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Clinical profile and immediate outcome of complicated malaria in children

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ABSTRACT

Malaria is one of the most common infectious diseases in the world which has made children frequent victims of its complications. In spite of measures taken to prevent and control malaria, its situation is getting worst globally, amounting to major mortality and morbidity. This work was intended to study the incidence of complicated malaria in children admitted in Sri Venkateswara Ram Narain Ruia Government General Hospital, Tirupati during the period of October 2010 to September 2011, to identify various clinical presentations of complicated malaria in children and to study the immediate outcome of complicated malaria in children who are admitted in our hospital. Falciparum malaria constituted the predominant type with 90% of all complicated cases. Severe malaria constitutes nearly half of total malaria cases admitted in our pediatric hospital. 1-5 years is the most common age group for both uncomplicated and complicated malaria cases indicating the endemicity. Mortality from complicated malaria is highest with cerebral malaria. Early identification and prompt treatment prevents most of deaths in children. Hyperparasitemia, malarial hepatitis and respiratory distress syndrome predict poor outcome. Stringent sanitary measures and vector control programmes are to be implemented in endemic areas in order to prevent the resurgence of malaria.

KEY WORDS: Malaria, Complications, Outcome, Children.

INTRODUCTION

Malaria is one of the most common infectious diseases in the world which has made children frequent victims of its complications. The disease supposedly had its origin in jungles of Africa. At present about 109 countries in the world are considered endemic for malaria, with an estimation of 247 million episodes of malaria per year and 8 lakh deaths. Childhood deaths constitute 25% of child mortality. Park in his text book of Social & Preventive Medicine said that "Infectious Diseases will last as long as the humanity itself"[1].This statement is exactly correct that the infectious diseases particularly preventable diseases are

common throughout the world particularly in developing countries. Robert Ward and Saul Krugman, who were among the ten individuals who found the subspecialty of pediatric infectious diseases in the late 1950s. They can be considered as the fathers of infectious diseases in children.[2] True to other things in life, nothing has remained constant in the field of malaria. There have been significant changes in the field of epidemiology, diagnostic tools, antimalarial drugs, drug resistance and emergence of complications. In spite of measures taken to prevent and control malaria, its situation is getting worst globally, amounting to major mortality and morbidity.

AIMS OF STUDY

- To study the incidence of complicated malaria in children admitted in Sri Venkateswara Ram Narain Ruia Government General Hospital Tirupati, during the period of October 2010 to September 2011.
- To identify various clinical presentations of complicated malaria in children
- To study the immediate outcome of complicated malaria in children who are admitted in our hospital.

HISTORICAL ASPECTS

The name of the disease malaria was given as far back as 1753. It is interesting to note that the treatment of the disease became first established (in the middle of the seventeenth century) before anything was known about its etiology and how the disease was transmitted. Malaria has been described in Ayurveda as 'Vishama Jwara'. Romans recognized that Malaria is associated with low marshy areas. Similarly, 'Herodotus' the great philosopher who lived in the 5th century B.C. used the term quotidian, tertian, and quartan fever. In early Nineteenth century Malaria was thought to be caused by the 'Offensive Vapours' emanating from the The Tiberian marshes.[3] The word 'Malaria' comes from the Italian, means literally 'Bad Air' (Mal – Bad, Aria – Air). The remarkable character "Alexander the great", ended abruptly in 323 B.C., when he died at the age of 32 years probably because of cerebral malaria.

MATERIALS & METHODS

It is a prospective study, conducted At Department of Paediatrics, S.V.R.R.G.G.H, Tirupati from 1st October 2010 to 31st September 2011. Children up to 12 Years, who were diagnosed with Malaria by MP-QBC method were the subjects.

Inclusion Criteria: Children up to 12 years, who were MP-QBC positive.

Exclusion Criteria: Children with MP-QBC negative and Children with clinical Malaria.

Information was recorded in a pre-designed questionnaire.

Children included in the study were investigated for:

A) Complete Blood Picture

B) Renal Functional Tests, where ever applicable

C) Liver Functional Tests, where ever applicable

D) Chest X Ray

CLINICAL ASSESMENT

All children were assessed according to WHO criteria (Table-1) for severe/complicated malaria which consists of clinical/laboratory criteria and supported by additional non defining supporting criteria.

