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OUTCOME AND CLINICAL SPECTRUM OF VARIOUS MALARIAL SPECIES AMONG CHILDREN

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Abstract:

Aim: *The purpose of this study was to compare the spectrum of clinical symptoms, hospital history, and treatment outcomes of children diagnosed with different types of malaria.*

Methods: *This descriptive cross-sectional study was conducted in the Pediatric department of PIMS Hospital, Islamabad for one-year duration from March 2019 to March 2020. In children 1 to 14 years of age diagnosed with malaria by peripheral smear or immuno-chromatography. Biological data, clinical presentation, and outcome were recorded. All children received supportive and anti-malarial treatments.*

Results: *Of the 2,357 children who reported to the emergency department, 400 of them developed malaria parasitemia. Two-thirds (65.2%) were infected with Plasmodium falciparum. In the falciparum group, the symptom age was often below 5 years (70%), in 90.4% intermittent fever was observed; jaundice in 21.8%, viscera in 62%, thrombocytopenia in 61%, and the neurological picture in 11.5% of cases. 16 children (6.1%) died from complications of malaria. Plasmodium vivax (P.v) induced parasitemia was found in 114 children (28.5%). In vivax patients, the common age of symptoms was less than 5 years (69%), intermittent fever was reported in 86.8%; jaundice in 20.2% and thrombocytopenia in 70%. Overall, 25 (6.2%) children were diagnosed with mixed falciparum and vivax infection. In this group, jaundice occurred in 52% of cases, and spleen enlargement in all children. The mortality in mixed infections was high compared to the falciparum and vivax groups (p-0.04).*

Conclusion: *It was clear from this study that malaria can manifest itself in many ways like any other disease and can mislead the diagnosis. The most common symptoms were fever, viscera and thrombocytopenia. Mixed infection resulted in higher mortality.*

Keywords: *Malaria, Clinical presentations, Complication, Outcome, Mortality, Children.*

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INTRODUCTION:

Malaria infections cause more than 1 million child deaths worldwide each year,1 with 10 dying every 30 seconds [1]. Data from the 1990s suggested sub-Saharan Africa; where malaria endemic levels are high, about 90% of all malaria cases occur predominantly in infancy and early childhood, leading to high morbidity and mortality. More recent data models indicate that approximately 25% of clinical cases worldwide occurred in South and Southeast Asia, where passive reporting can significantly underestimate the burden of disease [2-3]. Pakistan is one of the major contributors to the morbidity and mortality rate of malaria5. Although childhood malaria is now a well-known cause of mortality and morbidity in Asia [4-5]. Recent studies conducted in our region have shown a very high incidence of malaria in children with high morbidity and a mortality rate of 7-8. In children who are not immune, the signs and symptoms of malaria vary widely, ranging from low fever to > 104 ° F, with headache, somnolence, body pain, abdominal pain, anorexia, nausea, vomiting, altered taste in the mouth, diarrhea, rapid breathing, difficulty breathing, pallor, cyanosis, seizures, spleen enlargement, enlarged liver, jaundice, spontaneous bleeding, dark brown urine, or any combination of these [6-7]. Sometimes malaria exhibits clinical features that resemble other childhood diseases such as pneumonia, acute gastroenteritis, intestinal fever, viral hepatitis, meningitis, etc. In these situations, due to the overlapping features of diagnosed and diagnosed malaria treated late, therefore more complications developed [8-9]. The purpose of this study was to describe the clinical profile and outcomes of malaria in children.

PATIENTS AND METHODS:

This was a descriptive cross-sectional study conducted in the Pediatric department of PIMS Hospital, Islamabad for one-year duration from March 2019 to March 2020. All children aged 1 month to 14 years were recruited from the emergency and outpatient departments if they had a fever and a positive malaria test (positive peripheral blood smear for malaria species and / or positive malaria parasite immunochromatography (MP-ICT). Informed consent was given and, if necessary, they were placed in the pediatric ward. Children were excluded from the study if they were already at Antimalarial treatment or their examination during the stay indicated a different diagnosis, i.e. typhoid fever, dengue fever, viral hepatitis or bacterial meningitis with malaria A detailed history was taken and the clinical examination included vital status, general physical and systemic examination. (CBC), random blood sugar (RBS), urea, creatinine, and electrolytes, liver function test (LFT's), lumbar puncture (if CNS involvement), thyroid and blood culture (if suggesting intestinal fever) and viral profile. Organism identification: Post Giemsa staining microscopy followed by a thick and thin smear for species identification and / or MP-ICT were performed in a hospital laboratory by a trained laboratory technician and confirmed by a microbiologist.

Study analysis was performed using the SPSS software package (version 17.0, Statistical Package for the Social Sciences). Continuous variables (ie, age, length of hospital stay, weight) were listed as means and standard deviation; however, incidence and percentages have been listed for categorical variables (i.e., gender, malaria species, and complications). The children were compared with malaria caused by Plasmodium falciparum (P.F) and Plasmodium Vivax (P.V). The Chi-square test and the exact Fischer test were used to establish the relationship between the qualitative variables, and the Student's t-test was used to compare the quantitative variables. A p value of less than 0.05 was considered significant.

