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Original Research Article

A STUDY OF INCIDENCE AND PROGNOSTIC SIGNIFICANCE OF RENAL IMPAIRMENT IN PATIENTS SUFFERING FROM MALARIA

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Abstract

Background: Malaria is probably one of the oldest diseases known to mankind that has had profound impact on our history. It continues to be a huge social, economic and health problem, particularly in the tropical countries. The aim and objective are incidence and severity of renal impairment in patients confirmed to be suffering from malaria and its prognostic significance. **Materials and Methods:** A descriptive study was carried out on 100 patients of malaria admitted in Department of Medicine, Darbhanga Medical College and Hospital, Darbhanga, a tertiary level hospital. The study period extended from January 2022 to August 2023. **Result:** Out of 100 cases diagnosed as malaria and admitted in Medical ward, emergency and ICU were included for this study 30 cases were diagnosed as having acute kidney injury as per RIFLE/AKIN criteria in cases of malaria and comprised of different age groups ranging from 15-75 years and both sexes with male: female ratio 3.0:1. **Conclusion:** It is therefore suggested that early diagnosis of falciparum malaria and prompt treatment may help in preventing many of the devastating complication of their disease including renal or multi organ dysfunction.

INTRODUCTION

Malaria is a protozoal disease transmitted by the bite of infected anopheles mosquitoes. It is the most important of the parasitic diseases of humans, with transmission in 107 countries containing 3 billion people and causing 1-3 million deaths each year. Malaria is a major cause of mortality and morbidity in the tropical and subtropical regions of world. Developed countries are relatively free of malaria, but it remains well entrenched across the tropical world.[1]

Major endemic areas of India account for 77 percent of the regional total. Major endemic areas in India are in the North–Eastern states, Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Bihar, Madhya Pradesh, Maharashtra, Rajasthan and Orissa.[2]

Five species of the genus Plasmodium cause nearly all malarial infections in humans. These are P. falciparum, P. vivax, P. ovale, P. malariae, and—in Southeast Asia—the monkey malaria parasite P. knowlesi, which can be reliably identified only by molecular methods. Almost all deaths are caused by falciparum malaria.

Symptoms of malaria include fever, shivering, arthralgia, vomiting, anemia, hemolysis and jaundice, hemoglobinuria, and convulsions. There may be a feeling of tingling in the skin, particularly with malaria caused by P. falciparum.

The classical symptom of malaria is cyclical occurrence of sudden coldness followed by rigor and then fever and sweating lasting four to six hours, occurring every two days in P. vivax and P. oval infections, while every three for P. malariae. P. falciparum can have recurrent fever every 36-48 hours or a less pronounced and almost continuous fever. Splenomegaly, severe headache, cerebral ischemia, hepatomegaly, hypoglycemia, and hemoglobinuria with renal failure may occur. Chronic malaria is seen in both P. vivax and P. ovale, but not in P. falciparum. Here, the disease can relapse months or years after exposure, due to the presence of latent parasites in the liver. Describing a case of malaria as cured by observing the disappearance of parasites from the bloodstream can therefore be deceptive. Severe malaria should be suspected in patient with confirmed malaria and who have severe manifestations, If the patients· with falciparum malaria have jaundice, vital organ complications should be looked for. Also hyperpyrexia is no longer considered a sign of severity. The diagnosis of malaria is essentially made from clinical features, and can be confirmed by demonstration of plasmodium by laboratory examination.[4]

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MATERIALS AND METHODS

A descriptive study was carried out on 100 patients of malaria admitted in Department of Medicine, Darbhanga Medical College and Hospital, Darbhanga, a tertiary level hospital. The study period extended from January 2022 to August 2023.Cases were selected with complaint of untreated fever of short duration and/or raised body temperature without any preexisting documented systemic illness. Definite diagnosis of malaria was finally with clinical features like fever-paroxysmal, remittent or intermittent, chills, anaemia, splenomegaly, hepatomegaly, headache, vomiting, drowsiness, altered behaviour, confusion, unarousable coma, etc, the following investigations were done in all cases of primary pool to establish the diagnosis of malaria and to rule out other systemic illness:

The above investigations were done at the time of admission in all cases, thereafter cases with renal impairment were advised to report again after 6 weeks. They were investigated for blood urea, and serum creatinine and serum electrolyte. The results were compared to those found in the first week of admission.

