

RECORDS OF MALARIA AMONG CHILDREN AGED 0–5 YEARS IN ONDO WEST LOCAL GOVERNMENT AREA, ONDO STATE, NIGERIA: A RETROSPECTIVE DESCRIPTIVE STUDY

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ABSTRACT

Malaria remains a leading cause of morbidity and mortality among children under five years of age in sub-Saharan Africa. Nigeria bears the highest national malaria burden globally, accounting for approximately 27% of worldwide cases. Despite national elimination efforts, southern Nigeria, including Ondo State, continues to record high pediatric malaria case counts, particularly through Primary Health Centers (PHCs). This study examined the monthly distribution of malaria cases among children aged 0–5 years across five PHCs in Ondo West Local Government Area (LGA), Ondo State, Nigeria in 2025. It is important to note that, as population-at-risk denominators were unavailable from PHC registers, findings are presented as a descriptive analysis of case counts rather than computed incidence rates. A retrospective descriptive design was adopted. Secondary data were extracted from official health records of five purposively selected PHCs, covering January through December 2025. Descriptive statistics including frequency counts, percentages, and monthly trend analysis were used to summarize findings. A total of 471 malaria cases were recorded across the five PHCs. Maroko PHC recorded the highest burden (n = 137; 29.1%), followed by Janway PHC (n = 95; 20.2%) and Sabo PHC (n = 81; 17.2%). Case counts peaked during the early rainy season (January–February) and the mid-rainy season (July), consistent with increased *Anopheles* mosquito activity. Better Life PHC recorded the fewest cases (n = 71; 15.1%). The distribution of malaria cases among children under five exhibits seasonal variation aligned with rainfall patterns. Targeted vector control strategies, expanded ITN coverage, and strengthened PHC surveillance are urgently needed to reduce the pediatric malaria burden in this setting.

KEYWORDS: Malaria Case Distribution, Children under Five, Primary Health Centres, Insecticide-Treated Nets, Malaria Prevention

I. INTRODUCTION

Malaria is one of the most consequential infectious diseases of the 21st century, disproportionately affecting the most vulnerable populations in tropical and sub-tropical regions of the world. Globally, the World Health Organization (WHO) estimated 282 million malaria cases and 610,000 deaths in 2024, a 3% increase from 2023, with the WHO African Region accounting for 95% of all cases and 95% of all deaths (WHO, 2024). Children under five years of age bear the heaviest burden, constituting approximately 76% of all malaria deaths in the African region (WHO, 2024). Nigeria occupies a singularly critical position in the global malaria landscape. As Africa's most populous nation, Nigeria accounts for approximately 25.9% of all global malaria cases and 30.9% of malaria-related deaths, making it the single highest-burden country in the world (Severe Malaria Observatory, 2024). National estimates indicate that 97% of Nigerians are at risk of malaria infection, and children under five are particularly susceptible due to immature immune responses

and heightened exposure (Oluwafemi, 2023; Adeyemi *et al.*, 2024). Malaria contributes to approximately 30% of childhood mortality in Nigeria and 25% of infant deaths (Okonkwo *et al.*, 2024).

In Ondo State, located in the southwestern geopolitical zone of Nigeria, malaria remains endemic throughout the year. Ondo West LGA is an urban and peri-urban administrative district hosting dense populations whose sanitary conditions and proximity to stagnant water bodies facilitate year-round *Anopheles* mosquito breeding. Studies in Akure, Ondo State's capital city, have reported child malaria prevalence exceeding 35% in certain geostatistical hotspots (Bayode & Siegmund, 2024), highlighting the severity of the problem at local levels. Primary health centres (PHCs) are the frontline institutions for malaria case detection, diagnosis, and treatment in Nigeria. Despite the National Malaria Elimination Programme's (NMEP) 2021–2025 Strategic Plan, which targets a reduction in parasite prevalence to below 10% and malaria mortality to under 50 deaths per 1,000 by 2025 (Severe Malaria Observatory, 2024), facility level data from PHCs in rural and peri-urban settings remain under-utilized in evidence generation for policy. This retrospective descriptive study addresses that gap by analyzing 12 months of PHC-recorded malaria cases among children aged 0–5 years in Ondo West LGA. The primary objective was to describe the distribution of malaria cases among children aged 0–5 years across five PHCs in Ondo West LGA. The specific objectives were to:

- a) Determine the number of malaria cases across five selected PHCs on a monthly basis.
- b) Examine the seasonal distribution of malaria cases and identify peak transmission periods.
- c) Discuss the role of insecticide-treated nets (ITNs) in malaria prevention within the study population, drawing on existing literature.
- d) Describe the distribution of malaria cases among children aged 0–5 years across the five selected PHCs.

