

## Review Article

DOI: <http://dx.doi.org/10.18203/2394-6040.ijcmph20151026>

# Social and environmental determinants of malaria in under five children in Nigeria: a review

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**Received:** 11 August 2015

**Accepted:** 17 September 2015

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## ABSTRACT

There is no denying that malaria portends a serious present and future global concern; it is present in over one hundred countries worldwide, responsible for over 100 million clinical cases and an estimated 1-2 million deaths annually. However, the burden of mortality and morbidity is worse in poor countries and amongst the most disadvantaged in these countries. The World Health Organisation (WHO) suggests that Africa bear almost 90% of the global burden of malaria, and Nigeria, due to its population of over 160 million people bears the largest share of the burden. The last couple of decades have witnessed unprecedented global interest and efforts towards eradication of malaria. National and multinational bodies have expended millions of dollars on wide-ranging malaria control initiatives; unfortunately, results have not been completely positive, and malaria-related mortality amongst children has remained a core area of concern. This review shows that the persistence of Malaria, especially amongst under 5 children, can be linked to a dynamic interplay of biological, social and environmental risk factors and a host of health determinants. Cultural beliefs and values, knowledge and healthcare awareness of caregivers, the built environment, access, availability and affordability of food, water and healthcare are identified and discussed as the various socio-cultural, behavioural and environmental factors encumbering the success of malaria control initiatives in the country.

**Keywords:** Malaria, Under 5 children, Determinants, Sociocultural factors, Barriers, Africa

## INTRODUCTION

The last couple of decades, especially the 1950s onward, have witnessed unprecedented global interest and efforts towards eradication of malaria.<sup>1</sup> Programs such as the Roll Back Malaria Initiative (RBM) and the Multilateral Initiative on Malaria (MIM) have seen international donor organisations (public and private) spend millions of dollars on malaria eradication programs.<sup>2</sup> Unfortunately, the results have not been completely positive. Today, despite decades of concerted global efforts, malaria related mortality is higher than half a century ago.<sup>3</sup> Malaria has become the most important vector borne disease in Africa (especially south of the Sahara) parts of Asia and Latin America.<sup>4</sup>

There is no denying that malaria portends a serious present and future global concern; it is present in over one hundred countries worldwide, responsible for over 100 million clinical cases and an estimated 1-2 million deaths annually; however, the burden of mortality and morbidity is worse in poor countries.<sup>5</sup> The World Health Organisation (WHO) reckon that Africa bear almost 90% of the global burden of malaria, and Nigeria, due to its population of over 160 million people bears the largest share of the burden. With over 300, 000 malaria related deaths annually, especially in children under 5years, Nigeria with three other countries, suffer about 50% of global malaria mortality.

Today, scholars are arguing that the growing malaria epidemic in some African countries rest partly on the social, cultural and environmental factors peculiar to these countries that are often ignored in the design and implementation of malaria interventions.<sup>6</sup> There is a growing consensus that for interventions to succeed, they must focus on the fundamental causes of malaria by addressing the socio-cultural, behavioural and environmental dimensions of risks driving the malaria epidemic.<sup>3,7</sup>

Nigeria contributes almost a fifth of the global malaria burden and as such, has received a sizeable portion of global malaria eradication funds in the last decades.<sup>8</sup> Eradication of malaria in Nigeria can, therefore, contribute substantially to global malaria efforts. This review critically examines the social, environmental and behavioural drivers of the malaria epidemic within the Nigeria population, with particular focus on incidence in children under five.

## METHODS

Whilst there have been several articles published on Malaria and its effects on the developing world, few authors have sought to investigate the factors promoting the high levels of malaria mortality and morbidity in children (especially children under the age of 5) within the African region. This review therefore had to employ different search strategies to retrieve sufficient articles and publications on the topic. First, an online search was performed using Google Scholar, Web of Knowledge and PubMed to retrieve peer reviewed articles using keywords such as "Malaria", "Under 5 Children", "Nigeria", "Barriers", "Sociocultural Factors", "Behavioural Factors". The search was initially limited to articles dating between 2001 and 2014, however articles from the 1990s were later included. From the initial results, 20 journal articles were selected, retrieved and reviewed for this paper. Inclusion criteria included; full text availability, relevance to the topic, English language and peer review. In addition, reports and publications from national and international bodies were accessed. Key reports included World Health Organisation's Malaria reports, Policy documents from the National Population Commission and National Demographic reports from the Federal Ministry of Health. These were retrieved from the relevant websites.

