International Journal of Pathogen Research

11(1): 1-7, 2022; Article no.IJPR.90510
ISSN: 2582-3876

Malaria Parasitemia and Anemia among Pregnant Women Attending General Hospital, Enugwu-Ukwu, Southeastern Nigeria

Pauline U. Umeanaeto [a], Chukwujindu Odagwe [a], Ifenna C. Onwuagana [a], Kindness C. Irikannu [a*], Ginika L. Onwuachusi [a], Justina C. Akulue [b] and Stella C. Afulukwe [c]

[a] Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
[b] Department of Medical Laboratory Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.
[c] Department of Anatomy, Chukwuemeka Odumegwu Ojukwu University, Uli Campus, Anambra State, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPR/2022/v11i130260

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/90510

Original Research Article

Received 17 June 2022
Accepted 24 August 2022
Published 03 September 2022

ABSTRACT

Women has been reported to be more susceptible to malaria parasites infection during pregnancy. The disease causes severe anemia in pregnancy sometimes resulting to maternal morbidity and mortality in many parts of the world including Nigeria. A study to determine malaria parasitaemia among pregnant women attending General hospital Enugwu-Ukwu, Anambra State, Nigeria, was conducted between July and December, 2019. The specific objectives were to determine the prevalence of malaria parasites and anemia among the pregnant women as well and the relationship between malaria and anemia. Two milliliters of venous blood were collected from 408 pregnant women during antenatal visits. Thick and thin blood films were made, stained with 10% Giemsa stain and examined under the microscope for malaria parasites. Hemoglobin (Hb) concentration was estimated using cyanmethemoglobin method. Hemoglobin concentration below 11.0g/dl was regarded as anemia in pregnancy. Of 408 blood samples collected, 112(27.5%) were

**Corresponding author: Email: kc.irikannu@unizik.edu.ng;*

positive for malaria parasites. The age group 15–20 years had the highest prevalence 8(40%) while the age group 36–40 years had the least 24(23.1%). The primigravidae had the highest malaria prevalence 72(36%), while the multigravidae had the least 40(19.2%). The pregnant women in first trimester had the highest malaria prevalence 48(50%), while those in third trimester had the least 24(16.7%). Malaria parasitaemia in relation to trimester was statistically significant (P<0.05). A total of 248(60.7%) pregnant women had a Hb value less than 11g/dl. The multigravidae had the highest Hb 128(61.5%), while the primigravidae had the least 120(60%). Health education and proper administration of Intermittent Preventive Therapy (IPT) during pregnancy is recommended for malaria prevention and control in pregnancy.

Keywords: Malaria; pregnancy; haemoglobin; low birth weight; parasitaemia.

1. INTRODUCTION

Malaria is caused by a protozoan parasite of the genus *Plasmodium* that live in the human red blood cells [1]. The human malaria species are *Plasmodium falciparum*, *P. vivax*, *P. ovale, P. malariae, P. knowlesi* [2]. The most common and most dangerous of the parasite is *Plasmodium falciparum.* Malaria is a major cause of death in tropical and sub-tropical countries [3]. The estimated number of malaria deaths stood at 409,000 deaths in 2019 [1]. Malaria is endemic in Nigeria and pregnancy increases the susceptibility of infection with the parasites [4]. About 11% of maternal deaths was once attributed to malaria in Nigeria [5].

Malaria in pregnancy is an extremely important public health concern in malaria endemic areas of the world and it is both an obstetric and medical problem, requiring a multidisciplinary and multidimensional solution [6]. This is necessary because an estimated 125 million women become pregnant every year in malaria endemic regions, half of them in sub Saharan Africa, mainly in area of intense *P. falciparum* transmission [7]. In this aforementioned region, malaria is predominantly asymptomatic yet it has been reported to cause adverse effects on both mothers and babies [8, 9].

Age and pregnancy-associated anti-parasitic immunity have been identified to play important roles in *P*. *falciparum* infection. As a result, the severity of malaria in pregnancy was reported to be higher in younger pregnant women, primigravidae and secundigravidae [9]. Most malaria infections among pregnant women in areas of high or moderate transmission are asymptomatic and infected women may not seek treatment with a consequent outcome of anaemia and severe malaria during pregnancy. The symptoms and complications of malaria in pregnancy vary according to malaria transmission intensity in a given geographical area, and the individual's level of acquired immunity [10].

