

SJMLS-2(2)-2017-010

## Burden of Malaria at Community Level in Children Less Than 5 Years of Age in Sokoto, Nigeria.

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### Abstract

Malaria fever a public health issue is the commonest manifestation and children aged less than 5 years are most vulnerable. A retrospective study which is aimed at determining the prevalence of malaria case in children less than five years. The data was collected from the health facility daily outpatient department register. The malaria testing was carried out according to World Health Organization (WHO, 2011) standard using microscopy and Malaria rapid diagnostic tests (RDTs), an immune chromatographic antigen- detection tests was the technique used in the course of research from July to September 2016. Result from this study shows that the percentage of malaria cases vary across the months June 94(15.9%), July 100(15.7%), August 207(18.1%), September 150(17.4%) and October 219(21.4%). The prevalence of malaria in children less than five years reported out of 4261 patients that used the facility in this period was 18.1%. Malaria among male children under the age of 5 years was 456(59.2%). Male had highest number 125,124 cases in October and August respectively. The female highest malaria cases were 94 and 83 in October and August respectively. The lowest cases of malaria among the male 60 occurred in the month of June while that of the female is 34 cases in the same month. Community participation and health education strategies promoting awareness of

malaria and the importance of control measures should be implemented. The community should know the prevalence rate of the disease, its danger and how it can be prevented.

**Keyword:** Malaria, Community Level, Children Less Than 5 Years, Sokoto, Nigeria.

### Introduction

Malaria is an ancient scourge of humanity. Malaria is considered one of the main global health problems causing close to a million deaths each year. Ninety percent of these deaths occur in Sub-Saharan Africa and 70% of the deaths are among children under the age of 5 years (Against Malaria Foundation, 2015). Almost half the world's population live in countries where the disease is endemic, and almost every country in the world encounters imported malaria. Malaria continues to extract a heavy toll of life and health in a substantial part of the world. Children are the worst affected, especially children aged 6 months to 5 years. In parts of the world where malaria is endemic, it may cause as many as 10% of all deaths in children. In the 1950s, the World Health Organization launched an ambitious plan to control

or eradicate malaria. After initial successes, the plan foundered. Malaria is now returning to areas where it was once controlled, and it is entering new areas. Because of plasmodial and mosquito resistance to drugs and insecticides, the danger of malaria has worsened, and the disease is now a major global problem.

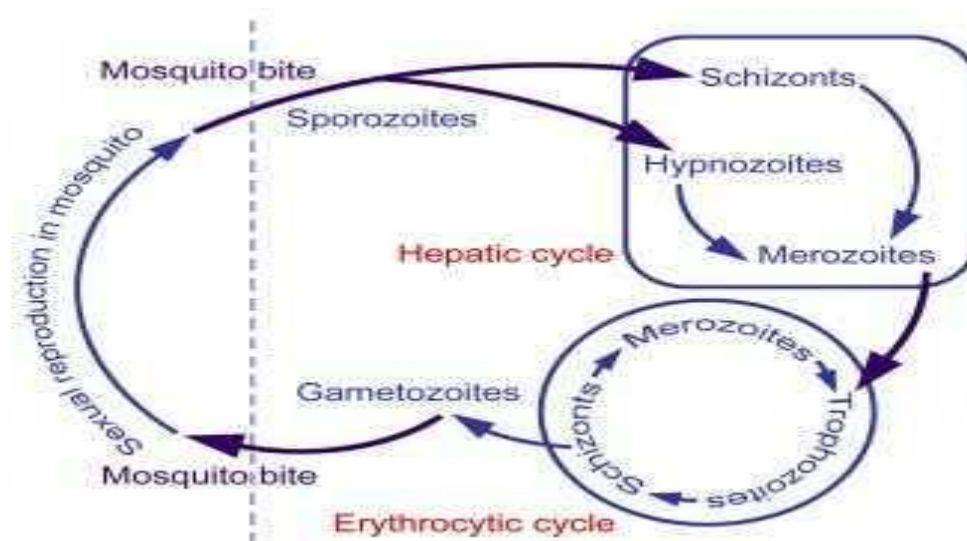
### Prognosis

Malaria is caused by *Plasmodium* species, which are protozoal blood parasites. The following 4 species can infect humans:

