**Original Research Article**

# Retrospective Analysis of Malaria Prevalence Trends in the Six Area Councils of the Federal Capital Territory, Nigeria (2020–2022)

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## Abstract

***Background:*** Malaria, caused by a protozoan parasite of the genus *Plasmodium* and highly endemic in Sub-Saharan Africa, continues to be a significant public health challenge in Nigeria, particularly among children and pregnant women, though it affects all age groups. Despite ongoing efforts to curb malaria, the parasite remains a global health issue, posing persistent challenges to people and healthcare systems in endemic regions. ***Method:*** This study employed a retrospective descriptive survey to assess malaria prevalence between January 2020 and December 2022. A total of 28,077 hospital records were analysed, encompassing 9,901 from AMAC, 5,394 from Kuje, 5,275 from Abaji, 1,601 from Kwali, 4,793 from Bwari, and 1,113 from Zuba, all within the Federal Capital Territory, over the three-year period. ***Result:*** This study revealed a total malaria prevalence of 37.2% from 2020 to 2022 across major hospitals in the six area councils of the Federal Capital Territory (FCT). The highest prevalence was observed in Wuse (46.2%) and the lowest in Bwari (26.5%). Yearly prevalence peaked in 2021 (41%), followed by 2022 (36%) and 2020 (32%). Malaria prevalence showed seasonal peaks, particularly in June and August, with variations across the regions. Age-dependent analysis indicated the highest prevalence among children aged 0-5 years, while pregnant women exhibited a 58.1% prevalence, with significant regional differences, particularly in Wuse (77.3%) and Kwali (63.7%). Statistical analysis highlighted significant differences in prevalence across regions between 2021 and 2022 (p<0.0347) and in pregnant women across regions (p=0.0035), though yearly trends were not statistically significant (p=0.075). ***Conclusion:*** This study underscores malaria's ongoing impact as a critical public health concern in the Federal Capital Territory (FCT) of Nigeria, revealing significant variations in prevalence across different regions, age groups, and seasons between 2020 and 2022. This study highlights the continued susceptibility of children under five to malaria and the disease's pronounced seasonal patterns, especially during the rainy months.
**Keywords**: Retrospective, Analysis, Prevalence, Trends, Area, Councils, Malaria, federal capital, Territory.

## INTRODUCTION

Malaria is caused by a protozoan parasite of the genus *Plasmodium*, which infects red blood cells (WHO, 2021). Despite being both preventable and curable, malaria remains one of the most persistent vector-borne diseases in sub-Saharan Africa. In 2019, there were over 229 million reported cases of malaria worldwide, with 95% of these cases occurring in the sub-Saharan African region. Nigeria, the Democratic Republic of the Congo, Uganda, Mozambique, and Niger accounted for approximately 51% of all global cases (WHO, 2020).

By 2022, the World Health Organization (WHO) reported an increase in malaria cases, with 249 million cases documented across 85 malaria-endemic countries. Of these, 94% (233 million cases) were reported in the WHO African Region. Nigeria had the highest number of cases, contributing 27%, followed by the Democratic Republic of the Congo (12%), Uganda (5%), and Mozambique (4%) (WHO, 2022).

Although global efforts have led to a reduction in malaria mortality rates, the sub-Saharan African region still accounted for over 90% of the 409,000 malaria deaths in 2019 (WHO, 2020). The most vulnerable populations include children under five and pregnant women. According to UNICEF (2019), a child under five dies from malaria every two minutes. In 2022, the global malaria mortality rate was 14.3 per 100,000 people at risk, amounting to 608,000 deaths. The majority of these deaths occurred in Nigeria, which accounted for 31% of the total, followed by the Democratic Republic of the Congo (12%), Niger (6%), and Tanzania (4%) (WHO, 2023).

Malaria poses significant risks to pregnant women, with over 12 million pregnancies exposed to malaria in the WHO African region in 2019, leading to fetal loss, low birth weights, and other health complications (Schantz-Dunn and Nour, 2009). By 2022, more than 13 million cases of malaria in pregnancy were reported globally (WHO, 2022). Despite substantial funding for malaria control and elimination, which reached $3 billion by 2019, with over $900 million contributed by governments of endemic countries, malaria remains a major public health challenge in sub-Saharan Africa (Feachem *et al*., 2019).

