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Seasonal Variations and the Prevalence of Malaria Among Patients at Bichi General Hospital, Kano, Nigeria

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Abstract

Malaria is among the most prevalent causes of mortality for individuals in developing countries. The goal of this research is to ascertain how the season affects the prevalence of malaria infection among patients who visit the Bichi General Hospital, Kano, Nigeria. The data for this research was gathered from hospital records. The analysis focused on monthly malaria cases throughout the rainy (May-October) and dry (November-April) seasons. To evaluate the variation in malaria prevalence between wet and dry seasons, we used the paired two-sample T-test for mean. The p-value of 0.04912 > 0.05 indicates that there was a difference in malaria prevalence between the wet and dry seasons. Additionally, the rainy season saw a 59.44% prevalence of malaria, while the dry season saw 40.56% prevalence.. Specifically, the months of May through October during the rainy season had the highest malaria prevalence, with September having the highest peak of prevalence (283) throughout the year. To avert the scourge of malaria, the study advised residents in endemic areas to implement preventive measures throughout the year, with a focus on the rainy seasons.

Keywords: *Seasonal variation, Malaria, Prevalence, Bichi, Kano, Nigeria*

1.0 INTRODUCTION

Malaria is an endemic protozoan fever disease that is a global public health concern. The majority of cases occur in Africa south of the Sahara and in Southeast Asian countries (WHO 2023). Malaria remains a serious problem despite the highly publicized decline in the global burden of the disease (Pradines et al, 2019). In 2016, there were 445,000 malaria fatalities and 216 million acute cases recorded globally (NMEP, et al, 2016; WHO 2017). Pregnant women and children under the age of five are most at risk of contracting the disease, and sub-Saharan Africa accounts for a sizable share of the recorded malaria morbidity (90%) and mortality (91%)(WHO 2017). Furthermore, among the 91 nations with indigenous malaria cases, only 15 countries reported 80% of the worldwide malaria burden. Nigeria is one of the nations with the

highest rates of malaria infection among the 15 countries in sub-Saharan Africa, except India (WHO 2017).

Nigeria has been projected to have had 68 million cases of malaria in 2021, accounting for 27% of the global burden and 28% of the disease's burden in the WHO African Region, according to the World Health Organization (2022) research on malaria in Nigeria.

Furthermore, figures from the World Health Organization (WHO) indicate that the most extreme form of malaria killed 194,000 individuals in 2021 alone, with children under the age of five accounting for almost 80% of these cases. WHO (2022) reports that this accounts for 40% of malaria-related deaths in the WHO African Region and 31% of deaths worldwide.

According to studies, patients with malaria account for over 60% of routine hospital visits, 30% of hospital admissions, 30% of deaths among children aged five, 25% of infant fatalities, and 11% of deaths for mothers in Nigeria (Noland et al., 2014). Due to the emergence of parasite species that are resistant to commercial insecticides and the appearance of vectors that seem resistant to these pesticides, the fight against malaria and its propagating agents in Nigeria and throughout Africa has not been as successful in the past ten years (Howard et al., 2007). Due to this, the conduct patterns of malaria vectors have undergone a fundamental change, making them as dangerous indoors as well as outdoors. This results in a noticeable difference in transmission rates during the rainy and dry seasons (FMOH 2010). Typically, the dry season lasts from November to April, and the rainy season falls between May and October.

Apart from the availability of water, other elements, including the ideal temperature, appear to encourage mosquito reproduction all year round (Kovats et al, 2001). In support of this, Paul (1997) showed how temperature influences the magnitude, course, timing, and intensity of malaria outbreaks. He characterized mosquitoes as hot-weather insects with set survival thresholds. Thus, the transmission of malaria by Anopheles mosquitoes and falciparum malaria takes place in locations where winter temperatures remain over 16°C. A thorough investigation of 278 houses in Kano towns, which house 3071 people and are located in approximately ten non-water discharge pools from various areas of the region, revealed that malaria is the most common illness among them (Maigari, 2005). Every month, on average, each individual in a family would contract malaria fever; children and women were prone to become infected with malaria as well as experiencing higher rates of infection (Maigari, 2005). The risk of malaria can be determined by a number of factors, including rainfall, humidity, temperature, open drains, waste, stagnated waters in ponds, and several more (Tukur, 2010).