Table - 1: WHO Criteria for severe/complicated malaria

Clinical /laboratory criteria
• Cerebral malaria: Impaired consciousness / seizures/ coma
• Acute renal failure (Oliguria <400ml/day + creatinine > 3mg/dl
• Respiratory failure: Pulmonary edema or ARDS
• Acidosis (p^H < 7.3)
• Shock: Algid malaria (B.P <90/60 mm Hg)
• Anemia: Hb <8g/dL
• Hypoglycemia

- Disseminated Intravascular Coagulation/spontaneous bleeding
- Hemoglobinuria without G6PD deficiency

Non defining supporting criteria

- Hyperparasitemia (>2% in non-immune, >10% in semi-immune)
- Hyperpyrexia >41°C
- Jaundice (Bilirubin > 3mg/dL)
- Hyponatremia
- Prostration

STATISTICAL ANALYSIS

Analysis was carried out using SPSS-17 software. In general, groups for continuous variables were chosen on the basis of accepted clinical cut off points (e.g : Hypoglycaemia - A glucose concentration < 40mg / dL, Severe anemia - Hb% < 5gm / dL)

OBSERVATIONS

INCIDENCE OF MALARIA

Total admissions during the period of study were 8500. Among them, total number of children diagnosed with Malaria were 210. Incidence of Malaria in total admissions 2.48%. Increased incidence of malaria in 1-5 years of age is statistically significant with p value <0.005.

INCIDENCE OF COMPLICATED MALARIA

Out of 210 cases which were diagnosed to have malaria, number of cases diagnosed as complicated malaria was 100. Incidence of complicated malaria in total number of malaria cases was 47.6%.

AGE & SEX DISTRIBUTION OF COMPLICATED MALARIA

Table-2 shows the distribution of complicated/severe malaria cases according to age and sex. Out of 100 cases, 62 (62%) were males and 38 (38%) were females. In all age groups the incidence of complicated malaria cases was more in males compared to females. The male to female ratio was 1.63:1.

Table - 2: Distribution of complicated malaria cases according to age and sex

Age group (in years)	Male	Female	Total	Percentage
<1	7	2	9	9
1-5	30	20	50	50
6-10	15	12	27	27
11-12	10	4	14	14
Total	62	38	100	100

Out of 100 cases of complicated malaria, sex and age wise distribution showed similar trend as total number of malaria cases. Highest percentage of cases (50%) was noted in the age group of 1-5 years, this was followed by 27% in 6 - 10 years. 14 % of cases were in 11 - 15 years and 9% were of < 1 year.

Table – 3 Incidence of various complications

Category	Total number of cases	Percentage
Anemia	64	64
Cerebral malaria	34	34
Hyperparasitemia	14	14
Hepatitis	14	14
Convulsions	14	14
Respiratory distress	8	8
Hypoglycemia	8	8
Acute renal failure	1	1
Circulatory collapse	1	1
Spontaneous bleeding(DIC)	1	1

Severe anemia is the most common complication noted constituting 64 cases, the next frequent complications observed were cerebral malaria (34%), hepatitis (14%), respiratory distress was observed in 8%, convulsions in 14%, hypoglycaemia in 8%, hyperparasitemia was observed in 14%, acute renal failure in 1%, spontaneous bleeding (DIC) in 1% and circulatory collapse in 1%.

Table – 4 Age group vs anemia cross tabulation

Age Group (Years)	Total number of cases	Number of cases with severe anemia	Percentage
<1	9	4	44.4
1 to 5	50	36	72
6 to 10	27	16	59.3
11 to 12	14	8	57.1

DESCRIPTION OF ANEMIA

Anemia with Hb% < 5 gm was seen as a complication in 64. Anemia is the most common complication observed. Highest prevalence of severe anemia is seen in 1 – 5 year age group constituting 72%, next common age groups observed were are 6 – 10 years (59.3%), 11- 12 years (57.1%) and <1 year (44.4 %) respectively.

