World Journal of Pharmaceutical Science and Research
www.wjpsronline.com
Research Article
ISSN: 2583-6579
SJIF Impact Factor: 5.111
Year - 2025
Volume: 4; Issue: 3
Page: 1278-1285

SEROPREVALENCE OF MALARIA PARASITE IN UMARARI/JAJERI AREA IN THE AFTERMATH OF FLOOD DISASTER IN MAIDUGURI METROPOLITAN COUNCIL, BORNO STATE, NIGERIA

[1]Askira U. M., [2]Ali K. B., [2]Baba A. S., [3]Yakubu Y. M., [4]Zaman A. A., [3]Mursal A. and [1]Mishara J. A.

[1]Department of Medical Laboratory Science, University of Maiduguri, Maiduguri, Nigeria.
[2]Department of Medical Microbiology, University of Maiduguri, Maiduguri, Nigeria.
[3]Department of Medical Microbiology, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria.
[4]Department of Obstetrics and Gynecology, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria.

Article Received: 11 May 2025 // Article Revised: 31 May 2025 // Article Accepted: 23 June 2025

***Corresponding Author: Askira U.M.**
Department of Medical Laboratory Science, University of Maiduguri, Maiduguri, Nigeria.
DOI: https://doi.org/10.5281/zenodo.15774951

How to cite this Article: Askira U.M., Ali. K. B., Baba A. S., Yakubu Y. M., Zaman A. A., Mursal A. Mishara J. A (2025) SEROPREVALENCE OF MALARIA PARASITE IN UMARARI/JAJERI AREA IN THE AFTERMATH OF FLOOD DISASTER IN MAIDUGURI METROPOLITAN COUNCIL, BORNO STATE. NIGERIA. World Journal of Pharmaceutical Science and Research, 4(3), 1278-1285. https://doi.org/10.5281/zenodo.15774951

ABSTRACT

Malaria is a serious and sometimes fatal disease caused by a parasite that infects female anopheles mosquito found in tropical and subtropical regions. This study investigates the seroprevalence of malaria parasites among residents of the Umarari/Jajeri Internally Displaced Persons (IDP) camp in Maiduguri, Nigeria, following a significant flood disaster. Malaria remains a major public health challenge in Nigeria, exacerbated by environmental factors that favor mosquito breeding. A cross-sectional study was conducted involving 140 participants, including 44 males and 96 females, from whom blood samples were collected and analyzed for malaria parasitaemia using a rapid diagnostic test (Malaria Ag p.f/p.v Abbott). The findings revealed that 41.4% prevalence of malaria infection was detected, with a notably higher incidence among females (68.6%) compared to males (31.4%), with a chi-square value ($\chi^2 = 0.25$, df = 3, p-value = 0.213) where $p<0.05$. This study highlights the critical impact of environmental changes on malaria transmission dynamics and underscores the necessity for targeted malaria control strategies in flood-affected areas. The results contribute to understanding the epidemiological landscape of malaria in Maiduguri and aim to inform public health interventions to mitigate the burden of this disease in vulnerable populations.

KEYWORDS: Malaria, Maiduguri, Umarari/Jajeri, Seroprevalence, Parasitaemia.

INTRODUCTION

Malaria is a life-threatening, mosquito-borne blood disease caused by *Plasmodium* species. The parasite is transmitted to humans through the bite of the female Anopheles mosquito, which carry the infective sporozoite stage of *Plasmodium* parasite in their salivary glands. It is one of the biggest impediments to progress and the biggest killer in Africa, with 90% of the global malaria deaths occurring on this continent (Isa *et al*., 2015). It affects all age groups, but children below 5 years, pregnant women, immunocompromised, and naive individuals are more susceptible (WHO, 2022).

