

SOCIODEMOGRAPHIC, CLINICAL, AND PATIENT OUTCOME IN MALARIA AMONG CHILDREN POPULATION IN SINDH PAKISTAN

Ghulam Shabir Laghari¹, Abdul Hameed Radhan², Zahid Hussain³, Khuda Bux Khoso⁴, Saeed Ahmed Shaikh⁵, Zameer Ahmed Qambrani⁶

Authors' Affiliation

¹⁻⁶ Department of Pediatrics, Liaquat University of Medical & Health Sciences Jamshoro

Corresponding Author

Zahid Hussain
Medical Officer, Department of Pediatrics, Liaquat University of Medical & Health Sciences Jamshoro.
Email: zahid.laghari216@gmail.com

ABSTRACT

Objective: To study the sociodemographic and clinical characteristics associated with a poor prognosis in pediatric malaria patients.

Material & Methods: A cross-sectional study was conducted at the Pediatric Department, Liaquat University of Medical & Health Sciences Jamshoro between October 2019 to May 2020. Children with a confirmed malaria diagnosis on parasitology were included in the study. Detailed history and thorough physical exam was performed. There were two possible outcomes, i) Recovery and ii) Expiry. A Chi-square test was applied to determine the association between variables and death occurrence.

Results: Mean age of the patient was 5.06 ± 1.89 years. There were 32 (26.67%) patients who developed three or more complications. We found that male gender ($p=0.02$), age less than one year ($p=0.05$), mixed species of malaria ($p<0.0001$), ≥ 3 complications ($p<0.0001$), and lengthier hospital stay ($p=0.001$) were significantly associated with a higher incidence of mortality.

Conclusion: We found that male gender, infants (age < one year), mixed species of both *P. falciparum* and *P. Vivax*, multiple complications, and increased duration of hospitalizations were strongly associated with a higher mortality rate among the pediatric population.

Key Words: Children, Epidemiology, Malaria., Paediatric.

This article may be cited as: Laghari GS, Radhan AH, Hussain Z, Khoso KB, Shaikh SA, Qambrani ZA. Sociodemographic, clinical, and patient outcome in malaria among children population in Sindh Pakistan. *Ann Allied Health Sci.* 2021; 7(2):36-40.

INTRODUCTION

Malaria is an infectious disease presented as intermittent episodes of fever which may or may not be associated with chills, rigors, generalized weakness, anemia, and visceromegaly.¹ There are currently three hundred to five hundred million cases of malaria reported resulting in more than one million deaths annually.²⁻⁴ Most malaria-related deaths occur in infants and young children.⁵⁻⁶

As per World Health Organization, Pakistan has malarial prevalence of 0.8 per 1000.⁷ The most malaria-ridden areas in Pakistan are Sindh and

Baluchistan with *Plasmodium falciparum* being the most dominant there.^{8,9}

In children malaria often have clinical features that differ from those of adults.⁸ Children mostly present with the non-specific sign and symptoms of low to high-grade fever, irritability, headache, fatigability, and body ache, but can also present with atypical findings such as pallor, cyanosis, drowsiness, altered mental status, unconsciousness, thrombocytopenia, decreased urine output, and respiratory distress. Due to the varying nature of the disease, it is often misdiagnosed in the pediatric population. This further deteriorates the patient outcome and prognosis.^{9, 10} Therefore, the present study was

undertaken to determine the various common and uncommon clinical features of malaria in the pediatric age group and its outcome. Furthermore, the study aimed to explore the various sociodemographic and clinical variables associated with the poor prognosis of malaria.

