

EPIDEMIOLOGY OF MALARIA IN INFANCY AT ENUGU, NIGERIA

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ABSTRACT

This was a retrospective study to ascertain the prevalence and clinical features of malaria in infants in Enugu between January 1998 and January 2000. Case notes of two thousand children were reviewed, one hundred and fifty-five (7.75%) had a diagnosis of malaria, with a male/ female ratio of 1.2:1. The age range was two days to twelve months with a mean of 5.06 ± 3.24 months. Nine infants (5.8 %) were less than seven days old. Ninety-nine of the patients (63.9%) had temperature $\geq 37.5^{\circ}\text{C}$. Diarrhea was a symptom in 52 (33.5%) patients, while vomiting alone or in combination with diarrhea was a presenting feature in 37 (23.87%) of the children. Twenty-eight children (18.1%) had respiratory symptoms of which, two had bronchopneumonia. Other associated illnesses included, septicaemia; 6(3.8%), infective diarrhea; 5(3.2%) , and urinary tract infection; 4 (2.6%).

Malaria is common in infants less than 6 months of age and associated with symptoms common with other childhood illnesses.

Key words: Malaria, infants, Enugu.

INTRODUCTION

Malaria remains a major cause of morbidity and mortality amongst African children especially those below the age of five (5) years¹ and is attributed with two (2) million deaths annually.² These deaths occur mostly amongst children who are between the ages of six months and five years and result almost entirely from severe and complicated malaria.³ Previously it was believed that in areas of stable malaria, congenital and neonatal malaria were rare occurrences^{4, 5} on the assumption that the children below this age group were protected by maternal antimalarial antibodies. Consequently most studies were focused on children who were from six to sixty months of age. Recently there are reports of increasing incidence of malaria in early infancy in Nigerian children.^{6, 7, 8} In the study in Benin Nigeria⁸ some atypical modes of presentation of malaria was reported in this age group. With these reports this study was aimed at reviewing cases that presented in infancy with fever in order to determine the prevalence and epidemiology of malaria in infancy.

METHODOLOGY

This was a retrospective study in which case notes of children aged 0-12 months seen at CHILDLIFE MEDICAL CENTRE, a private children's hospital in Enugu South east Nigeria, between January 1998 and January 2000, were reviewed. Entry criteria for review were; age twelve months and less, and a clinical diagnosis of malaria.

Other information obtained from the case notes of each child were, name, gender, weight, symptoms at presentation, months and less, and a clinical diagnosis of malaria. Other information clinical findings on physical examination blood film result for malaria parasites, results of other investigations, other diagnoses, treatment and response

STATISTICAL ANALYSIS

Epiinfo 6 statistical software was used for data entry and analysis. Case notes with incomplete data were excluded during analysis. The variables (symptoms, other diagnosis and treatment) obtained were categorized for age groups for comparative analysis and relationship of outcomes. The categorical variables such as age groups was tested against the symptoms for possible correlations, also the relationship of other diagnoses, with diagnosis of malaria and symptoms were tested with linear regression to determine associations. P value of ≤ 0.05 was used as the level of significance while the confidence interval of 95% was adopted.

RESULTS

A total of one hundred and fifty five children (7.75%) satisfied the study criteria, out of two thousand children who were aged 12 months and below seen during the period of review. One hundred and one (65.2%) infants were seen during the known period of dry season while 54 (34.8%) presented in the wet season, October to March and April to September respectively.

There were eight- three males and seventy-two females, thus giving a male: female ratio of 1.2:1.

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The age range was from two (2) days to twelve months, 104 patients (67%) were less than or six months of age, while 51 of the children (33%) were more than six months. Table I

There was a history of fever in only one hundred and twenty one of the infants, while 99 (63.87%) of the children had temperature above 37.5°C, with the rest; 56 (36.12%) being below 37.5°C.

