e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(12); 1212-1218

Original Research Article

Analysis of Management and Outcome of Falciparum Malaria among Pediatric Population

Hemantbhaiv Sanjivbhai Patel

MD Pediatrics, Assistant Professor, Vedantaa Institute of Medical Sciences, Saswand, Dahanu (Palghar) Maharashtra

Received: 22-10-2022 / Revised: 22-11-2022 / Accepted: 28-12-2022
Corresponding author: Dr. Hemantbhai Sanjivbhai Patel
Conflict of interest: Nil

Abstract

Introduction: The multistage lifecycle of the Plasmodium parasite causes recognizable cyclical fevers. Most persons get rapid symptom relief with prompt treatment; nevertheless, serious consequences, such as severe malarial anaemia, cerebral malaria, death, or coma may results. About 40% of the world's population travels to or lives in areas where malaria is prevalent. sub-Saharan and western Africa are home to P. falciparum. Early detection of probable respiratory failure should be the first step in the clinical assessment process, followed by the discovery of shock and a neurological evaluation.

Aims and Objectives: To evaluate the management and outcome of falciparum malaria among pediatric population.

Methods: This is a Prospective randomised double-blind control study which considered 51 patients with plasmodium falciparum malaria were given antimalarials per National and WHO recommendations. Patients who did not respond to first-line drugs to second-line drugs. The outcome was assessed by considering several factors and statistical analysis was conducted.

Results: The study found severe anaemia being the most common complication, which was found in 19 (37.25%) patients followed by cerebral malaria (27.45%), acute renal failure (17.64%), Hepatitis 13 (25.87%), Acidosis 1 (1.96%), Hypoglycemia 1 (1.96%), Hypotension 1 (1.96%), Disseminated intravascular coagulation (DIC) 1 (1.96%). The study showed that, out of 51 patients with *P. falciparum* malaria and the majority of patients were discharged from 5 to 10 days.

Conclusion: The study concluded 66.67% patients responded to chloroquine, 90 % responded to quinine and 94.11 % patients responded to artemisinin. The study also added that the overall mortality rate was 3.84%.

Keywords: Falciparum, Artemisinin, Malaria, Chloroquine, Antimalarials.

Introduction

The parasite disease known as malaria, which is spread by the Anopheles mosquito and causes acute, life-threatening illness, is a serious danger to global health. In addition to the 126 million patients and the two billion people who live in the 91 countries where malaria is endemic, 1.4 to 2.8 million people die from malaria each year [1]. The multistage lifecycle of the Plasmodium parasite causes recognizable cyclical fevers. Most persons get rapid symptom relief with prompt treatment;

nevertheless, serious consequences, such as severe malarial anaemia, cerebral malaria, death, or coma may happen [2]. The most effective antimalarial treatment and chemoprophylactic treatments are determined by the participant's demography, geographic location, and susceptibility. Years after exposure, latent or restarting infections may be discovered [3,4].

In areas where a parasitological examination is not feasible, the World Health Organization (WHO) suggested earlier presumptive diagnosis as the foundation for the first-line treatment of malaria that is uncomplicated. This program reduced treatment delays, especially for people who lived far from formal healthcare facilities, by allowing village health workers, shopkeepers, and relatives to treat uncomplicated malaria illnesses at home [5-7].

Every year, 40% of the world's population travels to or lives in areas where malaria is prevalent. sub-Saharan and western Africa are home to P. falciparum, which has the greatest morbidity and fatality rates of all the Plasmodia species [8]. South Asia, the Western Pacific, and Central America all contain P. vivax. Sub-Saharan Africa is home to P. ovale and P. malariae. Southeast Asia contains P. knowlesi [9].

