

# PREVALENCE OF MALARIA PARASITE INFECTION AMONG UNDER-FIVES MANAGED AT IDDO SARKI PRIMARY HEALTH CENTRE, ABUJA, NIGERIA

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## ABSTRACT

Malaria is an infectious disease, and a major cause of mortality in developing countries, especially in tropical and sub-tropical areas. To determine the prevalence of malaria infection among the children aged 1-5 years old who attended Iddo Healthcare in Abuja, Nigeria, between October and December 2023, a cross-sectional, observational and laboratory study was conducted. The total number of children involved in the study was 125, with parental consent. Structured questionnaire was used to collect socio-demographic data of the parents of the children. Microscopy was used to examine malaria parasite infection. The data obtained was analyzed using SPSS version 20. The prevalence data were obtained using frequencies and percentages. The overall prevalence of malaria infection was 80 (64%). Males (35; 64.8%) had a higher prevalence than females (45; 63.3%), and 3-year-olds had the highest prevalence (18; 69.2%), while 5-year-olds had the lowest (10; 52.6%). Children of farmers had the highest prevalence of infection, 33 (66.0%), and the lowest was 20 (60.6%) for children whose parents were civil servants. Children living in a single room had the highest prevalence of malaria infection, 26 (68.4%), while those living in a 3-bedroom flat had the lowest prevalence, 8 (53.3%). The findings from this research shows a high prevalence of malaria parasite infection among children ≤ 5 years in Iddo Sarki. Of this, the results found that malaria was present in the area with high prevalence, suggesting that there was active transmission of malaria and was endemic in the area. Environmental conditions are conducive to mosquito breeding, and so early diagnosis and treatment are needed. The knowledge gained from this study will help develop targeted interventions and strategies to curb the malaria burden among the vulnerable pediatric population in Iddo Sarki Village.

**Keywords:** Prevalence, Malaria parasite infection, Children Aged 1-5 Years, Iddo Sarki Primary Health Centre, Abuja.

## INTRODUCTION

Malaria is a common, severe febrile disease caused by *Plasmodium* parasites transmitted mainly by infected female *Anopheles* mosquitoes (WHO, 2020). Of the species that infect humans, *P. falciparum* is the most prevalent and lethal in SSA (Jamison *et al.*, 2006). The other species of *Plasmodium* that infect

humans are *P. vivax*, *P. knowlesi*, *P. ovale* and *P. malariae* (Ukaegbu *et al.*, 2014; Mbah *et al.*, 2015; Iwuafor *et al.*, 2016), of which *P. falciparum* and *P. vivax* are the most harmful globally.

Following infection via a mosquito bite, *Plasmodium* parasites enter the liver, multiply, and then invade red blood cells, where symptoms of malaria (chills, fever, and headache) appear (Parang, 2020; Adino *et al.*, 2021; CDC, 2021). *P. falciparum* infection, if left untreated, can develop into severe malaria and death (WHO, 2024). Malaria poses a significant burden of morbidity and mortality, particularly for children under five years of age and pregnant women, especially in sub-Saharan Africa (SSA) (WHO, 2022).

Although malaria is a vector-borne illness that can be prevented and treated, it remains a serious public health issue, particularly in tropical and subtropical regions (WHO, 2025). In endemic areas, the disease is disproportionately affecting the most vulnerable populations, particularly young children (aged 1-5 years) who are yet to develop adequate immunity (WHO, 2018). Children in this age group suffer from the greatest burden of morbidity and mortality from malaria because they have the least immune system response to *Plasmodium* infections (WHO, 2022). Malaria is a frequent occurrence in low-resource areas, where poor sanitation, lack of health services and poverty contribute to the problem of transmission (Asifat *et al.*, 2025). In addition, climate conditions such as rainfall and high humidity throughout the year favour mosquito breeding, amplifying malaria transmission year-round, particularly during the rainy seasons (World Bank, 2014).