MATERIAL AND METHODS

A cross-sectional study was conducted at the Pediatric Department, Liaquat University of Medical & Health Sciences Jamshoro, Pakistan, between October 2019 to May 2020. Children with a confirmed malaria diagnosis on parasitology were included in the study. A nonprobability purposive sampling was used to enroll participants in the study. Patients already on antimalarial therapy before their admission, those diagnosed with typhoid fever, viral hepatitis, and hemoglobinopathy were excluded. Since the study included children, consent was taken from the parents. Data was collected on a predefined structured proforma. Detailed history and thorough physical exam was performed. Investigations including Malaria Parasite by Giemsa Stain (thick and thin Smear to review different species), Complete Blood Count (CBC), Blood Sugar (RBS), Renal function tests, Electrolytes (UCE), Liver Functions Test (LFT's), Urine Detailed Report (UDR), Radiographs, Bone Marrow biopsy or Lumbar puncture (CSF DR, C/S) were ordered when needed.

Standard antimalarial treatment was offered to diagnosed patients. Strict vital monitoring, input/output charting, and response to 1st line drugs were done and documented. There were two possible outcomes, i) Recovery and ii) Expiry. Patients who recovered clinically (as signs and symptoms resided) and patients discharged to home were categorized as recovered. Any individual who developed severe anemia, cerebral malaria, hypoglycemia, multiple seizures (≥ 3 episodes observed within 24 hours), acute renal failure was said to have developed complications. Expiries were only considered if patients were declared dead during their stay in the hospital after being diagnosed with malaria.

The data analysis was performed using the SPSS software package (version 26.0, SPSS). All continuous variables including patient's age,

hospitalization stay, etc were presented as mean and standard deviation. Frequency and percentages were computed for qualitative variables. All data were presented in tabular and graphical form.

RESULTS

A total of 315 children were diagnosed with malaria during the study time period. Mean age (SD) of the patients was of 5.06 ± 1.89 years. 170 (53.97%) children were between the ages of 1 to 5 years while only 32 (10.16%) were below the age of one. There was evident male dominance in the study. Most of the patients, 211 (66.98%) presented from Karachi city, while 32 (10.16%) were from Interior Sindh and 47 (14.92%) were from Balochistan. The majority of the patients presented with fever associated with rigors and chills, malaise, and body aches. 246 (78.10%) had anemia/pallor, 202 (64.13%) had malnutrition, and splenomegaly was detected in approximately one-half of the study population. (**Table 1**) The majority of the patients presented in October 2019 with a frequency of 69 (21.9%). The number of cases reduced with succeeding months from October to May with the lowest cases presented in May i.e. 25 (7.9%). There were 120 (38.10%) who developed at least one or more complications during their stay in hospital, 88 (73.33%) developed two or fewer complications while 32 (26.67%) patients developed 3 or more complications, 296 (93.97%) recovered fully while 19 (6.03%) children expired. The mean stay of hospitalization was 8.21 ± 3.6 days; among them, 72 (60%) patients remain admitted for 1-7 days, 35 (29.17%) for 8-14 days, while 13 (10.83%) remain hospitalized for greater than 14 days. We found that male gender ($p=0.02$) and age less than one year (0.05) were significantly associated with a higher incidence of mortality i.e. 16 (84.21%) and 5 (15.63%), respectively. Similarly, out of the 19 (6.03%) patients diagnosed with mixed species of malaria, 7 (36.84%) expired ($p<0.0001$). Patients with ≥ 3 complications had a significantly worse prognosis with a mortality rate of 46.88% ($p<0.0001$). Finally, greater lengths of hospital stay were also associated with a high death rate among the patients ($p=0.001$). (**Table 2**)

Table 1. Sociodemographic and clinical variables of patients

Variables	n (%)
Gender	
Female	129 (40.95%)
Male	186 (59.05%)
Mean Age ± SD (years)	5.06 ± 1.89
< 1 year	32 (10.16%)
1 - 5 years	170 (53.97%)
6 - 15 years	113 (35.87%)
Malarial Species	
P. Falciparum	211 (66.98%)
P. Vivax	85 (26.98%)
Mixed species	19 (6.03%)
Signs and Symptoms	
Fever with Rigors & Chills	239 (75.87%)
Malaise / Fatigability	208 (66.03%)
Body aches	186 (59.05%)
Anemia/pallor	246 (78.10%)
Malnutrition	202 (64.13%)
Splenomegaly	167 (53.02%)
Hepatomegaly	46 (38.33%)