While global efforts toward malaria eradication have been intensified, climatic and weather factors play a crucial role in malaria transmission, particularly in tropical regions. Temperature, humidity, and rainfall significantly impact mosquito survival and the transmission of malaria (Ibrahim *et al*., 2021). Variations in climatic and weather conditions contribute to seasonal fluctuations in malaria prevalence across Nigeria. Studies from southern Nigeria indicate that malaria occurs year-round, with higher prevalence during the rainy season (Weli and Efe, 2015; Anumudu *et al*., 2019).

This retrospective study analyzes hospital data from 2020 to 2022 to assess malaria infection trends across different months in various government hospitals within the six area councils of the Federal Capital Territory (FCT), Abuja.

## MATERIALS AND METHODS
### Study Area
This study was conducted in selected government hospitals, specifically General Hospitals,

within the six area councils of the Federal Capital Territory (FCT), Nigeria. These area councils are Abaji, Abuja Municipal Area Council (AMAC), Bwari, Gwagwalada, Kuje, and Kwali. The FCT is situated in the north-central geopolitical zone of Nigeria, just north of the confluence of the Niger and Benue Rivers. It shares borders with Niger State to the west and north, Kaduna State to the northeast, Nasarawa State to the east and south, and Kogi State to the southwest.

As of 2021, the estimated population of the Abuja metropolitan area was approximately 3.46 million, reflecting a 5.67% increase from 2020, when the population was about 3.28 million. The population in 2019 was 3.10 million, representing a 6.03% increase from 2018. Although Abuja is the least populated state in Nigeria, it is rapidly growing and serves as a melting pot for various ethnic groups across the country.

Abuja experiences a humid rainy season from April to September, with temperatures ranging from 22°C to 30°C, followed by a brief harmattan period from October to December. The region receives annual rainfall ranging from 1,100mm to 1,600mm, and the city's altitude is approximately 476 meters above sea level. Malaria is endemic in this area, making it a significant public health concern.

### Study Design
This study employed a retrospective descriptive survey to assess the prevalence of malaria among patients who attended the six selected government hospitals within the FCT. The hospitals where data was sourced include, General hospitals in Wuse, Abaji, Kwali, Kuje and Zuba. These hospitals were selected purposively as there represent major hospitals with general access in the selected regions. Data was collected and analysed to determine malaria infection trends over time, providing insight into the disease's impact on the region.

### Data Collection and Analysis
Malaria data was gathered from various general hospitals in the FCT for the period between 2020 and 2022. Before data collection commenced, ethical approval was obtained from the respective Ethical Committees of the hospitals involved, ensuring adherence to ethical data collection standards. The data collected included patient age and the date of the malaria test, with the aim of analysing the prevalence of malaria across different age groups and determining monthly prevalence patterns over the years under review. Descriptive statistics were employed to analyse the collected data, providing insights into malaria prevalence trends within the study period.

### Statistical Analysis
Data collected was analysed using Analysis of Variance (ANOVA) and Chi-square test at 95 CI and

p<0.05. All data analyses were conducted using STATA 18 software (StataCorp LLC, College Station, TX, USA).

## RESULTS
### Malaria Prevalence in Different Districts in Abuja
The total Malaria prevalence in the current study is 37.2%. This malaria prevalence cuts across reports from 2020 to 2021 across representing major hospitals in the six area councils in the Federal capital Territory (FCT). There was a significant difference in the malaria cases reported in the six area councils between 2021 to 2022 (p<0.0347). The malaria prevalence was highest in Wuse (46.2%), followed by Abaji (40.9%), Kwali (34.6%), Zuba (32.2%), Kuje (28.6%), and 26.5% in Bwari. The yearly prevalence showed that 2021 had the highest prevalence (41%), followed by 2022 (36%) and the least prevalence was reported in 2020 (32%).

