Journal of Community Pharmacy Practice
Vol: 03, No. 02, July-Dec 2023
ISSN: 2799-1199, DOI: 10.55529/jcpp.52.21.30

Research Paper

Evaluation of incidence of asymptomatic Plasmodium falciparum in a peri-urban community in Ogun, Nigeria

A. Obafemi Solesi[1*], R. Ayodele Sowole[2], H. NwakaegoAdetoyi[3], B. Adebukunola Odugbemi[4]

[1*]Department of Pharmacy Technician Programme, School of Basic Medical Sciences, Ogun State Polytechnic of Health and Allied Sciences, Ilese- Ijebu, Nigeria.

[2]Department of Medical Laboratory Technician, School of Basic Medical Sciences, Ogun State Polytechnic of Health and Allied Sciences, Ilese- Ijebu, Nigeria.

[3]Department of Environmental Health Science and Diseases control, Ogun State Polytechnic of Health and Allied Sciences, Ilese- Ijebu, Nigeria.

[4] Department of Community Health and Extension Worker, Ogun State Polytechnic of Health and Allied Sciences, Ilese- Ijebu, Nigeria.

Article Info

Article History:
Received: 14 April 2023
Revised: 23 June 2023
Accepted: 01 July 2023
Published: 16 August 2023

Keywords:
Asymptomatic
Plasmodium Falciparum
Pregnancy
Tropical
Red Blood Cells
Malaria

ABSTRACT

Background: Malaria, caused by five Plasmodium species, is a public health concern in most tropical and subtropical countries and causes high morbidity and socioeconomic loss. Asymptomatic Plasmodium infection in pregnancy leads to placental infection and anemia, with placental inflammation and fibrosis. Screening for asymptomatic infection with sensitive and specific diagnostic tools is important to determine prevalence and support control.

Objective: To determine the prevalence of asymptomatic Plasmodium falciparum infection in the study area.

Methods: A total of 210 blood samples were randomly collected from students and staff of Ogun State Polytechnic of Health and Allied Sciences, Ilese Campus, Nigeria, between February and March 2023. Individuals with malaria symptoms (fever, nausea, chills, etc.) or on antimalarial drugs were excluded. [Diagnostic method, e.g. microscopy or RDT, to be stated here.]

Results: Of 210 participants, 15.2% (32/210) were male and 84.8% were female, reflecting a female-dominated population. By age, 59% were aged 17-26 years, 13.8% 27-36 years, 17.6% 37-46 years, 7.6% 47-56 years, and 1.9% 57-65+ years. The overall prevalence of P. falciparum was 87%, with infection in 18% males and 68.6% females.

Conclusion: A high prevalence of asymptomatic P. falciparum infection was found in this population, highlighting the need for routine screening with sensitive diagnostic tools to support malaria control.

Corresponding Author:
A. Obafemi Solesi
Department of Pharmacy Technician Programme, School of Basic Medical Sciences, Ogun State Polytechnic of Health and Allied Sciences, Ilese- Ijebu, Nigeria.

Journal of Community Pharmacy Practice (JCPP)

Email: solesi.obafemi@gmail.com

Copyright © 2023 The Author(s). This is an open access article distributed under the Creative Commons Attribution License, (http://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

1. INTRODUCTION

Malaria has been a public health concern in most tropical and sub-tropical countries around the world with causative agents by five Plasmodium species; Plasmodium falciparum and P. vivax are the two major species that exert infectious pressure on the world, the transmission of the disease is through multiple bites of infected female Anopheles mosquitoes [1].

Malaria is a prominent disease of high-temperature regions with high morbidity, leading to socio-economic loss; in 2021, Malaria cases estimated to be about two hundred million, and deaths scored over half a million, ninety per cent of these deaths were from sub-Saharan Africa [2], Malaria is the primary cause of sickness and impoverishment in sub-Saharan Africa [3].

Maternal-fetal complications are about 70% of pregnant women in Nigeria; worldwide, hundreds of millions of pregnant women are potentially infected with malaria-causing agents each year, and most of these cases and deaths result in Sub-Saharan Africa [4].