The study was guided by the following research questions:

- a) What is the overall distribution of malaria cases among children aged 0–5 years in the selected PHCs?
- b) How does malaria case frequency vary by month and season?
- c) Does malaria case frequency increase or decrease across the study period?
- d) What does existing evidence suggest about the effectiveness of ITN use as a malaria prevention strategy in comparable populations?
- e) What contextual factors are associated with increased malaria cases among children in Ondo West LGA?

II. LITERATURE REVIEW

A. Global and African Malaria Burden

Malaria remains a disease of profound global public health significance. The WHO World Malaria Report 2024 documented an estimated 282 million cases and 610,000 deaths globally, with the African region bearing 95% of both measures (WHO, 2024). Children under five years of age account for approximately 76% of malaria mortalities in Africa, reflecting the interplay between immature immunity, nutritional deficiencies, and high transmission environments (WHO, 2024; Gaston & Ramroop, 2024). The pooled prevalence of malaria across seven high-burden sub-Saharan African countries was estimated at 26.2%, with significant national and sub-national variation observed (Gaston & Ramroop, 2024).

B. Malaria in Nigeria

Nigeria's malaria burden is extraordinary in scale. As of 2023, Nigeria accounted for 25.9% of all global malaria cases and 30.9% of deaths, estimates that reflect the country's population size, climate, and the ongoing challenges of health systems strengthening (Severe Malaria Observatory, 2024). The 2023 World Malaria Report noted nearly 200,000 malaria deaths in Nigeria alone, with children under five and pregnant women identified as the most at-risk groups (UNICEF Nigeria, 2024). National malaria prevalence among children aged 6–59 months was 22% as of 2021 (UNICEF Nigeria, 2024). Socio-demographic analyses confirm that malaria prevalence is highest among children of mothers with no formal education, children in the lowest wealth quintiles, and children residing in rural settings (Okonkwo *et al.*, 2024). Geographically, transmission occurs throughout Nigeria but is year-round in the southern states, including Ondo State, while being more seasonal (three months or less) in the north. The South-South geopolitical zone has consistently reported among the lowest zonal malaria prevalence nationally (8.0%), attributed in part to differences in entomological and climatic conditions compared to the North-West (Okonkwo *et al.*, 2024).

C. Malaria among Children under Five Years

Children under five years are immunologically naive to malaria and therefore experience the highest rates of severe and complicated infection. A cross-sectional study at a secondary health facility in Ondo State found malaria prevalence of 60.2% among neonates (0–28 days), 49.2% among infants (29 days to 1 year), and progressively rising rates in older age groups (Oluwafemi, 2023). These findings mirror broader African data in which malaria risk increases with age up to approximately 48–59 months (OR = 1.010; 95% CI: 1.007–1.012) due to cumulative exposure (Gaston & Ramroop, 2024). Research in Akure using model-based geostatistical techniques identified spatial hotspots of child malaria prevalence exceeding 35%, with ITN usage, window protection, and water source as significant predictors (Bayode & Siegmund, 2024).

D. Role of Insecticide-treated Nets

Insecticide-treated nets (ITNs), particularly long-lasting insecticidal nets (LLINs), represent one of the most evidence-based, cost-effective malaria prevention tools available. Despite their proven efficacy, a systematic review of ITN utilization among children across Africa found that usage remains inadequate, with structural, socioeconomic, and cultural barriers constraining uptake (Okonkwo *et al.*, 2025). A secondary analysis of Nigeria's 2018 Demographic and Health Survey confirmed that ITN use among children under five was associated with wealth, household size, net age, and rural-urban residence (Ujuju *et al.*, 2022). Observational data from Nigeria revealed a paradoxical finding: malaria prevalence was higher among households reporting net ownership (72.7%) compared to those without nets (27.3%) (Okonkwo *et al.*, 2024). This counterintuitive result likely reflects confounding by residence type and net misuse rather than an effect of ownership per se. Novel dual-insecticide nets have been shown to reduce malaria infections in children by 20–50% compared to standard pyrethroid-only nets in randomized controlled trials in West Africa (WHO, 2024b; Unitaid, 2022).

E. Prevention strategies beyond ITNs

Seasonal Malaria Chemoprevention (SMC) has emerged as a critical complementary strategy in high-burden northern Nigeria. In 2023, approximately 28.9 million children in northern Nigeria

received SMC, more than any other country globally (Severe Malaria Observatory, 2024). The historic introduction of the malaria vaccine (RTS,S/AS01) in Nigeria in late 2024, initially in Kebbi and Bayelsa States, represents a landmark development with potential to reshape pediatrics malaria outcomes nationally (UNICEF Nigeria, 2024).