Pregnant women living in areas of low or unstable malaria transmission have little or no immunity to malaria, and are at 2 to 3 folds of higher risk of developing severe disease than non-pregnant adults living in the same area. In these areas, maternal death may also result directly from the complications of severe malaria, or indirectly from malaria related severe anaemia [11]. This can lead to low birth weight in infants, which is an important contributor to infant mortality and is most pronounced in women during their first pregnancy and increased risk of severe malaria leading to abortion, stillbirth, prematurity [10]. Other manifestations in pregnancy due to malaria may include include; fever chills, body-aches, headache, cough, repeated vomiting and impaired consciousness [12].

Effective control of malaria in pregnancy depends on the knowledge about the disease transmission in a given area. Therefore, the aim of this study was to determine the prevalence of malaria parasites and anaemia as well as their relationship among pregnant women attending antenatal clinic at the General Hospital, Enugwu-Ukwu, Anambra state.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted at the General Hospital, Enugwu-Ukwu, Njikoka Local Government Area, Anambra State, Nigeria. Enugwu-Ukwu town is geographically situated on a hilly terrain and lies between the coordinates of 6º 10'N, 7º 01'E. It is predominantly occupied by the Igbo ethnic group of Anambra State. The area consists primarily of rainforest type of

vegetation, with an annual mean rainfall of 1828mm. The temperature range is from 27ºC-30ºC between June and December but rises to 32ºC-34ºC between January and April. Relative humidity is about 80%. The climate of the study area is a tropical dry and wet season type, typical of East African savannah.

2.2 Study Design

This study was a cross-sectional survey lasting for a period of six months between July to December 2019. A total of 408 pregnant women attending antenatal clinic at Enugu-ukwu General Hospital voluntarily participated in the study.

2.3 Sample collection and Examination

Blood specimens of 408 pregnant women were collected. Thick and thin blood films were made, stained and examined for malaria parasites under the objective lens of the microscope according to the methods described by Cheesbrough [13]. Also, hemoglobin concentrations of the pregnant women were estimated using cyanmethemoglobin method according to Cheesbrough [13]. A haemoglobin concentration below 11.0gldl or packed cell volume (PCV) of less than 33.0% was regarded as anaemia during pregnancy according to World Health Organisation.

2.4 Demographic Data

Demographic data such as age and pregnancy status of the study participants were collected using a structured questionnaire.

2.5 Data Analysis

Descriptive statistics was used to calculate percentage (%) prevalence of malaria parasites and anaemia. Chi-square test (x^2) was used to determine significant association between prevalence of malaria parasites and anaemia in pregnancy.

3. RESULTS

Out of 408 blood samples collected from the pregnant women, 112(27.45%) were positive for malaria parasite. The age group of 15–20 years recorded the highest prevalence (40%) while the age group 36–40 years recorded the least prevalence (23.1%) [Table 1]. Malaria prevalence in relation to age of the pregnant women was not statistically significant (P>0.05).

The primigravidae had the highest prevalence 72(36%), while the multigravidae had the least prevalence of malaria parasites 40(19.23%) [Table 2]. Malaria prevalence among the pregnant women in relation to gravidity was not statistically significant (P>0.05).

The pregnant women in the first trimester had the highest prevalence of malaria 48(50%), while those in their third trimester had the least prevalence 24(16.7%) [Table 3]. Malaria prevalence in trimester was statistically significant (P<0.05).

Table 1. The prevalence of malaria parasitemia in the pregnant women in relation to their age

Age range	Number examined	Number positive	Percentage prevalence (%)
15 – 20	20	8	40
21 – 25	80	20	25
26 – 30	120	40	33.3
31 – 35	84	20	24
36 – 40	104	24	23.1
Total	**408**	**112**	**27.45**

(P > 0.05) (X^2 tab =9.488 > X^2 cal =1.465; d.f = 4)

Table 2. The prevalence of malaria parasite in the pregnant women in relation to gravidity

Gravidity	Number examined	Number positive	Percentage prevalence (%)
Primigravidae	200	72	36
Multigravidae	208	40	19.23
Total	**408**	**112**	**27.45**

(P > 0.05) (X^2 tab =3.841 > X^2 cal = 3.65; d.f = 1)

Table 3. The Prevalence of malaria parasite in the pregnant women in relation to trimester

Trimester	Number examined	Number positive	Percentage prevalence (%)
First	96	48	50
Second	168	40	23.8
Third	144	24	16.7
Total	**408**	**112**	**27.45**

($P < 0.05$) (X^2 tab =5.991 < X^2 cal =8.493; d.f = 2).

