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Prevalence of *Falciparum* Malaria in Relation to Age, Gravidity, Trimester, Blood Group and Genotype among Pregnant Women

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Authors' contributions

This work was carried out in collaboration among all authors. Authors CAI and J. C. Ozougwu designed the study, carried out the hospital and the laboratory analyses for the study. Authors J. C. Ozougwu and JEE performed the statistical analysis, wrote and proof-read the manuscript. Authors OPO, GUA, SCE and J. C. Ogbodo managed the literature searches and wrote the protocols. All authors thoroughly proof read and approved the final manuscript.

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ABSTRACT

Aim: This study was undertaken to ascertain the prevalence of falciparum malaria in relation to age, gravidity, trimester, blood group and genotype among pregnant women attending antenatal in Model Primary Health Centre, Omoku, Rivers State.
Methodology: The study was carried out from January to December, 2019, venous blood samples were collected from six hundred and ten pregnant women selected by simple random sampling, thick and thin blood films were made, stained with giemsa stain and viewed under the light microscope. ABO Blood group and haemoglobin genotype were determined using standard

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methods. Statistical result was performed using statistical package for social sciences version 20.
Results: The overall prevalence of malaria in relation to age showed that out of the 610 pregnant women tested, 320 were positive for malaria giving an overall prevalence of 52.5%. The age group between 46 – 50 yrs had the highest prevalence of malaria 100%, while the age group 36-40 yrs recorded the least prevalence of malaria 11.1%. The prevalence of malaria in relation to gravidity showed that the multigravida had higher prevalence (96.3%) than primigravida which had 45.5%. The overall prevalence of malaria in relation to gravidity is 54.9%. With regards to trimester, it showed that pregnant women in their second and third trimester both had the highest prevalence of malaria 57.0%, while those in the first trimester had the lowest prevalence of 50%. For blood group it showed that the blood group with the highest prevalence was AB (76.1%), while blood group A had the least prevalence (24.7%). The overall prevalence of malaria in relation to blood group is 55.6%. In relation to genotype, it showed that genotype AA had the highest prevalence of 85.2%, while the least prevalence was seen among AS genotype (35.4%). Prevalence values were statistically significant at $P < 0.05$.
Conclusion: This study showed that malaria in pregnancy is still endemic in Omoko, Rivers State, Nigeria. The high prevalence observed in most groups could be because rainy season lasts longer yearly which favours the breeding of Anopheles Mosquito, the malaria vector. There is need for adequate enlightenment on the malaria preventive and control measures to reduce the prevalence of malaria in pregnancy.

Keywords: Prevalence; Plasmodium falciparum; age; gravidity; trimester; blood group; genotype; pregnant women.

