

## Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood

\*Emmanuel Ifeanyi Obeagu<sup>1</sup> and Getrude Uzoma Obeagu<sup>2</sup>

<sup>1</sup>Department of Medical Laboratory Science, Kampala International University, Uganda.

<sup>2</sup>School of Nursing Science, Kampala International University, Uganda.

\*Corresponding author: Emmanuel Ifeanyi Obeagu, [Department of Medical Laboratory Science, Kampala International University, Uganda, emmanuelobeagu@yahoo.com, ORCID: 0000-0002-4538-0161](#)

### Abstract

Anemia and malaria, prevalent health challenges in childhood, often coexist in regions where the burden of these conditions intersects. This review explores the complexities of managing anemia in the context of malaria-affected childhood, investigating the interplay between these two conditions. We delve into the mechanisms, epidemiology, and risk factors, considering the challenges in diagnosis and clinical manifestations. Antimalarial drugs, iron supplementation, and nutritional interventions are scrutinized for their efficacy and limitations. The review emphasizes the need for integrated public health approaches to address anemia in malaria-endemic areas. Lastly, we identify current challenges and propose future research directions to optimize anemia management and pediatric health in the context of malaria. This synthesis aims to guide clinicians, researchers, and policymakers in crafting effective strategies to overcome hurdles in ensuring the well-being of children facing the dual burden of anemia and malaria.

**Keywords:** *Anemia, Malaria, Childhood, Hemoglobin, Iron Deficiency, Antimalarial Drugs, Nutritional Interventions, Public Health, Pediatric Healthcare.*

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. Elite Journal of Laboratory Medicine, 2024; 2(1): 59-69

## Introduction

Childhood anemia and malaria, individually formidable health challenges, often converge in regions grappling with the dual burden of these conditions. The intricate relationship between anemia and malaria poses unique hurdles to effective pediatric health management. Anemia and malaria stand as significant contributors to the global burden of childhood morbidity and mortality. Their coexistence amplifies health risks, particularly in regions where malaria is endemic, demanding nuanced strategies for effective management. Many malaria-endemic areas coincide with regions facing a high prevalence of anemia, creating a challenging healthcare landscape. The geographical overlap of these conditions necessitates an integrated and comprehensive approach to pediatric healthcare.<sup>1-6</sup>

The interplay between anemia and malaria involves intricate pathophysiological mechanisms. Malaria-induced hemolysis, dyserythropoiesis, and the inflammatory response contribute to the complexity of anemia in affected children, influencing diagnostic challenges and treatment outcomes. An exploration of the epidemiological landscape reveals the disproportionate burden of anemia in malaria-affected childhood. Identifying key risk factors, such as age, gender, and socioeconomic status, provides insights into the multifaceted determinants of this health confluence. Diagnosing anemia in the context of malaria presents challenges due to overlapping symptoms and limitations of conventional diagnostic tools. Accurate identification is crucial for targeted interventions, emphasizing the need for improved diagnostic approaches.<sup>7-11</sup>

The clinical manifestations of anemia in malaria-affected children extend beyond conventional symptoms, impacting overall health and development. Understanding these manifestations informs holistic healthcare strategies tailored to the unique needs of this vulnerable population. Antimalarial drugs, while fundamental in malaria management, present a dual-edged impact on anemia. The review scrutinizes the role of drugs such as artemisinin-based combination therapies (ACTs) in both treating malaria and influencing hemoglobin levels, exploring their potential benefits and limitations. Iron supplementation, a common strategy for anemia management, becomes a dilemma in the presence of malaria due to its inflammatory nature. Balancing the benefits of iron supplementation against potential risks necessitates a careful evaluation of intervention strategies.