### Prevalence of Malaria in Wuse District Hospital from 2020 – 2022
The prevalence of malaria reported in different months as reported in Wuse District Hospital from 2020 to 2022 is illustrated in Fig1. The result shows that all three years show peaked in June, with 2021 having the highest prevalence peak among the three years. Malaria parasitaemia in 2020 peaked in the months of June and August with a prevalence of 51% and 52% respectively; this was similar with prevalence of malaria reported in 2022, the prevalence was higher in June (68%) and August (68%). However, in 2021, a prevalence of 74% was recorded in the month of May, then a gradual decline was observed and a peak increase in September (76%).
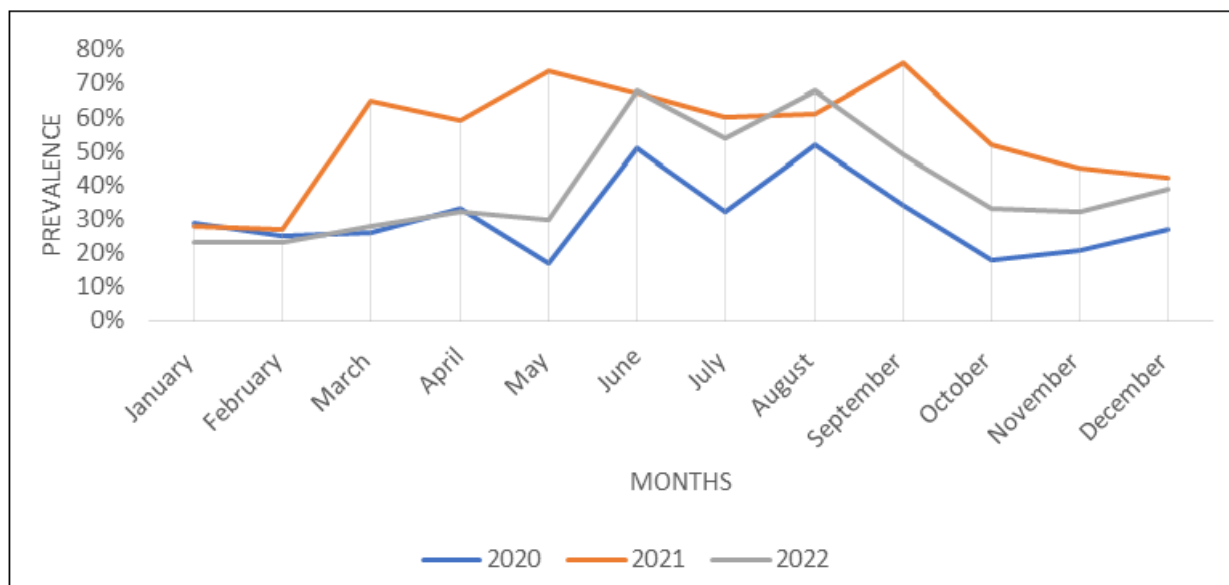


**Figure 1: Prevalence of Malaria Parasite in Different Months in Wuse District Hospital from 2020 – 2022**

### Prevalence of Malaria Parasite in Kuje
The malaria prevalence in different months in Kuje is shown in Figure 2. In 2020, the prevalence starts relatively low in January (21%) and February (18%), increases slightly in March (33%), and then shows a gradual rise, peaking in July (36%). The prevalence then declines, with notable drops in October (16%), and ends the year with prevalence in December (19%) lower than it was in January of the same year. In 2021, the trend starts higher in January (26%), increases sharply from April (40%), and peaks dramatically in July (64%). This is followed by a significant decline through the remaining months, reaching a low in October (20%) and November (20%) before a slight decrease in December (18%). In 2022, the prevalence begins lower than the previous years, showing minor fluctuations in the first half of the year, and a gradual increase peaking in August (28%). The trend then shows a decline, with the lowest point in October (11%), and a sharp increase in December (33%).
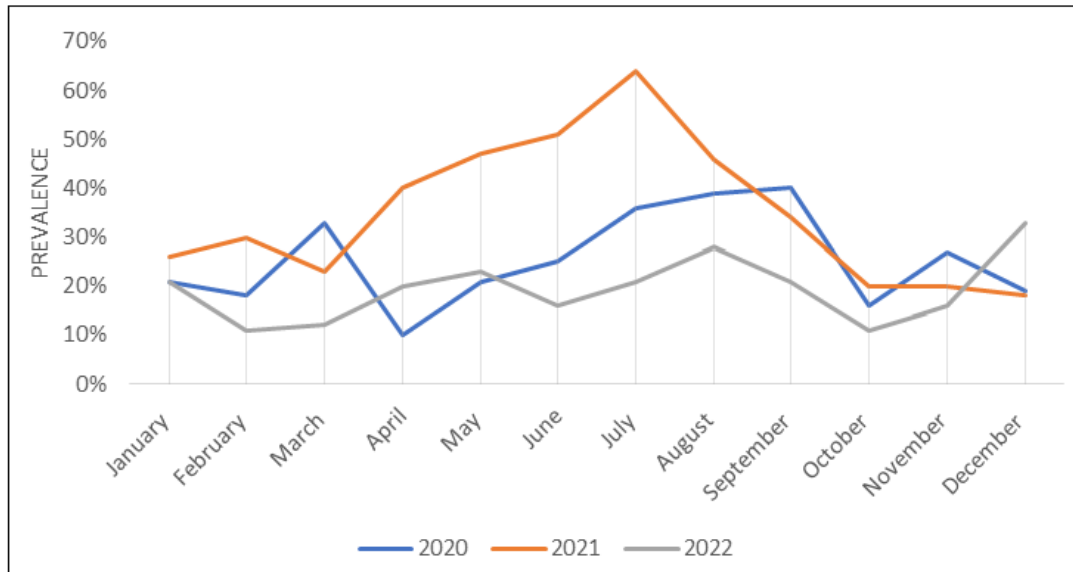
**Figure 2: Prevalence of Malaria Parasite in Different Months in Kuje**