The World Health Organization (WHO) estimates that almost half of the world's population is still susceptible to malaria (WHO, 2021). Vulnerable groups such as infants, young children, pregnant women and immunocompromised individuals are the most burdened by disease (WHO, 2023). According to WHO, malaria claimed 409,000 lives in the world in 2019, of which 67 % were children under 5 years old (WHO, 2020). Nigeria was the country with the highest number of malaria deaths in the world, accounting for 23 % of global malaria mortality (WHO, 2020). The 2022 WHO report also revealed that the number of malaria cases rose from 245 million in 2020 to 247 million in 2021, and an estimated 619,000 people died of malaria in 2021 (WHO, 2022). A child under five dies of malaria every 75 seconds, as well, according to UNICEF (2022), continuing the global health crisis. Malaria is still endemic in Nigeria and is one of the top killers of children (Ofiaeli *et al.*, 2020).

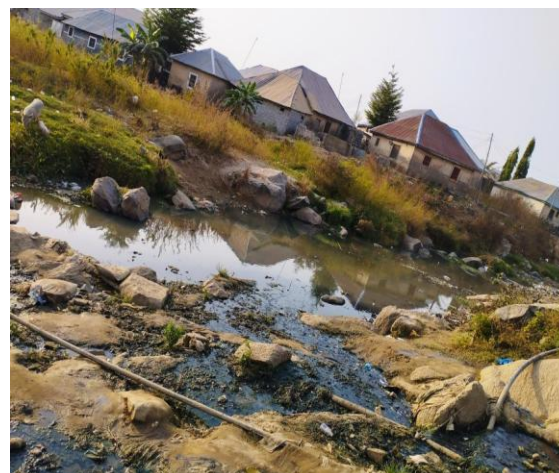
Iddo village is experiencing a health problem among children between the ages of 1 and 5 in the community, and this has started to have a significant impact on child health in the village. Despite the global and national reports by WHO (2022) and UNICEF (2022) on the high burden of malaria in Nigeria among children under 5 years, there is a lack of individual community data on the true burden of the issue in specific rural villages such as Iddo in Nigeria. This lack of localized evidence is a challenge in designing targeted and effective interventions. Therefore, this study aims to determine the prevalence of malaria among children aged 1-5 years in Iddo village.

## MATERIALS AND METHODS

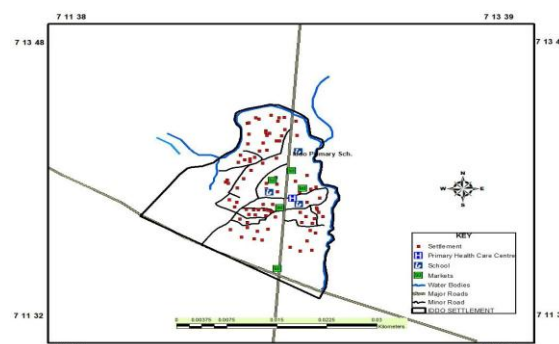
### Study Area

This study was carried out at the Iddo Sarki Health Centre in Abuja. Positioned adjacent to the University of Abuja permanent site, Iddo Sarki is a village located to the left of the University of Abuja along Nnamdi Azikiwe International Airport Road. Situated between latitude 8°59'2"N and longitude 7°12'23"E, the village is part of the Federal Capital Territory, Abuja, which had an estimated population of 2,456,945 in 2023 (National Bureau of Statistics, 2024). Iddo Sarki is home to indigenous ethnic groups, including the Gbari, Gbagy, and Bassa. The literacy level of a large proportion of the population is very low, such that they cannot communicate effectively in English. The area shares common ecological and climatic features, including endemic seasonal malaria (Oparaocha, 2003). The rainfall in this study area occurs from late March to early November, with August having the highest rainfall every year and a temperature of 36°C.

