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Prevalence of malaria parasitaemia among pregnant women attending three selected health centers in ideato south local government area, imo state

Abstract

This a community based study of prevalence of malaria parasitaemia in pregnancy carried out in three selected health centres in Idea to south LGA of Imo state. A simple random sampling technique was used to select the areas of study as well as the 120 participants used for the study. A checklist was used to collect the socio–demographic data of the subjects within the age range of 16–40years. Venous blood sample of the subjects were collected from the subjects and examined for presence of malaria parasites using standard procedures of haemoglobin and packed cell volume. Seventy–eight (66.7%) tested positive to malaria parasite with the highest prevalence occurring in the third trimester (79.2%). Also, the distribution of occurrence in different gravidity groups observed the highest prevalence occurrence amongst the primigravidae (71.0%), followed by secundigravidae (63.2%) and multigravidae (40.0%). The result shows reduction in both the PCV and HB levels of the pregnant women indicating anaemia especially in their third trimester. The chi–square statistics indicated that there is a significant relationship between age and malaria parasitaemia among pregnant women, (x^2=1.84, df=4, p =0.05). The null hypothesis was therefore rejected at 0.05 alpha level.

Keywords: Malaria, Parasiteamia, Pregnancy, Trimester, Gravidity, Primigravidae, Secundigravidae, Multigravidae

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Abbreviations: HCG, Human Chorionic Gonadotropin; LBW, Low Birth Weight; SP, Sulphadoxin–Pyrimethamine; CQ, Chloroquine; IPP, Intermittent Preventive Treatment; ITN, Insecticide Treated Net; LBW, Low Birth Weight; LMP, Last Menstrual Period; CHEW, Community Health Extension Workers; PCR, Polymerase Chain Reaction

Introduction

Malaria is an acute; chronic and/or recurrent febrile protozoan infection haunting mankind since evolution; it has killed more people than all the wars; has greatly influenced our history and geography and has changed many of our genes.[1] It is transmitted from person to person by the bite of female anopheles mosquito. The infection may be acquired wherever there are human hosts carrying the parasite and sufficient susceptible female anopheles mosquitoes; the insect vector for the organisms. A humid environment is known to favour the development of the parasites in the mosquitoes;[2] person living in damp and humid environment are therefore prone to the attack of these mosquitoes. Pregnant women become more susceptible to the infection because their immune response is suppressed by Human Chorionic Gonadotropin (HCG) and prolactin levels which are high in pregnancy.[3]

The yearly mortality from malaria exceeds one million individuals with an estimated 300 to 500 million cases and 1.5–2.7 million deaths.[4] Globally; ~3.2 billion people are at risk of malaria; and 1.2 billion are at high risk; in 2015; malaria caused 214 million infections and 438000 deaths; nearly 90% of these deaths occurred in Africa.[1] The malaria parasite found to be predominant in the blood of pregnant women is *plasmodium falciparum*; findings from a study reported a *plasmodium falciparum* occurrence ratio of 17.4% versus 5.6% for pregnant and control women respectively.[5]

Malaria infection during pregnancy poses substantial risk to the mother; the foetus and the neonate; higher parasitaemia particularly in 2nd and 3rd trimesters; anaemia and altered placental integrity result in less nutritional support leading to low birth weight (LBW); abortion; still birth; premature birth and high infant morbidity/mortality.[1] The risk of pulmonary edema and post partum hemorrhage is also increased.[6] With these problems; it is obvious that malaria in pregnancy is a serious obstetric; social and medical problem requiring multidisciplinary and multidimensional care approach. This is much more the case considering the fact that high yearly mortality from malaria has been reported.

