

PREDICTION OF OUTCOME IN SEVERE MALARIA BY GCRBS SCORE

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ABSTRACT

BACKGROUND

Malaria is a major cause of morbidity and mortality in the tropical and subtropical regions of the world. Our state Odisha alone accounts for 27% of all malaria cases and 18% of all malaria deaths. Since severe malaria is associated with high mortality, a scoring system for predicting the outcome (like GCRBS) will be of great help for a treating clinician in identifying the patients needing more intensive medical care and prognosticate chances of survival.

MATERIALS AND METHODS

A hospital-based descriptive study was conducted to include all cases of severe malaria in patients <14 years of age admitted to the Paediatric Department of MKCG Medical College and Hospital during the study period from October 2014-September 2016. The exclusion criteria included cases which were suspected malaria cases having negative lab diagnosis. The diagnosis of malaria was confirmed by blood tests (microscopic and RD test). Then a detailed clinical evaluation of each patient and laboratory investigations were done following which GCRBS scoring was given to each patient. Clinical findings, haematological and biochemical investigations were analysed in SPSS V24 software, and Chi Square analysis along with Odds ratio were calculated to know the statistical significance and the sensitivity and specificity of the GCRBS score was calculated.

RESULTS

A total of 185 cases of severe malaria as per WHO criteria were included in the study. In which, 107 (58%) were male and 78 (42%) were female. The age of the patients ranged from 3 months to 14 years. Majority were in <5 years age group (51.9%). Fever is the most common presenting symptom (97.8%). The most common clinical manifestation was severe anaemia (69.7%). The causative agent was *P. falciparum* in 81.1%. The overall mortality in the study was 9.7%. Higher the GCRBS score poorer was the outcome. As the scores increase, sensitivity of predicting mortality is decreasing and specificity is increasing. GCRBS has a good discriminatory ability between survivors and non-survivors.

CONCLUSION

The GCRBS score seems to be a very good working tool as it is very easy to calculate and easy to remember. Like GCS score system which is popular among doctors, this too will help in predicting outcome of severe malaria in children and indirectly reducing the mortality.

KEYWORDS

Severe Malaria, Outcome, GCRBS Score.

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BACKGROUND

Malaria is a major cause of morbidity and mortality in the tropical and subtropical regions of the world. 52% of all confirmed cases in South East Asia region are reported in India, where 5 states (Odisha, Chhattisgarh, MP, Jharkhand and WB) account for 60% of these cases. Our state Odisha alone accounts for 27% of all malaria cases and 18% of all malaria deaths.^[1] Since severe malaria is associated with high mortality, a scoring system for predicting the outcome (like GCRBS) will be of great help for a treating clinician in identifying the patients needing more intensive medical care

and prognosticate chances of survival. GCRBS score adopted by Mohapatra B N et al has a possible score of 0-10, with higher the score poorer the outcome. 5 parameters are required for its calculations namely GCS, Creatinine, Respiratory rate, Bilirubin and systolic BP (pneumonic GCRBS). Out of these creatinine and bilirubin are laboratory parameters and the rest three are clinical parameters. The score is given to each parameter and the summation of all will give the total score. At a cut-off score of 5, the prediction of mortality has a sensitivity of 85.3% and specificity of 95.6%.^[2] The greatest advantage of this scoring is that, all the parameters are objective and has very minimal to none observer bias.

Aims and Objectives

The primary objective of this study was to predict the outcome in severe malaria using GCRBS score. The secondary objective was to find the sensitivity and specificity of different parameters in GCRBS score and to correlate the morbidity and mortality pattern with that of various levels of GCRBS score.

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The diagnosis of malaria is confirmed by blood tests (microscopic and RD test). Then a detailed clinical evaluation of each patient and laboratory investigations were done following which GCRBS scoring was given to each patient.