## Anemia and Malaria: A Complex Interaction

Childhood anemia and malaria stand as formidable global health challenges, particularly in regions where their prevalence converges, creating a complex interplay that significantly impacts pediatric health. Anemia, characterized by a reduction in red blood cells or hemoglobin levels, is pervasive among children worldwide, contributing to a spectrum of adverse health outcomes. Malaria, caused by Plasmodium parasites transmitted through the bites of infected mosquitoes, is a leading cause of morbidity and mortality in many tropical and subtropical regions. The coexistence of anemia and malaria in childhood presents a multifaceted challenge, as each condition can exacerbate the severity and consequences of the other. Malaria, with its ability to induce hemolysis,

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. Elite Journal of Laboratory Medicine, 2024; 2(1): 59-69

dyserythropoiesis, and inflammation, contributes significantly to the burden of anemia. In turn, anemic children may be more susceptible to severe malaria-related complications, creating a vicious cycle that underscores the need for comprehensive and context-specific management strategies.<sup>11-17</sup>

## **Epidemiology and Risk Factors**

The co-occurrence of anemia and malaria poses a substantial burden on childhood health, particularly in regions with high malaria transmission. According to global estimates, approximately 200 million cases of malaria occur annually, predominantly affecting children under the age of five. Concurrently, childhood anemia remains a widespread concern, with the World Health Organization (WHO) reporting that nearly 273 million children under five years of age suffer from anemia globally. Malaria, primarily caused by *Plasmodium falciparum*, has a profound impact on hemoglobin levels in affected children. The parasites invade red blood cells, leading to their destruction (hemolysis) and reducing the overall red blood cell count. Chronic malaria infections contribute to persistent hemolysis and impair the production of new red blood cells in the bone marrow, exacerbating anemia.<sup>18-22</sup>

Malaria-endemic regions, primarily in sub-Saharan Africa, Southeast Asia, and parts of Latin America, bear a disproportionate burden of both malaria and anemia in children. Children under the age of five, whose immune systems are still developing, are more vulnerable to severe malaria and its associated complications, including anemia. The density of malaria parasites in the bloodstream correlates with the severity of hemolysis and the risk of anemia. Higher parasite densities often lead to more profound reductions in hemoglobin levels. Malnutrition, particularly deficiencies in iron, vitamin A, and other micronutrients, contributes to the risk of anemia in children with malaria. Malnourished children may have compromised immune responses, exacerbating the impact of both conditions. Genetic factors, including hemoglobinopathies such as sickle cell disease and thalassemia, can influence the severity of anemia in malaria-infected children. Maternal anemia during pregnancy increases the likelihood of infant anemia, creating a continuum of vulnerability. Maternal malaria infection further compounds the risk, highlighting the intergenerational impact. Limited access to healthcare facilities, diagnostic tools, and antimalarial treatments in resource-limited settings contributes to delayed or inadequate management, escalating the risk of anemia. Socioeconomic disparities, including poverty, lack of education, and inadequate sanitation, contribute to the burden of both malaria and anemia. These factors influence exposure to malaria vectors and nutritional status.<sup>23-26</sup>

## **Clinical Manifestations and Diagnostic Challenges**

Childhood anemia and malaria, coexisting in many regions, create a challenging landscape marked by intricate clinical manifestations and diagnostic nuances.<sup>27</sup> Understanding the multifaceted interplay of symptoms and navigating the complexities of accurate diagnosis are pivotal for effective management. Childhood anemia, compounded by malaria, manifests in a spectrum of clinical presentations that reflect the interplay of the two conditions. An observable pallor of the

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. *Elite Journal of Laboratory Medicine*, 2024; 2(1): 59-69

skin, conjunctiva, and mucous membranes is a hallmark sign of anemia. Anemic children may exhibit fatigue, weakness, and reduced physical activity. Decreased oxygen-carrying capacity results in dyspnea, especially during exertion. Reduced cerebral oxygenation can lead to dizziness and headaches. Anemia may impact cognitive function, with potential consequences for learning and development.

Malaria, depending on the species and severity, contributes additional clinical manifestations: Recurrent febrile episodes are a characteristic feature of malaria. Malaria paroxysms are marked by chills, followed by fever and sweating. Malaria-induced hemolysis intensifies anemia, exacerbating symptoms. Accurate diagnosis of anemia and malaria in tandem poses several challenges, particularly in resource-limited settings: The symptoms of anemia and malaria often overlap, making it challenging to attribute clinical manifestations to one condition. Resource constraints may limit access to diagnostic tools, such as complete blood counts (CBC) and malaria microscopy. Anemia can have various etiologies, including nutritional deficiencies and hemoglobinopathies, further complicating the diagnostic landscape. The prevalence of both anemia and malaria exhibits seasonal and geographic variations, influencing diagnostic considerations.<sup>22</sup>