Out of the 408 pregnant women examined, 248 (60.8%) had a PCV value less than 33% (11g/dl) which was regarded as anemic. The multigravidae had the highest prevalence 128(61.5%), while the primigravidae had the least prevalence of malaria 120(60%) [Table 4]. There was no significant difference (P>0.05).

Of the 408 pregnant women examined, 80(19.6%) had both malaria parasite and Haemoglobin level <11g/dl. The primigravidae had the highest prevalence of malaria related anaemia 48(24%), while the multigravidae had the least prevalence of malaria related anaemia 32(15.4%) [Table 5]. There was no significant difference (P>0.05). Table 6 shows the haemoglobin concentration level according to trimester of the pregnant women while table 7 shows the prevalence of both malaria parasitaemia and Haemoglobin level according to trimester of the pregnant women.

4. DISCUSSION

The prevalence of malaria recorded in this study was 27.45% among the pregnant women. This observation is lower than some reports in different parts of Nigeria. Ukibe et al. [14] earlier observed malaria prevalence of 73.1% Among pregnant women in Anambra State. Iwuchukwu and Vincent [15] reported prevalence of 65.6% among pregnant women attending Federal Medical Center Owerri. Nwagha et al. [16] reported a prevalence of 58.0% and Ogbodo et al. [17] recorded a prevalence of 59.9% in Ebonyi state. In contrast, the current finding is higher than Bello and Ayede [18] who observed prevalence of 4.3% among pregnant women in Ibadan and 10.2% observed in Ethiopia [19]. The observed prevalence of malaria in this study may be attributed to the attitude of many of the respondents during their pregnancy, where majority who had malaria registered for antenatal care in their second or third trimester. This seems to be a common practice in the area as it conforms to the study conducted in Zaire, where most of the pregnant women attended antenatal clinics for the first time in their sixth or seventh month of gestation and made three to four visits before delivery. This practice is detrimental as it does not allow for early diagnosis of malaria and complications such as anaemia during pregnancy [20].

Younger pregnant women appeared to be more susceptible to malaria in this study. Prevalence was highest in age group 15 – 20 years (40%), while age group of 36 – 40 years had the least prevalence of malaria, 23.1%. The primigravidae had the highest prevalence (36%), while the multigravidae had the least prevalence (19.23%). The observation here was lower than the report of Ogbodo et al. [17] where primigravidae had 45.8%. This has been attributed to the substantial reduction in the levels of immunity associated with first and second pregnancies [20].

This study also showed that pregnant women who were in their first trimester had the highest prevalence (50%), followed by the women in their second trimester (23.8%). A similar result among pregnant women (49.4%) was reported in Ebonyi state in the first trimester and 27.2% in the second trimester [20] and also 59.9% observed among pregnant women in their first trimester by Ogbodo et al. [17]. This may be so because in holo-endemic areas, parasite density and clinical malaria are most prevalent in the first trimester and early second trimester, as this period corresponds to the period during in which the most significant decrease in humoral and cell mediated immunity to malaria occur.

Packed cell volume level <33% was observed more in women with higher parity than in primigravidae. This may be due to repeated pregnancies at shorter intervals without allowing for replenishment of the iron stores. There was no recorded case of blood transfusion in all respondents that had anaemia, as has been advocated in cases of severe anaemia [21]. Furthermore, the women were not given IPT during antenatal, except when they were diagnosed of malaria.

