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OUTCOME AND CLINICAL SPECTRUM OF CHILDREN ADMITTED WITH VARIOUS MALARIAL SPECIES

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Abstract:

Objective: *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 was a descriptive cross-sectional study conducted in the pediatric Unit-II of Bahawal Victoria Hospital (BVH) Bahawalpur for two-years duration from October 2018 to October 2020. Children 1-14 years old admitted to the Pediatric Department diagnosed with malaria by peripheral swab 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 visited the emergency department, 400 of them were diagnosed with malarial parasitemia. Two-thirds (65.2%) were infected with Plasmodium falciparum. In the falciparum group the symptom age was often less than 5 years (70%), in 90.4% intermittent fever was observed; jaundice in 21.8%, visceral enlargement 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 frequent age of presentation 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 a mixed infection with both falciparum and vivax. In this group, jaundice occurred in 52% of cases, and spleen enlargement in all children. Mortality in mixed infections was high compared to the falciparum and vivax groups (p-0.04).*

Conclusion: *It is 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, visceromegaly and thrombocytopenia. Mixed infection resulted in higher mortality.*

Keywords: *malaria, clinical presentations, complication, outcome, mortality, children.*

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INTRODUCTION:

Malaria infection causes over 1 million child deaths worldwide each year, at a rate of 1 death in 30 seconds. Data from the 1990s suggested sub-Saharan Africa; where levels of endemic malaria are high, about 90% of all malaria cases occur predominantly in infancy and early childhood, leading to high morbidity and mortality[1-2]. Newer data-driven models indicate that approximately 25% of clinical cases worldwide occurred in Asia and Southeast Asia, where passive reporting can significantly underestimate the burden of disease[3-4]. Pakistan is one of the major contributors to malaria morbidity and mortality. Although childhood malaria is now a well-known cause of mortality and morbidity in Asia. The latest research conducted in our region has shown a very high incidence of malaria in children with high morbidity and mortality[5-6]. 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, pale skin, cyanosis, seizures, enlarged spleen, enlarged liver, jaundice, spontaneous bleeding, dark brown urine, or any combination of these symptoms[7-8]. Sometimes malaria presents with clinical features that resemble other childhood illnesses, such as pneumonia, acute gastroenteritis, intestinal fever, viral hepatitis, meningitis, etc. In these situations, due to the overlapping features of diagnosed and treated late, and therefore more complications developed[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 Unit-II of Bahawal Victoria Hospital (BVH) Bahawalpur for two-years duration from October 2018 to October 2020. All children aged 1 month to 14 years were recruited from the emergency and outpatient departments if they had a fever and positive malaria test (positive peripheral blood smear for malaria species and / or positive malaria parasite immunological chromatography (MP-ICT). Informed consent was given and, if necessary, admitted to the pediatric ward. Children were excluded from the study if they were already present. treated with antimalarial drugs or their examination during the stay showed a different diagnosis, i.e. typhoid, dengue, viral hepatitis or bacterial meningitis with malaria, i.e. blood count (CBC), random blood sugar level (RBS), urea, creatinine and electrolytes, liver function test (LFT ") s), lumbar puncture (in the case of CNS involvement), thyroid gland and blood e (if indicated by intestinal fever) and viral hepatitis profile. 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. The 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) are listed as mean and standard deviation; however, frequency and percentage have been listed for categorical variables (ie, gender, malaria species, and complications). The children were compared with malaria caused by Plasmodium falciparum (P.F) and Plasmodium Vivax (P.V). Chi-square test and Fischer's exact test were used to establish the relationship between qualitative variables, and Student's t-test was used to compare quantitative variables. A p value of less than 0.05 was considered significant.

RESULTS:

In 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 common age of presentation was less than 5 years (70% 60.9%), males accounted for 57.9%, and a male to female ratio of 1.4: 1. While 114 (28.5%) children tested positive for Pv, this group was often younger than 5 years old (69.3%), 67.5% were males and the ratio of males to females was 2. 1: 1. 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 ratio of men to women was 1: 4. The mixed infection presented with resolving fever (p <0.001), fatigue (p-0.007), spleen enlargement (p <0.001) and hyperbilirubinemia (p <0.001) in compared to Pf and Pv Mortality in mixed infections was high compared to P. f and P. v (p-0.04). A comparison of the demographic and clinical patterns by malaria species is summarized in Table 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

A comparison of the laboratory picture and results by malaria species is shown in Table 2. 31 patients died of 400 malaria children during their stay.