The study area, despite its large population, faces challenges in health care services, with only the Iddo Sarki Health Centre serving as the Primary Health Centre. Other health facilities include two private clinics (Bethel and Wakili clinics). Among the health services rendered by the clinic are outpatient, inpatient, medical, surgical, pediatric and obstetrics and gynecology services. The health care centre is located at the centre of the village and is within reach of most people because of its lower cost compared with private clinics. The predominant occupation of the people in the area is peasant farming and livestock keeping around houses. The houses are found between thickets of bushes; hence, the proximity to the bushes is close. There is only one source of river that serves the area. Apart from Eid Field and Upper Iddo, which have borehole water sources, other parts of the area lack piped water. Hence, the inhabitants resort to itinerant water vendors (Mairuwa), roof harvesting during the rainy season, and water stored in dung wells, open drums and plastic containers. This increases the number of breeding sites for mosquitoes during the rainy season. Seasonal drying of pools, puddles and dung wells or tanks creates a good breeding site for *Anopheles* mosquitoes and their ecological associates.



**Figure 1:** A view of the source of river water that serves Iddo Sarki village, showing its proximity to the people's houses.



**Figure 2:** Map of Iddo Sarki showing the point of Samples Collection. Map Source: ESRI/ArcGIS 2023

### Study Design

This study was designed as a descriptive and cross-sectional study.

### Study Population

The population for this study was children aged 1-5 years presenting with malaria symptoms and brought to Iddo Sarki Primary Health Center by their parents or guardians from October 2023 to December, 2023.

### Sample Size

A total of 125 children (54 males and 71 females) were enrolled in the study among those who came to the hospital for a medical check-up.

### Sampling Technique

All children who were febrile and presented to the Iddo Sarki Health Centre for any health-related matter, and whose parents or guardians provided verbal informed consent, were included in the study.

### Study Inclusions and Exclusions Criteria

The study included children aged 1-5 years who were febrile (temperature  $\geq 37.50^{\circ}\text{C}$ ) and had no history of anti-malaria drug ingestion in the last 48 hours.

### Ethical Considerations

Ethical clearance for the study was obtained from the Department of Biological Science at the University of Abuja and signed by the supervisor and the Head of the Department, with approval number 20/208 BIO/ 325.

### Study Procedure and Data Collection

The types of housing facilities and sanitary conditions of the participants, as well as their socio-demographic characteristics, were obtained using a structured questionnaire and oral interview. The study was done between 8:00- 10:00 am on weekdays (Monday to Friday) for a period of three (3) months.

### Physical and Clinical Examination

Participants' body temperatures were measured with a clinical thermometer, and pulse rate was determined using a radial pulse rate monitor.

### Parasitological Examination

#### Collection and Processing of Blood Sample

Trained laboratory technicians assisted in aseptically collecting 2-3 milliliters of peripheral venous blood from each child. Using a tourniquet tied to the upper arm, blood samples were collected and transferred into anticoagulant specimen bottles (EDTA), pre-labeled with the children's identification number. EDTA prevents blood clotting by removing calcium and is used for hematological tests (Cheesbrough, 2000).

### Malaria Parasite Identification (Malaria Diagnosis)

Thick and thin blood films were prepared on glass slides using the Giemsa technique for parasite identification and speciation (Cheesbrough, 2010). Stained slides were examined under a microscope with a 100× oil-immersion objective lens. A thick smear was reported as negative after examining under 100 high-power fields. Two trained microscopists independently assessed each slide, and a positive result was declared only when both microscopists concurred.

### Procedure for Making Thin Blood Film and Thick Blood Film

A drop of blood was gently pressed on one end of a grease-free slide. A spreader was positioned in front of the blood at a suitable angle, and the blood was allowed to touch the spreader and spread along its edge. The spreader was moved down the slide, dragging the blood behind it until the entire slide was covered in blood. This was tagged and left to air-dry. The parasites' shape and density, as well as the condition of the corpuscles, can be studied using this method (Cheesbrough, 2010).