Establishing appropriate hemoglobin cut-offs for anemia diagnosis in malaria-endemic areas requires consideration of population-specific factors and age-related variations. Severity classifications, such as mild, moderate, and severe anemia, help guide clinical decisions and interventions. Microscopy and RDTs are commonly employed for malaria diagnosis, but their sensitivity and specificity may vary. Polymerase chain reaction (PCR) techniques offer enhanced sensitivity, aiding in the detection of low-level parasitemia. Combining clinical assessment, hemoglobin measurements, and malaria diagnostics provides a more holistic understanding of the child's health status. Developing context-specific diagnostic algorithms helps guide healthcare providers in settings with limited resources.<sup>17</sup>

### **Antimalarial Drugs and Anemia Management**

The management of anemia in malaria-affected childhood presents a dual challenge, requiring a comprehensive approach that not only addresses the underlying causes of anemia but also effectively targets the malaria parasite. Antimalarial drugs play a central role in this integrated strategy, aiming to both alleviate the symptoms of malaria and mitigate the impact of the infection on hemoglobin levels.<sup>28</sup> ACTs, including artemether-lumefantrine and artesunate-amodiaquine, are highly effective against *Plasmodium falciparum*, the predominant malaria species in many endemic regions. The rapid action of artemisinin derivatives facilitates the swift clearance of parasitized red blood cells, potentially reducing the extent of hemolysis. Chloroquine remains effective against *Plasmodium vivax*, which can contribute to hemolysis. Primaquine may be used to prevent relapse. While effective against the malaria parasite, chloroquine may have limited impact on anemia directly related to hemolysis.

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. Elite Journal of Laboratory Medicine, 2024; 2(1): 59-69

Sulfadoxine-Pyrimethamine (SP) is employed in Intermittent Preventive Treatment (IPT) strategies during pregnancy to prevent maternal malaria, reducing the risk of adverse outcomes, including anemia in both mothers and infants.<sup>29</sup> Resistance to SP in certain regions necessitates careful consideration of its use. In areas with both high malaria transmission and anemia prevalence, the co-administration of iron and antimalarial drugs requires careful consideration to balance the benefits of addressing anemia with the potential risks associated with malaria. Some antimalarial drugs, such as primaquine, may pose a risk of hematological toxicity, including hemolysis in individuals with glucose-6-phosphate dehydrogenase (G6PD) deficiency. Regular monitoring for potential adverse hematological events is crucial during antimalarial treatment, particularly in children. The emergence of antimalarial drug resistance poses challenges to effective malaria treatment, potentially impacting efforts to reduce malaria-related anemia. Adaptive strategies, including the development of new antimalarial drugs and combination therapies, are essential to counter resistance.

Combining antimalarial drugs with complementary mechanisms of action enhances treatment efficacy, potentially improving outcomes for both malaria and anemia. Some combination therapies may also have synergistic effects on the immune system, influencing the overall response to both malaria and anemia. Formulating pediatric-friendly dosage forms for antimalarial drugs is essential to ensure accurate and safe administration in children. Challenges in adherence and tolerability, particularly in pediatric populations, may impact the effectiveness of antimalarial treatment.

### **Iron Supplementation Strategies**

The coexistence of anemia and malaria in childhood demands nuanced approaches to iron supplementation.<sup>30</sup> While iron deficiency is a common contributor to anemia, concerns regarding the potential exacerbation of malaria infection have prompted careful consideration of supplementation strategies. Targeted screening helps identify children at higher risk of iron deficiency anemia, enabling more focused supplementation efforts. Hemoglobin and ferritin levels serve as valuable indicators to guide targeted supplementation, ensuring that at-risk individuals receive appropriate intervention. Enhancing the iron content of staple foods through biofortification contributes to sustained iron intake, especially in populations with limited access to diverse diets. Providing micronutrient powders containing iron alongside other essential nutrients offers a convenient and adaptable strategy, particularly in settings with fortified food challenges. Intermittent iron supplementation, delivered weekly or biweekly, helps address compliance challenges and reduce the risk of adverse events associated with daily supplementation. Tailoring intermittent dosing regimens balances the need for efficacy in treating anemia with safety considerations, particularly in malaria-endemic regions.