1. INTRODUCTION

Malaria in pregnancy is a major health concern due to malaria related maternal illness and low birth weight which are frequently the consequence of *Plasmodium falciparum* infection [1]. The symptoms and complications of malaria in pregnancy vary according to the malaria transmission pattern in a given geographical place and also a person's condition of acquired immunity [1]. Malaria portends great danger to nearly 3.3 billion persons in 97 countries and leads to 214 million cases that causes almost 600,000 deaths yearly [2]. *P. falciparum* causes nearly 80% illness and 90% mortality; its clinical manifestations include headache, fever, body pains, body weakness and loss of appetite. Malaria is known to cause the death of above one million persons annually especially in pregnant Africa women where malaria is mostly asymptomatic and a key cause of maternal anaemia, low birth weight and infant death [3,4]. Studies have proven that 50 percent of Nigerians, at the very minimum, suffer from one malaria attack annually [5] and the high prevalence rates of malaria in pregnancy has been reported in several areas of Nigeria, from 19.7% to 72.0% [6]. Anaemia, miscarriages and low birth weight have been noted as the major devastating consequence of malaria in pregnancy which leads to 11% of maternal mortality in parts of Nigeria [7]. Some reports have revealed that malaria infection is predominant in primigravida than in multigravida [8] and the transmission pattern of malaria is powerful and stable in Nigeria due to the fact that the infection stays fairly constant throughout the year. Malaria is holoendemic within Nigeria and *P. falciparum* is responsible for ninety five percent of all malaria infections in Nigeria [9]. The primary effect of malaria infection is because of the existence of malaria parasite in the placenta which leads to maternal anaemia and low birth weight [10,8]. World Malaria report showed that Nigeria had 39% of all malaria reported in the 45 malaria endemic countries in Africa [11]. This could be because of the large number of Nigerians in a place of constant malaria attacks. During pregnancy, malaria inclines to be more unusual in clinical manifestations, because of the immunological and hormonal variations. The prevalence of malaria is more and its sternness larger in pregnant women than non - pregnant women, because during pregnancy, immunity status has been altered; making 70 - 80% of pregnant women in Malaria endemic places more vulnerable [8]. In first trimester regardless of parity standing, *P. falciparium* infection upsurges the probability of still birth, abortion, maternal anaemia, low birth weight and intrauterine growth retardation. The ABO blood is thought to play a significant part in protection against severe malaria attacks although the mechanism of this protection is not well established [12]. This study is designed to determine the prevalence of

malaria in relation to age, gravidity, trimester, ABO blood group and genotype among pregnant women attending antenatal clinics in Modern Primary Health Centre, Omoku Rivers state, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

This study was conducted in Modern Primary Health Centre, Omoku, located in River state, Nigeria. Malaria Patients in the hospital are usually of the low, moderate and high socio-economic status. The climate of the study area is basically rainy and dry season, the dry season lasts from November to March while the rainy season lasts from April to October every year.

2.2 Study Population

Blood samples were collected from six hundred and ten pregnant women between the ages of 15 and 50 years, who came for their antenatal routine checkup at Modern Primary Health Centre, Omoku, Rivers, State, Nigeria between January and December, 2019 and were used for this study. They were selected randomly without previous knowledge of their medical background. Structured questionnaires were given to pregnant women who came to the hospital to get the essential data, needed for the study.

2.3 Sampling Method

Random sampling through balloting was employed for the selection of pregnant women for the study. Pieces of papers written either Yes or No were picked by the pregnant women and those that picked yes were chosen for the study.

2.4 Blood Collection

Safety procedures for collection of blood samples were implemented, finger-prick blood samples were obtained by swabbing the area with 70% alcohol and allowed to dry before collection using routine methods [13]. Thick and thin blood films were made on the same slide and labelled properly for the recognition of malaria parasite and identification of the Plasmodium species present respectively [14]. About 10% Giemsa stain was used to stain the blood films. Before that, the thin blood film was fixed using methanol for 2 minutes. The diluted stain was then positioned on the slides until it enclosed the thick and the thin blood films. This was permitted to stand for 30 minutes and then cleaned off. The back of each slide was washed and put in a draining rack for it to dry. The thick and thin blood films were observed using a light microscope at x100 oil immersion objective lens. The thick blood film was observed first to check for the presence of malaria parasite. Examination of the thin blood film was done next for the detection of the Plasmodium species existing using routine methods [13]. For the purpose of this study only *Plasmodium falciparum* were used.

2.5 Determination of ABO Blood Group and Genotype

The ABO blood grouping was carried out on the subjects using routine methods [15]. Haemoglobin electrophoresis was done by means of cellulose acetate alkaline haemoglobin electrophoresis method, which permitted for the distinction of haemoglobin A, F, S, and C into separate bands. Haemolysate from every sample was prepared and electrophoresed in a haemoglobin electrophoresis chamber comprising Tris buffer solution for about 20 minutes at 230 V. Haemolysate from each blood sample, whose haemoglobin types are known were used as control. The result was obtained by making a comparison of the distance of migration of the test with the controls.