There are 5 plasmodium parasite species that cause malaria in humans, which are: *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale*, and *Plasmodium knowlesi.* Two of these species *P. falciparum* and *P. vivax* pose the greatest threat. *P. falciparum* is the deadliest malaria parasite and most prevalent on the African continent. *P. vivax* is the dominant malaria parasite in most countries outside of sub-Saharan Africa (WHO, 2023).

The infection occurs when this mosquito bites, and the parasite is released into the bloodstream. Once the parasites are inside the body, they travel to the liver, where they mature. After several days, the mature parasites enter the bloodstream and begin to infect red blood cells. Within 48 to 72 hours, the parasite multiplies inside the red blood cells, causing the infected cells to burst. In a non-immune individual, symptoms usually appear 10-15 days after the infective mosquito bite. Malaria presentation could be sub-clinical, where there is parasitaemia but the individual shows no signs and symptoms. On the other hand, clinical Malaria symptoms can be mild or life-threatening. Mild symptoms are fever, chills, and headache. Severe symptoms include fatigue, confusion, seizures, and difficulty breathing (WHO, 2023).

According to the latest World Malaria Report, there were 249 million cases of malaria in 2022 compared to 244 million cases in 2021. The estimated number of malaria deaths stood at 608,000 in 2022 compared to 610,000 in 2021 (WHO, 2022). In 2022, the Region was home to about 94% of all malaria cases and 95% of deaths. Children under 5 years of age accounted for about 78% of all malaria deaths in the Region. Four African countries accounted for just over half of all malaria deaths worldwide: Nigeria, 26.8%, the Democratic Republic of the Congo, 12.3%, Uganda, 5.1%, and Mozambique, 4.2% (WHO, 2023). Children under five years of age and pregnant women are particularly vulnerable to malaria in Nigeria (Oladimeji *et al*., 2019), where poverty, limited access to healthcare services, inadequate vector control measures, and sub-optimal use of preventive interventions exacerbate the burden of the disease. Malaria has significant economic and health consequences, costing Nigeria over US$1.1 billion annually and accounting for 60% of all hospital visits (WHO, 2019; Muanya, 2022).

Nigeria has the greatest number of malaria cases (NMEP, 2017). Malaria is a mosquito-borne infectious disease caused by the genus Plasmodium. The symptoms of malaria infection are headache, vomiting, lethargy, abdominal discomfort, and fever (Abigail *et al*., 2021; WHO, 2022).

MATERIALS AND METHODS

Study Area

The study was carried out at the Umarari/Jajeri IDP camp in Maiduguri, Borno State. Maiduguri is the capital of Borno State, Nigeria, which lies within Latitude 10°N and 14°N and Longitude 11°30’E and 14°45’E and an area of 72,152sq km. Borno is situated in the Northeastern region of the country with a population projection of 6,111,500 people,

bordered with three states; Yobe to the West, Adamawa to the South, and Gombe to the Southwest as well as sizeable number across the borders of Cameroon to the east, Chad to the Northeast and Niger Republic to the North (City Population, 2024).

Sample Size Determination

The minimum sample size was calculated from a standard formula for the calculation of minimum sample size (Araoye, 2004). The formula is as shown below;

$$n = \frac{(z_1 - a)^2 (p)\ (1-p)}{d^2}$$

At a prevalence rate of 22.6%= 0.226 (Balogun *et al*., 2019). Using 5% precision at a 95%

n=268.683264 subjects

Thus, the calculated sample size is 269. Regarding the constraints for the interview such as non-response, incompletely filled forms and time constraint, 45% buffer is subtracted, and the total sample size becomes:

$$n = 269 - \{\frac{45}{100} \times 269\} = 137.95$$

Therefore, the sample size is 140

Study design

This study was community based cross-sectional study which targeted the residents of Umarari/Jajeri IDP camp Maiduguri.

Study Population

The study population included all persons who are at the study site and gave their informed consent.

Ethical Consideration

Approval was obtained from the Ministry of Health Borno State to be able to carry on with the research. The guardian of the study site were informed of the intended study and they gave their approval. During data collection, consent was sought from the respondents and high level of confidentiality of the information collected was maintained.