### ***Malaria in Nigerian children under five years***

Malaria is an infectious disease caused by the plasmodium parasite and spread through mosquito bites.<sup>9</sup> Over the course of history, several strains of the plasmodium parasite have been discovered, each causing varying severity of malaria and sometimes spread by different species of mosquito. However, the female anopheles mosquito is now known to be the most common vector for malaria<sup>10</sup> in Nigeria. While mosquitoes can be found in several parts of the world, the

malaria-transmitting *Anopheles gambiae* mosquito is generally restricted to sub-Saharan Africa and some parts of Asia and Latin America. In fact, the most virulent form of malaria (*Plasmodium falciparum*) can be found almost exclusively in Nigeria and other sub Saharan countries.<sup>5,8,11</sup>

Malaria presents with several different signs and symptoms, but the most common symptom is fever (high body temperature). Other symptoms in adults may include headache, aches and pain, weakness (of especially the limbs), bitterness in the mouth and loss of appetite. In children, malaria also present with prolonged sleeping, nausea and vomiting.<sup>9</sup>

Generally, malaria affects adult and children equally, but because of a number of biological and cultural factors, its effect is worse and more fatal in children under 5 years and pregnant women.<sup>12</sup> One biological explanation for this difference is built immunity and resistance. Since malaria is spread by mosquito bites and has been endemic in the country for decades, the general adult population develops immunity and resistance, over time, which helps to reduce mortality and morbidity from the disease. However, developing such immunity come with age and after several malaria episodes. Children under five years are less likely to have developed sufficient immunity, especially against the most virulent strains of malaria. Consequently, they suffer higher rates of mortality and morbidity compared to the general population.<sup>8</sup>

Nigeria has an estimated population of 160 million people spread over a total land area of 923.8 thousand sq. km (356 700 sq. miles).<sup>10</sup> It is considered the most populous country in Africa and contributes more than a third of the continent's malaria mortality.<sup>5,8,13</sup> The country is broadly divided into Southern and Northern regions. The terrain and climate vary from coastal swamps in the South-South to tropical rain forests in the South-West, open woodlands and grasslands in the North central, to savannah and semi-desert in the far North-east and North-west. Due to its tropical climate, Nigeria is particularly suitable for mosquito breeding. The pools of stagnant water created by heavy and frequent rainfall during the wet season, and the high humidity of the dry season, all create the right environment for breeding and spreading of mosquitoes.<sup>10</sup>

Nigeria has one of the highest malaria burdens in the world. At any point in time, over 150 million people are at risk of malaria. Every year, more than 50% of the adult population suffer at least one episode of malaria, while children under five suffer an average of 2-4 malaria attacks per year.<sup>8,9,14</sup> In 2007, for example, there were 2,969,950 reported cases and 10,289 reported malaria related mortalities. Currently, it is estimated that 66% of all hospital visits and at least 30% of hospitalisations are due to malaria.<sup>15</sup> The total economic costs of malaria has been estimated at NGN132 billion annually.<sup>8,16</sup>

Specifically for children, 25% of mortalities in under five and 30% of childhood mortality can be attributed to malaria.<sup>8,12,17-20</sup> Currently, standard practice is that all cases of fever in children under five should be treated as malaria within 24hours.<sup>8</sup> Yet, of the 16% of children under five who had fever two weeks before the national demographic survey in 2008, only about 2.4% received the recommended combination therapy treatment regime and only 1.1% of them received the treatment within the stipulated 24hour period.<sup>15</sup> Thus, malaria remain a more serious health problem in under five children because of the large reservoir of plasmodium parasites always present in the 'malaria-resistant' adult population, the poor access to and knowledge about preventive measures and the delay in seeking proper treatment for malaria episodes.<sup>8,9</sup>

### ***Social and environmental risk factors for malaria***

Like every other disease condition, the persistence of malaria in Nigeria, especially in children under 5years, can be linked to a dynamic interplay of biological, social and environmental risk factors with a host of health determinants. Cultural beliefs and values, knowledge and health consciousness of caregivers, the built environment, access, availability and affordability of food, water and healthcare are all factors that influence malaria prevalence.