- *P. vivax*

- *P. falciparum*
- *P. malariae*
- *P. ovale*

The bite of an infected mosquito introduces asexual forms of the parasite, called sporozoites, into the bloodstream. Sporozoites enter the hepatocytes and form schizonts, which are also asexual forms. Schizonts undergo a process of maturation and multiplication known as pre-erythrocytic or hepatic schizogony. In *P. vivax* and *P. ovale* infection, some sporozoites convert to dormant forms, called hypnozoites, which can cause disease after months or years. The images below detail the various stages of the *Plasmodium* life cycle.



**Figure 1: The various stages of Plasmodium life cycle are shown.**

Knowledge of the life cycle of the malarial parasite is essential to understanding the chemotherapy of malaria. Pre-erythrocytic schizogony takes 6-16 days and results in the host cell bursting and releasing thousands of merozoites into the blood. Merozoites enter the erythrocytes and initiate another asexual reproductive cycle, known as erythrocytic schizogony. The parasite successively passes through the stages of trophozoite and schizont, ultimately giving rise to several merozoites. Upon maturation of these merozoites, the erythrocyte ruptures, releasing the merozoites and multiple antigenic and pyrogenic substances into the bloodstream.

These merozoites again infect new erythrocytes. After a few cycles of this erythrocytic schizogony, some merozoites differentiate into the sexual forms: the male and female gametocytes. A mosquito that takes a blood meal from a patient with gametocytemia acquires these sexual forms and plays host to the sexual stage of the plasmodial life cycle.

Rupture of a large number of erythrocytes at the same time releases a large number of pyrogens, causing the paroxysms of malarial fever. The periodicity of malarial fever depends on the time required for the erythrocytic cycle and is definite for each species. *P. malariae* needs 72 hours for each

cycle, leading to the name quartan malaria. The other 3 species each take 48 hours for 1 cycle and cause fever on alternate days (tertian malaria). However, this periodicity requires all the parasites to be developing and releasing simultaneously; if this synchronization is absent, periodicity is not observed.

Most malaria acquired in Africa is due to *P falciparum*. *P vivax* dominates in Asia and the Americas. The bite of an infected female *Anopheles* mosquito transmits malaria. Species of mosquito capable of transmitting malaria are found in all 48 of the contiguous states of the United States. Malaria can also be transmitted through blood transfusion. Among people living in malarious areas, semi-immunity to malaria allows donors to have parasitemia without any fever or other clinical manifestations. The malaria transmitted is by the merozoites, which do not enter the liver cells. Because the liver stage is not present, curing the acute attack results in complete cure. Organ transplantation is another malarial transmission route.

Transplacental malaria (congenital malaria) can be significant in populations who are semi-immune to malaria. The mother may have placental parasitaemia, peripheral parasitaemia, or both, without any fever or other clinical manifestations. Vertical transmission of this infestation may be as high as 40% and is associated with anaemia in the baby. Uncomplicated malaria due to *P. vivax*, *P. malariae* and *P. ovale* has an excellent prognosis. Most patients have a full recovery with no sequelae. Malaria due to *P falciparum* is dangerous; if it is not treated quickly and completely. Complicated and severe malaria can result, which carries a grave prognosis. Malaria in children younger than age 5 years carries the worst prognosis in endemic areas. In a non-immune population, malaria is equally deadly at all ages. Repeated attacks of malaria can lead to chronic anaemia, malnutrition, and stunted growth. Acidosis, seizures, impaired consciousness, renal impairment, and pre-existing chronic diseases are associated with poor outcomes in children with severe malaria. Other markers of poor outcomes are hyperparasitemia, respiratory distress, young age,

severe anaemia, and hypoglycaemia (Clark *et al.*, 2008).

