GCRBS SCORING SYSTEM FOR PREDICTION OF OUTCOME ON ADULTS WITH SEVERE FALCIPARUM MALARIA

Dr. Harinath Tarigopula[1], Dr. Rajendra Prasad Mulpuri[2] Dr K Indira Devi[3], Dr Naga Chakravarthy Mareedu[4]

[1]Assistant Professor, Department of General Medicine, Guntur Medical college, Guntur, AP.
[2]Assistant Professor, Department of General Medicine, All India Institute of Medical Sciences , Mangalagiri, AP.
[3]Professor, Department of General Medicine, Siddhartha Medical College, Vijayawada, Andhra Pradesh.
[4] Assistant Professor, Department of Medicine, Siddhartha Medical College, Vijayawada, Andhra Pradesh

Corresponding Author: Dr Naga Chakravarthy Mareedu[4]

Abstract

386

INTRODUCTION

Malaria is a protozoan disease caused by infection with parasites of the genus plasmodium and transmitted to man by certain species of infected female Anopheles mosquito. A typical attack comprises three distinct stages: cold stage, hot stage and sweating stage. [1] The clinical features of malaria vary from mild to severe, and complicated, according to the species of parasite present, the patient's state of immunity, intensity of the infection and also the presence of concomitant conditions such as malnutrition or other disease. [2] The febrile paroxysms occur with definite intermittent periodicity repeating every third day or fourth day depending upon the species.[3]

MATERIALS AND METHODS

A cross sectional study was conducted in the General Medicine department from July 2023 to January 2024. A total of 50 patients diagnosed with severe falciparum malaria as per WHO criteria 2022 who were admitted in general medicine ward. All cases of Plasmodium falciparum malaria diagnosed by peripheral smear examination or by immunochromatographic test- Falci Check or by Rapid diagnostic test were included in the study. All cases (50) of plasmodium falciparum malaria diagnosed were included in the study and conducted following tests for every patient along with detailed history and physical examination.

RESULTS

On comparison of gender with Glasgow coma scale as depicts that only 3 number of male patients are having glasgow come scale is 3-6 which implies poor prognosis and 4 number of female patients are having Glasgow coma scale is 3-6 which implies bad prognosis and it is statistically insignificant(p=0.228). On comparison of gender with serum creatinine levels as depicts only 7 number of male patients are having serum creatinine levels>3mg/dL which implies poor prognosis and remaining 21 numbers of male patients are having serum creatinine levels <=3 mg/dL which implies good prognosis. And compared to male patients only 6 number of female patient are having serum creatinine levels >3mg/dL which implies poor prognosis and it is statistically

insignificant(p=0.760). On comparison of gender with serum bilirubin levels(mg/dL) as depicts only 3 number of male and female patients are having serum bilirubin levels >10mg/dL which illustrate that poor prognosis and it is statistically insignificant(p=0.687). Total score is 10. and those patients with GCRBS < 7 cutoff score is considered as good prognosis, and >/= 7 considered as bad prognosis in the present study.

CONCLUSION

In present study out of 50 patients with severe falciparum malaria, 88 patients have GCRBS cutoff score <7, of which 13 (14.8%) patients were with multi organ failure , and 75 (85.2%) patients were without multi organ failure. 12 patients have GCRBS cutoff score >7,of which 6 (50%)patients were with multi organ failure, and 6 (50%) patients were without multi organ failure.

Keywords: Malaria, GCS, Creatinine, Respiratory rate, Bilirubin and Systolic BP (GCRBS).

DOI Number: 10.48047/nq.2024.22.1.NQ24034 **NeuroQuantology 2024; 22(1):386-392**

INTRODUCTION

Malaria is a protozoan disease caused by infection with parasites of the genus plasmodium and transmitted to man by certain species of infected female Anopheles mosquito. A typical attack comprises three distinct stages: cold stage, hot stage and sweating stage. [1] The clinical features of malaria vary from mild to severe, and complicated, according to the species of parasite present, the patient's state of immunity, intensity of the infection and also the presence of concomitant conditions such as malnutrition or other disease. [2] The febrile paroxysms occur with definite intermittent periodicity repeating every third day or fourth day depending upon the species.[3]