2.6 Data Analysis

Data collected were pooled and analyzed using Chi-square test and statistical significance was set at $P < 0.05$. All analyses were performed using statistical package for social sciences version 20.0.

3. RESULTS

A total of 610 pregnant women were used in the study and they were interviewed via a structured questionnaire for essential information before blood samples were taken to check for the presence of *P. falciparum*. The overall prevalence of malaria in relation to age among pregnant women in the study area showed that out of the 610 pregnant women tested, 320 were positive for malaria giving an overall prevalence of 52.5%. The age group between 46 – 50yrs had the highest prevalence of malaria 100%, followed by 41- 45yrs which had 80.0%, then by 21-25 age group (64.2%), while the age group 36-40 recorded the least prevalence of malaria 11.1%. The differences between the prevalence of malaria in different age groups were

statistically significant (P < 0.05). The prevalence of malaria in relation to gravidity showed that the multigravida had higher prevalence of 60.3% than the primigravida which had a prevalence of 45.5%. The overall prevalence of malaria in relation to gravidity is 54.9%. The differences between the prevalence of malaria in different gravida were statistically significant (P < 0.05). The prevalence of malaria in relation to trimester showed that pregnant women in their second and third trimester both had the highest prevalence of malaria 57.0%, while those in the first trimester had the lowest prevalence of 50%. The overall prevalence of malaria in relation to trimester is 54.9%. The differences between the prevalence of malaria among the trimesters showed that they are statistically significant (P < 0.05).

The prevalence of malaria in relation to blood group showed that the blood group with the highest prevalence was AB (76.1%), while blood group A had the least prevalence (24.7%). The overall prevalence of malaria in relation to blood group is 55.6%. The differences between the prevalence of malaria among the blood groups showed that they are statistically significant (P < 0.05). The prevalence of malaria in relation to genotype showed that genotype AA had the highest prevalence of (85.2%), while the least prevalence was seen among AS genotype (35.4%). The overall prevalence of malaria in relation to genotype is 56.4%. The differences between the prevalence of malaria among the genotypes showed that they are statistically significant (P < 0.05).

Table 1. Prevalence of malaria among pregnant women in relation to age

Age (yrs)	Number examined	Number positive	Percentage prevalence (%)
15-20	30	10	33.3
21-25	140	90	64.2
26-30	180	90	50
31-35	110	70	63.6
36-40	90	10	11.1
41-45	50	40	80.0
46-50	10	10	100
Total	**610**	**320**	**52.5**

Table 2. The prevalence of malaria in relation to gravidity

Gravidity	Number examined	Number positive	Percentage prevalence (%)
Primigravida	220	100	45.5
Multigravida	390	235	60.3
Total	**610**	**335**	**54.9**

Table 3. Prevalence of malaria in relation to trimester

Trimester	Number examined	Number positive	Percentage prevalence (%)
First	180	90	50
Second	230	131	57.0
Third	200	114	57.0
Total	**610**	**335**	**54.9**

Table 4. Prevalence of malaria in relation to blood Group

Blood group	Number examined	Number positive	Percentage prevalence (%)
A	170	42	24.7
B	141	95	67.4
AB	92	70	76.1
O	207	132	63.8
Total	**610**	**339**	**55.6**

Table 5. Prevalence of malaria in relation to genotype

Genotype	Number examined	Number positive	Percentage prevalence (%)
AA	264	225	85.2
AS	322	114	35.4
SS	24	5	20.8
Total	**610**	**344**	**56.4**