There are numerous fallacies surrounding the seasonal nature of the spread malaria and the related incidence across the wet and dry seasons, and some malaria-endemic communities do not have comprehensive awareness of these topics. Therefore, the purpose of this studyis to ascertain how the season affects the prevalence of malaria infection among patients who visit the Bichi Emirates Specialist Hospital in the Bichi local government area of Kano state, Nigeria.

MATERIALS AND METHOD

2.1 Study area

The study was conducted at Bichi General Hospital in Zone 12. Bichi is a Local Government Area and the headquarters of the Bichi Emirate Council in Kano, Nigeria. Bichi's geographical coordinates are 12.2342 latitude and 8.24111 longitude (12°14' north, 8° 14' 28" east). Bichi is at an elevation of zero meters (0 feet) above sea level and experiences a tropical grassland climate (classification: BSh). The annual low temperature is 24.26°C (75.67°F), and the annual maximum temperature is 39.13°C (102.43°F). The yearly average precipitation in Bichi is 53.64 millimeters (2.11 inches), with 67.84 rainy days (18.59% of the total precipitation). The dry period in Kano lasts seven months, from October to April, while the wet season lasts for five months from May through September. The peak months for malaria transmission are September through February because malaria is an endemic disease, and arid environments are preferred by mosquitoes for reproduction and parasite transmission (Tukur, 2010).

2.2 Data Collection

The data for this research was gathered from hospital records. The data set includes all reported malaria cases that were confirmed in the hospital using microscopy. The monthly malaria cases for the 12 months (January 2023 to December 2033) were retrieved.Every examined case of malaria reported each month is included in the data set. Furthermore, information was gathered regarding the average age range, sex, and number of patients who tested positive for malaria among those who sought treatment at the hospitals.

2.3 Study design

This study uses a descriptive research approach to compile secondary records that were gathered from January 2023 to December 2023 at Bichi General Hospital.

2.4 Statistical analysis

The collected data were examined using descriptive statistical analysis. Excel version 16 Microsoft Office software to compare the significant difference in malaria prevalence between the two seasons (wet and dry) using the t-test was used.

3.0 RESULTS

During the index period, which ran from January to December 2023, a total of 1531 requests for malaria parasite testing were issued. Of these, 691 (45.13%) were for males and 840 (54.70%) were for females.

3.1 The overall monthly prevalence of malaria among patients who visit Bichi Hospital

The overall monthly malaria prevalence throughout the study period is presented in Figure 1. September had the greatest malaria prevalence with 283 cases, while May had the lowest prevalence with 54 cases.

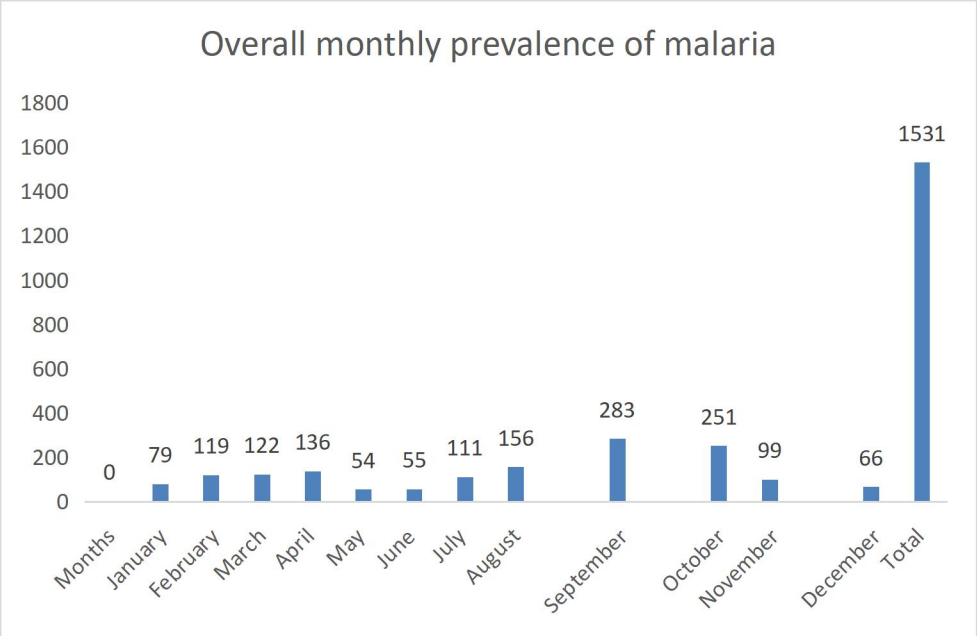


Figure 1: overall monthly prevalence of malaria

3.2 The overall seasonal prevalence of malaria among patients who visit Bichi Hospital

The statistics on the seasonal prevalence of malaria are also presented in Figure 2. During the rainy season (May–October), 910 which is about (59.44%) positive cases were documented, while during the dry season (November–April), 621 which is also about (40.56%) cases were registered.