**Prevalence of Malaria Parasite in Kwali**

The prevalence of malaria parasites in Kwali shows notable variability across different months from 2020 to 2022 (Figure 3). In 2020, the highest prevalence was observed in October (46%) and July (40%), while the lowest was in June (16%) and April (17%). In 2021, there was a significant peak in April (64%), with other months like March (38%) and July (47%) also showing high prevalence. The pattern in 2022 depicts a considerable increase in August (63%), while December (43%) and February (36%) also had high prevalence rates.
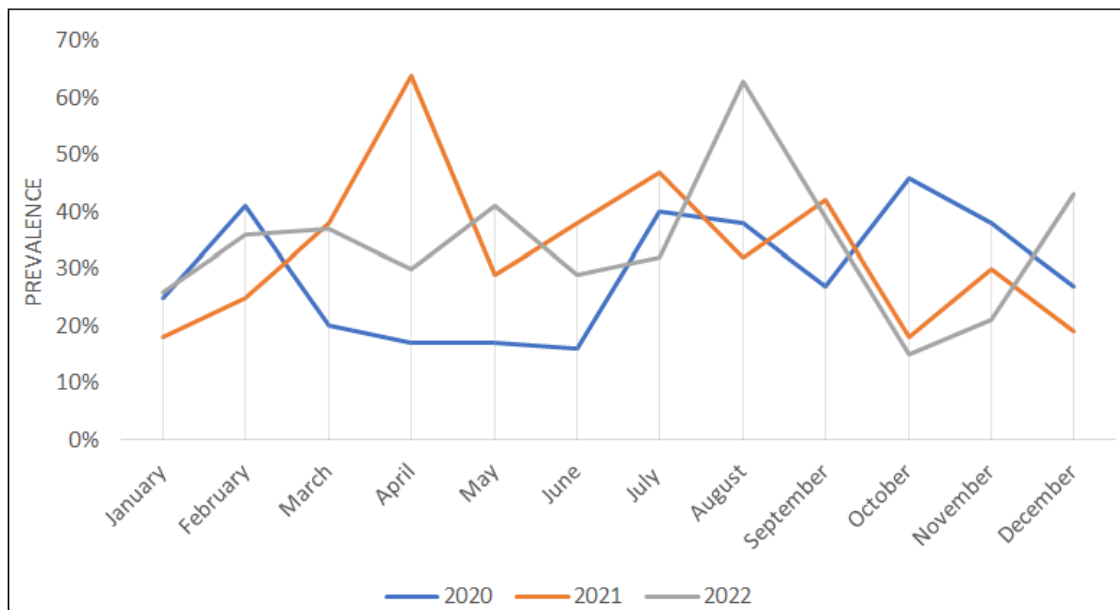


