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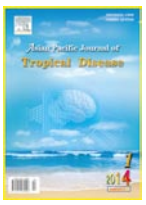

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A study of the clinical profile and management of malaria in pediatric age group in a tertiary care hospital in Mangalore

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PEER REVIEW

Peer reviewer

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Comments

Author has done this research to study the clinical profile and management of malaria in the paediatric age group. It will help the poor patients with malaria who are in migrant families from different parts of the state.
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ABSTRACT

Objective: To study the clinical profile and management of malaria in the paediatric age group.
Methods: This retrospective study was done at AJ Institute of Medical Sciences, Mangalore in Karnataka, India. The prescriptions case records of patients diagnosed with malaria, treated as inpatients in the Department of Paediatrics, AJ Institute of Medical Sciences from January 2010 to July 2012 were collected. The data (demographic profile, clinical features, investigation, treatment and complications) from all the case records were filled up in predesigned proforma and analysed statistically.
Results: A total of 74 patients were diagnosed and treated for malaria. Males (58.1%) were more affected than females (41.9%). The patients in the age group of 0-5 years (42%) were more affected. The incidence of malaria increased from the month of June onwards coinciding with the monsoon season. *Plasmodium vivax* was the major parasite type (56.8%), followed by mixed malarial infection(37.9%) and *Plasmodium falciparum* (5.4%). Main presenting symptoms were fever (100%), chills & rigors (90.5%), vomiting (52.7%) and headache (40.5%). Vomiting was the main drug adverse effect seen.
Conclusions: Malaria is a major health concern in this region, particularly more in rainy season. It is found that compared to the older children, the 0-5 years age group was more affected. *Plasmodium vivax* was the major parasite type causing malaria. Implementation of national drug policy on malaria has certainly decreased the morbidity and mortality in this region.

KEYWORDS

Malaria, *Plasmodium vivax*, ACT therapy, Seasonal trends

1. Introduction

Malaria is endemic in the tropics. A child dies due to malaria somewhere in the world every minute. It infects 219 million people each year (range 154-289 million). It is estimated that 660000 die due to malaria, of which most are children in Africa. Malaria accounts for about one in six of all childhood deaths and 90% is from the African region. It also causes anaemia in children which is the major cause of poor growth and development[1].

Malaria is one of the major public health problems of our country. Around 1.5 million confirmed cases are reported annually by the National Vector Borne Disease Control Programme (NVBDCP), of which about 50% are due to *Plasmodium falciparum* (*P. falciparum*)[2].

Plasmodium vivax (*P. vivax*) accounts for 50% of the malaria prevalence in Asia, and yet the morbidity associated with this infection and its spectrum of disease is largely ignored. Most of the researches and published literatures on malaria focus on *P. falciparum* and much less on *P. vivax*.

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Clinical profile of malaria among Indian children differed from the studies reported from African population. Multiple organ dysfunctions emerged as an important presenting feature and a new predictor of death in childhood[3].

In 2008, Mangalore was declared as chloroquine resistant area for malaria parasite *P. falciparum* by NVBDCP, and in 2010, Dakshina Kannada was declared so by the District Health Office based on the studies conducted by the Malaria Research Centre, New Delhi[4].

Dr. Kakkilaya, convener of Malaria Control Action Committee, says that mild to moderate degree of resistance to chloroquine is common in Mangalore. Severe resistance has also been observed in some cases, but resistance to other anti-malarial drugs has not been known till now. From 2006 to 2010, 15 664, 10 930, 5 915, 5 154, 6 335 cases of malaria are recorded from Mangalore respectively. Among them, malaria related deaths were 11 in 2006, eight in 2007, one in 2009, and no deaths in 2010 to 2012[4].

A revised national drug policy on malaria has been adopted by the Ministry of Health and Family Welfare, Govt. of India in 2010, and further these guidelines in the treatment of malaria were revised in 2011. These guidelines are the collaborative effort of NVBDCP, National Institute of Malaria Research and experts from different parts of the country[5].

