# Malaria Prevalence among Children in Abuja

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## *Abstract*

***Background:*** *Malaria has been noted as world's most important tropical parasitic disease that has killed millions of children mostly in developing countries of the World. The attendant problems associated with malaria prevention and treatment in most African countries had substantially increased the yearly rates of infant illness and child death. Therefore, this prospective study focused on the prevalence of malaria among children in different areas in Nigeria. Thick and thin films were made and stained using parasitological standard procedures. Structured questionnaire were also distributed to ascertain their state of health before recruiting them into the study. Overall 30% of Male and 15.7% of female were respectively positive to malaria diagnosis while 35.7% and 18.6% male and female were negative respectively. High rate of 87.5%, 88.9% and 100% of toddlers, infant and school children respectively had fever while 9.4% and 8.0% toddlers and pre-school children suffer convulsion respectively. Malaria parasite was found in 77.8% infants, 65.6% toddlers, 60% pre-school and 75% school children but total of 34.3% of all the children had no parasite. Symptoms observed among the children indicate a very high percentage of 88.9% infant showing fever while all the school age of 6 to 10 years age shows feverish symptoms due to malaria infection.*

***Conclusion:*** *The prevalence of malaria among children observed in this study shows increasing burden of malaria in the early years of many children. Aggressive and strategic intervention shall be needed to curtail and prevent unforeseen death rate of many vulnerable children.*

***Background:*** *Malaria has been noted as world's most important tropical parasitic disease that has killed more people than any other communicable disease (1). It has remains one of the most prevalent diseases in the World with an estimated 300-500 million cases annually of which 90% occurs in Africa (1). The increasing burden of malaria among children in sub-Saharan Africa has now constituted a leading cause of high mortality due to poverty in this region and poor environmental hygiene which serve as major risk factor. This is because sub-Sahara African region has the greatest number of people exposed to malaria transmission, greatest burden of malaria morbidity and mortality in the world (2). The problems associated with malaria treatment in Africa had substantially increased the rates of illness and death mostly among children (3,4). It is estimated that more than one million children living in Africa die yearly from direct and indirect effects of malaria infection (5). This make malaria a major public health problem and leading cause of premature death in tropical and subtropical countries among children (6).*

*Moreover, the attendant problems associated with malaria treatment in most Africa countries had substantially increased the yearly rates of infant illness and death (3,7). With regards to children aged between 1 and 3 years of age, malaria attack episode usually last for 5 to 15 days and often incapacitate the victim with several symptom which include frequent vomiting, convulsion and progressive difficult breathing.*

*In respect to this, many households had to spend enormous amount on lives, medical cost and drugs. The daily labour cost coupled with cost of treatment and high mortality associated with the disease make malaria one of the main factors retarding development in Africa. Despite huge loss of economic resources, public health, productivity and life span had been adversely affected subjecting many people to abject poverty (8), mostly in hyper-endemic areas in Nigeria (9).*

*Malaria is a known infection caused by the parasite Plasmodium, of which P. falciparum and P. vivax are the most common but mixed infections with two or more of the Plasmodium species are common. P. falciparum is responsible for most severe, often fatal forms of malaria disease in tropical region (10). Nigeria accounted for more than 25% of the malaria disease burden in Africa, and this has significantly contributed to death of million in a year, which mostly consist of children and pregnant women (11).Despite all efforts to provide several preventive methods; malaria related deaths accounts for up to 11% of maternal mortality, 25% of infant mortality and 30% of under five mortality, resulting in about 300,000 childhood death annually (12). The vast majority of deaths occur among children below five years of age and pregnant women (13), especially in remote rural areas with poor access to health. Therefore, this prospective study focused on the prevalence of malaria among children in different areas in Nigeria*

## Objective of the study:

1. To determine the prevalence of malaria parasitaemia among children in Kuje Village - an outskate town of Abuja.
2. To determine relative risk of prevalence of malaria and prevalent symptomatic parasitaemia by age.
3. To understand the current practice, severity of malaria in children and baseline for malaria control