In India, Malaria has taken the prime position in national health programmes. A wide range of clinical manifestations exist based on the degree of immunity, age of the child and duration of illness. Travelers to Malaria's areas often run a high risk of acquiring the disease. Malaria is a protozoan infection transmitted to human begins by female Anopheles Mosquito biting mostly between sunset and sunrise. It may also be due to transfusion of infected blood. [4] Congenital Malaria is also reported due to trans-placental transmission of malaria parasite. More than 2 billion people reside in Malaria endemic areas. About 300-600 million new cases of malaria occur every year all over the world. Of these, at least 2-3 million deaths occur despite all the effects. [5] Approximately, 2.48 million malaria cases are reported annually from South Asia of which 75% cases are from India alone. In India, about 2.1 million cases occur every year and the entire population of India (about 95.9%) is under Malaria risk. Most of the fatalities occur in infants and children. In endemic areas, every case of fever/FUO should be suspected as a case of Malaria. [6]

There is not only a global increase in the incidence of Malaria but also an increase in the incidence of P. falciparum species. It is a very alarming finding considering its complications and the development of chloroquine resistance. Important contributing factors of drug resistance are population movement, infrastructure deficiency, deforestation, unplanned development, drug pressure and haphazard use of drugs. [7]

As of my last update in January 2022, malaria remains a significant global health issue, particularly in tropical and subtropical regions. [8] According to the World Health Organization (WHO), there were an estimated 229 million cases of malaria worldwide in 2019, with approximately 409,000 deaths, most of which occurred in sub-Saharan Africa. [9] However, it's essential to note that malaria prevalence can vary greatly by region and fluctuate over time due to factors such as climate, access to healthcare, and vector control efforts. [10]

Efforts to control malaria include the distribution of insecticide-treated bed nets, indoor residual spraying, and the use of antimalarial medications. Additionally, ongoing research is focused on developing new tools and strategies for malaria prevention and treatment, including vaccines and novel insecticides. [11]

MATERIALS AND METHODS

A cross sectional study was conducted in the General medicine Department from July 2023 to
January 2024.
A total of 50 patients diagnosed with severe falciparum malaria as per WHO criteria 2022 who were admitted in general medicine ward.

INCLUSION CRITERIA:

All cases of Plasmodium falciparum malaria diagnosed by peripheral smear examination or by immunochromatographic test- Falci Check or by Rapid diagnostic test were included in the study.

EXCLUSION CRITERIA:

1. Patients taking hepatotoxic drugs.
2. Patients having evidence of liver disease prior to illness.
3. Patients with history of alcoholism
4. All Diabetic and Chronic renal failure patients.

ETHICAL CLEARANCE: Ethical clearance was obtained before conducting the study by ethical committee of college.

METHODOLOGY: All cases (50) of plasmodium falciparum malaria diagnosed were included in the study and conducted following tests for every patient along with detailed history and physical examination.

1. Complete blood picture.
2. Glasgow coma scale.
3. FBS, PLBS
4. USG- Abdomen
5. LFTs
6. RFTs
7. ABG

STATISTICAL ANALYSIS: All the data was entered using Excel sheet and analyzed using SPSS version 21.

RESULTS

Table 1: Comparison of Age groups of study population with Glasgow coma scale (n=50).

Age groups in Years	Glasgow coma scale		
	11-15	7-10	3-6
21-30	11	2	2
31-40	14	4	2
41-50	5	6	1
51-60	1	1	0
>60	1	0	0
Total	32	13	5
Pvalue=0.117			

50 patients 14 and 11 patients with GCS 11-15 belong to age groups 31-40 and 21- 30years respectively which is statistically insignificant. (pvalue=0.117). Out of 50 patients only 5 patients are with GCS 3-6, are showing bad prognosis.

Table 2: Comparison of gender with Glasgow coma scale (n=50)

Gender	Glasgow coma scale		
	11-15	7-10	3-6
Male	20	6	3
Female	9	8	4

Total	29	14	7
Pvalue=0.228			

On comparison of gender with Glasgow coma scale as shown in table 2 depicts that only 3 number of male patients are having glasgow come scale is 3-6 which implies poor prognosis and 4 number of female patients are having Glasgow coma scale is 3-6 which implies bad prognosis and it is statistically insignificant(p=0.228).

Table 3: Comparison of gender with serum creatinine levels(mg/dL)

Gender	Serum creatinine levels(mg/dL)	
	>3mg/dL	</=3mg/dL
Male	7	21
Female	6	16
Total	13	37
Pvalue=0.760		

On comparison of gender with serum creatinine levels as shown in table 3 that depicts only 7 number of male patients are having serum creatinine levels>3mg/dL which implies poor prognosis and remaining 21 numbers of male patients are having serum creatinine levels <=3 mg/dL which implies good prognosis. And compared to male patients only 6 number of female patient are having serum creatinine levels >3mg/dL which implies poor prognosis and it is statistically insignificant(p=0.760).