Controlled-release or slow-release iron formulations aim to mitigate gastrointestinal side effects associated with traditional iron supplements, potentially improving tolerability and adherence. Assessing the effectiveness of controlled-release formulations in the context of malaria coexistence is crucial, considering potential alterations in iron absorption. Home fortification

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. Elite Journal of Laboratory Medicine, 2024; 2(1): 59-69

strategies empower caregivers to supplement their children's diets with iron-rich foods or supplements. Integrating behavioral change counseling enhances the understanding of the importance of iron supplementation, promoting sustained adherence. Co-administering iron with antimalarial drugs requires careful consideration of the potential benefits in treating anemia against the risk of exacerbating malaria infection. Regular monitoring of malaria prevalence and adapting supplementation strategies based on local epidemiological factors is essential. Iron supplementation may have immunomodulatory effects, influencing the host response to infections, including malaria. Understanding the intricate host-pathogen interactions is crucial for optimizing iron supplementation strategies in malaria-endemic areas. Rigorous surveillance for infections, particularly malaria, is essential to monitor potential increases in infection risk associated with iron supplementation. Regular assessments of hemoglobin response to supplementation help evaluate efficacy and guide adjustments in dosage or regimen. Integrating iron supplementation programs within broader public health initiatives, including malaria control and maternal and child health programs, enhances overall impact. Strengthening health systems to ensure the availability of quality iron supplements, effective distribution, and community engagement is crucial for sustainable interventions.<sup>30</sup>

### **Nutritional Interventions and Micronutrient Support**

Nutritional interventions and micronutrient support play a pivotal role in addressing childhood anemia, especially in areas where malaria prevalence compounds the challenge.<sup>31</sup> Vitamin A is crucial for maintaining immune function, and supplementation may improve the overall health of children, potentially reducing the severity of malaria-related anemia. Folate and vitamin B12 are essential for erythropoiesis, and supplementation may contribute to improved red blood cell production. In areas with a high prevalence of nutritional deficiencies, folate and vitamin B12 supplementation may address specific hematological deficiencies contributing to anemia. Zinc plays a role in immune function, and supplementation may enhance the immune response, potentially reducing the severity and frequency of infections, including malaria. Zinc supplementation influences iron absorption, and understanding the interplay between these micronutrients is essential for optimizing anemia management strategies.

Encouraging diverse and balanced diets ensures a broad spectrum of essential nutrients, including iron, vitamin A, and other micronutrients necessary for optimal hematological health. Tailoring dietary recommendations to address prevalent nutrient deficiencies in a given population contributes to comprehensive anemia prevention. The timely introduction of nutrient-rich complementary foods complements breastfeeding, providing infants with essential micronutrients crucial for healthy growth and development. Designing nutrient-rich complementary foods that are culturally acceptable and accessible ensures their effective integration into local diets. Biofortification involves enhancing the micronutrient content of staple crops, offering a sustainable and cost-effective approach to addressing nutritional deficiencies. Selecting crops with inherent resistance to pests and diseases ensures the success of biofortification programs. Community-based nutrition education empowers caregivers with knowledge about optimal nutrition practices, including the selection and preparation of nutrient-dense foods. Effective

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. Elite Journal of Laboratory Medicine, 2024; 2(1): 59-69



communication strategies foster behavioral change, promoting improved dietary practices and reducing the risk of anemia. Maternal nutrition during pregnancy significantly influences fetal development, emphasizing the importance of antenatal supplementation to prevent anemia in both mothers and infants. Targeted interventions, such as iron and folic acid supplementation for pregnant women, contribute to improved maternal and infant outcomes.<sup>31</sup>