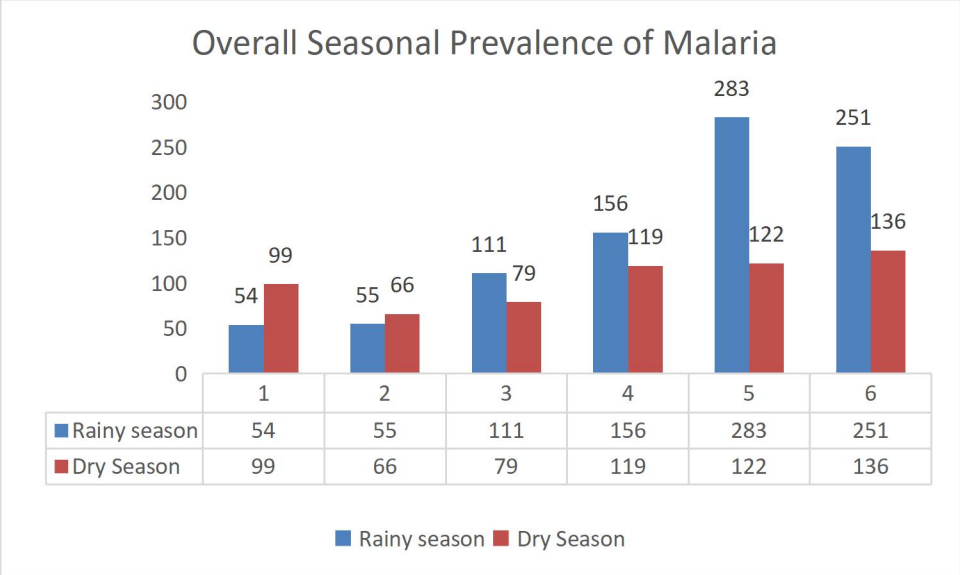


Figure 2: Overall Seasonal prevalence of Malaria

3.3 Monthly prevalence of positive malaria by Gender

Figure 3 shows the seasonal malaria prevalence by gender. Out of 1531 tested positive for malaria at Bichi General Hospital between January and December 2023, 691 cases were Males, while 840 on the other hand were Females.

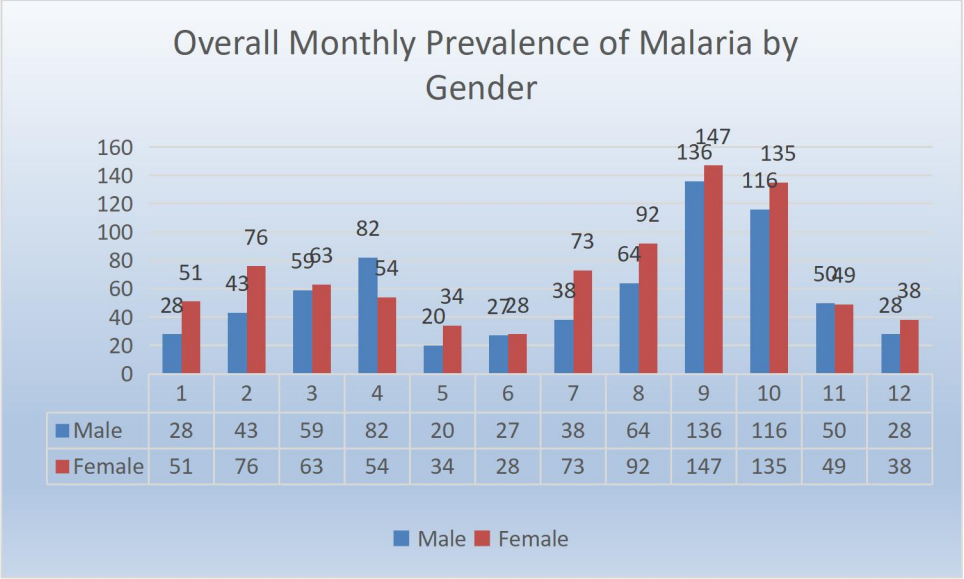
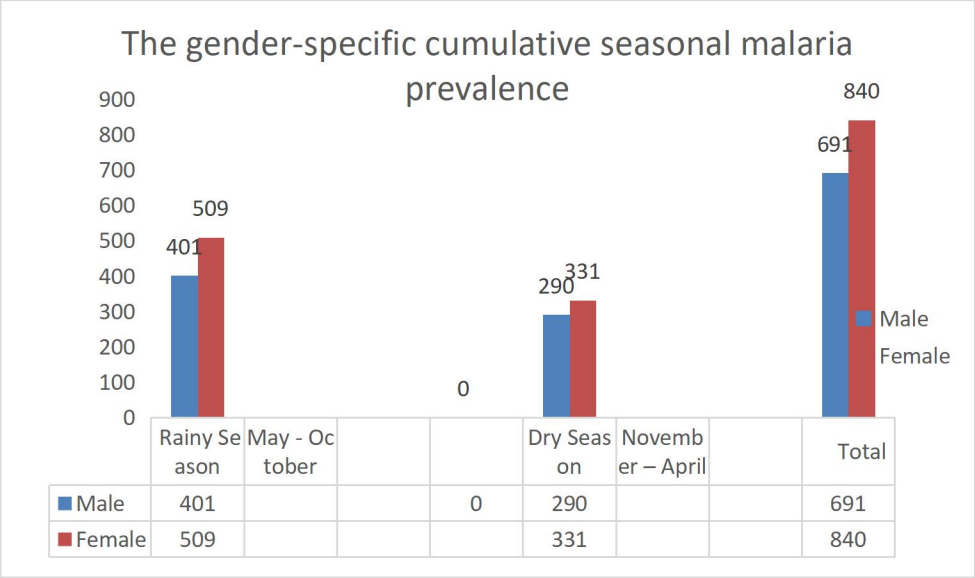