**Figure 3: Prevalence of Malaria Parasite in Different Months in Kwali**

**Prevalence of Malaria Parasite in Abaji**

The prevalence of malaria parasites in Abaji displays notable month-to-month and year-to-year fluctuations from 2020 to 2022 (Figure 4). In 2020, May had the highest prevalence at 55%, followed by June at 49%, while July saw the lowest at 16%. In 2021, June again showed a high prevalence at 51%, and August also saw a significant increase at 47%, while September dropped to the lowest at 11%. The year 2022 exhibited dramatic peaks in April (85%), June (58%), March (57%), indicating potential outbreaks or heightened malaria transmission during these months, while January had the lowest prevalence at 5%.
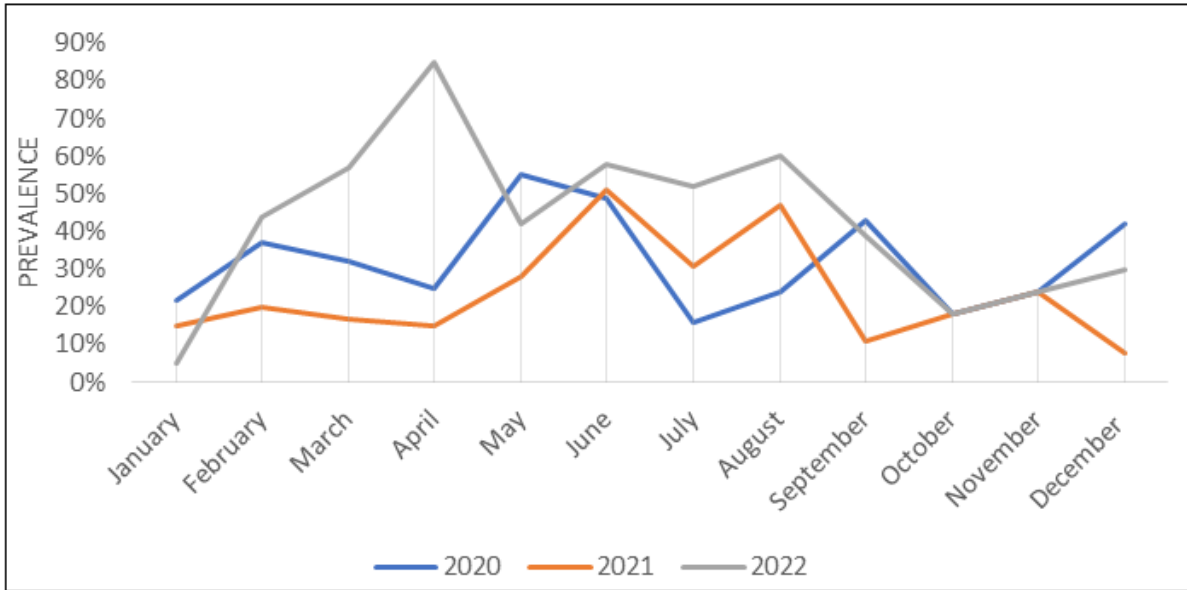
**Figure 4: Prevalence of Malaria Parasite in Different Months in Kwali**

**Prevalence of Malaria Parasite in Zuba**

The prevalence of malaria parasites in Zuba reveals notable trends and fluctuations across different months from 2020 to 2022 (Figure 5). In 2020, April and December had the highest prevalence rates, at 48% and 46%, respectively, while March had the lowest at 13%. In 2021, June and August showed peak prevalence at 46%, while October and February experienced lower rates at 16% and 19%. The year 2022 saw significant increases in prevalence during March (40%) and July (45%), with a sharp decline in April to 15%. Consistently high months across the years include December and November, though with variations, while months like October and May experienced noticeable drops in 2022.
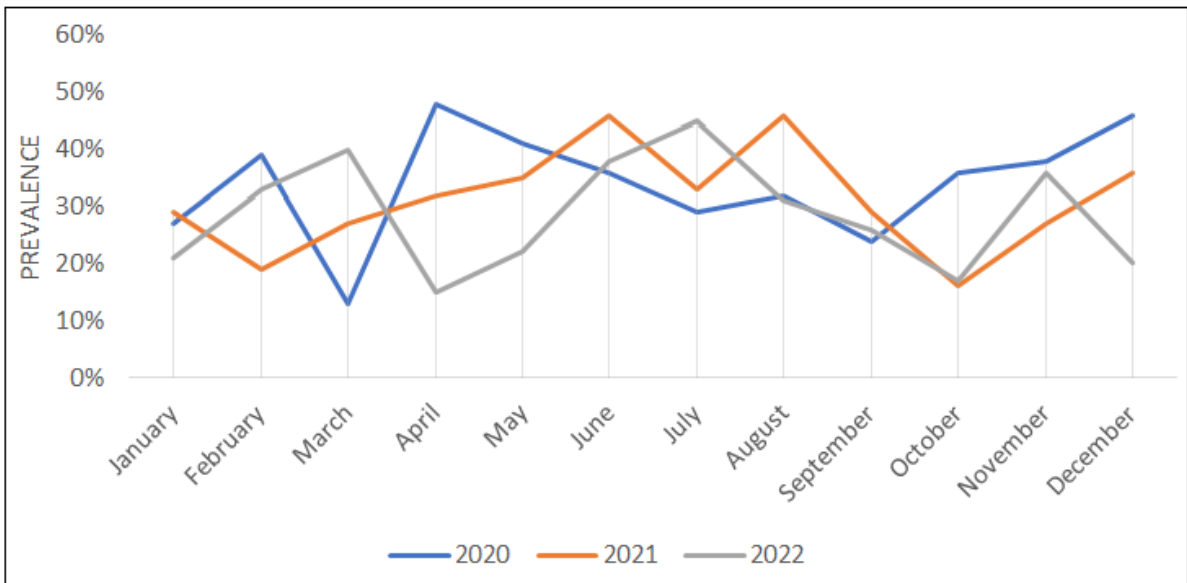