Statistica1 Ana1ysis: The data collection was entered in the Microsoft Excel computer program using SPSS version 16.0 Percentage were calculated for categorical variables. and checked for any indiscrepancy. The result was presented in proportion/percentages.

Ethical Consideration: Ethical clearance was taken from Institutional Ethical Committee of Darbhanga Medical college and Hospital, Darbhanga. The consent was taken from each patients included in the study.

RESULTS

Out of 100 cases 30 cases of renal impairment were chosen on the basis of Rifle/AKIN criteria for acute kidney injury. All the cases with renal impairment were followed up after 6 weeks with different renal parameters. The outcome of the study was tabulated statistically. Out of 100 cases studied 77 were male and 23 were female. The age of patient varied from 13-75 years. The maximum incidence of the disease was observed among patients in the age group from 21 years to 40 years in both sexes.

Out of 100 cases 62 were diagnosed by light microscopy in peripheral blood smears, 95 cases were diagnosed by immunochromatography [Optimal IT]. Out of these 100 patients 68 cases had Plasmodium falciparum infection, 27 had malaria from P.vivax and 5 patients had combined falciparum and vivax infection.

out of 30 cases of renal failure 25 cases (83.3%) were P.falciparum with mortality rate of 81.8%,2(6.6%) cases were P.vivax with no mortality and 3 cases (10%) were both falciparum and vivax positive with mortality rate of 18.18% [Tab1e 1].

Out of 100 cases, 30 cases showed serum creatinine>1.5 times baseline or creatinine rise >0.3 over 48 hours and/or urine output less than 0.5ml/kg/hr for 6 hours. [Table 2]

Out of 30 cases of ARF, 27 cases (90%) showed proteinuria, 19 cases (63.33%) showed casts, red blood cells in 16 (53.33%) and bile salt and bile pigment was seen 15 cases (50%). [Table 3]

Out of 30 cases of renal failure 24 cases (80%) were oliguric with mortality rate of 41.66% and 6 cases (20%) were non- oliguric with mortality rate of 16.67%.

Out of 30 cases of oliguric renal failure 17 cases were managed with hemodialysis. Dialysis was done in only 2 cases of non-oliguric renal failure. [Table 3]

Antimalarials were given in all the 30 cases of renal impairment, out of which 11 (36.6%) having mild renal impairment were managed conservatively with rehydration and or diuretics with mortality of 18.8% and fewer complication while 19 (63.3%) having moderate to severe renal impairment were managed with hemodialysis with mortality (47.36%) due to severe complication of malaria with multisystem involvement. Out of 11 cases that expired, 4 (36.3%) were severely anemic, 3 (27.2%) developed pulmonary edema/ARDS.7 case (63.3%) had hyperbilirubinemia, 5 cases (45.4%) had severe infection, 7 cases (63.3%) had cerebral malaria and 9 cases (81.8%) had hypoglycemia. More than one complication was seen in a patient at a time. [Table 4]

Table 1: Showing mortality in cases of renal failure due to different types of malarial parasite (n=30).