III. METHODOLOGY

A. Research Design

A retrospective descriptive survey design was employed. This approach was appropriate for systematically examining existing health facility records to characterize the magnitude and distribution of malaria cases over a defined period without experimental manipulation of variables (Polit & Beck, 2021). As population-at-risk denominators and person-time data were not available from PHC registers, this study reports absolute case counts and proportional distributions rather than computed incidence rates. The findings should therefore be interpreted as a descriptive analysis of malaria case distribution within the study facilities.

B. Study Setting

The study was conducted in Ondo West Local Government Area, Ondo State, Nigeria. Ondo West LGA is one of the 18 LGAs in Ondo State, situated in the southwestern region. The LGA encompasses both urban and peri-urban communities, with a predominantly working-class population engaged in commerce, civil service, and farming. The climate is characterized by two distinct rainy seasons (typically March–July and September–November) and a hot dry season, creating conditions favourable for *Anopheles* mosquito breeding throughout the year.

C. Study population and Sampling

The study population comprised children aged 0–5 years that presented to, and were treated for, malaria at any of the five selected PHCs during 2025. Five PHCs were purposively selected based on geographic spread within the LGA and accessibility of records: Better Life PHC, Sabo PHC, Jilalu PHC, Maroko PHC, and Janway PHC. Purposive sampling was employed to ensure coverage of diverse catchment areas across the LGA and to maximize geographic representativeness within the constraints of records accessibility. It is acknowledged that this approach may introduce selection bias; consequently, findings should be interpreted as indicative of trends within the selected facilities rather than as estimates generalizable to the entire LGA population. Future studies should consider probability based sampling across a larger number of facilities to improve representativeness.

D. Data Collection

Data were extracted from official PHC patient registers and malaria case records for January through December 2025, following written permission from the PHC officers-in-charge. The records contained monthly aggregates of confirmed and presumptive malaria diagnoses among children aged 0–5 years. No individual patient identifiers were collected or analyzed; all data were aggregated at the facility-month level, ensuring confidentiality and compliance with ethical standards.

E. Data Analysis

Descriptive statistics were employed for data analysis. Absolute frequencies (case counts) were compiled for each PHC and each month. Relative frequencies (percentage proportions) were calculated using the formula: Percentage (%) = (Facility or Monthly Count ÷ Total Annual Cases) × 100. Monthly case distributions across all five PHCs were summed to identify seasonal peaks

and troughs. Facility level comparisons were expressed as proportions of the annual total (N = 471). Data were organized and analyzed using Microsoft Excel. Inferential statistical testing was not conducted given the descriptive, facility-record-based design of the study; however, visual trend analysis via line graphs was employed to identify seasonal patterns.

F. Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (World Medical Association, 2013). Institutional approval was obtained from the relevant health authorities in Ondo West LGA. As the study utilized routinely collected, de-identified aggregate data, individual informed consent was not required. Anonymity and confidentiality were maintained throughout.

IV. RESULTS AND DISCUSSION

A. Overall Malaria Case Distribution

A total of 471 malaria cases were recorded among children aged 0–5 years across the five PHCs during 2025. Table 1 presents the complete monthly distribution by facility. Maroko PHC recorded the highest number of cases (n = 137; 29.1%), followed by Janway PHC (n = 95; 20.2%), Jilalu PHC (n = 87; 18.5%), Sabo PHC (n = 81; 17.2%), and Better Life PHC (n = 71; 15.1%).

Table 1: Monthly Distribution of Malaria cases among Children aged 0–5 years across five PHCs, in Ondo West LGA, 2025 (N = 471)

Month	Better Life PHC	Sabo PHC	Jilalu PHC	Maroko PHC	Janway PHC
January	3	1	6	23	15
February	14	7	5	19	10
March	6	7	4	14	8
April	5	10	9	15	10
May	13	9	15	11	4
June	7	5	10	9	8
July	6	11	9	18	10
August	5	13	3	8	9
September	4	4	5	3	8
October	2	9	10	5	4
November	3	3	6	7	5
December	3	2	5	5	4
Total	71	81	87	137	95

PHC = Primary Health Centre. Values represent absolute case counts.