**Figure 5: Prevalence of Malaria Parasite in Different Months in Kwali**

**Prevalence of Malaria Parasite in Bwari**

The prevalence of malaria parasites in Bwari is illustrated in Figure 6. In 2020, the month of May recorded the highest prevalence at 54%, while July had the lowest at 13%. In 2021, the highest prevalence was in April at 26%, and the lowest was in July at 19%. By 2022, May saw a significant decrease to 24%, with the lowest prevalence observed in October at 12%.
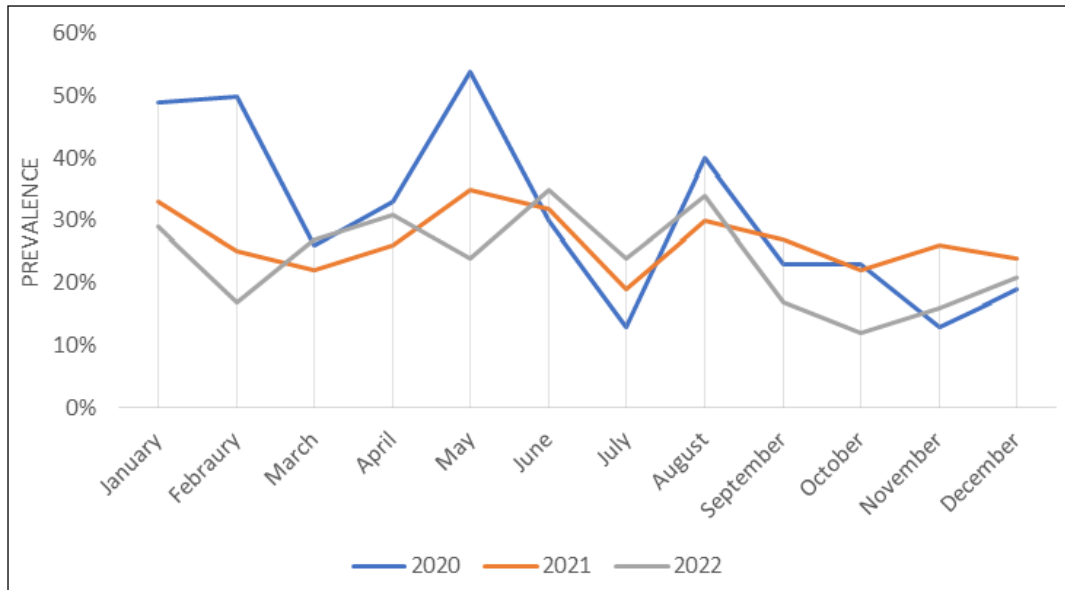
**Figure 6: Prevalence of Malaria Parasite in Different Months in Kwali**