## General consideration:

Children under ten years of age are most at risk for malaria infection. Infected children with severe parasitaemia burden often die less than 72 hours after developing symptoms. The symptoms develop when malaria parasite had fully gone through it complex life cycle that involves an insect vector (mosquito) and a vertebrate host (human). According to Dr Wiser, all four species (*P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae*) exhibit a similar life cycle with only minor variations. The infection is initiated when sporozoites are injected with the saliva of a feeding mosquito. Sporozoites are carried by the circulatory system to the liver and invade hepatocytes. The intracellular parasite undergoes an asexual replication known as exoerythrocytic schizogony within the hepatocyte. Exoerythrocytic schizogony culminates in the production of merozoites which are released into the bloodstream. A proportion of the liver-stage parasites from *P. vivax* and *P. ovale* go through a dormant period instead of asexual replication. These hypnozoites will reactivate several weeks to months (or years) after the primary infection and are responsible for relapses. Merozoites invade erythrocytes and undergo a trophic period in which the parasite enlarges. The early trophozoite is often referred to as 'ring form' because of its morphology.

Trophozoite enlargement is accompanied by an active metabolism including the ingestion of host cytoplasm and the proteolysis of hemoglobin into amino acids. The end of the trophic period is manifested by multiple rounds of nuclear division without cytokinesis resulting in schizonts**.** Merozoites bud from the mature schizonts, also called a segmenter, and the merozoites are released following rupture of the infected erythrocyte. Invasion of erythrocytes re-initiates another round of the blood-stage replicative cycle.

The blood stage is responsible for the pathology associated with malaria. The intermittent fever paroxyms are due to the synchronous lysis of the infected erythrocytes. *P.malariae* exhibits a 72 hour periodicity, whereas the other three species exhibit 48 hour cycles. However, *P. falciparum* often exhibits a continuous fever rather than the periodic paroxyms. *P. falciparum* also is responsible for more morbidity and mortality than the other species. This increase virulence is due in part to the higher levels of parasitaemia associated with *P. falciparum* infections. In addition, more complications are associated with *P. falciparum* because of the sequestration of the trophozoite- and schizonts-infected erythrocytes in the deep tissues.

As an alternative to the asexual replicative cycle, the parasite can differentiate into sexual forms known as macro- or microgametocytes. The gametocytes are large parasites which fill up the erythrocyte, but only contain one nucleus. Ingestion of gametocytes by the mosquito vector induces gametogenesis (i.e., the production of gametes) and escape from the host erythrocyte.

Factors which participate in the induction of gametogenesis include: a drop in temperature, an increase in carbon dioxide and mosquito metabolites. Microgametes, formed by a process known as exflagellation , are flagellated forms which will fertilize the macrogamete leading to a zygote.

The zygote develops into a motile ookinete which penetrates the gut epithelial cells and develops into an oocyst . The oocyst undergoes multiple rounds of asexual replication resulting in the production of sporozoites. Rupture of the mature oocyst releases the sporozoites into the hemocoel (i.e., body cavity) of the mosquito. The sporozoites migrate to and invade the salivary glands, thus completing the life cycle.

In summary, malaria parasites undergo three distinct asexual replicative stages (exoerythrocytic schizogony, blood stage schizogony, and sporogony) resulting in the production of invasive forms (merozoites and sporozoites). A sexual reproduction occurs with the switch from vertebrate to invertebrate host and leads to the formation of the invasive ookinete. All invasive stages are characterized by the apical organelles typical of apicomplexan species.

According to anti-malaria research reported by Jagannathan *et al (*14), early treatment failures has been known to be associated with complicated malaria following treatment with artemether-lumefantrine due to single convulsions or severe anaemia with recurrent episodes of malaria 14 days after treatment. Treatments with quinine + clindamycin following treatment with quinine has show significant curable outcome.