On a clean, grease-free slide, a large drop of blood was placed in the center to make a thin film. To cover a region on the slide, the smear was formed using the edge of another slide. A diamond pencil was used to label the slide, which was then allowed to air dry. The smear was tagged with a grease pencil and allowed to air dry. When parasites are present in small numbers, this approach yields a considerably higher parasite concentration. (Cheesbrough, 2010).

### Data Collection

A laboratory report form was provided to parents or guardians of children who presented to the health Center with malaria symptoms. Information such as the child's sex and age, as well as the parents'

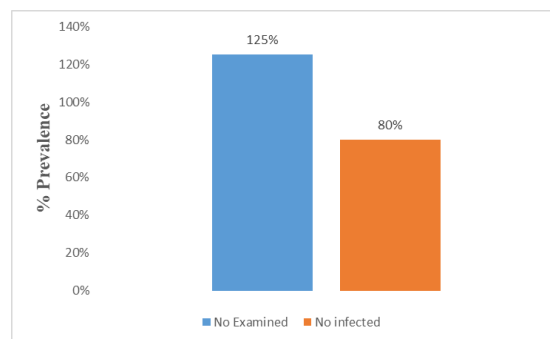
level of education and occupation, etc., were gathered using a structured questionnaire.

### Data Analysis

The collected data were analyzed using SPSS version 20.0. Data were presented in frequency tables, percentages and charts for relevant variables using Microsoft Excel. The chi-square test was used to test the association between the socio-demographic characteristics and the outcome variables. Quantitative variables (Parents' occupation, education level and child's sex, etc.) were summarized using simple percentages. The level of statistical significance was set at  $p < 0.05$ .

### RESULTS

A total of 125 children, consisting of 54 males and 71 females, were enrolled in the study. An overall prevalence of 80 (64%) was observed, as shown in Figure 2.



**Figure 3:** Overall Prevalence of Malaria Infection among Children 1-5 Years old visiting Iddo Health Care,

Table 1 shows that the prevalence of malaria infection was highest in the 3-year-old children, with a prevalence of 18 (69.2%). This was closely followed by the 4-year-old children, with a prevalence of 23 (67.7%). The 2-year-olds had a prevalence of 20 (66.7%). Children aged 1 year had a prevalence of 9 (56.3%), while the 5-year-olds category had the lowest prevalence, at 10 (52.6%).

**Table 1:** Prevalence of Malaria Parasite Infection among Children Aged 1-5 Years in Relation to Age

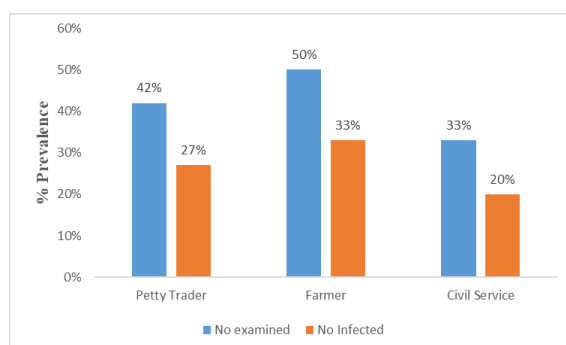
| Age (Years)  | No. Examined | No. of Positive | Percentage of Positive (%) |
|--------------|--------------|-----------------|----------------------------|
| 1            | 16           | 9               | 56.3                       |
| 2            | 30           | 20              | 66.7                       |
| 3            | 26           | 18              | 69.2                       |
| 4            | 34           | 23              | 67.7                       |
| 5            | 19           | 10              | 52.6                       |
| <b>Total</b> | <b>125</b>   | <b>80</b>       | <b>64</b>                  |

Table 2 shows that the prevalence of malaria parasite infection among 1-5-year-old children was slightly higher in males, 35 (64.8%), than in females, 45 (63.4%). The chi-square test showed no significant association between gender and malaria infection,  $\chi^2 = 0.03$ ,  $p = 0.87$ .