METHODS

Collection of Samples

Venous blood was collected into an EDTA container. 70% isopropyl alcohol was used to clean the site of collection, it was allowed to air dry, and the blood was collected into a hypodermic syringe and directly into an EDTA bottle. This was mixed properly to avoid coagulation.

Sample processing

The sample collected into an ant-coagulated container was mixed well to prevent clotting. About 20ul of the whole blood was dropped onto a test kit, a buffer was added, and allowed to stand for five minutes. It is then read for malaria parasite positivity when a band appears on both the control and the test, while if only a single band appears on the control shows a negative result.

Statistical analysis

Data collected were analyzed using Statistical Package for Social Sciences SPSS, version 22.0, 2020). Chi-square was used, probability value of 0.05 was reported as significant.

RESULTS

Results obtained in this study indicated that out of the 140 blood sample analyzed, 58(41.4%) were positive while 82(58.6%) were negative and the distribution of positivity and negativity of patients in the study area shows a proportion of female to be highest compare to their male counterpart (68.6%, 96/140) and (31.4%, 44/140), respectively ($\chi^2 = 0.25$, df = 3, p-value = 0.213). This is as shown in Table 4.1

Table 4.1: Distribution of positive and negative results of patients in the study area.

Gender	**Total examined**	**Percentage (%)**	**p-value**
Male	44	31.4%	0.2132
Female	96	68.6%	
Result	**Total positive**		
Positive	58	41.4%	
Negative	82	58.6%	
Total	140	100%	

P<0.05

4.2: Prevalence of Malaria Parasite infection in relation to the Demography and clinical presentation of subject in Jajeri IDP Camp

In the aftermath of flood with the highest proportion in female subjects (68.6%, 96/140) followed by their male counterpart (31.4%, 44/140).

With clinical symptoms of fever and headache showing high proportion (57.1%, 80/140) and (42.9%, 60/140) respectively, while vomiting and sneezing show low proportion of (28.3%, 41/140) and (10.7%, 15/140) respectively as shown in table 4.2.

Table 2: Distribution of Malaria Parasites in relation to Demography in Jajeri IDP Camp post flood disaster.

Age (yrs.)	**Gender**		**Clinical Details of the Subjects**			**Result**			
	M	**F**	**YES**	**NO**	**Location**	**POS %**		**NEG %**	
0 – 5	8	6	13	1	Jajeri IDP	10	(72)	4	(4.9)
6 – 10	7	9	16	-	Jajeri IDP	8	(13.8)	8	(9.8)
11 – 15	10	12	22	-	Jajeri IDP	13	(22.4)	9	(11.0)
16 – 20	3	14	17	-	Jajeri IDP	6	(10.3)	11	(13.4)
21 – 25	1	14	15	-	Jajeri IDP	5	(8.6)	10	(12.2)
26 – 30	4	9	13	-	Jajeri IDP	6	(10.3)	7	(8.5)
31 – 35	4	10	14	-	Jajeri IDP	3	(5.2)	12	(14.6)
36 – 40	2	9	11	-	Jajeri IDP	4	(6.9)	7	(8.5)
41 – 45	2	3	5	-	Jajeri IDP	1	(1.7)	4	(4.9)
46 – 50	2	7	9	-	Jajeri IDP	2	(3.4)	6	(7.3)
>- 50	1	3	4	-	Jajeri IDP	0	0	4	(4.9)
Total	**44**	**96**	**139**	**1**		**58**	**100%**	**82**	**100%**

Clinical details: YES indicates presences of disease condition with symptoms. NO indicates absences of diseases condition that shows symptoms.

4.3 Prevalence of malaria parasite in relation to gender in the study area

With high proportion in female subjects within the age group of 16-20 years and 21-25 years (14.6%, 14/96) and the age group of 11-15 years in the male subjects (22.7%, 10/44) as indicated in Table 4.3.