### **Risk factors**

Risk factors for malaria include the following:

- Residence in, or travel through, a malarious area
- No previous exposure to malaria (hence no immunity)
- No chemoprophylaxis or improper chemoprophylaxis

### **Statement of problem**

In endemic areas, children younger than age 5 years have repeated and often serious attacks of malaria. The survivors develop partial immunity. Thus, older children and adults often have asymptomatic parasitemia (ie, the presence of plasmodia in the bloodstream without the clinical manifestations of malaria). Most deaths resulting from malaria occur in children younger than age 5 years. A study found that *Plasmodium falciparum* infection prevalence in endemic Africa halved and the incidence of clinical disease fell by 40% between 2000 and 2015. Report that interventions have averted 663 million clinical cases since 2000. Insecticide-treated nets, the most widespread intervention, were by far the largest contributor to the reduction in malaria related deaths (Pullan *et al.*, 2010). Approximately 300-500 million cases of malaria occur every year, and 1-2 million deaths occur, most of them in young children.

### **Aim**

The aim and objectives of this study were therefore to determine the prevalence of malaria cases in less than five years in Sokoto, North Western Nigeria.

### **Significance of the study**

Results of the study would reveal the prevalence of malaria in this part in Sokoto metropolis. Specifically, result of the study would be significant to adults (male /female), public health officers,



health counselors, health educators, curriculum planners, medical allied personnel, researchers in assessing the prevalence malaria disease and initiating preventive measures among inhabitants which can potentially help prevention programs succeed in the populace in Sokoto metropolis.

### Research Questions

- What is prevalence of malaria cases among children < 5 year
- What is the number of malaria cases among female and male in less than 5 years

### Hypotheses

- There is no malaria case among children < 5 years.
- There is no malaria case among female and male who are less than 5 years old.

### Materials and Methods

#### Study area and the population

1 Brigade Medical Centre, Gingiya barracks, Dange Shuni LGA in Sokoto South senatorial zone was the location of this study. By the virtue of its origin, the State comprises mostly Hausa/Fulani and other groups such as Gobirawa, Zabarmawa, Kabawa, Adarawa, Arawa, Nupes, Yorubas, Igbos and others. The Sokoto township is in dry Sahel surrounded by sandy terrain and isolated hills. Rainfall starts late that is in June and ends in September but may sometimes extend into October. The average annual rainfall is 550 mm with peak in the month August. The highest temperatures of 45°C during the hot season are experienced in the months of March and April. Harmattan a dry, cold and dusty condition is experienced between the months of November and February (Udo and Mamman, 1993).

#### Ethical approval

Ethical clearance was obtained from the Ethical Committee of the 1 Brigade Medical Centre, Ginginya Barracks, Sokoto. This study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the

ethical research committee of the 1 Brigade Medical Centre, Ginginya Barrack, Sokoto.

#### Sample size

The sample size was the number of out-patient attending the facility between the months of June to October 2016.

#### Method of Data collection

The data was collected from the health facility daily Outpatient Department register. The malaria testing was carried out according to World Health Organization (WHO, 2011) standard using microscopy and Malaria rapid diagnostic tests (RDTs), an immune chromatographic antigen-detection tests was the technique used in the course of research over the period from July to September 2016.

#### Method of data analysis.

Data collected were analyzed using descriptive statistics of frequency count, normative percentage and grand mean; as well as inferential statistics of chi-square ( $\chi^2$ ). The level of significant was fixed at  $\leq 0.05$ . Appropriate degrees of freedom were worked out.

#### Result

This study investigated the prevalence of malaria among children under the age of 5 years between July and October. Result from this study showed that the percentage of malaria cases varied across the months June 94(15.9%), July 100(15.7%), August 207(18.1%), September 150(17.4%) and October 219(21.4%). The prevalence of malaria in children less than five years reported out of 4,261 patients that used the facility within this period was 18.1%. Table 1 shows varying malaria from June –October. Table 2 shows the percentage of malaria cases vary across the months. Figure 1 shows a graphical distribution of Malaria cases in less than 5 years across June –October 2016.