In children, the term "severe malaria" is currently used when asexual forms of P. falciparum are found in peripheral blood and there are signs of respiratory distress, vomiting, abnormal bleeding, shock, multiple convulsions, prostration, metabolic acidosis, severe anemia, dark urine, low blood sugar, jaundice, and/or kidney failure [10-11]. The selection/recruitment tactics, the precision of malaria diagnosis/speciation, and the definitions of the characteristics themselves will all influence the percentages of children with various clinical signs defining severity and their consequent case fatality rates (CFRs). However, the case fatality rates (CFRs) of kids hospitalized with severe malaria are not taken into account when estimating malaria mortality as a whole [12-15].

Most deaths from malaria occur within hours of admission in locations where the disease is endemic, primarily as a result of the clinician's failure to recognize the approaching collapse of the circulatory system or respiratory compromise. The latter is especially true for pediatric population who have long-lasting seizures. Patients who present in a coma may have elevated intracranial pressure, necessitating a careful approach to volumetric resuscitation in such youngsters [16,17].

The first therapy for pediatric population with possible malaria should follow the same rapid, structured triage examination used to determine emergency and priority symptoms for any other unwell child who presents to the hospital. Early detection of probable respiratory failure should be the first step in the clinical assessment process, followed by the discovery of shock and a neurological evaluation [18,19]. This strategy will direct early treatment toward the issues that pose the most significant risk to life. While the malaria diagnosis is being verified, emergency management should not be put off. The delivery of certain antimalarial medications can typically be delayed until resuscitation measures have been administered and the diagnosis has been established unless an unjustified delay is expected. Even if the outcomes are still expected, if the disease suspected of malaria is high, an intravenous administration of quinine should indeed be started [20].

Methods and Results

Research Design

This is a Prospective randomised double-blind control study which is conducted during the period of two years. The study considered 51 people were examined. The study used plasmodium falciparum-

positive peripheral smears. All of these patients had a comprehensive overview, clinical exam, and basic research, according to the proforma. Patients with plasmodium falciparum malaria were given antimalarials per National and WHO recommendations. Patients who did not respond to first-line drugs to second-line drugs.

Inclusion and Exclusion criteria

Out of 51 patients who had suppered with *P. falciparum* malaria and the majority of patients were discharged from 5 to 10 days. From 1 August 2008 to 31 July 2010 around 51 patients had *P. falciparum* malaria and 43 of the patients were discharged, 5 patients were expired, 2 left against medical advice, and 1 absconded.

Statistical analysis

The study used SPSS 25 and MS Excel for effective statistical analysis. . The continuous variables were expressed as mean±standard deviation. The discrete variables were expressed as counts and its respective percentage. The statistical method employed for analyzing continuous variables was ANOVA while for discrete variables was chi-square. The level of significance was considered to be α=0.05.

Ethical Approval

The authors explained the study process to each participant thoroughly before data collection. The study obtained written consent from each participant and received approval from the hospital's Ethical Committee.

Results

In this study, severe anaemia being the most common complication, was found in 19 (37.25%) patients followed by cerebral malaria (27.45%), acute renal failure (17.64%), Hepatitis 13 (25.87%), Acidosis 1 (1.96%), Hypoglycemia 1 (1.96%), Hypotension 1 (1.96%), Disseminated intravascular coagulation (DIC) 1 (1.96%).

Table 1: Investigations done and complications found in this study

Investigations	**No of Patients**
Peripheral smear positive for P. vivax	1 (1.96%)
Low platelet count (thrombocytopenia)	30(58.88%)
Altered Renal function tests	9(17.64%)
Altered liver function tests	14 (27.45%)
Serum dengue IgM - positive	2 (3.92%)
Abnormal urine examination	5 (9.80%)
Abnormal X-ray chest (PA view) [s/o consolidation]	3 (5.88%)
Abnormal cerebrospinal fluid examination	1 (1.96%)
Prolonged prothrombin time	3 (5.88%)
Abnormal arterial blood gas analysis (ABGA)	1 (1.96%)
Abnormal 2D- echocardiography	1 (1.96%)
Complications	**No of Patients**
Severe anaemia	19 (37.25%)
Cerebral malaria	14 (27.45%)
Acute renal failure	9 (17.64%)
Hepatitis	13 (25.87%)
Acidosis	1 (1.96%)
Hypoglycemia	1 (1.96%)
Hypotension	1 (1.96%)
Disseminated intravascular coagulation (DIC)	1 (1.96%)