### **Public Health Initiatives and Integrated Approaches**

Addressing anemia in the context of malaria-affected childhood requires not only targeted interventions but also comprehensive public health initiatives that encompass preventive measures, community engagement, and integrated healthcare approaches. Widespread distribution and promotion of Insecticide-Treated Nets (ITNs) contribute to malaria prevention, reducing the incidence of malaria-induced anemia in children. Indoor Residual Spraying (IRS), when feasible, complements ITNs in vector control efforts, further reducing malaria transmission. Antenatal Care (ANC) Services play a pivotal role in early detection and management of anemia in pregnant women, reducing the risk of maternal-fetal transmission of malaria. Integrating iron and folic acid supplementation within ANC programs supports maternal health, contributing to improved birth outcomes and reduced pediatric anemia risk. Routine immunization programs provide a platform for delivering essential micronutrients, reducing the overall burden of infectious diseases and their impact on anemia.<sup>32</sup>

Health education campaigns focusing on anemia, malaria prevention, and nutrition empower communities with knowledge, fostering positive health-seeking behaviors. Leveraging Community Health Workers (CHWs) enhances community engagement, facilitating targeted interventions and creating a bridge between healthcare providers and the community.<sup>33</sup> Integrated Management of Childhood Illness (IMCI) promotes a holistic approach to childhood illnesses, integrating the management of anemia, malaria, and other common childhood ailments. Training healthcare workers in IMCI principles enhances their ability to recognize and manage the complex interplay of multiple health conditions. Robust health information systems enable real-time surveillance, monitoring the prevalence of anemia and malaria, and facilitating timely interventions. School health programs that include iron-fortified meals contribute to sustained iron intake, addressing anemia risk in school-aged children. Integrating health education in schools instills lifelong health-promoting behaviors, influencing both children and their communities. Agriculture programs promoting diverse and nutrient-rich crops contribute to improved dietary diversity, addressing underlying causes of anemia. Empowering communities with agricultural skills enhance their capacity to cultivate and consume a variety of nutritious foods. Collaborative efforts involving healthcare, education, agriculture, and other sectors amplify the impact of interventions, fostering a holistic and coordinated approach. Partnerships with non-governmental organizations and international bodies strengthen resource mobilization and expertise.

### **Conclusion**

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. Elite Journal of Laboratory Medicine, 2024; 2(1): 59-69

Achieving success in managing anemia in malaria-affected childhood necessitates a deep understanding of the complex interplay between these conditions. The intricate mechanisms, clinical manifestations, and diagnostic challenges underscore the need for tailored, context-specific approaches. The role of antimalarial drugs in anemia management is pivotal, yet the balance between their efficacy against the malaria parasite and potential hematological side effects requires careful consideration. Continuous research, adaptive strategies, and innovative combination therapies are essential in the face of emerging drug resistance. Iron supplementation strategies must be tailored to the unique challenges of malaria-endemic regions. Targeted approaches, intermittent dosing regimens, and cautious co-administration with antimalarial drugs offer avenues to address iron deficiency without compromising safety.

Beyond individual interventions, public health initiatives play a crucial role. From vector control and maternal health programs to community engagement and school health initiatives, a holistic approach empowers communities, addresses underlying causes, and fosters sustained health improvements. Robust surveillance systems, real-time data, and ongoing research are foundational to evidence-based decision-making. Continuous monitoring of prevalence, interventions, and outcomes informs adaptive strategies and ensures the relevance and effectiveness of interventions. The empowerment of communities emerges as a central theme. Beyond healthcare facilities, initiatives that engage and educate communities, involve community health workers, and integrate health education into schools foster a sense of ownership and sustainability.