RESULTS

A total of 185 cases of severe malaria as per WHO criteria were included in the study. In which, 107 (58%) were male and 78 (42%) were female. (Table 1). The age of the patients ranged from 3 months to 14 years. Majority were in <5 years age group (51.9%). The mean age is 5.3 years and the median age is 4 years. Fever is the most common presenting symptom (97.8%) followed by impaired consciousness and convulsions (68%) (Coma was present in 16.8%, Acidotic breathing and jaundice were present in 16.2% and 14.1% respectively. (Table 2). The most common clinical manifestation was severe anaemia (69.7%) followed by cerebral malaria 39.4%. (Table 3). The causative agent was P. falciparum in 81.1% followed by mixed infections in 16.7% and P. vivax in 2.2%. The overall mortality in the study was 9.7% and 1.6% had sequelae. Maximum mortality was in under 5 age group (44.4%) followed by >10 years (38.9%) (Table 4). In our study, clinical features like impaired consciousness, coma, acidotic breathing, jaundice, significant bleeding, icterus, hypotension, tachypnoea, lower GCS score and laboratory findings like hypoglycaemia, creatinine >3 mg/dL and bilirubin >3 mg/dL were significantly (p<0.05) associated with mortality (Table 5 and 6). Higher the GCRBS score poorer was the outcome (Table 7). The sensitivity of predicting mortality with a cut-off value of 5 was 72.2% and the specificity was 96.4% (Table 8). As the scores increase, sensitivity of predicting mortality is decreasing and

specificity is increasing. GCRBS has a good discriminatory ability between survivors and nonsurvivors.

Sex	No. of Cases	Percentage
Male	107	58
Female	78	42
Total	185	100

Table 1. Sex Distribution

Presenting Symptom	No. of Cases	Percentage
Fever	181	97.8
Impaired consciousness	68	36.8
Convulsion	68	36.8
Coma	31	16.8
Acidotic breathing	30	16.2
Jaundice	26	14.1
Haemoglobinuria	15	8.1
Oliguria	16	8.6
Significant bleeding	8	4.3
Vomiting	35	18.9
Pain abdomen	11	5.9
Cough	7	3.8

Table 2. Presenting Symptoms

Clinical Manifestations	No. of Cases	Percentage
Severe anaemia	129	69.7
Cerebral malaria	73	39.4
Jaundice	20	10.8
Renal impairment	15	8.1
Prostatitis	14	7.5
Shock	28	15.1
Acidosis	14	7.5
Hypoglycaemia	7	3.7

Table 3. Clinical Manifestations in Severe Malaria

Age Group	Male	Female	Total	Percentage
<5 years	4	4	8	44.4
5-10 years	1	2	3	1.7
>10 years	1	6	7	38.9

Table 4. Age and Sex Distribution in Mortality

Clinical Features	No. of Cases	Percentage	No. of Deaths	Odds Ratio	95% CI	P value
Fever	181	97.8	18	infinity	0.09947-infinity	>0.99
Impaired consciousness	68	36.7	13	0.1889	0.07206-0.5481	0.016 Significant
Coma	31	16.7	9	6.591	2.405-17.96	0.0006 Significant
Convulsion	68	36.7	8	1.427	0.5337-3.793	0.067
Acidotic Breathing	30	16.2	12	16.56	5.188-50.94	<0.0001 Significant
Jaundice	26	14.1	7	4.957	1.851-13.38	0.0053 Significant
Haemoglobinuria	15	8.1	2	1.481	0.3089-5.938	0.643
Oliguria	16	8.6	2	1.366	0.2866-6.374	0.658
Significant bleeding	8	4.3	2	3.354	0.6395-1.564	0.013 Significant
Vomiting	35	18.9	1	0.2474	0.02293-1.56	0.2056
Severe pallor	81	43.8	8	1.03	0.3881-2.875	>0.99
Icterus	50	27	12	6.789	2.36-19.23	0.0002 Significant