Groups: Infants aged 6 months and less and Infants more than 6 months

Basic Characteristics

The mean age for infants 6 months and less was 3.17 ± 1.9 months with peak age incidence of four months. Twenty nine of the patients were less than six weeks of age of which nine were less than one week old. Among the infants aged more than 6 months, the mean age was 8.92 ± 1.45 months with an age range of 8 to 12 months and a peak age of 9 months. The mean weights were 5.29 ± 2.6 and 7.2 ± 3.25 respectively for infants 6 months and less and more than 6 months of age.

Symptoms

Among the two age groups fever was a symptom at presentation in 75, and 46 infants who were six months and less, and more than 6 months of age, respectively. Amongst the infants who were less than one week of age, 77.80% had temperature $\geq 37.5^\circ\text{C}$. The gastrointestinal symptoms of diarrhoea and vomiting were found in a higher proportion, in the older age group than among the infants 6 months and less (p values 0.49 and 0.26 respectively). Vomiting was not a presenting feature in neonates within one week of age. Twenty-eight children had respiratory symptoms of cough, catarrh, and 2 infants (aged 4.5 months and 6 months) had grunting respiration with diagnosis of bronchopneumonia.

Other symptoms such as jaundice and convulsions were observed in eight and three children respectively. Eight infants less than 2 weeks of age presented with jaundice and 4 of them were less than one week. The range of serum bilirubin was from 7 to 12.20mg/dl. All the neonates had Plasmodium falciparum parasitaemia and three had second diagnosis of sepsis. Convulsion was noticed in 3 infants and more among the younger age group, (p = 1.0). Table II

Diagnosis

One hundred and fifty four children were diagnosed as having malaria, clinically and with peripheral blood smear results, one child additionally who was diagnosed clinically with malaria but negative parasitaemia. Two of the children with respiratory symptoms had bronchopneumonia. Other associated illnesses were urinary tract infection in four patients, infective diarrhoea in 5 infants

(dysentery in one patient), sepsis in 6 patients, and impetigo in 2 patients.

The results of investigations, showed the presence of trophozoites of malaria parasites in peripheral blood smears of all the patients. Fifteen infants showed leucocytosis of greater than 10,000/cumm; with a range of 10, 000 to 15,000/cumm, only 4 of them were aged more than 6 months while the others were less than 6 months. Additional diagnoses in these patients included sepsis in 4, severe acute respiratory tract infection in 2, urinary tract infection in one and only one of the patients with gastro enteritis had leucocytosis. Of the fifty-eight children with gastroenteritis four (4) had positive cultures of *Escherichia coli* in their stool samples. These infants were all less than 6 months of age, (range 7 weeks to 5 months).

Table I: Age Group Frequency

Age	Number of patients	%
≤ 6 months	104	67
> 6 months	51	33
Total	155	100

Table II: Presenting Features

Symptoms	Age ≤ 6 months (104)	Age ≥ 6 months (51)	p value
Fever	75	46	0.01
Diarrhoea	33	19	0.49
Vomiting	22	15	0.26
Cough	11	10	0.12
Jaundice	8	0	0.05
Catarrh	3	2	0.66
Grunting	2	0	0.31
Convulsions	2	1	1.00
Temp ≥ 37.5	66	33	0.88

Table III: Temperature On Presentation

Temperature	Number of patients	%
≥ 37.5	99	63.87
≤ 37.5	56	36.13
Total	155	100

Treatment and outcome

One hundred and fifty four children were treated with antimalarial drugs. Out of this number of infants, 114 were initially treated with chloroquine and 52 responded while the remaining sixty two

received in addition other antimalarial drugs. Fifteen, three, and four patients were treated with sulphadoxine/pyrimethamine, halofantrine and artemether respectively as single therapy while the remaining 15 patients received combinations of the other antimalarial drugs. Out of the nine neonates aged one week and less, treated with chloroquine, 8 responded but one had to receive sequentially sulphadoxine/pyrimethamine and halofantrine in addition before any clinical response was recorded. The other infants with concomitant illnesses were treated with appropriate antibiotics, and all improved.