Exposure to malaria is predominant in sub-Saharan Africa; the four notable countries in that part of the continent recorded about 50% of all malaria deaths globally in 2021, with Nigeria having 26.6%, the Democratic Republic of the Congo recording 12.3%, Uganda 5.1% and Mozambique, at 4.1% [5].

The malaria endemic areas are mostly with warm temperatures and heavy rainfall; this feature favoured mosquito breeding. Past studies showed that after being infected with malaria parasites, clinical immunity is gained and partially develops depending on variations such as endemicity, mode of prevention engaged and multifactor of co-morbid situations [6] studies have pointed out that escalated poverty levels, retrained accessibility to quality health care, and unprotected exposure to mosquito bites in rural communities hamper the vigour and ability to maintain partial immunity, particularly in old age [7] this necessitates campaign for malaria prevention programs such as the use of Long-Lasting Insecticide Nets (LLINs), Indoor Residual Spray (IRS), and the emergence of other strategies to minimize the incidence of asymptomatic plasmodium infections, with emphasis in villages [8].

The medical implication of asymptomatic malaria may be different in various epidemiological zones; in endemic areas, asymptomatic parasitemia confers partial immunity [9] and possibly guard against clinical disease resulting from new infections [10].

Asymptomatic Plasmodium species infection (API) is an observation of Plasmodium species in the blood with no evidence of clinical signs and symptoms of malaria [11]. Although there is no scientific definition for this condition, and reports from other scholars showed that over 70% of asymptomatic infections were caused by P. falciparum little information is reported for other Plasmodium species [12].

[13] Reported that pregnancy asymptomatic Plasmodium species infection causes placental infection and anaemia; separation of infected red blood cells in the mother intervillous spaces of the placenta resulted in its infection and is associated with placental inflammation and fibrosis; also triggers the infected site swollen with invasive penetration of immune cells like macrophages, monocytes and lymphocytes and is called inflammatory placental malaria [14], this blockage affects nutrient and air exchanges between the mother and the foetus causing increased fetal mortality, prematurity, low birth weight, abortion, stillbirths and fetal anaemia [15].

Despite vigorous campaign on malaria control strategies- Roll Back Malaria, the Multilateral Initiative on Malaria and the use of artemisinin-based manipulation therapy, malaria continue to pose a risk to the well-being of children in Nigeria: [16] reports that Nigeria accounts for 25% of the malaria burden of the entire African continent. Screening for individuals with asymptomatic infections to

determine their prevalence and possibly control it is pertinent using sensitive cum precise diagnostic tools. This study aim's at evaluating the incidence of asymptomatic plasmodium falciparum in the study area.

2. METHODOLOGY

2.1 Sample Collection

Two hundred and ten blood samples were collected randomly from Ogun State Polytechnic of Health and Allied Science, Ilese Campus; this constituted students and staffers with asymptomatic Plasmodium falciparum between February and March 2023. The students and staffers exhibiting any symptoms of Malaria infection, such as fever, nausea, chills, etc., and on anti-malaria drugs were excluded from the tested population.

2.2 Laboratory Analysis

A two-millilitre of blood drawn from a peripheral vein into an EDTA bottle use for preparing thick, thin blood film and cell volume, thick and thin blood films prepared using the technique described by [17], [18] two glass slides labelled for each volunteer, blood was drop on a clean and grease-free glass slide to air-dry, smears made using 6 µL and 2 µL for thick and thin blood respectively, the thin smear made on the glass slide translucent enough to read through it, fixed in absolute methanol for 5s and allowed to air-dry thoroughly before staining. The air-dried thick blood films at 25℃ were stained with 5% Giemsa stain for 25 minutes, water rinsed, and air-dried again. The slides, were microscopically examined using an oil-immersion lens (100x magnifications). The parasites count of 1-10 plus for every 100 thick film fields accepted as positive result. The thin blood films were air-dried but fixed with 100% methanol for 60 s, stained with 3% Giemsa stain for 30 min, water rinsed, air-dried, and microscopically examined for Plasmodium species identification.