These guidelines have been successfully implemented in our hospital and we would like to examine the impact of the same. Moreover, very few studies have been published on malaria in pediatric age group in Mangalore which is an endemic area. Hence we undertook this retrospective study in our hospital where the clinical profile of the various types of malaria in children and the treatment given could be studied.

2. Materials and methods

The retrospective study was conducted in the Paediatric Department of AJ Institute of Medical Sciences Hospital, Mangalore which is a tertiary care centre. A total of 74 patients diagnosed with malaria were included in this study. The data of patients diagnosed with malaria, treated as inpatients in the Department of Paediatrics, AJ Institute of Medical Sciences from January 2010 to July 2012 were collected. A case sheet proforma was prepared and the data (demographic profile, clinical features, investigation, treatment and complications) from all the case records were filled up and analysed using SPSS 16 version.

2.1. Inclusion criteria

1. Patients who have been treated in the Department of Paediatrics for malaria, the diagnosis confirmed by peripheral smear/malarial parasite flocculation fluorescence test.

2. Patients of either gender below 15 years.

3. Patients presenting with symptoms of malaria (peripheral smear negative and malarial parasite flocculation fluorescence test negative), but treated as malaria when household contacts people who were diagnosed to have malaria.

2.2. Exclusion criteria

1. Patients presenting with clinical features mimicking malaria (malaria parasite test negative), as in leptospirosis, dengue fever, urinary tract infection and sepsis *i.e.* patients with other diagnosis.

2. Patients presenting with fever (malaria smear negative), but treated empirically for malaria.

3. Results

A total of 74 paediatric cases were treated for malaria as inpatients. Out of these 74 patients, 43 (58.1%) were males and 31 (41.9%) were females. The mean age was 6.889 years and standard deviation was 4.076 8 years. Age and sex wise distribution is shown in Table 1.

Table 1
Age and sex wise distribution of patients with malaria.

Age group (years)	Male	Female	No. of cases	Percentage (%)
0-5	21	10	31	42
6-10	12	15	27	36
11-15	10	6	16	22
Total	43	31	74	100

Among these cases, 42 (56.8%) cases were *P. vivax* infection, 28 (37.9%) were mixed malarial infections and 4 (5.4%) were *P. falciparum*. There was a rise in the number of cases from April onwards. The maximum number of malaria cases of 27 (36.5%) were recorded in the months of July to September. This coincides with the monsoons in this region. About 63.5% of cases belonged to families who were migrants working in Mangalore as construction workers, watchman *etc*.

Analysis of the clinical symptoms during admission showed that all (100%) cases were admitted with fever, history of duration of fever in a range of 1-15 d with mean duration of 4.65 d. Chills and rigors were reported in 90.5%, history of duration in a range of 1-15 d with a mean duration of 4.08 d. Nausea and vomiting was present in 52.7% where as 40.5% had headache, Pain abdomen was reported in 21.6%, cough in 16.2%, jaundice in 5.4%, convulsions in 4.1% and haematuria in 2.7%. The predominant symptoms were fever, chills, rigors, nausea and vomiting in all types of malaria (Table 2).

On general examination during admission, all 74 (100%) had temperature. There were 45 (60.3%) patients who had temperature above 100 °F. Mean temperature was 100.7 °F. Pallor was observed in 20.3% cases and jaundice in 5.4% cases.

Systemic examination revealed splenomegaly in 39 (52.7%), hepatomegaly in 17 (23%) and hepatosplenomegaly in 15 (20.27%) cases (Table 3). Low haemoglobin <8 gm% (25.6%) and low platelet count in 38 (51.4%) cases, both entities were more common in *P. falciparum* cases compared to mixed infections and *P. vivax* cases (Tables 4 and 5).

Table 2
Clinical symptoms in various types of malaria patients.