Figure 3: Overall Monthly Prevalence of Malaria by Gender

3.4 The gender-specific cumulative seasonal malaria prevalence

Statistical data on the seasonal prevalence of malariais presented in Figure 4. During the rainy season (May–October), 401 male and 509 female cases were reported, while during the dry season (November–April), 290 male and 331 female cases were reported.



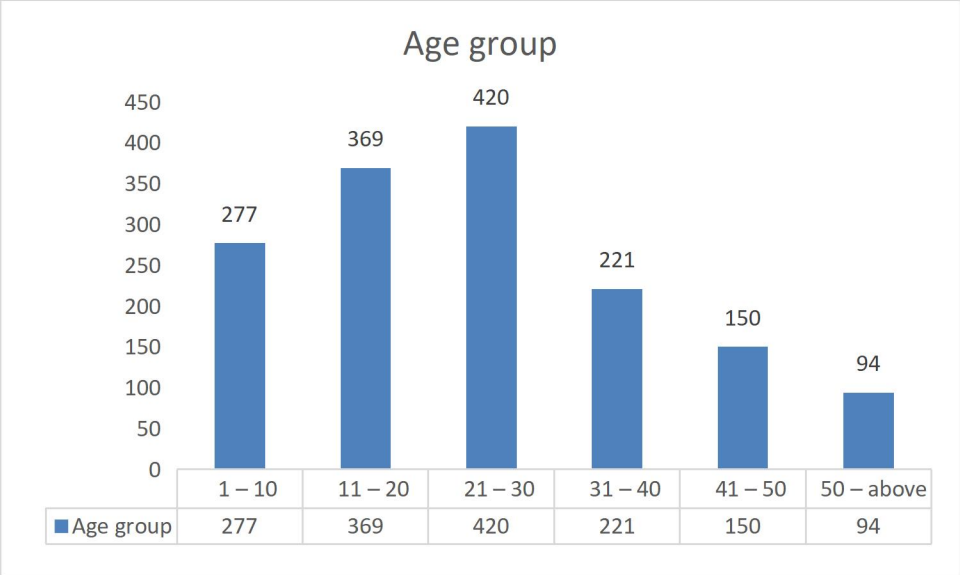
	Rainy Season	May - October			Dry Season	November – April		Total
Male	401			0	290			691
Female	509				331			840

Figure 4: The gender-specific cumulative seasonal malaria prevalence

3.5 Malaria prevalence based on age

The burden of malaria parasitemia according to patient age is presented in Figure 5 below.

Out of the total cases of malaria which is 1531, patient between the age of 21–30 years, had the highest incidence of 420 which is about (27.43%), Followed by patient between the age of 11–20 years, with 369 cases which is about (24.10%), while patient between the age range of 1-10 years has 277 cases which is about (18.10%), those between the age range of 31-40 years, has 221 cases which is about (14.44%) and those between the age range of 41-50 had the second to the least cases of 150 which is about (9.90%), while the age group above 50 years had the lowest prevalence of malaria cases with 94 which is about (6.14%).



