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Prevalence and Mortality of Malaria among Children under Five in Sub-Saharan Africa: A Review

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ABSTRACT

Malaria had been a significant public health challenge in sub-Saharan Africa, particularly affecting children under five years of age, who accounted for over two-thirds of all malaria-related deaths globally. This review examined the prevalence and mortality rates of malaria among this vulnerable population, highlighting key determinants such as socioeconomic status, maternal education, environmental conditions, and access to healthcare. Recent data indicated that approximately 24.2% of children under five in the region are affected by malaria, with socioeconomic disparities exacerbating the risk. The review also discussed the effectiveness of various preventive interventions, including insecticide-treated nets (ITNs), indoor residual spraying (IRS), and seasonal malaria chemoprevention (SMC), emphasizing the need for multifaceted approaches that address both biological and social determinants of health. A comprehensive literature review was conducted to synthesize current research findings and provide insights into the challenges and opportunities for reducing malaria incidence and mortality in this demographic. Ultimately, addressing the complex interplay of risk factors is essential for developing targeted strategies to mitigate the impact of malaria on young children in sub-Saharan Africa.

Keywords: Malaria, Children under five, Prevalence, Mortality, Sub-Saharan Africa.

INTRODUCTION

Malaria remains a critical public health issue in sub-Saharan Africa (SSA), particularly among children under five years of age, who are the most vulnerable to its devastating effects [1,2] In 2019, approximately 274,000 children in this age group succumbed to malaria, representing over two-thirds of all malaria-related deaths globally [3]. The disease, primarily caused by the Plasmodium falciparum parasite, leads to severe morbidity and mortality due to the immature immune systems of young children, which cannot effectively combat the infection [4,5]. The prevalence of malaria among under-five children varies widely across SSA, influenced by numerous factors including socioeconomic status, access to healthcare, and environmental conditions [6,7]. Children from impoverished backgrounds face heightened risks due to inadequate housing, poor sanitation, and limited access to preventive measures such as insecticide-treated nets (ITNs) and prompt medical treatment [8]. Rural areas are particularly affected, where healthcare infrastructure is often lacking, exacerbating the risk of severe malaria infections [9,10]. Understanding the prevalence and mortality associated with malaria in this demographic is crucial for developing effective intervention strategies. Despite significant global efforts aimed at reducing malaria incidence through various public health initiatives, the burden remains alarmingly high [11-13]. This review aims to synthesize current data on the prevalence and mortality rates of malaria among children under five in SSA, exploring the underlying factors contributing to this public health crisis and highlighting the urgent need for targeted interventions to protect this vulnerable population.

EPIDEMIOLOGY

Epidemiology plays a crucial role in understanding the dynamics of malaria transmission, particularly among children under five in sub-Saharan Africa (SSA), where the disease remains a leading cause of morbidity and mortality [14]. The epidemiological landscape of malaria is characterized by complex interactions between the Plasmodium falciparum

parasite, the anopheles mosquito vectors, and various environmental, social, and biological factors [15].

i. **Prevalence of Malaria:** The prevalence of malaria among children under five in SSA is alarmingly high, with significant variations across different regions [16]. Recent studies indicate that this age group accounts for approximately 80% of all malaria-related deaths in the region [17]. For instance, the overall pooled prevalence of malaria among under-five children has been reported to be around 26.2%, with variations influenced by local transmission patterns, healthcare access, and socioeconomic conditions [18].

ii. **Mortality Rates:** The mortality rates associated with malaria in young children are particularly concerning [1]. In 2020, SSA accounted for about 95% of global malaria cases and 96% of deaths, with a significant proportion occurring in children under five. Factors contributing to high mortality rates include delayed diagnosis and treatment, inadequate access to preventive measures like insecticide-treated nets (ITNs), and co-infections with other diseases such as HIV/AIDS [19-21].

RISK FACTORS

Malaria remains a significant public health challenge in sub-Saharan Africa, particularly among children under five years of age. The prevalence and mortality rates in this vulnerable group are influenced by a complex interplay of risk factors, primarily socioeconomic status, environmental conditions, and behavioral practices [22,6] Understanding these risk factors is essential for developing effective interventions aimed at reducing malaria transmission and its associated morbidity and mortality.