Plasmodium species	No	Percentage	Mortality	
			No	Percentage
P.falciparum	25	83.3	9	36
P.vivax	2	6.66	-	-
Combined	3	10	2	67

Table 2: Evidence of impaired renal function in cases of malaria (n=100)

Parameters	No	Percentage (%)
Serum creatinine>1.5 times baseline or creatinine rise >0.3 over 48 hours.	30	30
Decreased urine output less than 0.5ml/kg /hr for 6 hours	24	24

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Table 3: Routine examination of urine (with microscopic examination) in cases of renal impairment in malaria

Sl.no	Findings	No	Percentage
1	Proteinuria	27	90
2	Cast (hyaline and granular)	19	63.33
3	Red blood cells	16	53.33
4	Bile salt and bile pigment	15	50

Table 4: Dialysis in cases of renal failure (n= 30)

Type of renal failure	No. (n=30)	Dialysis	Percentage %
Oliguric	24	17	70.8
Non-oliguric	6	2	33.33

DISCUSSION

Acute kidney injury (AKI) is a serious complication of malaria mostly in falciparum malaria that carries a high mortality. Out of 100 cases, 62 were diagnosed by light microscopy in peripheral blood smears, 95 were diagnosed by immunochromatography (optimal) and 65 were diagnosed by Buffy coat examination.In these 68 cases had P. falciparum infection alone,27 had P. vivax infection and 5 cases have combined P. falciparum and P. vivax infection. Mahakur et.al. (1983,1992) also included combined cases in their study.77 % of total cases were male and 23% were female.[5] This male predominance is difficult to explain but is supported from other studies. The age of patients varied from 15-75 years. The maximum incidence of the disease was observed among patient in the age group from 21-40 years in both sexes. Prakash et al (1996) also reported maximum incidence of the disease in age range from 15-85 years.[6] Incidence was found higher in males probably because they are more exposed to outdoors. pulmonary edema. This is in agreement with findings of Kulkarni et al (2000), T. Shababet. al. (2003), Anil k Mohanty et al (2004). In the present study 48 cases presented with hepatomegaly and 86 cases with splenomegaly.[7,8] Mohanty et al (2004) found hepatomegaly in 72% cases and splenomegaly in 80% cases respectively. Newton et al (2003) found similar results. All the above findings showed that malaria along with renal involvement also had multisystem involvement in various ways and effects on prognosis of the disease. In our study 44 cases showed serum bilirubin >3mg/dl and 37 showed ALT > 100 U/L. Marsh et al (1995) found similar observation.[9] In our study among extra renal involvement and its outcome in total patients (n= 100), 22 % were severely anemic with Hb% <5 gm/dl out of which 4 cases died. 44 showed hepatic involvement with serum bilirubin >3 mg/dl out of which 7 died. 28 patients had cerebral malaria out of which 7(25%) died. 3% had developed pulmonary oedema/A.R.D.S. with 100% mortality. 29% were hypoglycaemic (blood sugar <40 gm/dl) at the time of admission out of which 31% died. Hyponatremia < 135 mEq/L) was present in 41% cases with 21.9% mortality and hyperkalemia (>5 mEq/L) in 22% out of which 5 (22.72%) died. Similar extra renal involvement was observed by different workers. Prakash Jet.al. (1996), Segasothy M (1994) and Trang TT et al (1992) has similar observation.[10] In our study renal impairment was detected on the basis of serum creatinine >1.5 times baseline or rise in serum creatinine >0.3mg/dl and/ or oliguria (<0.5ml/kg for 6 hours). Out of 100 cases 30 (30%) showed acute kidney injury on the basis of mentioned criteria. This finding corresponded well with the findings of other workers. Rath et.al.(1990) reported 38.4%, A. Sowunmi et.al.(1996) reported 45%, Sitprija et al (1970) reported 66.6% and Patis et al (2003) reported 51% incidence of renal failure due to falciparum malaria in their study.10 Mild proteinuria was reported in 28.6% by Sitprija et al. 1970, in 38.4% by Rath et.al. 1990, in 40% by Sowunmi et al 1996 and in 57.7% by Prakash et al. 1996respectively in their study.[9] Bile salts and bile pigments in the urine observed in the patients of ARF is highly suggestive of hyperbilirubinemia and intrahepatic cholesteasis as reported by Dash. S. C. et al (1994) and Segasothy M. et.al. (1994). Among patients with ARF mean creatinine was 5.42 mg/dl, mean serum sodium was 129.3 mEq/L and mean serum potassium was 4.52 mEq/L.In the study by Segasothy M et al (1994) the mean serum Na+ was slightly lower than normal range and serum K+ were within normal range though hyperkalemia was observed in 36% of cases which bore poor prognosis.[10] In our study out of 30 patients of renal failure, parasite count was found to be more than 100,000/µl in 23 patients out of which 13 patients survived.In our study out of 30 cases of renal failure 24 cases (80%) were oliguric with mortality of 41.6%. ARF in malaria is usually oliguric and hypercatabolic and oliguric phase lasts for a few days to several weeks. Non-oliguric cases were 6 (20%) with mortality of 16.6%. In this study we observed oliguric ARF in majority of our patients. Higher incidence of oliguric renal failure in falciparum malaria has been reported previously (Prakash J. et al 2003, Naqvi R. et al 2003 and Wilairatana P. et al 1999).[10]