## References

1. Obeagu EI, Obeagu GU, Chukwueze CM, Ikpenwa JN, Ramos GF. EVALUATION OF PROTEIN C, PROTEIN S AND FIBRINOGEN OF PREGNANT WOMEN WITH MALARIA IN OWERRI METROPOLIS. *Madonna University journal of Medicine and Health Sciences*. 2022;2(2):1-9.
2. Obeagu EI, Ibeh NC, Nwobodo HA, Ochei KC, Iwegbulam CP. Haematological indices of malaria patients coinfectd with HIV in Umuahia. *Int. J. Curr. Res. Med. Sci*. 2017;3(5):100-4.
3. Opeyemi AA, Obeagu EI. Regulations of malaria in children with human immunodeficiency virus infection: A review. *Medicine*. 2023;102(46): e36166.
4. Obeagu EI, Chijioke UO, Ekelozie IS. Malaria rapid diagnostic test (RDTs). *Ann Clin Lab Res*. 2018;6(4):275.
5. Obeagu EI, Alum EU, Ugwu OP. Hepcidin: The Gatekeeper of Iron in Malaria Resistance. 2023.
6. Ogomaka IA, Obeagu EI. Methods of Breast Feeding as Determinants of Malaria Infections among Babies in IMO State, Nigeria. *International Journal of Medical Science and Dental Research*. 2019;2(01):17-24.
7. Obeagu EI, Obeagu GU, Egba SI, Emeka-Obi OR. Combatting Anemia in Pediatric Malaria: Effective Management Strategies. *Int. J. Curr. Res. Med. Sci*. 2023;9(11):1-7.
8. Hassan AO, Oso OV, Obeagu EI, Adeyemo AT. Malaria Vaccine: Prospects and Challenges. *Madonna University journal of Medicine and Health Sciences*. 2022;2(2):22-40.

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. *Elite Journal of Laboratory Medicine*, 2024; 2(1): 59-69



9. Obeagu EI, Ogbonna US, Nwachukwu AC, Ochiabuto O, Enweani IB, Ezeoru VC. Prevalence of Malaria with Anaemia and HIV status in women of reproductive age in Onitsha, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(4):10-9.
10. Obeagu EI, Busari AI, Uduchi IO, Ogomaka IA, Ibekwe AM, Vincent CC, Chijioke UO, Okafor CJ, Okoroiwu HU, Adike CN. Age-Related Haematological Variations in Patients with Asymptomatic Malaria in Akure, Ondo State, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(42B):218-24.
11. Ogomaka IA, Obeagu EI. Malaria in Pregnancy Amidst Possession of Insecticide Treated Bed Nets (ITNs) in Orlu LGA of Imo State, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(41B):380-386.
12. Ogbonna CO, Obeagu EI, Ufelle SA, Ogbonna LN. Evaluation of haematological alterations in children infected by Plasmodium falciparum Species in Enugu, Enugu State, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(1):38-45.
13. Okorie HM, Obeagu EI, Obarezi HC, Anyiam AF. Assessment of some inflammatory cytokines in malaria infected pregnant women in Imo State Nigeria. *International Journal of Medical Science and Dental Research*. 2019;2(1):25-36.
14. Ezeoru VC, Enweani IB, Ochiabuto O, Nwachukwu AC, Ogbonna US, Obeagu EI. Prevalence of Malaria with Anaemia and HIV status in women of reproductive age in Onitsha, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(4):10-19.
15. Okorie HM, Obeagu EI, Eze EN, Jeremiah ZA. Assessment of some haematological parameters in malaria infected pregnant women in Imo state Nigeria. *Int. J. Curr. Res. Biol. Med*. 2018;3(9):1-4.
16. Nwosu DC, Obeagu EI, Ezenwuba C, Agu GC, Amah H, Ozims SJ, Nwanjo HU, Edward A, Izuchukwu IF, Amadike JN, Nwagwu AJ. Antioxidant status of children with Plasmodium falciparum malaria in Owerri municipal council of Imo state. *Int. J. Curr. Res. Chem. Pharm. Sci*. 2016;3(8):40-6.
17. Okamgba OC, Nwosu DC, Nwobodo EI, Agu GC, Ozims SJ, Obeagu EI, Ibanga IE, Obioma-Elemba IE, Ihekaire DE, Obasi CC, Amah HC. Iron Status of Pregnant and Post-Partum Women with Malaria Parasitaemia in Aba Abia State, Nigeria. *Annals of Clinical and Laboratory Research*. 2017;5(4):206.
18. Anyiam AF, Arinze-Anyiam OC, Omosigho PO, Ibrahim M, Ironi EA, Obeagu EI, Obi E. Blood Group, Genotype, Malaria, Blood Pressure and Blood Glucose Screening Among Selected Adults of a Community in Kwara State: Implications to Public Health. *Asian Hematology Research Journal*. 2022;6(3):9-17.
19. Obeagu EI, Nimo OM, Bunu UO, Ugwu OP, Alum EU. Anaemia in children under five years: African perspectives. *Int. J. Curr. Res. Biol. Med*. 2023; 1:1-7.
20. Madekwe CC, Madekwe CC, Obeagu EI. Inequality of monitoring in Human Immunodeficiency Virus, Tuberculosis and Malaria: A Review. *Madonna University journal of Medicine and Health Sciences*. 2022;2(3):6-15.
21. Offie DC, Ibekwe AM, Agu CC, Esimai BN, Okpala PU, Obeagu EI, Ufelle SA, Ogbonna LN. Fibrinogen and C-Reactive Protein Significance in Children Infected by Plasmodium falciparum Species in Enugu, Enugu State, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(15):1-8.