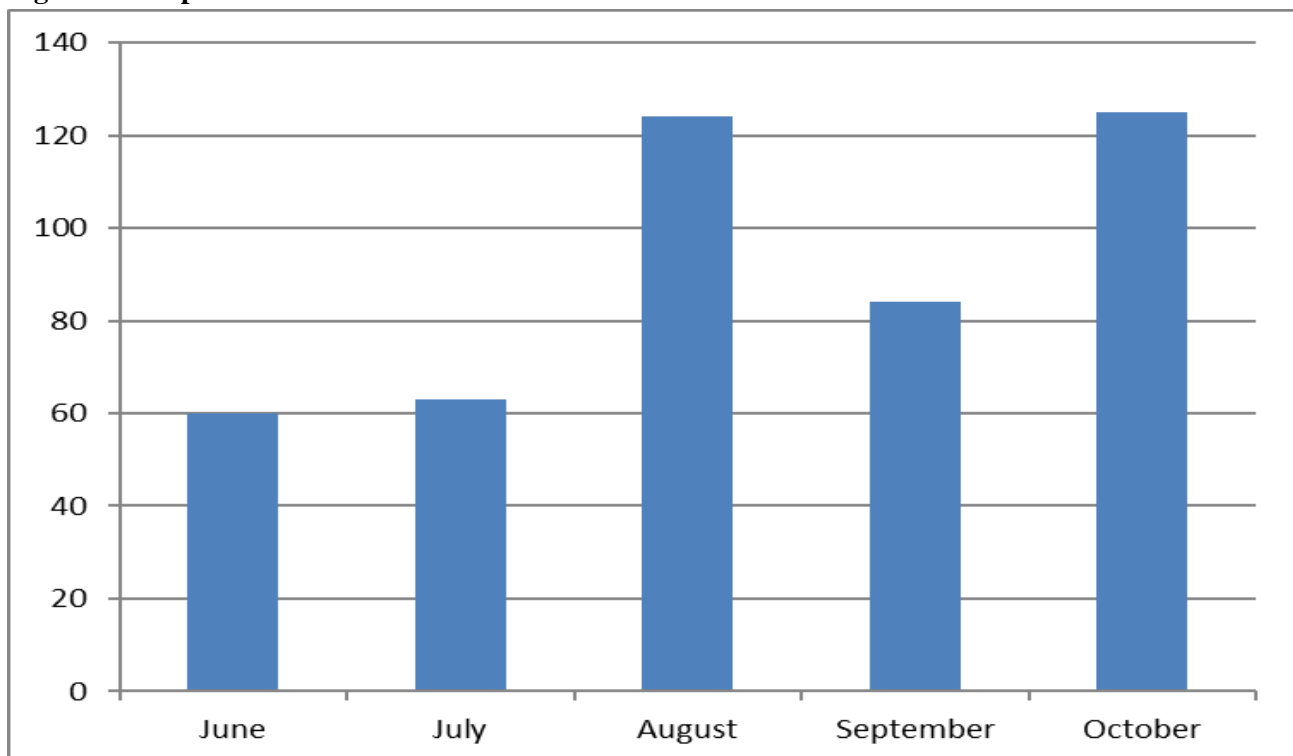
Malaria among male children under the age of 5 years was 456(59.2%). Male had highest number 125,124 cases in October and August respectively. The female highest malaria cases were 94 and 83 in October and August respectively. The lowest cases of malaria among the male 60 occurred in the month of June while that of the female is 34 cases in the same month. In the cases on malaria, the calculated chi-square ( $\chi^2=457.7$ , was greater than tabulated  $\chi^2_{0.05=11.07}$  at  $df=5$ ,  $p<0.05$ ). Therefore, the null

hypotheses were rejected and conclusion drawn that there is significant difference among male and female gender on the prevalence of malaria. In the month of October there is general increase in both male and female, followed by August while the lowest reported case among both gender is in the month of June. Figure 2 shows the graphical distribution of Malaria case among children < 5 years based on gender among Male and Female from June To October 2016.