Table 2: Patient outcome and factors associated with poor prognosis

Characteristics	Patient Outcome				P-value
	Total	Recovery		Death	
	315 (100%)	296	93.97%	19	6.03%
Gender					
Female	129 (40.95%)	126	42.57%	3	15.79%
Male	186 (59.05%)	170	57.43%	16	84.21%
Age Groups					
< 1 year	32 (10.16%)	27	84.38%	5	15.63%
1 - 5 years	170 (53.97%)	162	95.29%	8	4.71%
6 - 15 years	113 (35.87%)	107	94.69%	6	5.31%
Malarial Species					
P. Falciparum	211 (66.98%)	205	97.16%	6	2.84%
P. Vivax	85 (26.98%)	79	92.94%	6	7.06%
Mixed species	19 (6.03%)	12	63.16%	7	36.84%
Complications					
≥ 3 complications	32 (10.2%)	17	53.13%	15	46.88%
≤ 2 complications	88 (27.9%)	85	96.59%	3	3.41%
No complications	195 (61.9%)	194	99.49%	1	0.51%
Hospitalization					
1-7 days	72 (60.00%)	67	93.06%	5	6.94%
8-14 days	35 (29.17%)	27	77.14%	8	22.86%
> 14 days	13 (10.83%)	7	53.85%	6	46.15%

DISCUSSION

The current study evaluated the socio-demographic and clinical parameters associated with malaria in the young population. We found that the male gender and *P. falciparum* were dominant in our study. The majority were between the ages of 1-5 years of age. Our study is in accordance with a study conducted by Akbar JU et al.¹¹ who observed a high incidence of *falciparum* as compared to *vivax* (65% vs 35%). Similarly, males were predominant in a study by Jalal-ud-din et al.⁴ and Idris M et al.¹² Nizamani MA et al.¹³ and Hozhabri S¹⁴ documented that malaria risk was high in Sindh during September to January months. We reported the highest number of cases in October. Literature shows that fever associated with rigors or chills is strongly suggestive of malarial infection, and children with these symptoms should be evaluated for malaria.¹⁵ In current study, over 3/4th of the patients presented with fever associated with rigors and chills. Thrombocytopenia was another major manifestation of malaria in our study. The current findings coincided with a recent study conducted by Mohamedahmed KA et al, which revealed that severe malaria was significantly associated with thrombocytopenia where a mean platelet count of $160.91 \pm 186.24 \times 10^9$ was observed.¹⁶

The current study revealed that infants younger than one year of age, male gender, multiple complications, mixed species of the malarial parasite, and lengthier hospitalization were significantly associated with increased mortality. The most common complications in malaria patients according to the literature are thrombocytopenia, liver dysfunction, and anemia in 43%, 40%, and 34% of patients, respectively.¹⁷ It was observed that patients also developed acute renal failure. Multiple complications were significantly associated with an increased risk of mortality. Bassat Q et al. revealed that patients with four or more complications had a case fatality rate of 9.9-81.6%.¹⁸ Multiple complications such as severe anemia, thrombocytopenia, or hypoglycemia are known to be associated with a worse prognosis.¹⁹ Furthermore, lengthier stay in hospital was strongly associated with increased death rates in our study ($p < 0.001$).

Malaria can be difficult to diagnose because of its wide array of symptoms. Some of the atypical findings include cough, diarrhea, hepatitis, among others may cause the physician to think of other infectious diseases and delay prognosis. Therefore, the physician needs to keep up to date with the current trends and presentation of malaria in countries where the disease is highly prevalent.

As in this study, most of the children were presented with fever, associated with rigor or chills, anemia, and/or splenomegaly, therefore all these signs and symptoms can be taken as suggestive indicators for suspicion of malaria infection.