4. DISCUSSION

The outcome of this study has shown that *P. falciparum* is prevalent in Omoku, Rivers State. It was evident that *P. falciparum* was the major specie seen among pregnant women in the area which was in line with the earlier report [16]. The prevalence of malaria changed substantially between age groups, gravidity, trimester, blood group and genotypes of the subjects examined. In relation to age group, the result from this study showed that age group between 46 – 50yrs had the highest prevalence of malaria while the age group 36-40yrs recorded the least prevalence of malaria 11.1%. Our findings are in line with [17] in Oshogbo, Nigeria but not in agreement with previous report [18] in Anambra, Nigeria where they documented the maximum prevalence in age group below 21 years. The prevalence of malaria in relation to gravidity showed that the multigravida had higher prevalence of 60.3% than the primigravida which had a prevalence of 45.5%. This could probably be due to low state of specific immunity to malaria parasite and the immunological variations throughout pregnancy. This is in agreement with the report of [19] done in Angola which showed that multigravida recorded the largest prevalence of malaria. The prevalence of malaria in relation to trimester showed that pregnant women in their second and third trimester both had the highest prevalence of malaria 57.0%, while those in the first trimester had the lowest prevalence of 50%. Our findings disagreed with earlier report [8] in Kenya and [20] in Nigeria, although in line with the findings of [21] which indicated that pregnant subjects in their second trimester were most susceptible to malaria. The prevalence of malaria in relation to blood group showed that the blood group with the highest prevalence was AB (76.1%). Earlier reports showed that persons of blood group A and B are more prone to malaria infection than persons of blood group O. Nevertheless, the infection fluctuates due to disparity in host vulnerability [22]. This may be due to the fact that there are no blood group antigens on the exterior of blood group O red cells, and therefore more quantity of receptors and probabilities of attachment of malarial parasites, where as in blood groups A, B and AB, the red cells are enclosed by individual blood group antigens with fewer number of receptor for malarial parasites and hence less probabilities for attachment of the parasite to these red blood cells [23]. The prevalence of malaria in relation to genotype showed that genotype AA had the highest prevalence of (85.2%), while the least prevalence was seen among AS genotype (35.4%). This is in agreement with the work of [24] which reported high prevalence of malaria parasite among persons with AA genotype.

5. CONCLUSION

This study showed that malaria in pregnancy is still endemic in Omoko, Rivers State, Nigeria. The high prevalence observed in most groups could be because rainy season lasts longer yearly which favours the breeding of Anopheles Mosquito, the malaria vector. There is need for adequate enlightenment on the malaria preventive and control measures to reduce the prevalence of malaria in pregnancy.

CONSENT

Voluntary informed-consent was gotten after each pregnant woman was given information concerning the aim of the study and guarantee of confidentiality. The subjects for this study are pregnant women attending antenatal at Modern Primary Health Centre, Omoku.