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. *Elite Journal of Laboratory Medicine*, 2024; 2(1): 59-69

22. Okorie HM, Obeagu EI, Eze EN, Jeremiah ZA. Assessment of coagulation parameters in malaria infected pregnant women in Imo state, Nigeria. *International Journal of Current Research in Medical Sciences*. 2018;4(9):41-49.
23. Ogbonna LN, Ezeoru VC, Ofodile AC, Ochiabuto OM, Obi-Ezeani CN, Okpala PU, Okafor CJ, Obeagu GU, Busari AI, Obeagu EI. Gender Based Variations of Haematological Parameters of Patients with Asymptomatic Malaria in Akure, Ondo State, Nigeria. *Journal of Pharmaceutical Research International*. 2021;33(8):75-80.
24. Eberendu IF, Ozims SJ, Agu GC, Amah HC, Obasi CC, Obioma-Elemba JE, Ihekaire DE, Ibanga IE, Amah CC, Obeagu EI, Nwosu DC. Impact of human activities on the breeding of mosquitoes of human disease in Owerri metropolis, Imo state. *Int J Adv Res Biol Sci IJARBS*. 2017;4(12):98-106.
25. Obeagu EI, Ofodile AC, Okwuanaso CB. A review on socio economic and behavioral aspects of malaria and its control among children under 5 years of age in Africa. *J Pub Health Nutri*. 2023; 6 (1): 136.
26. Obeagu EI, Obeagu GU, Ukibe NR, Oyebadejo SA. Anemia, iron, and HIV: decoding the interconnected pathways: A review. *Medicine*. 2024;103(2):e36937.
27. Obeagu EI, Obeagu GU. Advances in Understanding the Impact of Blood Transfusion on Anemia Resolution in HIV-Positive Children with Severe Malaria: A Comprehensive Review. *Elite Journal of Haematology*. 2024;2(1):26-41.
28. Mishra M, Mishra VK, Kashaw V, Iyer AK, Kashaw SK. Comprehensive review on various strategies for antimalarial drug discovery. *European Journal of Medicinal Chemistry*. 2017; 125:1300-1320.
29. Mosha D, Chilongola J, Ndeserua R, Mwingira F, Genton B. Effectiveness of intermittent preventive treatment with sulfadoxine–pyrimethamine during pregnancy on placental malaria, maternal anaemia and birthweight in areas with high and low malaria transmission intensity in Tanzania. *Tropical Medicine & International Health*. 2014;19(9):1048-1056.
30. Armitage AE, Moretti D. The importance of iron status for young children in low-and middle-income countries: a narrative review. *Pharmaceuticals*. 2019;12(2):59.
31. Loechl CU, Datta-Mitra A, Fenlason L, Green R, Hackl L, Itzkowitz L, Koso-Thomas M, Moorthy D, Owino VO, Pachón H, Stoffel N. Approaches to address the anemia challenge. *The Journal of Nutrition*. 2023;153: S42-59.
32. Igwe I, Agwu P, Okoye U, Onyeneho N, Aronu N, Odii A. Controlling malaria spread with insecticide-treated nets: Reactions trailing usage and mortality consequences in Anambra State, Nigeria. *The international Journal of Community and social development*. 2019;1(2):169-183.
33. Lloyd J, Davis R, Moses K. Recognizing and sustaining the value of community health workers and promotores. *Center for Health Care Strategies*. 2020.

**Citation:** Obeagu EI, Obeagu GU. Overcoming Hurdles: Anemia Management in Malaria-Affected Childhood. *Elite Journal of Laboratory Medicine*, 2024; 2(1): 59-69