Table 4.3: Distribution in Relation to Gender in the Study Area.

Age(yrs.)	Gender				Results			
	Male %		Female %		Pos %		Neg %	
0 – 5	8	(18.2)	6	(6.2)	10	(17.2)	4	(4.9)
6 – 10	7	(15.9)	9	(9.4)	8	(13.8)	8	(9.8)
11 – 15	10	(22.7)	12	(12.5)	13	(22.4)	9	(10.8)
16 – 20	3	(6.8)	14	(14.6)	6	(10.3)	11	(13.4)
21 – 25	1	(2.3)	14	(14.6)	5	(8.6)	10	(12.2)
26 – 30	4	(9.1)	9	(9.4)	6	(10.3)	7	(8.5)
31 – 35	4	(9.1)	10	(10.4)	3	(5.2)	12	(14.6)
36 – 40	2	(4.5)	9	(9.4)	4	(6.9)	7	(8.5)
41 – 45	2	(4.5)	3	(3.1)	1	(1.7)	4	(4.9)
46 – 50	2	(4.5)	7	(7.3)	2	(3.4)	6	(7.3)
> - 50	1	(2.3)	3	(3.1)	0	0	4	(4.9)
TOTAL	**44(31.4%)**	**100%**	**96(68.6%)**	**100%**	**58**	**100%**	**82**	**100%**

Table 4: Distribution of Malaria Parasite based on Clinical Details in Jajeri IDP camp.

Age (yrs.)	Gender		Clinical Details				
	M	F	Fever	Cough	Sneeze	Vomiting	Headache
0 – 5	8	6	12	3	3	12	4
6 – 10	7	9	10	5	2	8	6
11 – 15	10	12	15	8	5	13	14
16 – 20	3	14	7	4	1	3	9
21 – 25	1	14	6	2	0	1	2
26 – 30	4	9	6	3	0	4	6
31 – 35	4	10	5	5	2	0	4
36 – 40	2	9	5	6	3	0	5
41 – 45	2	3	1	2	0	0	5
46 – 50	2	7	2	4	0	0	3
>- 50	1	3	1	2	0	0	2
Total	**44 (31.4%)**	**96 (68.6%)**	**80 (57.1%)**	**44 (31.4%)**	**15 (10.7%)**	**41 (29.3%)**	**60 (42.9%)**

DISCUSSION

Malaria is a major public health problem in sub-Saharan Africa, particularly affecting children under 5 years of age, pregnant women, and immunocompromised individuals (WHO, 2023). Efforts to control malaria include the use of insecticide-treated bed nets (ITN), intermittent preventive therapy (IPT), and prompt diagnosis and treatment, among other strategies (FMoH, 2018). Although the uptake of intermittent preventive treatment has been limited, a recent pilot study demonstrated the potential benefits of community IPT delivery (Kalu et al., 2018; Gonzalez et al., 2023). This could have contributed to the persistent incidence of malaria recorded across the country, highlighting the need for periodic monitoring. In this study, the seroprevalence of malaria parasites in the aftermath of the flood disaster in Maiduguri was investigated, and the results showed a higher prevalence compared to the report by Askira et al. (2024), which indicated a higher rate of 74.4% in Maiduguri.

The prevalence of Malaria parasite infection of 41.4% observed in this study is high when compared with the results obtained from other studies carried out in different part of the country, such as 12.7% and 22.6% reported in Maiduguri

(Balogun *et al*., 2010; 2019), 18.5% in Nnewi, Southeastern Nigeria (Stella *et al*., 2024), 17.4% and 23.1% in Northern Nigeria (Andy *et al*., 2018), 27.3% in Sokoto (Abdullahi *et al*., 2009), 4.3% in Ibadan (Bello & Ayede, 2019) and 7.7% in Lagos (Chimere & Wellington, 2013). It is, however, low when compared with the studies that revealed 42.9% in Kano (Idris *et al*., 2024), 45.4% in Zaria (Bernard *et al*., 2018), 61.8% in Bauchi (Samalia *et al*., 2017), and 63.7% in Mbaitoli, Southeast (Okoro, 2023). The relative prevalence rates of malaria infection in the study area may be attributed to the decrease in environmental hygiene due to the flood disaster.