**Table 1: Malaria cases confirmed and treated in the health facility among under 5 children between the month of June to October 2016.**

Months	Total number
June	94
July	100
August	207
September	150
October	219

**Figure 1: Graphical Distribution of Malaria Case in Less Five Years Across June –October 2016**



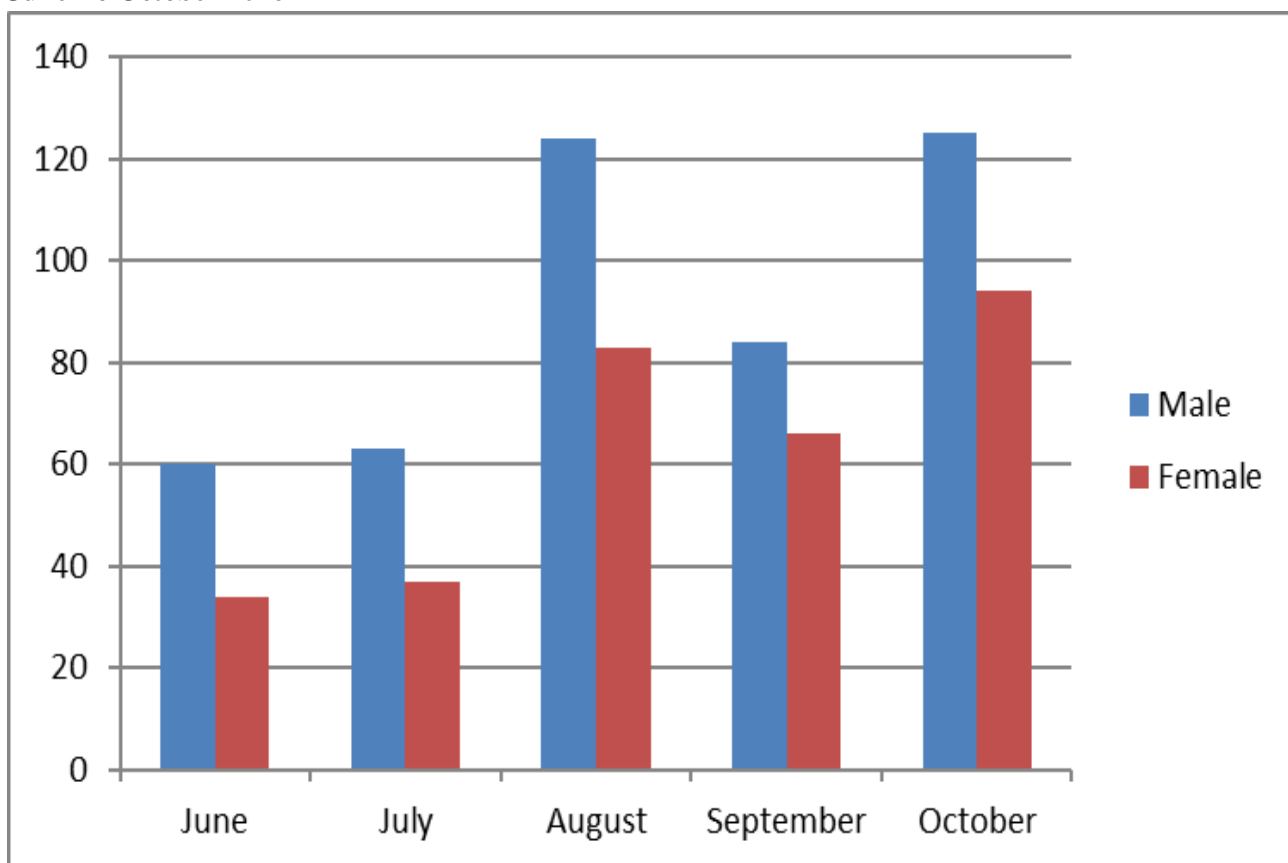


**Table 2: Malaria cases confirmed and treated in the health facility among under 5 children between the month of June to October 2016.**