Table 4. Haemoglobin concentration level according to gravidity of the pregnant women

Gravidity	No	Anaemia assessment: Haemoglobin concentration (Hb) <11g/dl			Total	Haemoglobin concentration (Hb)≥11g/dl	Percentage prevalence (%) of Hb <11g/dl	Percentage prevalence (%) 0f Hb ≥11g/dl
		Mild (<11g/dl)	Moderate (≤8g/dl)	Severe (≤5g/dl)				
Primigravidae	200	76	44	-	120	80	60	40
Multigravidae	208	108	20	-	128	80	61.5	38.5
Total	408	184	64		248	160	60.8	39.2

(P > 0.05) (X^2 tab =3.841 > X^2 cal =0.025; d.f = 1)

Table 5. Prevalence of both malaria parasitaemia and Haemoglobin level <11g/dl according to gravidity of the pregnant women

Gravidity	No	Anaemia assessment: Haemoglobin concentration (Hb) <11g/dl and malaria positive			Total	Percentage prevalence (%)
		Mild (<11g/dl)	Moderate (≤8g/dl)	Severe (≤5g/dl)		
Primigravidae	200	36	12	-	48	24
Multigravidae	208	20	12	-	32	15.4
Total	408	56	24	-	80	19.6

(P > 0.05) (X^2 tab =3.841 > X^2 cal =1.1; d.f = 1)

Table 6. Haemoglobin concentration level according to Trimester of the pregnant women

Trimester	No	Anaemia assessment: Haemoglobin concentration (Hb) <11g/dl			Total	Haemoglobin concentration (Hb)≥11g/dl	Percentage prevalence (%) of Hb <11g/dl	Percentage prevalence (%) 0f Hb ≥11g/dl
		Mild (<11g/dl)	Moderate (≤8g/dl)	Severe (≤5g/dl)				
FIRST	96	32	-	-	32	64	33.3	66.7
SECOND	168	124	20	-	144	24	85.7	14.3
THIRD	144	48	24	-	72	72	50	50
TOTAL	408	204	44		248	160	60.7	39.3

Table 7. Prevalence of both malaria parasitaemia and Haemoglobin level <11g/dl according to Trimester of the pregnant women

Trimester	No	Anaemia assessment: Haemoglobin concentration (Hb) <11g/dl and malaria positive			Total	Percentage prevalence (%)
		Mild (<11g/dl)	Moderate (≤8g/dl)	Severe (≤5g/dl)		
FIRST	96	12	-	-	12	12.5
SECOND	168	36	8	-	44	26.2
THIRD	144	16	4	-	20	13.9
TOTAL	408	64	12	-	76	18.6

5. CONCLUSION

A reasonable number of the study participants had malaria parasites, with a greater number of the women having a hemoglobin value less than 11g/dl. Younger pregnant women appeared more susceptible to malaria parasites. These findings are an indication that the problem of malaria in pregnancy is not abating. Since maternal death may result from complications of severe malaria and anaemia, periodic evaluation of the impact of available tools in reducing the burden of malaria in pregnancy is recommended. The quality of antenatal care received by pregnant mothers needs remarkable improvement. Early antenatal registration, regular attendance at antenatal clinics and judicious use of the recommended intermittent preventive treatment for malaria will reduce the morbidity and mortality associated with this problem.

CONSENT AND ETHICAL APPROVAL

Ethical approval to conduct the study was obtained from the Health Research Ethical Committee of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka Anambra State (Ref: COOUTH/CMAC/Eth.c/VOL. 1/0097). Oral Informed consents were obtained from the pregnant women prior to specimen collection.

CONFERENCE DISCLAIMER

Some part of this manuscript was previously presented and published in the following conference.

Conference name: 2021 Annual Meeting (TropMed21)
Dates: November 17-21, 2021
Location: Maryland, USA
Web Link of the proceeding:https://midasnetwork.us/astmh-2021-annual-meeting/