Types of patients	Symptoms								
	Fever	Chills & Rigors	Vomiting	Headache	Pain abdomen	Cough	Jaundice	Convulsions	Haematuria
P. vivax	42 (100%)	41 (97.6%)	20 (47.6%)	15 (35.7%)	7 (16.6%)	5 (11.90%)	1 (2.38%)	1 (2.38%)	0
P. falciparum	4 (100%)	3 (75%)	2 (50%)	2 (50%)	2 (50%)	0	1 (25%)	1 (25%)	1 (25%)
Mixed	28 (100%)	23 (82.14%)	17 (60.71%)	13 (46.42%)	7 (25%)	7 (25%)	2 (7.14%)	2 (7.14%)	1 (3.57%)
Total	74 (100%)	67 (90.54%)	39 (52.70%)	30 (40.54%)	16 (21.62%)	12 (16.21%)	4 (5.4%)	4 (5.4%)	2 (2.7%)

Table 3
Systemic examination findings in various types of malaria patients.

Types of malaria patients	Organomegaly		
	Splenomegaly	Hepatomegaly	Hepatosplenomegaly
P. Vivax	20 (47%)	6 (14%)	6 (14%)
P. falciparum	3 (75%)	3 (75%)	2 (50%)
Mixed infections	16 (57%)	8 (29%)	7 (25%)
Total	39	17	15

Table 4
Haemoglobin counts in various types of malaria patients.

Types of malaria patients	Haemoglobin (gm%)			Total
	<8	8-12	>12	
P. vivax	8 (19.04%)	31 (73.80%)	3 (7.14%)	42
Mixed	7 (25%)	19 (67.85%)	2 (7.14%)	28
P. falciparum	4 (100%)	0	0	4
Total	19	50	5	74

Table 5
Platelet counts in various types of malaria patients.

Types of malaria patients	Platelet counts (μL)			Total
	<50 000	510000-149000	>150 000	
P. vivax	1 (2.3%)	23	18	42
Mixed	3 (10.71%)	11	14	28
P. falciparum	1 (25%)	1	2	4
Total	5	35	34	74

Fever subsided in 79% of the cases and chills subsided in 77.6% cases within 3 d.

Chloroquine and primaquine were the most preferred antimalarial combination in vivax species in 33 (44.59%) patients and artemisinin based combination therapy (ACT) was administered in mixed infection (33.78%) and falciparum malaria (12.1%) cases.

About 14.86% of the patients suffered from adverse effects. The common adverse effects noted were vomiting (9.4%), abdominal pain (1.4%), SJ syndrome (1.4%) and diarrhoea (1%). There were 5.4% cases which needed intensive care unit admission. There was one case of relapse, readmitted within 2 months, started on new treatment of choloroquine for 3 d and primaquine for 14 d. Change of treatment was recorded in 10 (13.7%) patients. Chloroquine to ACT was noted in 6 (8.1%) cases, ACT to chloroquine in 1 (1.4%) case, and chloroquine to quinine in 2 (2.8%), oral ACT to artemether in 1 (1.4%).

4. Discussion

Malaria caused by *P. vivax* and *P. falciparum* is endemic in many parts of India including Mangalore[6]. This retrospective study shows males (58.1%) were most affected compared to females (41.9%). The patients most affected were in 0-5 years age group. Among the patients, 41.9% were less than 5 years, 36.5% were between 6-10 years and 21.6% were between 11-15 years. There was an increasing incidence of malaria from June onwards coinciding with the onset of rainy season in this region. The cases were more prevalent in the families of migrant workers (63.5%) who tend to live in malaria-prone areas in poorly-constructed dwellings that offer few barriers against mosquitoes.

P. vivax was the major infection (56.8%) followed by mixed infections (37.9%) and *P. falciparum* (5.4%). These results are comparable with a study conducted by Bhandary *et al.* on 102 adult patients in our hospital[6]. They found 50 (49.01%) patients had mixed malaria and 46 (45.09%) were positive for *P. vivax*. Isolated *P. falciparum* was detected in only 6 (5.88%), thus showing that *P. falciparum* monoinfection was less seen in Dakshina Kannada region[6].