B. Seasonal and Monthly Trends

Malaria case frequency displayed a clear bimodal seasonal pattern (Figures 1a & b). Across all facilities combined, the highest aggregate monthly caseloads were recorded in February (n = 55), July (n = 54), and January (n = 48). The lowest monthly aggregates were recorded in December (n = 19) and September (n = 24). The bimodal peaks—coinciding with the early and mid-rainy

seasons—are consistent with the recognised epidemiological pattern in southern Nigeria, where *Anopheles* mosquito populations expand during periods of elevated rainfall and humidity. The highest single-month, single-facility count was at Maroko PHC in January (n = 23).

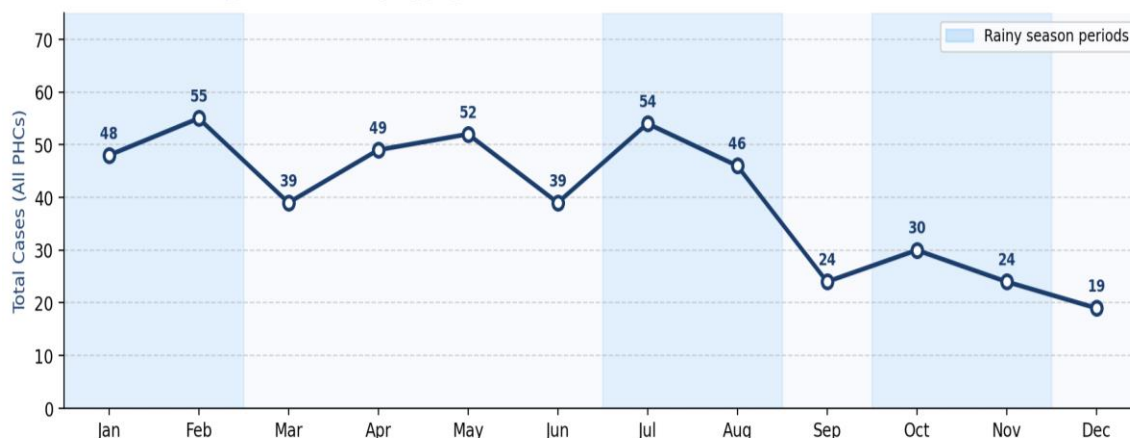
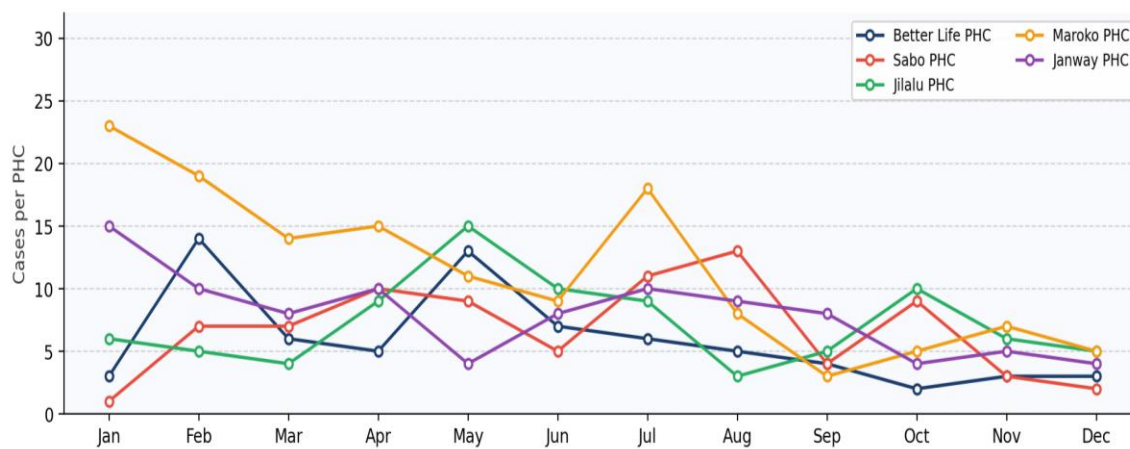


Figure 1a: Monthly Aggregate Malaria Cases across all five PHCs, Ondo West LGA, 2025
PHC = Primary Health Centre. Blue shading denotes rainy season periods. Values are absolute case counts of children aged 0–5 years, Ondo West LGA, 2025.



Note: Blue shading denotes approximate rainy season periods (January–February; June–August; September–November). PHC = Primary Health Centre. Values represent absolute case counts of children aged 0–5 years.

Figure 1b: Monthly malaria cases by PHCs Ondo West LGA, 2025

C. Facility-Level Analysis

Maroko PHC consistently recorded above-average case counts throughout the year, with particularly elevated numbers in the first quarter (January: 23, February: 19, March: 14). This facility’s catchment area is likely characterized by denser peri-urban settlements with suboptimal drainage infrastructure. Sabo PHC showed a distinct mid-year peak, with August recording its highest monthly count (n = 13). Better Life PHC recorded the fewest total annual cases (n = 71), suggesting either lower exposure risk in its catchment population, better uptake of preventive measures, or lower case-seeking behaviour resulting in potential underreporting.