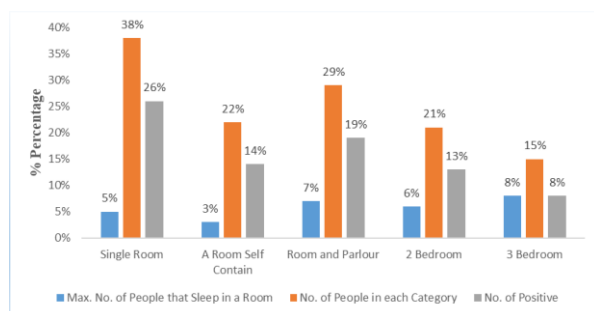
**Table 2:** Prevalence of Malaria Parasite Infection among Children 1-5 Years Old in Relation to Sex.

| Sex          | No. Examined | No. Positive | Percentage (%) | $\chi^2$ | P value |
|--------------|--------------|--------------|----------------|----------|---------|
| Male         | 54           | 35           | 64.8           | /        | /       |
| Female       | 71           | 45           | 63.4           | 0.03     | 0.87    |
| <b>Total</b> | <b>125</b>   | <b>80</b>    | <b>64</b>      |          |         |

The prevalence of malaria parasite infection in relation to parents' occupation is shown in Figure 2 below, which indicates that children whose parents are farmers had the highest prevalence of infection, 33 (66.0 %), followed by those whose parents are petty traders, 27 (64.3%), whereas children whose parents are civil servants had the lowest prevalence of 20 (60.6 %).



**Figure 4:** Chart Showing Prevalence of Malaria Parasite among Children in Iddo Health Centre in Relation to Parents' Occupation. The prevalence of malaria parasite infection in relation to housing types as shown in figure 3 below indicates that children who live in a single room had the highest prevalence of malaria parasite infection 26 (68.42 %), followed by those who live in a room and parlour self-contain 19(63.6 %), and those who live in a room self-contain had a prevalence of 14(63.6%), and those who live in 2-bedroom flat apartment had a prevalence of 13(61.9%). In contrast, children who live in 3-bedroom flat apartments had the lowest prevalence of malaria parasite infection, at 8 (53.3%).



**Figure 5:** Prevalence of Malaria Parasite Infection among Children Aged 1-5 Years old in Relation to Housing Type

## DISCUSSION

In this study, 80 (64%) out of 125 children tested positive for malaria parasite infection, indicating a high prevalence of malaria among children aged 1-5 years in Iddo Sarki village. This elevated prevalence aligns with findings from the World Health Organization's global report (WHO, 2023), which emphasizes the heightened vulnerability of children aged 5 and below, especially in African regions.

However, the prevalence observed in this study surpasses those reported by Mbah and Agu (2014) in Zaria (47.9%) and by Jombo et al. (2010) in a similar study in Jos, Nigeria (56.9%). The higher prevalence in children could generally be attributed to their relatively underdeveloped immune systems (Jombo et al., 2010). However, in this study, the higher prevalence is attributable to a combination of poor sanitary conditions and the predominant farming occupation of the people. Notably, children aged 3 years had the highest infection prevalence, at 69.2%. The high prevalence of malaria among 3-year-old children indicates that there is a need to enhance sanitation, ensure effective mosquito control and promote the use of insecticide-treated nets, timely diagnosis and treatment in the community to help reduce malaria morbidity in the community.