**Age Dependent Malaria Prevalence**

The age dependent prevalence of malaria in the study period reveals significant trends in malaria prevalence across various age groups from 2020 to 2022 (Figure 7). There was a consistently high prevalence among children aged 0-5 years, with rates increasing from 62% in 2020 to 70% in 2022. For the 6-10 age group, malaria prevalence showed a non-significant decrease from 50% in 2021 to 43% in 2022, although it was higher than the 48% recorded in 2020. Result shows changing trends in other age groups; the 11-15 age group experienced a rise in prevalence in 2021 (46%) before dropping to 35% in 2022. Similar variations were observed in the 16-20 and 21-25 age groups. In the older age groups (41-50 years), there was a significant increase in prevalence, particularly in the 46-50 age group, which saw a rise from 13% in 2020 to 39% in 2021, before decreasing slightly to 26% in 2022. The prevalence in the >50 age group also increased significantly in 2021 to 29% from 6% in 2020, before declining to 23% in 2022.
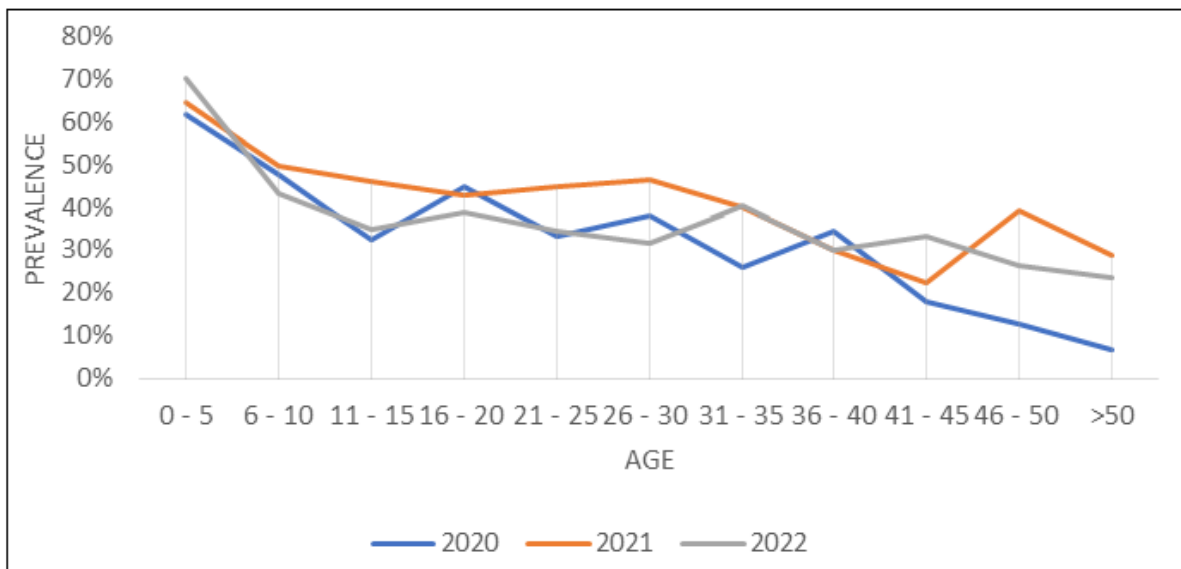


**Figure 7: Age Dependent Malaria Prevalence**

**Prevalence of Malaria in Pregnant Women:**

The total prevalence of malaria in pregnant women from 2020 to 2022 was 58.1%. The prevalence of malaria in pregnant women varied significantly across different regions in the Federal Capital Territory, with a statistically significant difference (p=0.0035) observed. Specifically, the highest prevalence was recorded in Wuse (77.3%), followed closely by Kwali (63.7%), Zuba (63.2%), and Abaji (60.5%). In contrast, the lowest prevalence was found in Kuje (45.0%) and Bwari

(31.5%). There was no significant difference (p=0.075) in the yearly prevalence of malaria in pregnant women from 2020 to 2022. In 2020, the prevalence of malaria in pregnant women was recorded as 58%, this increased but non-significant to 64% and reduced to 54% in 2022.

## DISCUSSION

Malaria remains a significant public health challenge, despite global efforts to reduce morbidity and mortality, which have achieved some notable successes but still fall short of the ambitious malaria control targets. This study employed a retrospective descriptive survey to assess the prevalence of malaria from January 2020 to December 2022.

In this study, the malaria prevalence in the three years under study was 37.2%. This prevalence is lower than the prevalence (43.3%) reported in South-East Nigeria by Nnamonu *et al*., (2020). The difference in prevalence could be as a result of study location and population. There was a significant difference in the malaria cases reported in the six area councils between 2021 to 2022 (p<0.0347) with Wuse and Abaji having the highest prevalence and Kuje and Bwari having the lowest prevalence. The malaria prevalence reported in Kuje (28.6%) is slightly lower that the baseline prevalence reported by Ashikeni *et al*., (2013). In the yearly prevalence, there was no significant difference, the year 2020 had a prevalence of 32%, a slight increase was observed in 2021 (41%) and 2022 experienced a decline to 36%. The difference in prevalence in the different years' studies may be attributed to several factors including socio-economic (Ibrahim, 2018) and environmental factors such as climatic factors (Ugwu and Zewotir, 2020) and anthropogenic factors (Ugwu and Zewotir, 2020).