Socioeconomic Factors

Socioeconomic status (SES) significantly impacts malaria prevalence and mortality among children under five in sub-Saharan Africa (SSA) [23]. Factors such as income, education, housing conditions, and healthcare access contribute to the relationship between SES and malaria risk [24]. Wealthier households have lower malaria risks due to access to preventive measures and better housing conditions. Maternal education is also a protective factor, with secondary education reducing the risk by 56%. Access to healthcare services is also influenced by SES, with low-income children often facing barriers to accessing health facilities. Geographical disparities further complicate the relationship, with rural children at a higher risk due to limited access to healthcare, education, and preventive resources [25-27. Addressing these socioeconomic determinants is crucial for reducing malaria prevalence and mortality in this vulnerable population.

Environmental Conditions

Malaria transmission in sub-Saharan Africa is influenced by environmental conditions, particularly the presence and characteristics of mosquito breeding sites [28]. Anopheles mosquitoes breed in stagnant or slow-moving freshwater bodies, such as puddles, swamps, and rice fields. Larger and more stable water bodies support higher larval densities, increasing the likelihood of adult mosquito emergence [29,30]. Seasonal variability in malaria transmission is closely tied to rainfall, with increased precipitation creating numerous breeding sites. The proximity of human habitation to breeding sites significantly influences malaria risk, with households within 500 meters of breeding sites at a heightened risk. Land use changes, such as agricultural expansion and urbanization, can alter environmental conditions, creating new breeding habitats for mosquitoes [31-33]. Addressing these environmental factors through targeted interventions and community education can significantly reduce the burden of malaria in vulnerable populations.

Behavioral Factors

Malaria transmission is influenced by various behavioral factors, particularly among children under five in sub-Saharan Africa [1,34]. Outdoor exposure, knowledge of risk, and health-seeking behavior are key factors in malaria transmission. Children spend more time outdoors during peak mosquito activity hours, which increases their risk of contracting malaria. Knowledge about malaria transmission and prevention is also crucial, as misconceptions about risk and susceptibility can influence behavior [35]. Health-seeking behavior is influenced by social norms and individual beliefs, with caregivers often delaying medical care due to traditional remedies or lack of understanding. Compliance with preventive measures, such as ITNs and IRS, is heavily influenced by accessibility, cultural attitudes, and perceived comfort [36]. Cultural practices also shape malaria prevention and treatment, with traditional beliefs often conflicting with modern medical practices. Understanding these cultural contexts is essential for designing effective public health campaigns. By integrating behavioral insights into malaria control strategies, public health initiatives can effectively reduce the burden of malaria in vulnerable populations [37,38].

Preventive Interventions:

Preventive interventions are crucial in reducing malaria among children under five in sub-Saharan Africa. These include insecticide-treated nets (ITNs), indoor residual spraying (IRS), seasonal malaria chemoprevention (SMC), and health education initiatives. ITNs provide a physical barrier to mosquito bites, reducing malaria incidence by up to 50% [39]. However, challenges remain in equitable distribution and sustained use. IRS, which involves applying insecticides to homes' interior walls, has shown significant reductions in malaria transmission. However, resistance patterns can compromise its effectiveness. SMC, which involves administering antimalarial medications to children during peak transmission seasons, has shown substantial reductions in malaria incidence and mortality [40,41]. Integrating SMC with ITNs and health education enhances its effectiveness. Health education is essential for empowering communities to adopt preventive measures effectively [42]. Community engagement initiatives involving local leaders can increase awareness and uptake of preventive measures [43]. Holistic approaches, including addressing socioeconomic determinants, are more effective than isolated efforts [44]. By implementing holistic strategies, public health initiatives can mitigate malaria's impact on vulnerable populations and contribute to global efforts to eliminate the disease.

CONCLUSION

Malaria among children under five in sub-Saharan Africa remains a significant public health challenge, accounting for over two-thirds of all malaria-related deaths globally. Key determinants include socioeconomic status, maternal education, environmental conditions, and access to healthcare services. Low-income households are at risk due to inadequate access to preventive measures and healthcare. Maternal education significantly impacts children's health outcomes. To combat malaria, multifaceted efforts involving community engagement, health education, and improved healthcare access are needed. Achieving significant reductions requires sustained commitment from governments, international organizations, and local communities.

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