Out of these 51 patients, 1 patient was resistant to chloroquine and 3 patients were resistant to quinine 30, Artemisinin compounds 18 when used as a first-line antimalarial drug. In addition, when used the second line of antimalarial drugs out of these patients Quinine 2, Artemisinin 4 patients (Table 2).

Table 2: First and Second line antimalarials and number of patients received in this study

First line Antimalarial drug	**No of Patients**
Chloroquine	3 (5.88%)
Quinine	30 (58.82%)
Artemisinin compounds	18 (35.29%)
Second line Antimalarial drug	**No of Patients**
Quinine	2 (33.33 %)
Artemisinin	4 (66.67 %)

As per analysis, it had found, 100% of patients who did not respond the first line to second line antimalarial drugs.

Table 3: Response to First-line and Second-line anti-malarials

Drug	**Number of Patients**		
	Chloroquine	**Quinine**	**Artemisinin Compounds**
Response to first-line anti-malarials			
Administered	3(5.88%)	30(58.82%)	18(35.29%)
Responders	1(33.33%)	27(90%)	17(94.44%)
Non-responders	2(66.67%)	3(10%)	1(5.56%)
Response to second-line anti-malarials			
Administered		2 (33.33%)	(66.67%)
Responders		2 (100%)	4 (100%)
	All patients responded to second-line antimalarial drugs		

The results had experimented out of 51 patients with *P. falciparum* malaria and the majority of patients were discharged from 5 to 10 days. 43 of the patients were discharged, 5 patients were expired, 2 left against medical advice, and 1 absconded. The study has assessed several factors like blood products, time for recovery of fever in days, duration of hospital stays in days and the prognosis of the patients for overall outcome assessment (Table 4).

Table 4: Outcome assessment of the patients in this study

Type of blood product	**No of Patients**
Packed cell volume (PCV)	17 (33.33%)
Platelet-rich concentrate (PRC)	14 (27.45%)
Fresh frozen plasma (FFP)	9 (17.65%)
Time for recovery of fever in days	**No of Patients**
<2	13 (25.49%)
2-5	29 (56.86%)
>5	9 (17.65%)
Duration of hospital stay (in days)	**No of Patients**
<5	18(35.29%)
5-10	26 (50.98)
>10	7 (13.73%)

Prognosis	No of Patients
Discharge	43 (84.31%)
Expiry Transfer to IKDRC (expired) Total	4 (7.84%) 1 (1.96%) 5 (9.80%)
LAMA (Left against medical advice)	2 (3.92%)
Abscond	1 (1.96%)

Discussion

Estimates may not take into account improved inpatient treatment of severe malaria (SM), where estimated case fatality rates (CFRs) range from 1-25%, even if worldwide malaria mortality is reducing. In order to determine whether the alleged distinctions among clinical features and outcomes in Melanesian children, as opposed to Asian children, actually exist and to explore temporal changes in both the overall and complication-specific CFRs, a meta-analysis of prospective studies of SM was conducted. In conclusion, the current meta-analysis validates the claim made from different studies and observations that PNG kids with serious malaria present with a lower CFR compared to children. There is still significant variation among all trials, despite the possibility that low rates of hypoglycemia and concurrent bacteremia are mediating this in part. The lack of temporal change as a whole and cerebral malaria CFRs inside an era of increased access to parenteral artesunate should be a catalyst for renewed efforts to improve the diagnosis of severe malaria, enhance pre-referral procedures, and optimize inpatient management, even though there is strong evidence that CFRs owing to low blood sugar and metabolic acidosis have been declining [21].

