neck rigidity does not occur in patients of cerebral malaria⁴, whereas it was observed in 2

patients at the time of admission in our study. It was also observed in some patients in the Mishra's study conducted in India (2004)⁸. Only one patient had hiccup during the period of illness which is similar to Kenyan study⁵. Convulsion was found in 29 patients in our study which is almost similar to another study done in India².

There is a statistically significant difference in the mortality in the group of patients with neurological manifestations compared to those without neurological manifestations.

This indicates that patients who have neurological manifestations have unfavorable prognosis compared to those without neurological manifestations. According to a study done in India, 10% of all admissions and 80% of deaths are due to central nervous system involvement in falciparum Malaria². Our study had 26.2% death with neurological manifestations. Most of the death was due to delayed hospital admission which occurred for the poor perception or delayed diagnosis by the local health care personnel. Almost similar result showed in a study done in Pakistan¹².

Conclusion

Neurological involvement is associated with high mortality in falciparum malaria. By documenting different neurological patterns of falciparum malaria mortality rates can be reduced by early diagnosis and management. Awareness in tribal community should be increased and primary health care personnel should be trained properly to make them aware of the different neurological presentations of this fatal disease. Health care personnel should be trained to make the tribal aware of the neurological presentations of this fatal disease.

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