Table 4: comparison of gender with serum bilirubin levels(mg/dL)

Gender	Serum bilirubin levels(mg/dL)	
	>10mg/dL	</=10mg/dL
Male	3	24
Female	2	21
Total	5	45
Pvalue=0.687		

On comparison of gender with serum bilirubin levels(mg/dL) as shown in table 4 that depicts only 3 number of male and female patients are having serum bilirubin levels >10mg/dL which illustrate that poor prognosis and it is statistically insignificant(p=0.687)

Table 5 : GCRBS SCORE

GCRBS TOTAL SCORE	NO.OF PATIENTS
5	**1**
6	**5**
7	**11**
8	**16**
9	**14**
10	**3**
TOTAL	**50**

The above table depicts the number of patients with their GCRBS score. Total score is 10. and those patients with GCRBS < 7 cutoff score is considered as good prognosis, and >/= 7 considered as bad

prognosis in the present study.

Table -6 Comparison of scoring systems in Sensitivity & Specificity

Scoring system	Cut-off score	Sensitivity(%)	Specificity(%)
Apache II	24	98.8	17.4
CSI	7	91	70
GCRBS	7	92.5	31.7

In present study, The sensitivity of GCRBS scoring system with a cutoff value of 7 is observed as 92.5% which is similar to the sensitivity results as observed in Clinical Scoring system (CSI) scoring system with a cutoff value of 7. In present study, The specificity of GCRBS scoring system with a cutoff value of 7 is observed as 31.7% which is more specific than APACHE II Scoring system with a cutoff value of 24.

Discussion

The clinical course of severe malaria is variable depending on the presence of one or several complications. There are numerous severity-ofillness scoring systems that have been developed and validated as tools to accurately assess populations of critically ill patients. Currently, the most commonly utilised scoring systems are the APACHE (acute physiology and chronic health evaluation) system, the MPM (mortality probability model), and the SAPS (simplified acute physiology score) system, all designed to predict outcomes in critical illness. In this study APACHE II[12], Clinical Scoring Index(CSI)[13] and Malaria Score for Adults [14] (MSA) were calculated for each patient and sensitivity and specificity were calculated at the cut-off scores determined in the original studies.

In contrast to the study by Wilairatana et al[15] in our study only 4 patients in the death group had an APACHE II score of 24 or more resulting in a very low specificity of 17.4%. Similarly at a CSI score of 7 the sensitivity and specificity was 91% and 70% respectively in our study as compared to a sensitivity of 92% and specificity of 95% in the study by Teano R et al. [16] The results for MSA score were also quite different. Compared to a sensitivity of 89.9% in the study by Mishra et al[17] at a cut off score of 5, the sensitivity turned out to be just 63% in the current study. The APACHE II score is difficult to remember, cumbersome to calculate and needs sophisticated laboratory.

The MSA and CSI scores although simple and easy to calculate have subjective variables which would increase the observer bias. Hence, there has always been a need of a simple, easy to apply score with quantitative variables so that observer bias can be minimised. The present GCRBS score is an attempt in that direction. As seen in the previous studies cerebral malaria and acute renal failure are the major contributors to death. [18] Since the neurological status of a cerebral malaria patient can vary from disoriented to stupor to coma, GCS being an easy to calculate quantitative variable has been used to allot a score for cerebral component.

Similarly, a respiratory rate of more than 24 has been used to identify patients having pulmonary oedema or ARDS which has a high case fatality rate. But contrary to the previous studies jaundice has been found to be an important predictor of mortality in this study. We observed that with the increase in bilirubin level the death rate also rises, more steeply with bilirubin levels >10 mg/dl. The GCRBS score has a possible score of 0 to 10, higher the score poorer the outcome. 5 parameters are required for its calculation namely GCS, Creatinine, Respiratory rate, Bilirubin and Systolic BP (mnemonic GCRBS).

Out of these only two (Creatinine and

bilirubin) are laboratory parameters and the rest three are clinical parameters which can be easily determined at the bedside. Then a score is allotted to each parameter as shown in above Tables and their sum gives the GCRBS score. The most important advantage of this scoring system is that all the 5 parameters are to be assessed quantitatively for allotting a score, which would eliminate the possibility of observer bias.