3. RESULTS AND DISCUSSION

The result was gathered through the collection of two hundred and ten (210) blood samples from Ogun State Polytechnic of Health and Allied Science, Ilese-Ijebu.

3.1 Gender Distribution of Sample Collection

Table 1. Gender Distribution

Gender	Frequency	Percentage
Male	32	15.2
Female	178	84.8
Total	210	100

Table 1 above shows the gender of the subject blood sample of Ogun State Polytechnic of Health and Allied Science, Ilese-Ijebu. A 15.2% of males test and 84.8% of the females test.

3.2 Age Group Distribution of Subjects Collected

Table 2. Age Distribution

Age (year)	Frequency	Percentage (%)
17-26	124	59
27-36	29	13.8
37-46	37	17.6
47-56	16	7.6

57-65+	04	1.9
Total	210	100

Table 2 shows that 59% of the subjects were between the ages of 17-26 yrs., 13.8% were in the age group of 27-36 yrs., 17.6% were in the age range of 40-49 yrs., while 7.6% falls within the ages of 47-56 yrs., and 1.9% were in the age bracket of 57-65+.

3.3 Distribution of Plasmodium Falciparum among Subjects in Ilese, Ogun, Nigeria in Relation to Gender

Table 3. According to their Gender

Sex		**Negative Sample**		**Positive Sample**	
		(f)	**(%)**	**(f)**	**(%)**
Male	32	12	37.5%	20	62.5%
Female	178	70	39.3%	108	60.7%

F= frequency
%= percentage

3.4 Prevalence Distribution of Plasmodium Falciparum by Age of the Subjects in Ilese, Ogun, Nigeria

Table 4. Showing Prevalence of Infection in the Study Area

Age (Years)	**No. of Samples Examined (%)**	**No. of Positive Samples (%)**	**No. of Male Samples (%)**	**No. of Positive Male Samples (%)**	**No. of Female Samples (%)**	**No. of Positive Female Samples (%)**
< 46	190(90.5)	87(67.9)	30(93.8)	18.8(94)	113(63.5	68.6(63.5)
<65	20(9.5)	41(32.0)	02(6.3)	1.2(06)	65(36.5)	39.4(36.5)
Total	210(100)	128(100)	32(100)	20(100)	178(100)	108.0(100)

3.5 Discussion

The malaria endemic areas are mostly with warm temperatures and heavy rainfall; this feature favoured mosquito breeding. Past studies showed that after being infected with malaria parasites, clinical immunity is gained and partially develops depending on variations such as endemicity, mode of prevention engaged and multifactor of co-morbid situations [6] the medical implication of asymptomatic malaria may be different in various epidemiological zones; in endemic areas, asymptomatic parasitemia confers partial immunity [9] and possibly guard against clinical disease resulting from new infections [10]. In this study, the male volunteer was 15.2% (32/ 210) while the female was 84.8%, reflecting the nature of the population's gender skewness being a female-dominated place, as shown in Table 1. The age distribution, 17-26 years age group was high with 59%; 27-36 was 13.8%, 37-46 with 17.6%, 47-56; 7.6%, 57-65+ being lowest with 1.9%. The age group between 17-26 years strongly indicated that the study was conducting in a tertiary institution, where young adults populated. This study agreed with the work of [19], where students between 16 – 22 years old had the highest infection rate at 28.28%. The asymptomatic distribution of the subjects according to gender male with positive infection without any clinical manifestation was 62.5% (20/ 32) and the female with 60.7% (108/178). The prevalence of plasmodium falciparum in the blood of subjects in this study was 87%; the male infected was 18%, and the female was 68.6%, according to [20], the infection rate in males was 30.24% higher than in females with a 24.47% infection rate.

4. CONCLUSION

The study revealed that asymptomatic plasmodium falciparum infection is prevalent in the study area, and the participants are potential reservoirs of transmission.

Acknowledgments

The authors have no specific acknowledgments to make for this research.