ETHICAL APPROVAL

The study protocol was approved by Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. The aim of the research was well elucidated to the pregnant women after which their consent was obtained before samples were taken. Ethical clearance was obtained from the ethical committee of Modern Primary Health Centre, Omoku. The clearance was on the agreement that patient anonymity must be maintained, good laboratory practices and information must be treated with utmost confidentiality and for the purpose of research only.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World Health Organization: World Malaria Report (2019). World Health Organization, Geneva; 2019.
2. WHO. Global technical strategy for malaria (2016-2030). World Health Organization. 20 Avenue Appia, 1211 Geneva 27; 2015. Switzerland.
3. World Health Organization: World Malaria Report (2018). World Health Organization, Geneva; 2018.
4. Adefioye OA, Adeyeba, OA Hassan WO, Oyeniran OA. Prevalence of Malaria Infection among pregnant women in Osogbo South West Nigeria. American-Eurasian Journal of Scientific Research. 2007;2(1):43-5.
5. Odongo CO, Odida M, Wabinga H, Obua C, Byamugislic J. Burden of placental malaria among pregnant women who use or do not use intermittent preventive treatment at Mulago Hospital, Kampala. Malaria Research and Treatment. 2016; 8-14.
6. Emiasegen SM, Fatima JG, Ajumobi O, Ajayi IO, Ahmed SA, Olayinka AT. (2017). Asymptomatic Plasmodium falciparum parasitaemia among pregnant women: a health facility based survey in Nassarawa-Eggon, Nigeria. Malaria World Journal. 2017;8(7):205-367
7. Federal Ministry of Health. Malaria situation analysis document. Federal Ministry of Health. 2000;14.
8. Akanbi OM, Odaibo AB, Olaturegun RS, Ademowo OG. Role of malaria induced stress on anaemia in pregnancy. Asian Pacific Journal of Tropical Medicine. 2010;3:211-4.
9. Bawa JA, Auta T, Liadi S. Prevalence of Malaria: Knowledge, Attitude and Cultural practices of Pregnant Women in Katsina Metropolis, Nigeria. European Scientific Journal. 2014;10(21):148-167.
10. Aribodor DN, Ugwuanyi IK, Aribodor OB. Challenges to Achieving Malaria Elimination in Nigeria. American Journal of Public Health Research, 2016;4(1):38-41.
11. World Health Organization: World Malaria Report (2014). World Health Organization, Geneva; 2014.
12. Agbolanho JJ. Response to malaria epidemics in Africa. Emerging Infectious Diseases. 1993;13(5):68–186.
13. Cheesbrough M. District Laboratory Practice Manual in Tropical Countries, Part 2. Cambridge University Press, Second Edition, New York. 2000;321-340.
14. WHO. Malaria Diagnosis, New Perspectives. Geneva, World Health Organisation. WHO/CDS/RBM/ 2000.14.
15. Dacie JV, Lewis SM. Investigation of haematological disorders: Practical haematology. Churchill Livingstone Edinburgh United Kingdom. 2006;177-180.
16. Iwueze MO, Okwusogu MI, Onyido AE, Okafor FC, Nwaorgu OC, Ukibe AE. Prevalence, Intensity and Clinical profile of malaria among pregnant women attending antenatal clinics in Onitsha North Local Government Area, Anambra State, Southern Nigeria. The Bioscientis. 2014; 2(1):17-9.
17. Amodu, OK, Olaniyan SA, Adeyemo AA, Trove-Blomberg M, Olumese PE, Omotade OO. Association of Sickle cell trait and the ABO group with clinical severity of malaria in Southwest, Nigeria. Act. Trop. 2012; 123(2):72-77.
18. Amala SE, Nwibani CP. Malaria in Children, Its Association with ABO blood group and Haemoglobin Genotype. International Journal of Development Research. 2015; 5(11):5958-62.
19. Uneke CJ, Ogbu O, Nmojiji V. Potential risk of induced malaria by blood transfusion in South East, Nigeria. Mc Gill Journal. Med. 2006;9:8-13.
20. Olasunkanmi OI, Akhigbe OA, Akinjimi AA, Okerentugba PO, Onajobi IB, Okonko IO. Prevalence of Malaria Plasmodium among children in Abeokuta, Nigeria. Academia Arena. 2013;5(10):41-7.
21. Okonko IO, Adejuwon AO, Okerentungba PO, Frank PN. Plasmodium falciparum and HIV amomg children presentation at the out patients clinic in Oni Memorial Children hospital in Ibadan Southwestern Nigeria. Nature and Science. 2012;10(8): 94-100.
22. Gayathri BN, Harendra KML, Gomathi N, Jeevan S, Reethesh RP. Relationship between ABO blood groups and malaria with clinical outcome in rural area of South India. Glob J Med Public Health. 2013;2: 1-7.
23. Singh G, Urhekar AD, Si R. A study on correlation of malaria infection with A, B,

O, RH blood group system. J. Parasitol Vector Biol. 2015;7:67-73.

24. Esan AJ, Ifeanyichukwu MO. Effect of haemoglobin genotype variants on pre, post anti-malaria drug treatment in Plasmodium falciparum malaria infected and non-infected individuals on blood cell line parameters in Ido- Ekiti. International Journal of Science and Research. 2012;1763–1769.

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