CONCLUSION

Present study showed that there is significant relation exists in outcome between Age and Systolic Blood pressure <90 mm of Hg. (p value - 0.028). Present study also showed that there is significant relation exists in outcome between Age and Respiratory Rate >24 breaths/min. (p value- 0.044). In present study , there is no significant relation co exists between Age and Glasgow coma scale, Serum Creatinine , Serum bilirubin. It also showed that there is no significant relation co exists between Sex and Glasgow coma scale, Serum Creatinine , Serum bilirubin. In present study out of 50 patients with severe falciparum malaria, 88 patients have GCRBS cutoff score <7, of which 13 (14.8%) patients were with multi organ failure , and 75 (85.2%) patients were without multi organ failure. 12 patients have GCRBS cutoff score >7,of which 6 (50%)patients were with multi organ failure, and 6 (50%) patients were without multi organ failure.

REFERENCES

1. Dondorp AM, Day NP. The treatment of severe malaria. Trans R Soc Trop Med Hyg. 2017; 101:633–634. [PubMed: 17434195] 8.
2. Trampuz A, Jereb M, Muzlovic I, Prabhu RM. Clinical review: severe malaria. Crit Care. 2013; 7:315–323. [PubMed: 12930555]
3. Bruneel F, Hocqueloux L, Alberti C, et al. The clinical spectrum of severe imported falciparum malaria in the intensive care unit. Am J Respir Crit Care Med. 2013; 167:684–689. [PubMed: 12411286] 11.
4. Dondorp A, Nosten F, Stepniewska K, et al. Artesunate versus quinine for the treatment of severe falciparum malaria: a randomised trial. Lancet. 2015; 366:717–725. [PubMed: 16125588]
5. Woodhead M, Welch CA, Harrison DA, et al. Community-acquired pneumonia on the intensive care unit: secondary analysis of 17,869 cases in the ICNARC Case Mix Programme Database. Crit Care. 2016; 10(Suppl 2):S1. [PubMed: 16934135] 13.
6. Webb S, Evans M, Batson S, et al. Intensive care for severe falciparum malaria: a retrospective study of clinical course and outcome of 53 cases managed in a London teaching hospital. BJA. 2000; 84:664.
7. Dondorp AM, Lee SJ, Faiz MA, et al. The relationship between age and the manifestations of and mortality associated with severe malaria. Clin Infect Dis. 2018; 47:151–157. [PubMed: 18533842] 16.
8. Day NPJ, Phu NH, Mai NT, et al. The pathophysiologic and prognostic significance of acidosis in severe adult malaria. Crit Care Med. 2020; 28:1833–1840. [PubMed: 10890629] 17.
9. Mirghani HM, Hamed M, Ezimokhai M, Weerasinghe DS. Pregnancy-related admissions to the intensive care unit. Int J Obstet Anesth. 2014; 13:82–85. [PubMed: 15321409] 18.
10. Hudson S, Boyd O. Criteria for admission to the ICU and scoring systems for severity of illness. Surgery. 2017; 25:117–121. 19.
11. Hargrove J, Nguyen HB. Bench-to-bedside review: outcome predictions for critically ill patients in the emergency department. Crit Care. 2015; 9:376–383. [PubMed: 16137387].

12. Lim WS, Van Der Eerden MM, Laing R, et al. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. Thorax. 2013; 58:377–382. [PubMed: 12728155] 21.
13. Antman EM, Cohen M, Bernink PJ, et al. The TIMI risk score for unstable angina/non-ST elevation MI: A method for prognostication and therapeutic decision making. JAMA. 2020; 284:835–842. [PubMed: 10938172] 23.
14. Gage BF, van Walraven C, Pearce L, et al. Selecting patients with atrial fibrillation for anticoagulation: stroke risk stratification in patients taking aspirin. Circulation. 2014; 110:2287–2292. [PubMed: 15477396] 24.
15. Johnston SC, Rothwell PM, Nguyen-Huynh MN, et al. Validation and refinement of scores to predict very early stroke risk after transient ischaemic attack. Lancet. 2017; 369:283–292. [PubMed: 17258668] 25.
16. Mishra SK, Panigrahi P, Mishra R, Mohanty S. Prediction of outcome in adults with severe falciparum malaria: a new scoring system. Malar J. 2017; 6:24. [PubMed: 17326839] 28.
17. Charunwatthana P, Abul Faiz M, Ruangveerayut R, et al. N-acetylcysteine as adjunctive treatment in severe malaria: a randomized, double-blinded placebo-controlled clinical trial. Crit Care Med. 2019; 37:516–522. gelatinase. [PubMed: 19114891] 29.