Month	Male	Female	Monthly Total
June	60	34	94
July	63	37	100
August	124	83	207
September	84	66	150
October	125	94	219
Total	456 (59.2%)	314 (40.8%)	770

$\chi^2=457.7, \chi^2_{0.05}=11.07$  at  $df=5, p<0.05$

**Figure 2: Graphical Distribution of Malaria Case Less Than 5 Years Among Male and Female from June To October 2016**





**Table 3: Malaria cases confirmed and treated in the health facility among under 5 children between the month of June to October 2016.**

Month	Total Malaria Case (%)	Total Number of Patients That Used the Health Facility
June	94(15.9%)	592
July	100(15.7%)	638
August	207(18.1%)	1144
September	150(17.4%)	864
October	219(21.4%)	1023
Total	770(18.1%)	4261

**Discussion**

Malaria fever is a public health issue and the commonest manifestation and Children aged less than 5 years are most vulnerable. Result from this study shows that the percentage of malaria cases vary across the months June 94(15.9%), July 100(15.7%), August 207(18.1%), September 150(17.4%) and October 219(21.4%). This study observed a malaria prevalence of 18.1% out of of 4261 patients that used the facility in the period under review. We observed a higher prevalence among male children compared to female children. Our observed prevalence among children less than five is less that observed 411 (56.3%) in a previous report (Eseigbe *et al.*, 2013) among 730 febrile children assessed with majority of the malaria infected being males. Similarly, our observed prevalence is also lower than that observed by Roberts and Colleagues (2015) in Uganda among their cohort of 3,972 children who were tested for malaria. Of those children, 1,725 tested positive, resulting in an observed prevalence of 43.4%. Also, Wolkon, and Colleagues (2006) in a community-based baseline cross-sectional survey conducted in three districts in Togo in September 2004 as part of a multidisciplinary evaluation of the impact of the Togo National Integrated Child Health Campaign among 2,532 enrolled children from 1,740 households, 62.2% (1,352/2,172) were parasitemic and 84.4% (2,129/2,524) were anaemic (haemoglobin < 11 g/dL). Moderate-to-severe anaemia (< 8.0 g/dL) was found in 21.7% (543/2,524), with a peak prevalence in children 6-17 months of age and was strongly correlated with parasitemia (OR = 2.3, 95% CI: 1.8-2.5).

There were more cases of malaria case among male children that are under 5 age 456(59.2%). Male had highest number 125,124 cases in October and August respectively. The female highest malaria cases were 94 and 83 in October and August respectively. The lowest cases of malaria among the male 60 occurred in the month of June while that of the female is 34 cases in the same month. In the cases on malaria, the calculated chi-square ( $\chi^2=457.7$ , is greater than tabulated  $\chi^2_{0.05}=11.07$  at  $df=5$ ,  $p<0.05$ ). Therefore, the null hypotheses were rejected and the conclusion drawn that there is significant difference among male and female gender on the prevalence of malaria. Higher cases of malaria among males (476, 65.2%) were also reported by Eseigbe and Colleagues (2013) in a related research among 730 febrile children.

**Conclusion**

The research study has revealed the presence of malaria infection in children less than five years in both male and female children in 1 Brigade Medical Centre Sokoto State, Nigeria. The overall infection rate is slightly high.

**Recommendations**

1. Environmental and health education on the preventive measures at all level in the community by health environmental officers should be implemented.
2. Sanitary measures aimed at reducing the breeding sites of mosquitoes such as filling and draining areas of water should be done.



3. Larvicides should be applied to the gutters and drainages in front and around the houses in the area.
4. Community participation and health education strategies promoting awareness of malaria and the importance of control measures should be done. The community should know the prevalence rate of the disease, its danger and how it can be prevented.
5. Practical and intensive home visits should be done by health workers to ensure that people make use of insecticide-treated nets. They may have to check their rooms to see if the nets are hung.
6. Incentives should be giving to people that have clean environment that will prevent the breeding of mosquitoes and the people that always make use of their insecticide-treated nets. This will bring competition within the community and there will be overall reduction of prevalence of malaria. This should be done quarterly.

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