Malaria prevalence was relatively low at 56.3% among the 1-3-year-old age group in this study. The lower prevalence in younger children may also be partly due to maternally acquired antibodies, which wane significantly during early childhood. Herman et al. (2023) reported that maternal antimalarial antibody levels fall significantly in the first few months of life, and that the relationship between maternal and infant antibody levels is largely lost by 6 months. This may thus lead to higher rates of malaria infection as children get older because they are exposed to more malaria parasites. This corresponds with the result of Oyibo et al. (2023), who reported that malaria parasite prevalence among children below age 1 year was 13.3%, while at 1 year, 2 years, 3 years, 4 years and 5 years, the prevalence was 17.4%, 17.7%, 25.2%, 27.9% and 28.1% respectively. The present study found a lower prevalence among children over 5 years of age, which may be related to the gradual acquisition of immunity through repeated exposure to *Plasmodium* infection. However, it may also reflect differences in exposure and malaria prevention practices.

Regarding malaria parasite infection with respect to gender, 64.8% of the male and 63.4% of the female children were infected. In addition, the malaria prevalence found in this study was consistent with that reported by Oviedo et al. (2023) in Nigeria, which was 23.4% and 21.8% among children aged 6–59 months, respectively, using the microscopy method.

Regarding parental occupation, children of farmers had the highest prevalence of infection (66.00%). This elevated prevalence may be attributed to increased exposure to malaria-causing factors, such as stagnant water in mosquito breeding sites and houses situated near bushes and forests in farming areas. Similarly, children of traders, exposed to poorly constructed trading environments with bad roads and potholes, had a high prevalence of 64.3%. In contrast, children of civil servants, benefiting from fumigated work environments, proper drainage, frequent clearing of bushes, and possibly enhanced socio-economic status, showed the lowest prevalence of malaria parasite infection, at 60.6%. This aligns with the findings of Nwaneli et al. (2020), who reported that children from lower socio-economic families had a higher likelihood of malaria infection. In relation to the type of housing they inhabit, it was further observed that children residing in single rooms

demonstrate the highest prevalence at 68.4%, potentially attributed to factors like limited ventilation, potentially poor sanitation conditions in single-room dwellings and overcrowding which can facilitate the breeding of mosquitoes and the vectors for malaria parasite infection. Following closely are those in room and parlor self-contain (65.5%) and a room self-contain (63.6%), suggesting that even slightly more spacious dwellings still pose a notable risk. The prevalence decreases marginally in two-bedroom flats (61.9%). In comparison, children in three-bedroom flats show the lowest prevalence at 53.3%, suggesting that larger, well-ventilated housing options may reduce the risk of malaria transmission. These findings agree with those reported by Anjorin et al. (2023), which found that children whose mothers lived in wealthy households had a 73% lower risk of infection compared to children in poorer, congested homes. This underscores the significance of considering housing conditions in malaria prevention strategies and emphasizes the need for improved infrastructure to reduce the vulnerability of children to malaria, especially children aged 1-5 years old. One of the limitations of this study was its cross-sectional design and small sample size, which may limit the generalizability of the results and the capacity to draw causal links between malaria infection and the factors assessed in the study.

### Conclusion

This study showed a high prevalence of malaria, indicating active transmission and the endemic nature of malaria in the area. Environmental conditions favour mosquito breeding, highlighting the need for prompt diagnosis, early treatment, and strengthened control measures to reduce transmission and prevent child mortality. The baseline data generated is essential for planning effective malaria interventions by government agencies and stakeholders in the region.

### Recommendations

Due to the high prevalence of malaria recorded among children in Iddo Sarki village, there is a need to strengthen malaria prevention and control measures through improved environmental sanitation, consistent use of insecticide-treated nets, prompt diagnosis and treatment of malaria, and health education for parents and caregivers. Further studies involving larger populations and both rainy and dry seasons are recommended to provide a more comprehensive understanding of the factors influencing malaria transmission in the community. Further studies involving larger populations and both rainy and dry seasons are recommended to provide a more comprehensive understanding of the factors influencing malaria transmission in the community.

### Conflict of Interest

The authors declare no conflict of interest

### Disclosure

The authors have read the final draft of this manuscript and approved it for publication.

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