RESULTS:

During the analyzed period, 2,357 children visited the pediatric emergency room; 400 children were enrolled in the study according to the inclusion and exclusion criteria for the final analysis. Overall, 261 (65.2%) children tested positive for PF, in this group the frequent age of presentation was less than 5 years (70% 60.9%), males accounted for 57.9%, and the male-female ratio was 1.4: 1.While 114 (28.5%) children tested positive for PV, in this group the frequent presentation age was less than 5 years (69.3%), 67.5% were males and the male / female ratio was 2. 1: 1.

TABLE 1: Comparison of demographic and clinical presentation based on malarial species.

		P. falciparum N=261 (%)	P. vivax N=114 (%)	P.V& P.F N=25	P-value
Age	<5 year	183 (70.0)	79 (69.3)	14 (36.0)	0.002
	5-15 years	78 (29.9)	35 (30.7)	16 (64.0)	
Sex	Male	151 (57.9)	77 (67.5)	5 (20.0)	<0.001
	Female	110 (42.1)	37 (32.5)	20 (80.0)	
Fever	Intermittent	236 (90.4)	99 (86.8)	12 (48.0)	<0.001
	Remittent	17 (6.5)	14 (12.3)	13 (52.0)	
Fatigue/ Malaise (66.5%)		181 (69.3)	64 (56.1)	21 (84.0)	0.007
Nausea (44%)		122 (46.7)	38 (33.3)	17 (68.0)	0.003
Difficulty in breathing (36%)		85 (32.6)	43 (37.7)	15 (60.0)	0.122
Abdominal Pain (30%)		76 (29.1)	36 (31.6)	9 (36.0)	0.278
Jaundice (23%)		57 (21.8)	23 (20.2)	13 (52.0)	0.002
Vitals	High grade fever (18.5%)	35 (13.4)	30 (26.3)	9 (36.0)	0.001
	Tachypnea (44%)	103 (39.5)	51 (44.7)	21 (84.0)	<0.001
	Tachycardia (39%)	97 (37.2)	42 (36.8)	17 (68.0)	0.009
	Hypotension(18%)	48 (18.4)	16 (14.0)	8 (32.0)	0.102
Visceromegaly	Hepatomegaly(44%)	121 (46.4)	44 (38.6)	13 (52.0)	0.28
	Splenomegaly (58%)	164 (62.8)	44 (38.6)	25 (100.0)	<0.001
Neurological	GCS <7	12 (4.6)	1 (0.9)	2 (8.0)	<0.001
Signs of Meningeal irritation		30 (11.5)	0	4 (16.0)	<0.001
Papilledema		4 (1.5)	0	8 (32.0)	<0.001

Twenty-five (6.2%) children tested positive for mixed infection (PF and PV). in the mixed infectious group, the frequent onset was 5-15 years (64%). Women accounted for 80% and the male to female ratio was 1: 4. The mixed infection was associated with resolving fever (p <0.001), fatigue (p-0.007), spleen enlargement (p <0.001), and hyperbilirubinemia (p <0.001) compared to with PF and PV Mortality in mixed infections was high compared to P. f and P. v (p-0.04). A comparison of demographic and clinical patterns by malaria species is summarized in Table 1. A comparison of the laboratory picture and results by malaria species is shown in Table 2.

TABLE 2: Comparison of laboratory findings, and outcome based on malarial species.

		P.falciparum N=261 (%)	P.vivax N=114 (%)	P.vivax & falciparum N=25 (%)	P-value
Blood picture	Anemia (75%) (Hb<10gm/dl)	205 (78.5)	74(68.4)	22(88.0)	<0.003
	Leukocytosis (11.2%)	38 (14.6)	5(4.3.0)	2(8.0)	<0.001
	Leukopenia (24%)	53 (20.3)	33(28.9)	10(40.0)	
	Thrombocytopenia (64.5%)	161 (61.7)	80(70.2)	17(68.0)	0.094
Hyperbilirubinemia		18 (6.9)	13(11.4)	8(32.0)	<0.001
SGPT		56 (21.5)	32(28.1)	13(52.0)	0.003
Outcome	Survived	245 (93.9)	104(91.2)	20(80.0)	0.04
	Died	16 (6.1)	10(8.8)	5(20)	

31 patients died of 400 malaria children during their stay. A comparison of the outcomes of children with malaria is summarized in Tables 3 and 4.