## Material and methods

Seventy- Four infants and children between the age of 1and 6years that were sent to the Laboratory for malaria diagnosis test under the free malaria program a General Hospital at the outskirt of Abuja Nigeria in the month of June 2014 were recruited for this study. Safely procedures were adopted in the collection of finger-prick blood samples by swabbing the area to be sampled with 70% alcohol and allowed to dry before collection. Thick and thin blood films were made on clean slides and labelled accordingly. The thin films were fixed methanol and all films were stained with 3% Giemsa stain at ph 7.0 for 30 min as recommended by WHO (12). Blood films were examined microscopically using 100x 9oil immersion) objectives as described by Cheesbrough (11). The thick films were used to determine the parasites densities while thin films were used to identify the parasites species. Questionnaires were designed and administered to parents and guardians of infants to determine the age, sex, drug usage for prophylaxis, attitude to use of insecticide treated mosquitos' nets. Scientific and ethical permit/clearance was gotten before this study was carried out. Consent for the children was provided by the parents/guardians.

Data analysis: Significant of malaria infection among different age groups with symptoms was determined using Chi square analyzed using SPSS version 16 taken p value <0.005 at confidence interval of 95%.

## Result and discussion

Among all the children studied for malaria parasitaemia, 30% male and 15.7% female had malaria parasite ($\chi^2$ = 0.012,p= 0.912) but the remaining 35.7% male and 18.6% female were tested negative to malaria. Symptoms observed among the children indicate a very high percentage of 88.9% infants showing fever while all the school age of 4 to 6 years shows feverish symptoms due to malaria infection. As the infection progresses, many of the children of age 4 to 6 (25%) suffer difficulty in breathing while pre-school of ages 3 to 5 years had similar experience. Significant weakness of the body parts was noticed among all the

children. 50% of ages 4 to 6 years with infant of less than a year (22.2%) also suffer weakness due to malaria infection. Dehydration could as well set in due to increased vomiting which was observed among toddlers ages 1 to 2years and pre-school children (9.4%). Convulsion is terrible experience which usually leads to brain damage in many mis-managed children. A significant percentage of 9.4% toddler at tender age of 1to 2 suffer convulsion while 8.2% pre-school children had similar experience as a result of malaria parasitaemia ($\chi^2$=6.914 p=0.009).

Malaria parasitaemia is significantly high among all the children irrespective of their age class. Highest percentage rate of 77.8% infants, 75.0% school children, 65.6% toddlers and least rate of 60.0% pre-school children were significantly positive to malaria($\chi^2$=32.8, p=0.002).

This is similar to high malaria parasite rates of 74% reported among primary school children in Nigeria by David *et al* (8), 80% rates by Adeyemo *et al*, in 1999 (16) among primary school children in Erunmu village in South- West Nigeria while 52% rates was reported in rural and urban communities of Ebonyi State by Ani *et al* (10) but lower rate of 27% was reported by Ademowo *et al*, in 1995 among school children from a rural village in Western Nigeria (17). Highest malaria parasite intensity was observed among infants (28%), 27% school children and least intensity of 21% and 24% percentage was noticed among pre-school and toddlers respectively.

**Conclusion:** The prevalence of malaria among children observed in this study shown increasing burden of malaria in the early years of many children. Eradication or reduction in mosquito must be put up to undertake a massive attack of the parasite and its vectors in various households as it is evident that malaria parasitaemia is widespread among younger children. In spite of children vulnerability to malaria attack, many of the debilitating effects of malaria will soon surface and this shall increase morbidity and mortality rate among children. There is urgent need for effective control malaria infection mostly among the children. In spite of various malaria preventive strategies put in place to reduce malaria burden, there is need for concerted effort from both individual and community towards reduction in breeding of mosquito, use of preventive net and other preventive methods gear towards effective elimination and eradication of malaria.