The burden, risk factors, and complete amount of neurological involvement caused by Plasmodium falciparum are yet unknown, despite the parasite's apparent predisposition to affect the brain. There are many studies conducted which quantify the prevalence of neurological involvement in children suffering from acute falciparum malaria and to define its clinical presentations and consequences. According to the study's findings, neurological involvement is a common complication of acute falciparum malaria in and is linked to metabolic abnormalities, poor perfusion, parasitemia, increased mortality, and neurological sequelae. According to the study, plasmodium falciparum exposes many youngsters to injuries to their brains [22].

Mixed-species infections are often far less frequent in symptomatic patients in comparison to asymptomatic individuals, according to cross-sectional and longitudinal surveys conducted in that have revealed negative relationships between the incidence of various Plasmodium species. Additionally, P. falciparum patients who have a mixed infection with P. vivax have a lower incidence of severe malarial disease, but not a fatality, according to epidemiologic data from Thailand. Additionally, P. vivax co-infection tends to reverse the hemoglobin nadir that results from falciparum malaria treatment. These findings have been regarded as proof that P. vivax defends against clinical P. falciparum illness [23,24].

The low-interest rates of low blood sugar in this setting, as shown in the current meta-analysis, and a more recent finding that concomitant bacteremia, in particular non-typhoidal salmonellae (NTS), takes place far less commonly who have severe malaria, provide two possible explanations for the low CFRs in children who have severe malaria. The reduced CFRs seen in comatose children as well as the total CFR may be explained by the extremely low

incidence of hypoglycemia in Melanesian kids with severe malaria (1%) [25,26].

Conclusion

The study has concluded that 66.67% patients responded to chloroquine, 90 % responded to quinine and 94.11 % patients responded to artemisinin compounds used as the first-line anti-malarial drugs. About 56.86% patients became afebrile within 2 to 5 days. Again, 26 (50.98%) patients were discharged within 5 to 10 days. The overall mortality rate was 3.84%.

References

1. Snow RW, Guerra CA, Noor AM, Myint HY, Hay SI. The global distribution of clinical episodes of Plasmodium falciparum malaria. Nature. 2005;434: 214–217.
2. World Health Organisation (WHO). Severe falciparum malaria. Trans R Soc Trop Med Hyg. 2000;94 Suppl 1: S1–90.
3. Manning L, Laman M, Law I, Bona C, Aipit S, et al. Features and prognosis of severe malaria caused by Plasmodium falciparum, Plasmodium vivax and mixed Plasmodium species in Papua New Guinean children. PLoS One. 2011; 6: e29203.
4. World Health Organisation (WHO). Severe and complicated malaria. World Health Organization, Division of Control of Tropical Diseases. Trans R Soc Trop Med Hyg. 1990; 84 Suppl 2: 1–65
5. World Health Organisation (WHO). Severe and complicated malaria. World Health Organization Malaria Action Programme. Trans R Soc Trop Med Hyg. 1986; 80 Suppl: 3–50.
6. Imbert P, Yen KK, Migliani R, Sokhan C, Martin YN, et al. [Malaria in children at the Sihanoukville Hospital (Cambodia)]. Bull Soc Pathol Exot. 1994; 87: 253–260.
7. Murray CJ, Rosenfeld LC, Lim SS, Andrews KG, Foreman KJ, et al. Global malaria mortality between 1980 and 2010: a systematic analysis. Lancet. 2012;379: 413–431.
8. Imbert P, Gerardin P, Rogier C, Ka AS, Jouvencel P, et al. Severe falciparum malaria in children: a comparative study of 1990 and 2000 WHO criteria for clinical presentation, prognosis and intensive care in Dakar, Senegal. Trans R Soc Trop Med Hyg. 2002; 96: 278–281.
9. Severe falciparum malaria. World Health Organization, communicable diseases cluster. Trans R Soc Trop Med Hyg. 2000;94(suppl 1): S1-90.
10. Posner E, Advanced Paediatric Life Support Group. Advanced paediatric life support: The practical approach. 3rd ed. London: BMJ Publishing Group, 2001.
11. Ladhani S, El Bashir H, Patel VS, Shingadia D. Childhood malaria in East London. Pediatr Infect Dis J 2003;22: 814-9.
12. Al-Taiar A, Jaffar S, Assabri A, Al-Habori M, Azazy A, et al. Severe malaria in children in Yemen: two site observational study. BMJ. 2006; 333: 827.
13. Gbadoe AD, Lawson-Evi K, Badayodi A, Geraldo A, Guedenon J, et al. [Severe malaria: assessment of the treatment of anaemia and cerebral manifestations in a tropical intensive cares unit]. Arch Pediatr. 2006;13: 1554–1555.
14. Idro R, Aloyo J, Mayende L, Bitarakwate E, John CC, et al. Severe malaria in children in areas with low, moderate and high transmission intensity in Uganda. Trop Med Int Health. 2006;11:
15. Issifou S, Kendjo E, Missinou MA, Matsiegui PB, Dzeing-Ella A, et al. Differences in presentation of severe malaria in urban and rural Gabon. Am J Trop Med Hyg. 2007; 77:1015–1019.
16. Modiano D, Sirima BS, Sawadogo A, Sanou I, Pare J, et al. Severe malaria in Burkina Faso: influence of age and transmission level on clinical