Moreso, other studies, for example Blessing *et al.* (2023) and Bankole *et al*. (2012), reported high prevalence of 76% and 78.9% respectively. The variations in the prevalence reported may be attributed to the skills and experiences of laboratory personnel and the sensitivity of the kits or equipment (Agomo *et al*., 2019). Other factors that may have contributed to the differences in prevalence rates could be due to several environmental factors such as socio-economic condition of the study population, level of exposure, disparities in nutritional status, and unhygienic living conditions (Worral *et al*., 2016).

This study has shown that age, poor drainage system and stagnant water, not using insecticide-treated net beds, and staying late at night outside were predisposing/risk factors associated with malaria infection among the individuals in the study area.

CONCLUSION

In conclusion, the high prevalence of malaria observed in this study indicates persistent malaria, which could be a result of the non-compliance with malaria control measures such as the use of ITN and IPT. Thus, malaria remains a major health challenge in Maiduguri, especially after the flood disaster, and efforts should be intensified to curb this menace.

Recommendations

i. Awareness on the importance of proper use of insecticide-treated net beds should be intensified by Governments and Non-governmental organizations.
ii. Malaria screening should remain part of routine tests.
iii. Where malaria diagnostic facilities are not available, individuals in the camp should be treated for malaria periodically.
iv. Government should intensify efforts to control malaria, especially in children, pregnant women, and other people who may serve as a reservoir of infection.
v. The government and community should provide nutritional support to boost immunity, potentially reducing the risk of malaria infection.

REFERENCES

1. Abigail, O; Aminu, M; and Abdullahi U. Malaria Parasite Infection and its Effect on Packed Cell Volume among Pregnant Women in Zaria, Nigeria. Int J Trop. Dis, 2021; 4: 055.
2. Agomo, C. O., Nwankwo, C., Worrall, E. The burden of malaria in Nigeria: A review of the evidence. Malaria Journal, 2019; 18(1): 1-9.
3. Andy Emmanuel, Grace Onyejekwe, and Esther Funke Adeleke. Malaria in pregnancy: Two-year prevalence among women attending antenatal clinics in a Nigerian hospital. African journal of Midwifery and Women Health, 2018; 12(3): 117-120