Malaria remains a significant health concern, particularly affecting children under 5 years in sub-Saharan Africa. In the currents study, malaria prevalence was highest among children aged 0-5 years with prevalence rates increasing from 62% in 2020 to 70% in 2022. This high prevalence among this age group indicates that young children remain the most vulnerable group; this may be due to their underdeveloped immune systems (Ranjha *et al*., 2023), uncontrolled exposure to the mosquito vector; other risk factors include proximity to stagnant water, poverty, low education of parents /guardians and lack of insecticide treated nets (Abossie *et al*., 2020; Sarfo *et al*., 2023). The yearly prevalence of malaria in children under 5 years in the current study was higher than the prevalence of 22.1% in febrile children under 5 years reported by Abossie *et al*., (2020).

The ager group 6-10, had a non-significant decrease in malaria prevalence from 50% in 2021 to 43% in 2022. Result of the current study showed changing trends in other age groups; the 11-15 age group experienced an increase in prevalence in 2021 (46%)

before dropping to 35% in 2022. Similar variations were seen in the 16-20 and 21-25 age groups. This result suggests factors such as environmental changes, healthcare access, or seasonal variations may influence these trends (Touré *et al*., 2022). The decrease of malaria prevalence in this age groups is at variance with the report of Boresa *et al*., (2024) who reported a higher prevalence in individuals aged ≥15 years.

The result of this study showed that the older age groups (41-50 years), showed a significant increase in prevalence, particularly in the 46-50 age group, which saw a rise from 13% in 2020 to 39% in 2021, before decreasing slightly to 26% in 2022. This result suggest that adults may adopt preventive malaria measures better than children (Asare, 2022), they also have more developed immune systems; adults visiting hospitals were higher than children; therefore, the low prevalence may not be attributed to low numbers of hospital visits.

The prevalence in the >50 age group also increased significantly in 2021 to 29% from 6% in 2020, before declining to 23% in 2022. The low prevalence in this age group in 2020 could be attributed stronger immunity as well as to self-treatment; 2020 was the year COVID-19 pandemic occurred making many adults seek self-treatment with different malaria drugs with the goal of keeping themselves free from the virus. This may be the reason that the prevalence increased significantly in the next year (2021). The low prevalence of malaria during the COVID-19 pandemic is in congruence with the report of Lobo *et al*., (2024). Secondly, age-dependent variations in malaria testing and treatment compliance have been reported, with adults more likely to receive presumptive treatment without prior testing (Asare, 2022).

The prevalence of malaria between 2020 to 2022 in the current study was 58.1%. This prevalence is higher than the prevalence of malaria in pregnant women in North-West Ethiopia (20.8%) reported by Almaw *et al*. (2022). The prevalence was however, lower than the 70.5% observed among pregnant women in Lugbe and Gosa by Onyemaechi & Malann (2020). There was no significant variation (p=0.075) in the yearly prevalence of malaria in pregnant women in the year under study (2020 – 2022). However, through the three years under study, there was a statistically significant (p=0.0035) location dependence malaria prevalence in pregnant women; the highest prevalence was recorded in Wuse which is in the Abuja Municipal Area Council; it was observed that in the non-municipal area councils like Kuje and Bwari, lower prevalence was reported. This trend could be attributed to the lower number of hospital visits in these regions.

The analysis of malaria prevalence from 2020 to 2022 in selected regions within the Federal Capital Territory (FCT) of Nigeria reveals significant seasonal

and inter-annual fluctuations, with peaks generally coinciding with the rainy season. Wuse District Hospital and Kuje consistently showed high malaria prevalence during June and July; which may be attributed to high rainfall during these months. This is in agreement with the reports of Segun *et al.*, (2020). Kwali and Abaji exhibited more variability, suggesting the influence of localized environmental and socio-economic factors (Asare, 2022). Zuba's data indicated extended transmission beyond the rainy season, likely due to year-round breeding conditions, while Bwari showed a general decline in prevalence, reflecting potential effectiveness of ongoing control measures, though periodic peaks still highlight areas of vulnerability that require continued attention.

## CONCLUSION AND RECOMMENDATION

This study highlights the impact of malaria as a significant public health issue within the Federal Capital Territory (FCT) of Nigeria, with variations in prevalence across different regions, age groups, and seasons from 2020 to 2022. The findings of this study highlight the persistent vulnerability of children under five to malaria, and the seasonal nature of the disease, particularly during the rainy months. It is therefore, recommended that the FCT administration in conjunction with the Federal Ministry of health enhance vector control during peak seasons, implement targeted interventions for children under five years as well as strengthen health infrastructure.

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