#### ***Socio-cultural risk factors:***

##### ***Cultural beliefs/knowledge about malaria***

Despite the growing global concern about malaria and its devastating effects on health outcomes of poor people in developing countries, the level of knowledge and general awareness about malaria remains low in the most affected societies.<sup>21,22</sup> In most Nigerian communities, especially the very rural ones, knowledge about causes of malaria, transmission modes and/or severity of the disease is still abysmally low.<sup>13</sup> Most communities still refer to malaria as 'ordinary fever'; some people still do not associate malaria with mosquito bites and worst still, most parents still do not take their children to health facilities as first line of action when they notice 'fever'. Disturbingly, the trend is similar across the length and breadth of the country.

In the Yoruba population of a South-West state of Nigeria for example, less than 10% of a surveyed population associated mosquito bites with malaria. Instead, 'too much work' (17.7%), 'staying for too long in the sun' (12.6%), 'drinking bad/dirty water' (5.3%) were most often believed to be the cause of malaria.<sup>23</sup> In addition, convulsion and anaemia were not seen as complications of malaria and most infant mortality are not linked to malaria, whatsoever. Most cases of malaria are treated at home or with traditional healers as first line of action.<sup>23</sup> While this study may be biased as almost 50% of the sample had no formal education, it still does,

perhaps, fairly represent the level of knowledge about malaria, its prevention and treatment in most rural communities of Nigeria.

Also, within the Ibo population of South-East Nigeria, Dike<sup>24</sup> found that just about half of the population associated mosquito bites with malaria. Again, malaria was generally characterised as 'ordinary fever'. However, a larger proportion of this sample could accurately identify the signs of malaria, even though seeking medical treatment for their kids with 'fever' was not the most popular first line of action. In the northern city of Maiduguri, while almost 90% of a surveyed population was aware of the existence of malaria, 83% of the sample did not consider malaria a serious health issue, nor did they associate mosquito bite with malaria.<sup>6</sup>

Such low level of accurate knowledge about the mode of transmission and signs of malaria across the population could only result from a combination of poor access to information and wrong cultural/social beliefs about malaria.<sup>25</sup> This perhaps explains why interventions built around distribution of free insecticide treated nets (ITNs) or drugs have not really achieved the desired results. Until malaria is seen, by all concerned, as a serious disease caused by mosquito bites, the motivation to protect children from mosquito or take immediate actions to treat malaria in children would remain poor. The consequence is the high and increasing incidence and prevalence of malaria in children.

##### ***Hierarchy and social stratification:***

Another socio-cultural factor that influences the prevalence of malaria in children is the hierarchical structure of most Nigerian communities.<sup>4</sup> Children under five are more vulnerable to malaria because their level of built immunity is still very low. This combination of low immunity in the face of a reservoir of plasmodium parasites housed by parents and older siblings create a 'malaria endemic zone' for children in most homes. To strengthen their immune systems, children need regular and nutritiously balanced meals. However, the social structure in most communities deprives children access to such meals. Fathers hold the right to the best part of a meal, and children are left, most times, with meals far below their biological requirements for proper development.<sup>26</sup> Inadequate nutrition due to cultural structures, thus further aggravate children's vulnerability to malaria.

##### ***Environmental risks factors***

The WHO argues that more than a quarter of the global disease burden and at least 42% of global malaria incidence are due to modifiable environmental factors.<sup>3,5,7</sup> The environment plays a defining role in the health outcomes of any society. Unfortunately, for most developing countries, the environment constitutes a particularly negative influence on health. This is

especially true in Nigeria, where until very recently, the environment was one of the most de-emphasised health issues, nationally and locally.<sup>10</sup> Environmental factors that contribute to malaria risks include the large rural population, poor waste disposal, water and sanitation infrastructures and habits.