4. Araoye M.O. Sample size determination in Research Methodology with Statistics for Health and Social Sciences 1st ed. Ilorin: Nathadex Publishers, 2004: 115-201.
5. Okoro Emmanuel Enyi, Ifeanyichukwu Romanus Iroha, Moses Nkechukwu Ikegbunam and Charles Okechukwu Esimone (2023) Effects of age and gender on malaria knowledge among people attending Federal Medical Centre, Owerri, Imo and University of Nigeria Teaching Hospital, Ituku Ozalla, Enugu, Southeast Nigeria, *Open acess publication magna scientia advanced biology and pharmacy*, *E-ISSN* 2583-8363 Cross ref DOI 10. 30574.
6. Askira U.M., E. T. Kutdang, L. Bukar, and Abubakar H. K. Frequency and array of malaria infection among under five years pyretic children attending emergency paediatric unit of university of Maiduguri teaching hospital, Maiduguri, Borno state. ISAR Journal of Medical and Pharmaceutical Sciences, 2024; 2(3): 2584-0150.
7. Balogun S.T., Umar K. Sandabe, Kenneth O. Okon, Ayodele O. Akanmu and Fatai A. Fehintola Malaria burden and pre-hospital medication among subjects with malaria in Maiduguri, Northeast Nigeria. Heliyon, 2019; 5(8).
8. Balogun, S.T., Fehintola, F.A., Adejanyu, O.A. & Adedeji, A.A. Asexual and sexual stages of Plasmodium falciparum in Nigerian pregnant women attending antenatal clinic. Obstetric Medicine, 2010; 3: 106-109.
9. Bello, FA, and Ayede, AI. Prevalence of Malaria Parasitaemia and the use of Malaria Prevention Measures in Pregnant Women in Ibadan, Nigeria. Annals of Ibadan Postgraduate Medicine, 2019; 17(2): 124-129.
10. Bernard, E. I., Paul, I., Iquo Bassey, O., and Ofonime, O. Prevalence of Malaria and Available Practice for Its Prevention Among Patients with Febrile Illness Attending Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. Journal of Preventive Medicine and Public Health, 2018; 4(2): 44-45.
11. Blessing, N. E., Godly, C., Frank, E. E., Jerry, C. E., and Vandy, P. Prevalence of malaria parasite and its effects on some haematological parameters amongst pregnant women in Yola, Nigeria. Journal of Umm Al-Qura University for Applied Sciences, 2023; 10: 200-210.
12. Cheesbrough M. District Laboratory Practice in Tropical Countries Part 2. 2nd ed., United Kingdom; Cambridge University Press, 2006: 280-370.
13. Chimere, O., and Wellington, A. O. Factors associated with risk of malaria infection among pregnant women in Lagos, Nigeria. Agomo and Oyibo Infectious Disease of Poverty, 2013; 2: 19.
14. City Population. (n.d.). Borno [Data Set]. Retrieved August 28, 2024, from https://www.citypopulation-de/en/nigeria/admin/NGA008__borno/
15. Idris H. Y., Umar A. M, Auta T, and Abdulmalik U. (2023). Prevalence of Malaria among Pregnant Women Attending Muhammad Abdullahi Wase Teaching Hospital Kano State, Nigeria. Dutse journal of Pure and Applied Sciences. 9(4a): 302-309.
16. Isa M A, Bello H S, Mustapha A, Mangga H K, Gulani I A, Aisha M A and Hyelabari I. prevalence of Malaria Parasite Infection among Pregnant Women Attending Ante-Natal Clinic in State Specialist Hospital, The Journal of Applied Sciences Research, 2015; 2(1): 13-19.
17. Muanya C. World Malaria Day: Nigeria records 200,000 deaths, loses N646bn yearly to malaria. The Guardian. April 25, 2022. Accessed June 16, 2023.
18. NMEP. Epidemiology and control profile of malaria. National malaria elimination program and Ministry of Health Abuja, 2017.
19. Oladimeji K.E., Tsoka-Gwegweni J.M., Ojewole E., and Yunga S.T. Knowledge of malaria prevention among pregnant women and non-pregnant mothers of children aged under 5 years in Ibadan, Southwest Nigeria. Malar J., 2019; 18:doi10.1186/s12936-019-2706-1.

20. Samalia, A. B., Uchendu, S. C., and Yarma, A. A. Prevalence of Plasmodium falciparum malaria in pregnant women and non-pregnant women attending specialist hospital Bauchi, Bauchi State, Nigeria. Palgo Journal of Medicine and Medical Sciences, 2017; 4(1): 139-144.
21. World Health Organization (WHO). Malaria in Pregnancy. WHO Malaria in Pregnancy, 2021.
22. World Health Organization (WHO). Malaria in Pregnancy. WHO Malaria in Pregnancy, 2021.
23. World Health Organization (WHO). World Malaria Report 2022. Geneva: WHO; 2022. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2022
24. World Health Organization. (2021). Guidelines for the treatment of malaria (3rd edition). Geneva, Switzerland: World Health Organization.
25. World Health Organization. World Malaria Report 2019. WHO; 2019. Accessed June 16, 2023.
26. World Health Organization. World Malaria Report 2022. WHO; 2022. Accessed June, 2023.