This study recorded 471 malaria cases in children aged 0–5 years across five PHCs in Ondo West LGA over one calendar year. As noted in the methodology, these figures represent facility-based case counts and should not be interpreted as population-level incidence rates due to the absence of denominator data. Nonetheless, the case volumes are consistent with existing evidence establishing southern Nigeria as a zone of high, year-round malaria transmission. The WHO (2024) estimates that Nigeria alone accounts for nearly one-third of global malaria deaths, and children under five bear the greatest proportionate burden. Maroko PHC's disproportionate case load (29.1%) warrants targeted public health attention and may reflect higher transmission intensity and greater care-seeking behaviour in that catchment community. The seasonal pattern observed, with case peaks in January–February and July, aligns with documented malaria epidemiology in Ondo State and neighbouring regions. Increased rainfall creates waterlogged environments that accelerate *Anopheles gambiae* and *Anopheles funestus* mosquito breeding, the dominant malaria vectors in southwestern Nigeria (Bayode & Siegmund, 2024). The late year trough in September through December likely corresponds to the onset of the dry season and the concomitant reduction in vector density, though sporadic transmission continues throughout.

Considering the ITNs, while this study did not collect direct data on ITN ownership, usage, or compliance, the case burden documented can be contextualized within the broader evidence base. Nationally, ITN ownership in Nigeria has been associated with reduced malaria risk at the population level; however, actual usage rates remain suboptimal, particularly among children under five (Ujuju *et al.*, 2022). The paradoxical finding from large national surveys, where malaria prevalence appears higher among households that own ITNs, has been attributed to rural mentality and economic vulnerability (Okonkwo *et al.*, 2024). Consistent and correct nightly use of LLINs, rather than mere ownership, is the critical determinant of protection at the individual level. In the study communities' incomplete adherence to ITN use is likely a contributing factor to the case burden documented, though this cannot be confirmed from the available data.

Study Limitation

The limitations of this study are outlined as follows:

- (a). First, as a retrospective analysis of PHC records, the data may be affected by underreporting, misclassification of fever cases, and incomplete documentation. Some cases may have been recorded as presumptive rather than confirmed diagnoses.
- (b). Second, the study does not capture data from private health facilities, patent medicine dealers, or households managing illness without professional care.
- (c). Third, data on ITN usage, sex, nutritional status, and socioeconomic factors were not available at the facility level, limiting covariate analysis; the objective concerning ITN effectiveness was therefore addressed through a literature-based discussion rather than primary data analysis. Fourth, the purposive selection of five PHCs may introduce selection bias, and findings should not be generalized beyond the study facilities.

Future research should integrate community-level surveys with facility data, incorporate appropriate population denominators to enable the computation of true incidence rates, and collect ITN usage data to enable direct analysis of prevention strategies.

V. CONCLUSION AND RECOMMENDATIONS

The findings of this study confirm that malaria remains a high-burden disease among children aged 0–5 years in Ondo West LGA, Ondo State, with 471 cases recorded across five PHCs over a 12-month period. These figures are descriptive case counts from facility records, and population-level

incidence rates cannot be computed without denominator data. Case distribution was uneven across facilities, with Maroko PHC bearing a disproportionate share. A bimodal seasonal peak aligned with the rainy seasons underscores the role of climatic drivers in local malaria transmission dynamics. These findings serve as a valuable baseline for further epidemiological investigation. Based on these findings, the following recommendations are proposed:

- (a). Community-level mass distribution campaigns for long-lasting insecticidal nets should prioritise Maroko and Janway PHC catchment areas, with emphasis on correct and consistent nightly use rather than mere ownership.
- (b). Health education programmes targeting caregivers of children under five should address early care-seeking at PHCs and preventive behaviours including ITN use, environmental sanitation, and larviciding of water bodies.
- (c). PHCs in Ondo West LGA should be equipped with rapid diagnostic tests (RDTs) and trained personnel to ensure confirmatory malaria diagnosis, improving data quality for future surveillance.
- (d). Local government health authorities should develop a malaria case surveillance dashboard aggregating monthly PHC data to enable real-time identification of epidemiological spikes and timely resource deployment.
- (e). Future research should incorporate community-based sampling, population denominators for incidence rate computation, direct ITN usage data, and inferential statistical analysis to enable more robust epidemiological conclusions.

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