Hypotension	28	15.1	16	103.3	21.81-465.4	<0.0001 Significant
Tachypnoea	49	26.5	16	32.48	8.074-144.8	<0.0001 Significant
GCS<11	60	32.4	13	6.638	2.264-17.43	0.003 Significant
GCS<9	33	17.8	13	19.11	5.882-51.22	<0.0001 Significant

Table 5. Clinical Features at Admission and its Prognostic Significance

Laboratory Parameters	No. of cases	%	No. of Death	%	Odds Ratio	95% CI	P value
Hypoglycaemia	7	3.8	5	71	31.73	5.563-163.6	<0.0001 Significant
Hb<7	141	76.2	14	10	1.102	0.3471-3.216	>0.9999
Hb<5	89	48.1	9	10	1.088	0.4391-2.692	>0.9999
Platelets<1 lakh	72	38.9	4	5.5	0.416	0.1446-1.281	0.2021
Creatinine >3 mg/dL	14	7.6	5	35	6.752	2.14-20.71	0.0057 significant
Bilirubin>3 mg/dL	20	10.8	8	40	10.33	3.144-32.02	<0.0001 Significant
Bilirubin>10 mg/dL	6	3.2	4	67	9.429	2.593-37.09	0.0009 Significant

GCRBS Score	No. of Cases	Cured	Sequelae	Death
0	90	90(100%)	0	0
1	33	33(100%)	0	0
2	22	22(100%)	0	0
3	13	12(92%)	0	1 (8%)
4	8	4(50%)	0	4
5	2	2(100%)	0	0
6	14	1(7%)	3 (21%)	10 (71%)
7	2	0(0%)	0	2 (100%)
8	1	0(0%)	0	1 (100%)
Total	185	164	3	18

Table 7. GCRBS Score and Outcome

GCRBS Score	Death	Survival	Sensitivity	Specificity
>=x	a c	B D	a/a+c *100	d/b+d *100
>=3	18	22	100%	86.8%
<3	0	145		
>=4	17	10	94.4%	94%
<4	1	157		
>=5	13	6	72.2%	96.4%
<5	5	161		
>=6	13	4	72.2%	97.6%
<6	5	163		
>=7	2	0	11.1%	100%
<7	16	167		
>=8	1	0	5.5%	100%
<8	17	167		

Table 8. Sensitivity and Specificity of GCRBS Score in Predicting Mortality

DISCUSSION

The GCRBS score by Mohapatra BN et al is a new scoring system for predicting the outcome in severe malaria. Glasgow Coma Scale (GCS<11), Creatinine (>3 mg/dL), Respiratory rate (>24/min.), Bilirubin (>10 mg/dL) and Systolic BP (<90 mmHg) are taken into account. The GCRBS score has a

possible score of 0-10.[2] In the present study, male outnumbered female with the ratio of 1.37:1. In a study by Sathpathy et al, it was found to be 1.6:1.[3] This can be explained by the fact that more outdoor activity of the males and better clothing of females in India may favour this trend. In the series reported by Bhav S Y et al, maximum cases were observed in the age group of 0-5 years[4] which is similar to our study. This may be due to differential parasite organ sequestration in young children as compared to older children and also because of low complementary regulatory protein. Cerebral malaria was responsible for maximum number of deaths. This finding was similar to Tripathy R et al[5] but less than African studies by Mockenhaupt FP et al.[6] The relationship between higher GCRBS and poorer outcome was similar to Mohapatra BN et al.[2]

CONCLUSION

The severe cases are likely to be only the ‘tip of the iceberg’. Many children living far from the health care units may die at some local hospital due to delay in the referrals, hence early diagnosis and classification of severe malaria would allow appropriate management and early referrals. The GCRBS score seems to be a very good working tool as it is very easy to calculate and easy to remember. Like GCS score system which is popular among doctors, this too will help in predicting outcome of severe malaria in children and indirectly reducing the mortality.

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