Our results suggests that malaria complicated with ARF is associated with high morbidity and mortality, but early detection and timely therapeutic intervention with appropriate anti- malarial and renal replacement therapy in the form of hemodialysis can revert the renal function to normal.

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CONCLUSION

Overall mortality in this study was 36.6% among the cases of ARF. Oliguria, serum creatinine, dyselectrolytemia and multisystem involvement were risk factors for death in the study. The overall prognosis of non-oliguric renal failure was far better than oliguric renal failure. The patients who developed oliguric renal failure had bio-chemical parameters higher than non-oliguric renal failure patients. Patients with milder renal impairment not requiring dialysis had a better prognosis, it seems likely the patients who fared worse did so because of multisystem dysfunction and more severe renal impairment. It is therefore suggested that early diagnosis of falciparum malaria and prompt treatment may help in preventing many of the devastating complication of their disease including renal or multi organ dysfunction.

REFERENCES

1. Abdullah S, Weatherall DJ, Wickrama Singhe SN and Hughes M, The anaemia. of P. falciparummalaria. Br J Haemato2010; 46:171-183.
2. Ahmad SH, Danish T, Faridi MM, Ahmad AJ, Fakhir S, Khan AS. et. al. Renal function in acute malaria in children". J Trop Pediatr. 2019 Dec;35(6):291-294.
3. Mockenhaupt FP, Ehrhardt S, Burkhardt J, Bosomtwe SY, Laryea S, Anemana SD, Otchwemah RN, Cramer JP, Dietz E, Gellert S, Bienzle U. Manifestation and outcome of severe malaria in children in northern Ghana. American Journal of Tropical Medicine and Hygiene. 2014;71:167–172..
4. B.B. Thakur, Smita Thakur. Medicine Update volume - 11 2011, section VII, Chapter - 36: 241.
5. B.S. Das Renal failure in malaria J Vector Borne Dis 45, June 2018, pp. 83- 97.
6. Bag S, Sarnal GC, Deep N, Patra DC, Nayak M, Meher LK. Complicated falciparum malaria. Indian Paediatrics 2020; 31 : 821-825.
7. Barsoum R. Sitprija V, Tropical Nephrol. Disease of the Kidney, 6th ed. 2021,2221-2268.
8. Barsoum R. et.al. "Malarial nephropathies". Nephrol Dial Transplant 13:1588 -1597, 2022. 9. Beadle C et.al. "Diagnosis of malaria by detection of plasmodium falciparum HRP-2 antigen with rapid-dipstick antigen capture assay". Lancet, 343 ;564-8,2023.
9. A rapid dipstick antigen capture assay for the diagnosis of falciparum malaria. WHO Informal Consultation on Recent Advances in Diagnostic Techniques and Vaccines for Malaria. Bull World Health Organ. 1996;74(1):47-54. PMID: 8653815; PMCID: PMC2486846.
10. Berkley J, Mwarumba S, Bramharn K, Lowe B, Marsh K.et.al. Bacteraemia complicating severe malaria in children". Trans R Soc Trop Med Hyg 2024;93:283-286.

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