Table – 5 Clinical findings in severe anemia (N=64)

Clinical findings	Number of cases	Percentage
Hepatosplenomegaly	36	56.25
Thrombocytopenia	26	40.62
Icterus	20	31.25
Splenomegaly	13	22
Hepatomegaly	10	16
Respiratory Distress	06	9.37
Hyperparasitemia	04	6.25

In the total severe anaemia cases with Hb % < 5 gm, organomegaly was seen in all 59 cases. Hepatosplenomegaly was observed in majority of cases amounting to 56.25%, followed by splenomegaly in 22% and hepatomegaly in 16%. Respiratory Distress was observed in 6 cases

(9.37%), icterus was observed in 20 cases (31.25%). Thrombocytopenia was observed in 26 cases (40.62%), hyperparasitemia was present in 4 cases (8.19%). Most common associated clinical finding was splenomegaly (49 cases) either isolated or in association with hepatomegaly.

Table – 6 Cerebral malaria (N=34)

Age group (Years)	Total number of complicated malaria cases	Number of cerebral malaria cases	Percentage
<1	9	03	33.3
1 to 5	50	19	38
6 to 10	27	08	29.6
11 to 12	14	04	28.7

Out 100 cases of complicated malaria, cerebral malaria was seen in 34 cases. This is the second most frequent complication observed. As shown in Table-6, the highest percentage of cases constituting 38% was observed in the age group of 1-5 years, this was followed by 33.3% in <1year age group.

Table – 7 Clinical features in Cerebral Malaria (N=34)

Clinical finding	Number of cases	Percentage
Altered sensorium	34	100
Convulsions	20	58.8
Meningeal signs	10	34.37
Anemia	24	70.58
Icterus	2	5.88
Bleeding manifestations	2	5.88
Respiratory distress	6	17.64
Hepatomegaly	8	23.52
Splenomegaly	16	25
Hepatosplenomegaly	12	35.29
Thrombocytopenia	16	47.05

- Out of 34 cases of cerebral malaria studied, altered sensorium was observed in all cases.
- Convulsions were observed in 20 cases (58.8%) and meningeal signs in 10 cases (34.37%).
- 4 Cases out of 34 died, which were associated with severe anaemia, icterus and hyperparistemia.
- Respiratory distress was associated with altered sensorium in 6 cases, of which one child died.
- One child who died had multi-organ dysfunction with bleeding manifestations and circulatory collapse.
- Thrombocytopenia was observed in 16 cases. Lumbar puncture was performed in all children and it showed no abnormality.

Table – 8 Hyperparasitemia and associated complications

Associated complication	No. of cases	Percentage
Severe Anemia	4	28.57
Cerebral Malaria	2	14.28
Isolated Hyperparasitemia	12	6.66

- In all cases of hyperparasitemia Anemia is observed but severe Anemia is present in only 4 cases.
- 2 cases of hyperparasitemia are associated with cerebral malaria of which 2 children died.
- 2 cases were associated with hypoglycemia.
- Isolated hyperparasitemia is observed in 12 cases.

Table – 9 Outcome of severe malaria in relation to age

Age group	Total no of cases	No. of deaths	Percentage
<1	9	-	-
1-5	50	3	6
6-10	27	2	7.4
11-12	14	-	-

OUTCOME

- Out of 5 deaths, 4 children had cerebral malaria along with other complications.
- High mortality seen with cerebral malaria was statistically highly significant with p value <0.00005.
- Severe pallor, hyperparasitemia was present in all 4 cases.
- Respiratory distress and icterus were observed in 3 cases.
- All 5 cases were associated with thrombocytopenia.
- One case, a 10 years old child had multi-organ dysfunction. He had evidence of severe anemia, hepatitis, hyperparasitemia, DIC and circulatory shock.

DISCUSSION

This study was done in a tertiary care teaching hospital at Tirupati that belongs to Chittoor district, one among the Rayalseema districts of Andhra Pradesh. The referrals are mainly from endemic areas of malaria. The study was conducted during the period October 2010 to September 2011. In this period total pediatrics hospital admissions were 8500. Total malaria cases recorded were 210 (2.48%). Total complicated cases, which satisfy WHO criteria were 100 (47.6%). Most cases are from endemic areas. This high incidence of severe malaria cases was probably because: large number of cases are referred in a very late stages, and only in-patients admitted were taken into study. This also correlates with reported cases in Andhra Pradesh in 2010 (52%). There is slight male preponderance in this study with 62% males and 38% females, male to female ratio being 1.63:1. This is similar to studies of Mishra SK, Mohanthy et al[16]. This may be due to evening or overnight outdoor stay of males and also cultural preferences seeking health care for males in society. The maximum incidence of severe malaria is seen age group of 1-5 years constituting 50% of cases. This is similar to other studies conducted by S.Bag[17], Kevin Marsh et al. Higher incidence of severe malaria seen this age group indicates endemicity of malaria in this region. Out of 100 children studied, the most common complication observed was severe anemia that constituted 64 cases (64%). Majority cases were noted in 1-5 years age group. This high incidence of severe anemia may be due to pre existing nutritional deficiency or