		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)	
	Leukopenia (24%)	53 (20.3)	33(28.9)	10(40.0)	<0.001
	Thrombocytopenia (64.5%)	161 (61.7)	80(70.2)	17(68.0)	0.094
		18 (6.9)	13(11.4)	8(32.0)	<0.001
Hyperbilirubinemia					
SGPT		56 (21.5)	32(28.1)	13(52.0)	0.003
Outcome	Survived	245 (93.9)	104(91.2)	20(80.0)	
	Died	16 (6.1)	10(8.8)	5(20)	0.04

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 5-	257 (69.6)	17 (54.80)	0.081
	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 an important cause of morbidity and mortality, especially among children under the age of 5. This study was conducted to know the incidence of P.f was higher (65.2%) compared to P.v (28.5%), and the rest were mixed species 6.2%. A higher percentage of P.f cases was also reported in other studies. Local surveillance also showed a high P.f factor in Sindh. In this study, 69.5% of children were under 5 years of age, and Jamal et al. Also showed a similar age of presentation[9-11]. However, with mixed infection, the symptom age was often greater than 5 years. In the case of P.f and P.v, men prevailed, as in other studies. 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 cases % had high fever

in mixed infection. Similar proportions were found in other studies[12]. The majority of patients had non-specific constitutional signs and symptoms such as malaise, fatigue, and body pain in 66.5%, while other investigators reported this in 58-80% of malaria cases. 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%[12-13]. This study included all respiratory symptoms; rapid breathing in 175 (44%) children and difficulty breathing in 143 (36%) cases, and most often in mixed infections (60%). These results are similar to the studies 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, hepatomegaly was found in 178 (44%) children, and spleen enlargement was found in 233 (58%) cases, similar to other studies. Anemia was found in 301 cases (75%) of children (Hb = 10gm / dl) according to other Ahsan and Akbar series. 5.5% of the cases had severe anemia. The anemia observed in these cases is usually hemolytic in origin, suggesting that pale, feverish patients 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 common in P. f (14.6%). Overall, 258 (65%) children had thrombocytopenia, more frequent in P.v (70%). Memon AR et al. Described thrombocytopenia in 70% of cases. Thrombocytopenia is considered an important indicator of the severity of malaria and malaria should therefore be included in the differential diagnosis when examining children with thrombocytopenia. Clinical jaundice occurred in 93 (23%) children; half of them also showed insane LFTs. He suggests that malaria may mimic viral hepatitis[14]. The cardiovascular involvement was tachycardia in 156 (39%), while Maitland et al. 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. In this study, mental confusion was found in 18.4% of cases, meningeal symptoms were present in 34 (9%) cases, and 12 cases had papilledema. In the literature, mental confusion was reported in 17% of patients, symptoms of meningeal irritation in 18%, and thyroid edema in 10%. The neurological symptoms of cerebral malaria resemble mainly meningitis, encephalitis, and metabolic encephalopathy and mislead the physician. It has been observed that many doctors in such cases simultaneously administer antibiotics and antimalarial drugs. In our study, 31 children died, mostly from complications from malaria. Mortality was high in younger children, women, and children with mixed infections, and there were numerous complications. Malaria is known to have a variety of symptoms, mimicking upper and lower respiratory tract infections, acute gastroenteritis, acute hepatitis, intestinal fever, viral fever and meningitis, etc. Practicing doctors in endemic areas in countries like Pakistan should be well known from various forms of malaria, and this diagnosis should be considered in any child with a fever[15]. The vast majority of children had fever, chills or anemia and / or enlarged spleen; therefore, all these signs and symptoms may suggest that you are infected with malaria.

CONCLUSION:

From the study, it was concluded that malarial infection can manifest itself in many ways with the involvement of multiple systems and can 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 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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