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World Health Organisation. World malaria report: 20 years of global progress and challenges, 2020.
Available:https://www.who.int/publications/i/item/9789240015791
Accessed on 13/08/2021
2. Irikannu KC, Chukwuekezie OC. Malaria and man-biting mosquitoes in tropical Africa. Lambert Academic Publishing, Deutschland Germany; 2015. ISBN: 978-3-659-76718-0.
3. Akulue JC, Ekwunife AC, Umeanaeto PU, Amilo GI, Ochiabuto OMTB, Onwuasoanya UF, Irikannu KC, Ekekwe EN. A comparative analysis of different diagnostic techniques for malaria. International Journal of Novel Research in Healthcare & Nursing. 2017;4(2)73-78.
4. World Health Organization. Fact sheet: World Malaria Report, World Health Organization, 20 avenue: Appia 1211, Geneva 27, Switzerland; 2015.
5. World Health Organization. Fact sheet: World Malaria Report, World Health Organization, 20 avenue: Appia 1211, Geneva 27, Switzerland; 2011.
6. Taura DW, Oyeyi TI. Prevalence of malarial parasites in pregnant women attending Sir Muhammad Sunusi Specialist Hospital, Kano, Nigeria. Bayero Journal of Pure and Applied Sciences. 2009;2:186-8.
7. World Health Organization. Fact sheet: World Malaria Report, World Health Organization, 20 avenue: Appia 1211, Geneva 27, Switzerland; 2018.
8. Steketee RW, Wirima JJ, Campbell CC. Development of effective strategies for

malaria prevention programs from pregnant African Women. Annual Journal of Tropical Medicine and Parasitology. 1996;55(1):95-100.
9. Emiasegen SE, Fatima JG, Ajumobi O, Ikeoluwapo OA, Saad AA, Adebola TO. Asymptomatic Plasmodium falciparum parasitemia among pregnant women: A health facility based survey in Nassarawa-Eggon, Nigeria. Malaria World Journal. 2017;8:7.
10. World Health Organization. Fact sheet: World Malaria Report, World Health Organization, 20 avenue: Appia 1211, Geneva 27, Switzerland; 2017.
11. Grigg MJ, Barber BE, Marfurt J. Artesunate-mefloquine versus chloroquine for treatment of uncomplicated Plasmodium knowlesi malaria in Malaysia: an open-label, randomised controlled trial. Lancet Infectious Diseases. 2016;16(2): 180-188.
12. Ashley AE, Pyae PA, Woodrow C. Malaria. The Lancet. 2018;391. DOI:10.1016/S0140-6736(18) 30324-6
13. Cheesbrough M. District laboratory practice in tropical countries 2nd Edition update Part 1. Cambridge University Press Edinburgh, UK. 2006;239-242.
14. Ukibe SN, Ukibe NR, Mbanugo JI, Ikeakor LC. Prevalence of malaria among pregnant women attending antenatal clinics in hospitals in Anambra State, south-east, Nigeria. Nigerian Journal of Parasitology. 2016;37(2):240-244.
15. Iwuchukwu IC, Vincent CN. Studies on prevalence of malaria and its adverse fetal outcomes in Federal Medical Centre (FMC), Owerri, IMO State, Nigeria. Archives of Community Medicine and Public Health. 2021;7(2):151-163. DOI: 10.17352/2455-5479.000156
16. Nwagha UI, Ugwu VO, Nwagha TU, Anyaechie USB. Asymptomatic *Plasmodium* parasitemia in pregnant women; almost a decade after Roll Back Malaria. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2009; 103:16-20.
17. Ogbodo SO, Nwagha UI, Olaka ANC, Ogeniyi SC, Okoko RO, Nwagha TU. Malaria parasitemia among pregnant women in rural communities of Eastern Nigeria; Need for combined Measures. Nigerian Journal of Physiological Sciences. 2009;246:95-100.
18. Bello FA, 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. PMID: 32669988; PMCID: PMC7358809.
19. Gontie GB, Wolde HF, Baraki AG. Prevalence and associated factors of malaria among pregnant women in Sherkole district, Benishangul Gumuz regional state, West Ethiopia. BMC Infectious Disease. 2020;20:573. DOI:https://doi.org/10.1186/s12879-020-05289-9
20. Nwonwu EU, Ibekwe PC, Ugwu JI, Obarezi HC, Nwagbara OC. Prevalence of malaria parasitaemia and malaria related anaemia among pregnant women in Abakaliki, south east Nigeria. Nigerian Journal of Clinical Practice. 2009; 12(2):182-186.
21. Okafor AC, Ekwunife CA, Umeanaeto CU, Irikannu KC. Malaria parasitaemia and intensity among voluntary blood donors in Port Harcourt Metropolis, Rivers State, Nigeria. South Asian Journal of Parasitology. 2020;4(4):9-17.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/90510