Funding Information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
A. Obafemi Solesi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R. Ayodele Sowole	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
H. NwakaegoAdetoyi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
B. Adebukunola Odugbemi	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

Not Applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

[1] (2022). WHO. World malaria report 2022.
[2] "WHO. Malaria control in the WHO African Region-Turning resources into results," Annual Report, 2003.
[3] W. L. Kilama, "Ethical perspective on malaria research for Africa," Acta Tropica, vol. 95, pp. 276-284, 2005. doi.org/10.1016/j.actatropica.2005.06.011
[4] M. Bauserman, A. L. Conroy, K. North, J. Patterson, C. Bose, and S. Meshnick, "An overview of malaria in pregnancy," Semin Perinatol, vol. 43, pp. 282-290, Aug. 2019. doi.org/10.1053/j.semperi.2019.03.018
[5] WHO. (2023).

[6] O. A. Adefioye, O. A. Adeyeba, W. O. Hassan, and O. A. Oyeniran, "Prevalence of malaria parasite infection among pregnant women in Oshogbo, Southwestern Nigeria," American- Eurasian Journal of Scientific Research, vol. 2, pp. 43-45, 2007.

[7] J. V. Remais, G. Zeng, G. Li, L. Tian, and M. Engelgau, "Convergence of non-communicable and infectious diseases in low- and middle-income countries," Int J Epidemiol, vol. 42, pp. 221-227, 2013. doi.org/10.1093/ije/dys135

[8] U. M. Chukwuocha, A. N. Chukwuocha, O. G. Udujih, C. Amadi, E. A. Nwoke, and S. N. O. Ibeh, "Malaria among the Geriatic population in parts of South-Eastern Nigeria: Prevalence, Complications and Co-morbidity with Non- communicable Diseases," Epidemiology, vol. 6, 2016.

[9] T. Staalsoe and L. Hviid, "The role of variant-immunity in asymptomatic Malaria infections: maintaining a fine balance," Parasitol. Today, vol. 14, pp. 177-178, 1998. doi.org/10.1016/S0169-4758(98)01228-9

[10] A. Farnert, A. P. Arez, A. T. Correia, A. Bjorkman, G. Snounou, and V. D. Rosario, "Sampling and storage of blood and the detection of malaria parasites by PCR," Transactions of the royal Society of Tropical Medicine and Hygiene, vol. 93, pp. 50-53, 2009. doi.org/10.1016/S0035-9203(99)90177-3

[11] "World Health Organization," Factsheet on the World Malaria Report, Dec. 2017.

[12] I. Harris et al., "A large proportion of asymptomatic Plasmodium infections with low and sub-microscopic parasite densities in the low transmission setting of Temotu Province, Solomon Islands: challenges for malaria diagnostics in an elimination setting," Malar. J., vol. 9, no. 1, p. 254, Sep. 2010, doi.org/10.1186/1475-2875-9-254

[13] P. Mayengue et al., "Submicroscopic Plasmodium falciparum infections and multiplicity of infection in matched peripheral, placental and umbilical cord blood samples from Gabonese women," Trop Medicin Intern Health, vol. 99, pp. 949-958, 2004. doi.org/10.1111/j.1365-3156.2004.01294.x

[14] J. Ordi et al., "Placental malaria is associated with cell-mediated inflammatory responses with selective absence of natural killer cells," J. Infect. Dis., vol. 183, no. 7, pp. 1100-1107, Apr. 2001. doi.org/10.1086/319295

[15] A. Tilahun, M. Yimer, W. Gelaye, and B. Tegegne, "Prevalence of asymptomatic Plasmodium species infection and associated factors among pregnant women attending antenatal care at Fendeka town health facilities, Jawi District, North west Ethiopia: A cross-sectional study," PLoS One, vol. 15, Apr. 2020. doi.org/10.1371/journal.pone.0231477

[16] World malaria report 2019. World Health Organisation, Geneva. Licence CC BY-NC-SA 3.0 IGO. 2019.