P. vivax was the common species in the study conducted by Shetty *et al.*, though many of the patients who were included had mixed infection (17%) with both *P. falciparum* and *P. vivax*[7]. Faseela *et al.* in her study found similar results, which were attributed to endemicity for malaria in this area[8].

Fever was the most common symptom (100%) followed by chills (90.5%), vomiting (52.7%) and headache (40.5%). Similar findings were observed in other studies with slight variation[9,10].

Pallor was observed in 20.3% cases and jaundice in 5.4% cases. Such severe complications were also reported in several studies carried out in a tertiary care hospitals[9,10]. Our study revealed 54.05% cases with thrombocytopenia, 25.67% cases with anaemia and mean haemoglobin was 9.50%. Similar results were reported by Bhandary *et al.*[6], so, *P. vivax* can also give rise to thrombocytopenia though it is believed to be seen more in *P. falciparum* infections.

Males were affected more than females. The 0-5 years age group were more affected than the older age groups. In our region, malaria incidence is more in the migrant population working as construction workers, labours settled in urban slums. Fever, chills and rigors, nausea and vomiting, and headache were the common symptoms seen in all types of malaria.

High grade fever (>100 °F) was seen in 60.3%. Splenomegaly was more predominant compared to hepatomegaly and hepatosplenomegaly.

Increasing resistance of the malaria parasite to chloroquine and sulphadoxine-pyrimethamine previously the most widely used antimalarial treatments has prompted 79 countries and territories (as of 2011) to change their national treatment

protocols to incorporate the highly-effective ACTs. In the past, chloroquine was effective for treating nearly all cases of malaria. In recent studies, chloroquine-resistant *P. falciparum* malaria has been observed with increasing frequency across the country.

The implementation of these guidelines have been very effective in our hospital and could be one of the reasons for the reduced complications we have come across in this study. Moreover advances in detection, diagnosis and management of malaria have reduced the severe morbidity and mortality.

A drastic increase in travel and commerce around the world is certainly changing the clinical picture of this disease gradually. Therefore country-specific and region-specific studies are required to develop guidelines for management of this disease.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

I would like to acknowledge the contribution made by my colleagues. I feel this research paper would not have been possible without the foresight and drive of my head of the department, Professor Dr. Santhosh T. Soans. Presently he is the President of National Indian Academy of Paediatrics, Pediatric Critical Care Chapter [2012-2013].

Comments

Background

This study is conducted in Mangalore district of Karnataka state where the highest rain fall as well as large number of malaria cases are registered every year. In 2008, Mangalore was declared as chloroquine resistant area for malaria parasite *P. falciparum* by NVBDCP, and in 2010, Dakshina Kannada (Mangalore is a city under Dakshina Kannada) was declared so by the District Health Office based on the studies conducted by the Malaria Research Centre, New Delhi. This Article has showed how effective is the newer regimen artisunate based combined therapy in treating malaria in and around Mangalore city and compared the clinical profile of malaria with other studies.

Research frontiers

Study performed based on the implication of ACT in the tertiary health care teaching hospital, where maximum cases admitted are migrants who are construction workers, and many of them are resistant to chloroquine treated effectively by ACT therapy.

Related reports

Bhandary *et al*. Shetty *et al*. conducted similar studies with little higher number of patients showed almost comparable results with this research.

Innovations & breakthroughs

Morbidity and mortality due to malaria has decreased dramatically after strict implication of ACT therapy in falciparum and mixed malaria . The study reinforces the guidelines and encourages to follow the guidelines.

Applications

The side effects of the ACT therapy is minimal compared to any other antimalarial drugs. One can easily use ACT therapy in cases of falciparum and mixed malaria in outpatient department when patients are refusing to get admitted due to financial strains.

Peer review

Author has done this research to study the clinical profile and management of malaria in the paediatric age group. It will help the poor patients with malaria who are in migrant families from different parts of the state.

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