Cerebral malaria in adult Sudanese patients. *Clinical presentation and outcome*

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In endemic areas, adults are far less vulnerable to cerebral malaria (CM) than children because of acquisition of partial immunity. That is why we see less attention received by the adult sector in epidemiology and case studies of CM. However, among adults, CM is the most frequent and best-known manifestation of severe falciparum malaria. Reports state that adult CM accounts for approximately 10% of all cases of falciparum malaria admitted to hospital.[1]

To describe the clinical presentation of CM in adult Sudanese patients; we recruited consecutive adult patients presenting with CM to the medical emergency department of Khartoum Teaching Hospital, during the period from October 1998 to November 1999, in this prospective study. We reached the diagnosis of CM according to the World Health Organization definition.[1,2] We included 30 patients in the study. The mean age was 32.23 years ± 15.4 SD, 19 (63.3%) were males, and 11 (36.7%) were females. All patients lived in endemic areas and had experienced previous attacks of clinical malaria however; none gave a history of a recent attack within the last 3 months. Three patients gave a history of a previous episode of CM. Sixty percent of patients had taken or started antimalarial medication before presentation. All patients were comatose at presentation; most of them had some preceding symptoms starting 1-20 days (mean 6.7 ± 5.3 days) before lapsing into coma (**Table 1**). In hospital, all patients received intravenous quinine sulphate in 5% dextrose solution infusion, starting with a loading dose of 20 mg/kg given over 4 hours followed by a maintenance dose of 10 mg/kg 8 hourly for 7 days. The fever and other prodromal symptoms settled within 4 days and that was the first indication of a favorable response to treatment. We noted recovery from coma, on average, 4 days after initiation of therapy. Twenty-two patients (73.3%) completely recovered and 7 died. Mortality was exclusively within the first 48 hours. One patient developed post-malaria cerebellar ataxia.

In areas of seasonal malaria transmission like Sudan, we frequently see severe, and CM in adults.[3] In this study, we found the disease twice as common in males when compared to females, and that could be due to the presence of undetermined sex related host factors, less exposure to mosquitoes or cultural behavior such as the nightly prolonged stay in dense perfumed smoke sauna exclusively used by women. The predominant prodromal symptoms were fever, excessive sweating, severe headache, nausea, and vomiting initially making CM indistinguishable from any other form of uncomplicated malaria. We did not see the classical intermittent fever paroxysms, as these are not typical feature of *Plasmodium falciparum* infection, and probably also because of early intake of antimalarial drugs by patients before presentation.[1]

The neuropsychiatric manifestations, mostly as behavioral disturbances and epileptic convulsions occurred in just over half of the patients (53.3%), within 4 days from the start of the prodromal symptoms, and they usually preceded the loss of consciousness. When coma supervened, it tended to progress rapidly and reach its maximum depth within less than 24 hours. In more than half of the patients, the coma was deep with a modified Glasgow coma score (GCS) of ≤ 3. It is noteworthy that 6 of the 7 deaths, and the one who developed post-malaria cerebellar ataxia

Table 1 - Presenting clinical features in 30 adult patients with cerebral malaria.

Symptoms and signs	No.	(%)	Mean value
History			
Fever	28	(93.3)	
Headache	25	(83.3)	
Nausea	26	(86.7)	
Vomiting	20	(66.7)	
Sweating	21	(70)	
Chills	15	(50)	
Rigors	15	(50)	
Psychosis	15	(50)	
Convulsions	14	(46.7)	
Diarrhea	9	(30)	
Examination			
Modified GCS			
2	10	(33.3)	
3	7	(23.3)	
4	2	(6.7)	
5	1	(3.3)	
6	3	(10)	
7	7	(23.3)	
Hypertonia / hyperreflexia	8	(26.7)	
Absent abdominal reflexes	26	(86.7)	
Ocular fundus changes	8	(26.7)	
Neck stiffness	7	(23.3)	
Opisthotonos	1	(3.3)	
Jaundice	1	(3.3)	
Temperature (^{0}C)			40.9±10.7
Pulse rate/min			109±16
Systolic blood pressure (mm Hg)			120±20
Diastolic blood pressure (mm Hg)			70±15

GCS - Glasgow coma score

were all among those deeply comatose patients. We observed that vascular ocular fundus abnormalities with or without papilledema occurred only in deeply comatose patients scoring ≤ 3 in GCS, consistent with previous observations that a deeper coma and specific ocular fundus findings associate with poor outcome in patients with CM.[1,4] In our series, we could not find a correlation between the level of coma and the time duration to recover from CM. Neck stiffness in the absence of other signs of meningeal irritation, and absent superficial abdominal reflexes with preserved deep tendon and planter reflexes are features of CM.[1]

We noted a history of previous episodes of CM in 3 patients suggesting the presence of some form of susceptibility to disease progression. We know that host factors operating in determining mode of presentation and outcome of severe falciparum malaria occur. In addition to the recognized inherited hemoglobin defects and structural abnormalities, at least 3 human genes of the major histocompatibility complex are known to influence the outcome and presentation of malaria infections.[5] Sixty percent of our CM patients received some form of antimalarial chemotherapy, commonly oral chloroquine, before coming to hospital. This reflects the magnitude of resistance of *Plasmodium falciparum* strains to chloroquine in the region,[6] and advocates the use of quinine as the first choice in treatment of severe malaria.

In conclusion, CM, though common in children, can affect other age groups. High mortality and ocular fundus changes are more common in deeply comatose patients who had modified GCS ≤ 3. We should direct special attention to individuals with a previous history of CM when they develop symptoms of a new infection, as they are prone to develop the cerebral form.

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