presentation. Am J Trop Med Hyg. 1998; 59: 539–542.
17. Oduro AR, Koram KA, Rogers W, Atuguba F, Ansah P, et al. Severe falciparum malaria in young children of the Kassena-Nankana district of northern Ghana. Malar J. 2007; 6: 96.
18. Garcia, L. S. Malaria. Clinics in Laboratory Medicine, 2010; 30(1), 93–129.
19. Amexo M., Tolhurst R., Barnish G., & Bates I. Malaria misdiagnosis: Effects on the poor and vulnerable. The Lancet. 2004; 364(9448): 1896–1898.
20. Sharma R. K., Thakor H. G., Saha K. B., Sonal G. S., Dhariwal A. C., & Singh N. Malaria situation in India with special reference to tribal areas. The Indian Journal of Medical Research. 2015;141(5): 537.
21. Manning L., Laman M., Davis W. A., & Davis T. M. E. Clinical Features and Outcome in Children with Severe Plasmodium falciparum Malaria: A Meta-Analysis. PLoS ONE. 2014; 9(2): e86737.
22. Idro R., Ndiritu M., Ogutu B., Mithwani S., Maitland K., Berkley J., Crawley J., Fegan G., Bauni E., Peshu, N., Marsh K., Nevill B., & Newton C. Burden, Features, and Outcome of Neurological Involvement in Acute Falciparum Malaria in Kenyan Children. JAMA. 2007; 297(20): 2232.
23. Stanisic DI, Mueller I, Betuela I, Siba P, Schofield L. Robert Koch redux: malaria immunology in Papua New Guinea. Parasite Immunol. 2010; 32: 623–632.
24. Luxemburger C, Ricci F, Nosten F, Raimond D, Bathet S, et al. The epidemiology of severe malaria in an area of low transmission in Thailand. Trans R Soc Trop Med Hyg. 1997; 91: 256–262.
25. Maitland K, Williams TN, Peto TE, Day KP, Clegg JB, et al. Absence of malaria-specific mortality in children in an area of hyperendemic malaria. Trans RSoc Trop Med Hyg. 1997; 91:562–566.
26. Batool D. R., Jamal D. K., Sheroze D. M. W., Bhatti D. I. A., Jaffar D. N., Haider D. G., & Faridi D. M. A. Clinical features of colorectal carcinoma at the Jinnah Postgraduate Medical Centre, Karachi, Pakistan: a cross-sectional study. Journal of Medical Research and Health Sciences. 2022; 5(9): 2203–2209.