Therefore, concrete steps should be taken to quickly avert an epidemic of malaria especially among children of school age. Adequate health education focusing on malaria control should be intensified both at school and at the community level.

**Recommendation:** The study clearly showed that malaria still pose great danger to children and could be a major factor to increase mortality. Therefore, the following recommendations were made:-

1. Public health education for mothers and health care givers to create awareness that may lead to reduction of vectors of malaria should be enhanced.
2. Infection and control of malaria should be a collective approached in schools, community and hospitals.
3. Free or subsidized insecticide treated bed nets should be made available to mothers so that the infection of malaria could be controlled in various households.
4. Mothers and other caregivers need to be empowered to treat malaria infection at home.

## Tables and figures

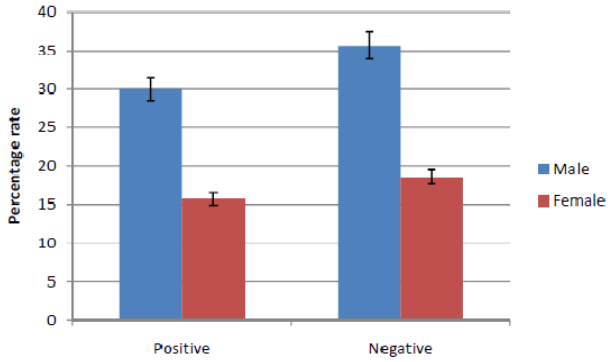


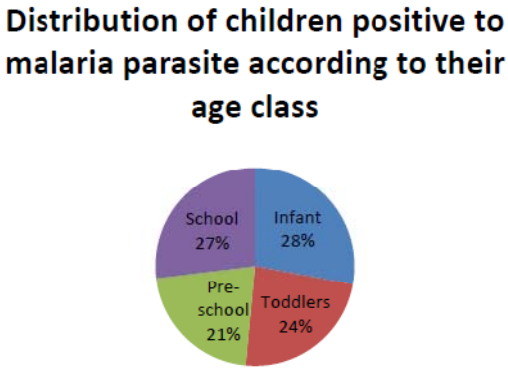

**Figure 1;** percentage distribution of malaria infection among the children

**Table 1;** variation of malaria symptoms observed among the children studied from different locations.

| | | **Symptoms observed among the subjects** | | | | |
|---|---|---|---|---|---|---|
| Age class | Age class (year) | Fever | Difficult breathing | Weakness | Vomiting | Convulsion |
| | | n(%) | n(%) | n(%) | n(%) | n(%) |
| Infant (n=9) | 0 < 1 | 8(88.9) | 0(0.0) | 2(22.2) | 0(0.0) | 0(0.0) |
| Toddlers (n=32) | 1 - 2year | 28(87.5) | 0(0.0) | 2(6.3) | 3(9.4) | 3(9.4) |
| Pre-school (n=25) | 3 – 5 | 22(88.0) | 2(8.0) | 5(20.0) | 2(8.0) | 2(8.0) |
| School (n=4 ) | 6 – 10 | 4(100.0) | 1(25.0) | 2(50.0) | 0(0.0) | 0(0.0) |
| Total (n=70) | | 62(43.4) | 3(4.3) | 11(15.7) | 5(7.1) | 5(7.1) |

**Table 2;** percentage parasitaemia found among the children

| | | **Malaria parasite** | |
|---|---|---|---|
| Group | Age class | Present n(%) | Absent n(%) |
| Infant (n=9) | 0 < 1 | 7 (77.8) | 2(22.2) |
| Toddlers (n=32) | 1 - 2 | 21(65.6) | 12(37.5) |
| Pre-school (n=25) | 3 – 5 | 15(60.0) | 9(36.0) |
| School (n=4 ) | 6 – 10 | 3(75.0) | 1(25.0) |
| Total (n=70) | 46(65.7) | 24(34.3) | |



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