DISCUSSION

The incidence of malaria in infants has been a subject of intense discussion especially when it relates to infants less than six months of age. The subject of congenital malaria has increasingly been of interest to both clinicians and researchers. Earlier workers^{9, 10} had reported the low incidence of malaria in early infancy and an age-dependent increase of prevalence. But recently there have been increasing reports of malaria in young infants including neonates. Balaka and co-workers¹¹ described congenital malaria; as the presence of malaria parasitaemia within seven days of birth, and it is in two forms: namely disease and infection. The review of patients in this study suggests that malaria with an incidence of 7.75% causes significant morbidity. Significant in the incidence is the predominance of the infants in the age group less than 6 months and the number of children who were one week of age and less, (5.81%) which suggests the possibility of congenital clinical malaria in this review.

Fever defined as temperature 37.5°C and above which is regarded as the cardinal sign of malaria was a significant finding in most of the patients more so in our cases of possible congenital malaria. Vince¹² suggested that malaria should always be considered in a febrile or ill neonate. The use of fever as a predictor of malaria has been shown to have good sensitivity.¹³ However, there was a significant proportion, 36.13%, who despite the history of fever had no recorded fever even in the presence of parasitaemia. Smith and coworkers¹⁴ noted that absence of fever is not necessarily an exclusion criterion for diagnosis of malaria, as *Plasmodium falciparum* cases in endemic areas may not have measurable temperature elevations. They equally observed that in infants 66.50% of morbidity due to malaria is attributable to temperature less than 37.5°C, and that most malaria episodes in older children tend to correspond to higher temperatures. These findings are comparable to ours, although the difference was not statistically significant. Thus in early infancy, fever as an index of malaria should not be ignored when present, in spite of the possibility of other probable causes of fever and illness.^{8, 15}

Jaundice was the second most common sign among neonates; this is a confounding factor in view of the possibility of other probable causes in this age group. In the cases seen in this study 50% of the children less than one week presented with this symptom, with the highest bilirubin level of 12.20mg/dl. It is pertinent to observe that three out of eight had the second diagnostic consideration of sepsis as probable cause of jaundice, as well as malaria. Other studies have equally reported jaundice as a symptom of congenital malaria.^{8, 16, 17}

Gastro-intestinal symptoms of diarrhea and vomiting were proportionately more significant in the older infants. Laurenz¹⁸ found an incidence of malaria diarrhea in 20.90% of cases, which they studied with majority less than one year and attributed most to *Plasmodium falciparum* infections. Although a higher proportion of the children who presented with gastroenteritis in this study were more than 6 months old, those who had infective diarrhea were in the younger age group. This is not an unexpected finding in this age group and the environment with its poor hygienic condition.

Respiratory symptoms of cough, grunting and breathlessness have been noted in other studies^{19, 22} as presenting features in neonatal malaria. In this study 18% had such symptoms with only two of the twenty-eight children having overt bronchopneumonia. The overall response to chloroquine in our patients reflects the general decline in sensitivity to the drug in the study area, although in those with congenital clinical malaria, there was good sensitivity. This is in contrast to the observation from another part of the country where chloroquine resistance was observed in 25% of neonates studied¹⁴. This is not unusual as sensitivity of malaria parasites is determined by multiple factors in spite of consanguinity of geography. The differential response to chloroquine in relation to age, maybe due to other unknown factors which will require further investigations.

From the observations made in this study we conclude that congenital and infantile malaria causes significant morbidity in this environment and therefore recommend that particular attention should be paid to the neonate where symptoms might overlap with those of perinatally acquired illnesses. Our results also revealed that chloroquine is effective in the infants, but we recommend a site-specific approach to therapy based on drug sensitivity in the environment.

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