	1 – 10	11 – 20	21 – 30	31 – 40	41 – 50	50 – above
Age group	277	369	420	221	150	94

Figure 5: Malaria prevalence based on age

4.0 DISCUSSION

Given that malaria is among the most prevalent causes of mortality for individuals in developing countries, it is alarming that diseases in Nigeria and all over Africa affect people of all generations.especially in the twenty-first century. Malaria infection not only causes death but also significantly reduces human efficacy, which has a detrimental influence on the affected areas. The study explains the seasonal variations in malaria incidence. The results demonstrate that malaria infections were noted throughout the entire study period. This shows that the illness is still widespread in the area. The presence of numerous tiny dugout reservoirs in the area, which provide household water to numerous rural settlements, particularly during times when it's accessible, may be the reason for this. Furthermore, dispersed throughout the area were ponds, wet plains, open drainages, rivers, streams, and discarded waste. In addition to often increasing mosquito populations, all of these points may have offered mosquitoes excellent places to breed throughout the dry season. In most neighborhoods, the quality of the environment and the types of housing is poor. In addition to being small, some homes don't have cross ventilation, which discourages the use of mosquito netting. This may help to explain why the illness is so common even during the dry months. This finding has been supported by other several studies (Oesterholtet al., 2006; Gurmu et al., 2009; Lemessa et al., 2011; Coulibaly et al., 2013; Kasasa et al., 2013; Kumar et al., 2014).

The analysis focused on monthly malaria cases throughout the rainy (May-October) and dry (November-April) seasons, spanning from January 2023 to December 2023. To evaluate the variation in malaria prevalence between wet and dry seasons, we used the paired two-sample T-test for mean. The p-value of 0.04912 > 0.05 indicates that there was a difference in malaria prevalence between the wet and dry seasons. Additionally, the rainy season saw a 59.44% prevalence of malaria, while the dry season saw 40.56% prevalence.Malaria prevalence for the rainy season (M =171.2, SD =95.16407, n =5) was hypothesized to be greater than the level of Malaria prevalence in thedry season (M =104.4, SD =30.1711, n =5). This difference was significant, t (4) =2.77, *P = 0.04912 (*1 tail).

According to the results, during the study period (January–December 2023), malaria positive casesthat were confirmed in the hospital using microscopy test were higher in Females than Males. This result, however, differed from earlier research by Oladele et al. (2018), which found that among patients visiting the Murtala Muhammad Specialists Hospital in Kano, Nigeria, males had a greater frequency of Plasmodium falciparum than females.

The age distribution of patients revealed that individuals between the ages of 21 and 30 had the highest prevalence of malaria. This finding is in line with other studies (Raimi et al., 2010; Desai

et al., 2007; Chukwuocha et al., 2012), which discovered that individuals under thirty had the highest burden of malaria infection. The greater number of positive outcomes observed in these age groups may be attributed to their respective socio-cultural and vocational environments. Mosquito bites are more common in people who expose themselves due to work or school than in people who spend most of their time indoors. This is in agreement with the hypothesis (Jenkins et al., 2015) that socioeconomic and cultural factors influence individuals and can impact health outcomes, including the risk of infectious diseases like malaria, either directly or indirectly.

The findings suggest that climatic factors may have an impact on the incidence of Plasmodium. Specifically, the months of May through October during the rainy season had the highest malaria prevalence, with September having the highest peak of prevalence (283) throughout the year. During the wet season, the highest number of malaria cases was reported nearly year-round. This is not surprising, since the wet season increases the vector's biting density and infectivity. Following the May to July rains, there is high transmission of malaria throughout the region between September and December, although there is low transmission between January and February. This may be related to the widespread observation that a variety of social, biological, and economic factors, including resistance to drugs, population immunity, government policies, mosquito control measures, and seasonality, influence the range of malaria infections (Adhanom et al, 2006).

4.1 CONCLUSION

In summary, the data shows that the prevalence of malaria was influenced by meteorological factors. The wet season, which spans from May to October, is when the highest prevalence of malaria was observed, with September showing the largest peak of prevalence in the area.

4.2 RECOMMENDATION

To avert the scourge of malaria, the study advised residents in endemic areas to implement preventive measures throughout the year, with a focus on the rainy seasons.

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