multifactorial. This is similar to the studies of Kevin Marsh et al. All children with anemia had organomegaly either in the form of hepatosplenomegaly, splenomegaly or hepatomegaly. This observation is statistically significant with p value <0.005. Out of 100 cases of severe malaria studied, second most common complication observed is cerebral malaria (34%). Majority of cases are in the age group of 1-5 years (38%). This is similar to studies by Kevin Marsh et al with mean age of 26.4 months. Common clinical presentations of cerebral malaria are altered sensorium (100%), convulsions (78.5%) and anemia (70.58%). Thrombocytopenia is common laboratory parameter observed in 47.5%, where as meningeal signs were seen in 37.45%. Malarial hepatitis (14 cases) is next common observation in age group of 6-10 years (29.6%). Anemia (100%), icterus (100%), abdominal distension (83%) are commonly associated clinical findings. Elevated TSB more than 3 -5 mg/dl, (42.8%), abnormal LFT more than two fold raise (100%) are the laboratory findings associated. Common age group showing Hyperparasitemia is 1-5 years (16%). Hyperparasitemia is associated with anemia and cerebral malaria in 8 cases. Among them 4 cases died. Case fatality rate is 28.57%. Common age group presenting with acute respiratory distress is 1-5 years (16%). Metabolic acidosis and congestive cardiac failure due to anemia were excluded before labeling a case of respiratory distress. Case fatality rate of respiratory distress is (25%). This is similar to study conducted by Kevin Marsh et al. Convulsions (n=14) seen in age group of less than 1 year (22%) followed by 1-5 years (16%). Hyperparasitemia was commonly associated finding in 6 cases. CSF analysis was done in all the cases (to rule out meningitis) which revealed no abnormality. Hypoglycemia is seen in 8 cases (8%), out of which two were associated with hyperparasitemia; five were associated with cerebral malaria and one case with hepatitis. Hypoglycemia was detected early by repeated random blood sugar estimation and corrected promptly. As a result of which no case was discharged with sequelae. Acute renal failure was seen in one case, a 10 year old child, who presented with decreased urine output, abnormal RFT, associated with DIC and died. Acute Renal failure is a rare complication observed in our study. This is similar to study conducted by Satapathy SK, Mohanty et al[16].

Table – 10 Comparisons with other studies

Feature	Satpathy et al[16]	Kevin Marsh et al	Present Study
Mean age	6.5 years	26.4 months	6.6 years
Male to female ratio	1.6:1	Not significant	1.63:1
Commonest feature	Cerebral malaria	Severe anemia	Severe anemia
Next frequent	Severe anemia	Cerebral malaria	Cerebral malaria
Mortality due to Falciparum	9.9%	3.5%	5%
Commonest cause of death	Cerebral malaria	Cerebral malaria	Cerebral malaria
Age at presentation for cerebral malaria	<5 years	<5 years	<5 years
Age at presentation for malaria hepatitis	<5 years	<5 years	>5 years
Mortality(CFR) in cerebral malaria	16.1%	11.9%	11.76%
Mortality(CFR) in hyperparasitemia	28%	30%	25%
Mortality(CFR) from ARDS	80%	13. 9%	25%

CONCLUSIONS

Malaria is an important cause of morbidity and mortality in high transmission areas. Falciparum malaria constituted the predominant type with 90% of all complicated cases. Severe malaria constituted nearly half of total malaria cases admitted in our

pediatric hospital. 1-5 years is the most common age group for both uncomplicated and complicated malaria cases, indicating the endemicity. Mortality from complicated malaria is highest with cerebral malaria. Early identification and prompt treatment prevents most of deaths in children. Hyperparasitemia, malarial hepatitis and respiratory distress syndrome predict poor out come. Stringent sanitary measures and vector control programmes are to be implemented in endemic areas in order to prevent the resurgence of malaria.

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