The vast populations of Nigerians live in rural communities, with less than 25% living in urban communities.<sup>10</sup> Both categories of communities present some level of malaria risk, however, rural dwellers are far more exposed to malaria. In most rural communities, the primary occupation is farming (or fishing in coastal areas). The vast area of open fields, stagnant pools of water and green vegetation in these communities, create the perfect breeding environment for mosquitoes, especially during wet seasons. Children have to accompany parents to the farm and as such are exposed, for most parts of the day, to mosquito bites. Moreover, formal education is lowest in rural communities, thus the awareness about malaria; malaria control efforts and/or seeking medical treatment for malaria early are quite minimal.<sup>10</sup> Thus, rural communities suffer a dynamic interplay of higher malaria vector density, sparse human population and limited access to health information and facility.<sup>20</sup>

While rural dwellers are exposed to mosquitoes due to vast expanse of natural vegetation and water bodies, urban residents often create their own mosquito-breeding sites through improper disposal of waste, allowing water to accumulate in crevices and containers around the home and sometimes uncleared bushes around residential areas.<sup>20</sup> In most cities, wastes are often deposited indiscriminately on open grounds, in city centres, uncompleted buildings and sometimes around the homes, creating man-made mosquito breeding sites.<sup>10</sup> In rural communities, sanitation levels can be very poor, and access to water limited.<sup>5</sup>

#### *Barriers and enablers:*

National and international malaria programs in Nigeria have expended millions of dollars and targeted every sector of the country. However, two strong barriers have reduced behavioural change and by extension, success of these programs. These barriers are:

- i. Spiritualisation of health and social issues
- ii. Limited flow of information.<sup>21,27,28</sup>

In most rural communities, health is strongly linked with spiritual beliefs. Ill health is often believed to be caused by demons and evil spirits that require herbal or spiritual remedies. Dissociating malaria, especially in children, from such spiritual linkages would require strong and consistent behavioural change communications. Unfortunately, this is not happening yet. Most times, public health messages do not get to rural communities where it is needed the most because most rural

communities still have very limited access to print and electronic media that are often employed in disseminating public health information.<sup>21</sup> However, on a positive note, the level of social and communal support in most rural communities has often helped to enhance health outcomes of children.

#### *Social determinants*

From the foregoing, it is apparent that two major social determinants influence most of the malaria risks highlighted so far. These are low socio-economic (SES) status and low levels of literacy. From the ten social determinants of health identified by Wilkinson and Marmot<sup>29</sup> at least seven are related to these two and thus shape children's exposure to malaria in Nigeria. These are Work, Social gradient, stress and anxiety, early life, social exclusion and food. At least 75% of children in Nigeria are born to parents in the low SES,<sup>15</sup> who live in the lowest gradient of the society with limited access to well-paid job. WHO emphasised that poverty is the greatest single risk factor for malaria. Global malaria reports have shown that more than two-third malaria cases occur in the poorest fifth of the population.<sup>5</sup> Poverty reduces opportunities for formal education, which then reduces chances for a good job which lead to more poverty. Social exclusion due to low SES creates and sustains anxiety while also limiting life's chances for children from the beginning of their life. And then the circle continues again.

#### **CONCLUSION**

Malaria is a global disease, affecting populations in Africa, parts of Asia and Latin America. In Nigeria and some other parts of Sub Saharan Africa, children from age 0 to 5 years bear the greatest burden of the disease. This is largely because, unlike adults, children cannot take care of themselves. They lack the built immunity that reduces malaria morbidity in adults, yet they are denied access to nutritious food that is needed to develop their immunity. Limited access to public health information, healthcare, and proper education, especially for those in poor rural communities, all compound the malaria risks for children. Like WHO pointed out, a dynamic interplay of socio-cultural and environmental factors have made infant mortality from malaria needlessly high. Given the relative similarity of weather, social, cultural and economic conditions across most sub-Saharan African countries, it is perhaps safe to contend that the factors highlighted in this review influence the effectiveness of malaria eradication campaigns across most countries in the region. Consequently, public health campaigns to eradicate malaria in the region, must, as a matter of priority, focus on and address these issues to ensure and promote effectiveness and success of malaria eradication drives not only in Nigeria but across the sub-Saharan African region.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Adefemi K, Awolaran O, Wuraola C. Social and environmental determinants of malaria in under five children in Nigeria: a review. *Int J Community Med Public Health* 2015;2:345-50.