CONCLUSION

We found that male gender, infants (age < one year), mixed species of both *P. falciparum* and *P. Vivax*, multiple complications, and increased duration of hospitalizations were strongly associated with a higher mortality rate among the pediatric population. Malaria is endemic to our region and places a substantial amount of stress on the health care sector. Therefore, there is a dire need for collective efforts by all involved departments, personnel-related to health, and community members, to ensure that preventive measures against malaria are not only promoted but also followed.

REFERENCES

1. Desai RR, Patange A, Palekar V. Study of clinical profile of malaria. *Journal of Critical Reviews*. 2019;6(6):1027-30.
2. Cibulskis RE, Aregawi M, Williams R, Otten M, Dye C. Worldwide incidence of malaria in 2009: estimates, time trends, and a critique of methods. *PLoS Med*. 2011 Dec 20;8(12):e1001142.
3. World Health Organization. Eliminating malaria. World Health Organization; 2016.
4. Kumar A, Valecha N, Jain T, Dash AP. Burden of malaria in India: retrospective and prospective view. *The American journal of tropical medicine and hygiene*. 2007 Dec 1;77(6_Suppl):69-78.
5. Crawley J. Reducing the burden of anemia in infants and young children in malaria-endemic countries of Africa: from evidence to action. *The American journal of tropical medicine and hygiene*. 2004 Aug 1;71(2_suppl):25-34.
6. White NJ. Anaemia and malaria. *Malaria Journal*. 2018 Dec;17(1):1-7.
7. World Health Organization. WHO report on the responsiveness of the Roll Back Malaria (RBM) program to the country needs in the WHO Eastern Mediterranean Region (EMRO). Cairo: WHO;2004.
8. Nizamani MA, Kalar NA, Khushk IA. Burden of malaria in Sindh, Pakistan: a two years surveillance report. *J Liaquat Uni Med Health Sci* 2006;5(2):76-83.

9. Yaszaini MI, Kakarsulemankhel JK. Prevalence of human malaria infection in bordering areas of East Balochistan, adjoining with Punjab: Loralai and Musakhel. *J Pak Med Assoc* 2009;59(3):133-4.
10. Uzochukwu BS, Ossai EN, Okeke CC, Ndu AC, Onwujekwe OE. Malaria knowledge and treatment practices in Enugu state, Nigeria: A qualitative study. *International Journal of Health Policy and Management*. 2018 Sep;7(9):859.
11. Akbar JU. Malaria in children at a children hospital. *J Surg Pak* 2002;7(3):20-2.
12. Murtaza G, Memon I, Noorani AK. Malaria Prevalence in Sindh. *Med Channe* 2004;10(2):41-2.
13. Nizamani MA, Kalar NA, Khushk IA. Burden of malaria in Sindh, Pakistan: a two years surveillance report. *J Liaquat Uni Med Health Sci* 2006;5(2):76-83.
14. Hozhabri S, Akhtar S, Rahbar M, Luby S. Prevalence of plasmodium positivity among the children treated for malaria, Jhangara, Sindh. *J Pak Med Assoc* 2000;50(12):401-5.
15. Taylor TE, Molyneux ME. Clinical features of malaria in children. In *Essential malariology* 2017 Dec 14 (pp. 206-218). CRC Press.
16. Mohamedahmed KA, Nour BY, Abakar AD, Babker AM. Diagnostic and prognostic value of thrombocytopenia severity in Sudanese children with Falciparum malaria. *World Journal of Advanced Research and Reviews*. 2020;6(3):197-204.
17. Arévalo-Herrera M, Rengifo L, Lopez-Perez M, Arce-Plata MI, García J, Herrera S. Complicated malaria in children and adults from three settings of the Colombian Pacific Coast: A prospective study. *PLoS One*. 2017 Sep 25;12(9):e0185435.
18. Bassat Q, Guinovart C, Sigauque B, Aide P, Sacarlal J, Nhampossa T, et al. Malaria in rural Mozambique. Part II: children admitted to hospital. *Malar J* 2008;7:37.
19. Njim T, Tanyitiku BS. Prognostic models for the clinical management of malaria and its complications: a systematic review. *BMJ open*. 2019 Nov 1;9(11):e030793.