[17] T. Hanscheid, "Diagnosis of Malaria: A review of alternatives to conventional microscopy," Clin. Lab. Haematol., vol. 21, pp. 235-245. 1999. doi.org/10.1046/j.1365-2257.1999.00220.x

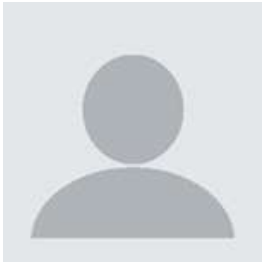
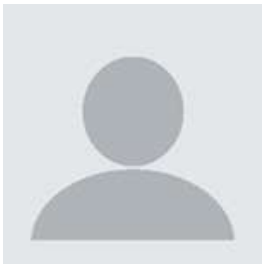
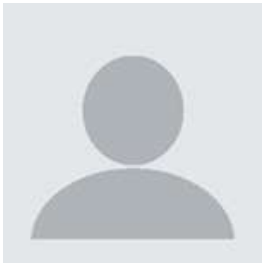
[18] District Laboratory Practice in Tropical Countries, vol. 1. Cambridge: University Press, 2006, pp. 239-258.

[19] I. C. Mgbemena et al., "Asymptomatic malaria among students of Federal University of Technology," Issues in Biological Sciences and Pharmaceutical Research, vol. 4, pp. 50-57, 2016.

[20] U. Abdullahi et al., "Malaria in Sokoto," African Journal of Biotechnology, vol. 8, pp. 7101-7105, 2009.

How to Cite: A. Obafemi Solesi, R. Ayodele Sowole, H. NwakaegoAdetoyi, B. Adebukunola Odugbemi. (2023). Evaluation of incidence of asymptomatic plasmodium falciparum in a peri-urban community in Ogun, Nigeria. Journal of Community Pharmacy Practice (JCPP), 3(2), 43-49. https://doi.org/10.55529/jcpp.52.21.30

BIOGRAPHIES OF AUTHORS

	**A. Obafemi Solesi,** works with the Department of Pharmacy Technician Programme at Ogun State Polytechnic of Health and Allied Sciences in Ilese-Ijebu, Nigeria. His research focuses on how pharmacies support practice, public health topics, infectious diseases, and pharmaceutical sciences. He has published work on malaria prevalence, other infectious diseases, and community health. In teaching and academic output, he concentrates on disease assessment and raising health awareness. He also supports better healthcare results by using community-based studies and healthcare methods based on evidence. Email: solesi.obafemi@gmail.com
	**R. Ayodele Sowole,** works with the Department of Medical Laboratory Technician at Ogun State Polytechnic of Health and Allied Sciences in Ilese-Ijebu, Nigeria. Her research focuses on medical laboratory science. She also studies infectious diseases and looks at diagnostic investigations. Public health is another area she is interested in. She has co-authored a study on asymptomatic Plasmodium falciparum infection in a Nigerian community. Her academic output helps explain how common infectious diseases are. It also supports laboratory-based ways to assess health. In addition, it sheds light on health issues faced by communities. Email: sowolemm@gmail.com
	**H. NwakaegoAdetoyi,** works with the Department of Environmental Health Science and Diseases Control at Ogun State Polytechnic of Health and Allied Sciences in Ilese-Ijebu, Nigeria. Her focus is on environmental health. She also looks at how to stop diseases before they spread. Infectious diseases and public health are part of her main interests. She has joined team projects that look at malaria. These studies also touch on other issues seen in local communities. In her academic work, she pays attention to how diseases are tracked. She also evaluates environmental health conditions. She emphasizes prevention in healthcare. Email: helenadetoyi@gmail.com
	**B. Adebukunola Odugbemi,** works with the Department of Community Health and Extension Worker at Ogun State Polytechnic of Health and Allied Sciences, Ilese-Ijebu, Nigeria. Her work includes community health and health education. She also looks at ways to prevent disease. Public health is a key area for her. She has co-authored a study on asymptomatic Plasmodium falciparum infection. The study was carried out in Ogun State, Nigeria. Her contributions support health checks at the community level. She also promotes awareness of infectious diseases. Overall, her efforts aim to improve public health results. Email: Bk.odugbemi@gmail.com