TABLE 3: Comparison of demographic and clinical presentation in relationship to outcomes in children with malaria

		survived n=369 (%)	Died n=31 (%)	P-value
Age	<5year	257 (69.6)	17 (54.80)	0.081
	5-15 years	112 (30.4)	14 (45.16)	
Sex	Male	156 (42.3)	11 (35.00)	0.57
	Female	213 (57.7)	20 (64.50)	
Fever	Intermittent	331 (89.7)	16 (51.60)	<0.001
	Remittent	29 (7.9)	15 (48.40)	
Fatigue/Malaise/Myalgia		235 (63.7)	31 (100.00)	0.001
Nausea		151 (40.9)	26 (83.90)	<0.001
Difficulty in breathing		110 (29.8)	11 (35.50)	0.03
Abdominal Pain		93 (25.2)	20 (64.50)	<0.001
Jaundice		68 (18.4)	25 (80.60)	<0.001
Vitals	High grade fever	58 (15.7)	16 (51.60)	<0.001
	Tachypnea	130 (35.2)	26 (83.90)	<0.001
	Tachycardia	144 (39.0)	29 (93.50)	<0.001
	Hypotension	46 (12.5)	26 (83.90)	<0.001
Visceromegaly	Hepatomegaly	147 (39.8)	30 (96.80)	<0.001
	Splenomegaly	202 (54.7)	29 (93.50)	<0.001
Neurological	GCS <7	7 (1.9)	5 (16.10)	<0.001
Signs of meningeal irritation		28 (7.6)	6 (19.40)	0.037
	Papilledema	7 (1.9)	5 (16.10)	<0.001

TABLE 4: Comparison of laboratory presentation in relation to outcome of children with malaria.

		Alive N=369 (%)	Died N=31 (%)	P-value
Blood Picture	Anemia	46 (12.5)	26 (83.9)	<0.001
	Leukocytosis	32 (8.7)	6 (19.4)	<0.001
	Leukopenia	71 (19.2)	15 (48.4)	
	Thrombocytopenia	138 (37.4)	29 (93.5)	<0.001
Hyperbilirubinemia		25 (6.8)	15 (48.4)	<0.001
SGPT		81 (22.0)	20 (64.0)	<0.001

DISCUSSION:

Malaria is one of the major public health problems in Pakistan and a major cause of morbidity and mortality, especially among children under the age of 58[10]. This study was conducted in the Karachi Civil Hospital for 36 months, the incidence of P.f was higher (65.2%) compared to P.v (28.5%), and the remaining species were mixed species 6.2%. A higher percentage of P.f cases was also reported in another studies16-19. local surveillance also recorded high P.f in Sindh16,18,22. In this study, 69.5% of children were under 5 years of age, and Jamal et al. Also showed a similar age of presentation 20. However, with mixed infection, the symptom age was often greater than 5 years. Men predominated in P.f and P.v, as in another studies [11-12]. However, women prevailed in mixed infections with a male to female ratio of 1: 4. In this study, 35 cases (13.4%) had a fever> 1020F in PF, while 30 (26.2%) had a high fever in Pv and 36 % had high fever in mixed infection. Similar proportions have been reported in another studies [13-14]. The majority of patients experienced non-specific constitutional signs and symptoms of malaise, fatigue, and body pain in 66.5%, while other investigators reported this in 58-80% of malaria19,24. We reported all gastrointestinal symptoms such as anorexia in 51.4%, nausea / vomiting in 44% and abdominal pain in 30% of cases. In contrast, Siddiqi reported anorexia in 23.3%, nausea or vomiting in 33.2%, and abdominal pain in 1.6% 25. All respiratory symptoms were reported in the study; rapid breathing in 175 (44%) children and breathing difficulties in 143 (36%) cases, and most often in mixed infections (60%). these results are similar to the study by Idro et al and Siddiqi. These respiratory symptoms in malaria cases are similar to respiratory infections and a high rate of suspicion is needed. Overall, liver enlargement was found in 178 (44%) children and spleen enlargement was found in 233 (58%) cases, similar to other studies[15]. Anemia was found in 301 cases (75%) of children (Hb = 10 gm /

dl) according to other Ahsan and Akbar series,27. 5.5% of the cases had severe anemia. The anemia observed in these cases is usually hemolytic in origin, suggesting that pale patients with fever in endemic areas should be screened for malaria infection. Other changes in blood are as important as leukopenia (24%), leukocytosis (11.2%). Leukopenia was more common in mixed infection (40%) and leukocytosis was more frequent in P. f (14.6%). Overall, 258 (65%) children had thrombocytopenia, more frequent in P.V (70%). Memon AR et al found thrombocytopenia in 70% of cases. Thrombocytopenia is considered an important indicator of the severity of malaria and malaria should therefore be considered in the differential diagnosis of children with thrombocytopenia. Clinical jaundice occurred in 93 (23%) children; half of them also showed insane LFTs. This suggests that malaria may mimic viral hepatitis. The cardiovascular involvement was tachycardia in 156 (39%), while Maitland et al. 30 reported tachycardia in 16.1% of cases. This difference may be due to the fact that in my study many patients were dehydrated and had a fever. Hypotension occurred in 72 (18%) children.

CONCLUSION:

Based on the study, it was concluded that malarial infection can manifest itself in multiple ways with the involvement of multiple systems and mimic other clinical conditions. Mixed infection with Pl. Falciparum and Pl. Vivax is associated with high morbidity and mortality rates. According to this study, Pl. Falciparum was common compared to Pl. Vivax. This study showed that the overall score was dependent on the type and number of complications, with worse outcomes being seen in patients with multiple complications. Therefore, children with malaria who have any of these complications are an alarming symptom, carefully monitoring, and treating appropriately and aggressively to reduce mortality.

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