However the prevalence of malaria parasitaemia is said to be more common in first and second pregnancies and tends to decrease with increasing number of pregnancy. This decrease is attributed to a progressive increase in immunity level with increasing number of pregnancies.[7]

An important development in the epidemiology of malaria in pregnancy is the fact that sulphadoxin–prymethamine(SP); which has gradually replaced Chloroquine (CQ); as the first line treatment is already beginning to show reasonable failure rate.[8] It therefore becomes expedient to intensify efforts to identify the most effective drug or drug combination for use as chemoprophylaxis in pregnancy; and strategize preventive modalities for malaria infestation.

The use of intermittent preventive treatment (IPP) and insecticide treated net (ITN) currently advocated seem to be gaining grounds. It is believed that if pregnant women embrace these preventive modalities and comply with their usage; the threat to the health of pregnant women or her unborn child will be faulted.

The researchers in an attempt to determine the level of compliance to the malaria infestation prevention modalities are investigating the

prevalence of parasitaemia among pregnant women in Idea to South LGA; Imo State.

Specific objectives of the study

i. To determine the prevalence of malaria parasitaemia among pregnant women.

ii. To determine the gravidity with the highest occurrence of malaria parasitaemia.

iii. To determine the trimester of prevalence rate of occurrence of malaria parasitaemia.

Hypothesis

There is no significant relationship between age and malaria parasitaemia among pregnant women.

Materials and methods

The study area was Idea to south LGA. Three health centres located in Nwobosi; Ogboko and Umuma–Isiaku within the LGA were used. These health centres have only one trained midwife and each was assisted by community health extension workers (CHEW); and they have client capacity of 100 women per month.

Idea to LGA was carved out from the old Idea to LGA. It is made up of 10 towns which are located in areas of tropical rainforest with a network of streams and other water bodies which also serve as their sources of water supply. Igbo language is the commonest means of communication; their occupation is predominantly farming and petty trading.

All the pregnant women aged 16–40 years were the target population. A sample size of 120 was selected using simple random sampling.

A checklist was developed and used to collect data of the subjects aged between 16–40 years. The data included last menstrual period (LMP); age; parity; gravidity; duration of pregnancy. Secondly; the venous blood samples of the pregnant women who were not on anti–malaria or any other chronic disease treatment attending ante–natal clinics in the selected health centres were collected with sterile needles and syringes; sterile cotton wool moistened with 70% alcohol was used to sterilize the part of the body (Volar surface of the arm) from where the blood samples were drawn into EDTA containers. After drawing the blood samples from each subject the following tests were done,

Parasitological and haematological tests

Malaria parasite screening, The malaria parasite was detected by microscopic examination of Giemsa stained thick blood films. The parasitaemia was expressed as number of malaria parasite per microlitre of blood.

Thick blood film preparation, A thick blood smear was prepared by spreading a drop of blood placed on the centre of a clean grease free slide. This was allowed to air–dry for ten minutes. It was then rinsed under tap water; air–dried and a drop of immersion oil placed on it for examination with x100 objectives.

Packed cell volume (%) microhaematocrit technique of cheesbrough (2000).[9]

Principle of test, Anti coagulated blood in a glass capillary of specified length; bore size and wall thickness is centrifuged in microhaematocrit centrifuge at RCF 12000xg for five minutes to obtain constant packing of the red cells. A small amount of plasma remains trapped between the packed red cells. The PCV value is read from the scale of a microhaematocrit reader.

Method

Plain capillary tubes were ¾ filled with well mixed EDTA anti coagulated blood and sealed at one end with a sealant material (plasticine). The tubes were balanced in the microhaematocrit centrifuge with their sealed ends facing the outside away from the centre; touching the rubber gasket and were spun at 12000g for five minutes. The PCVs were calculated using the microhaematocrit reader.

Reference ranges (%),

Children at birth	0.44–0.54
Children 2–5 years	0.34–0.40
Children 6–12 years	0.35–0.45
Adult men	0.40–0.54
Adult women	0.36–0.46

Haemoglobin Estimation Using the Cyanmethaemoglobin Method of Cheesbrough (2000)

Principle of test, When whole blood is diluted in a solution of potassium ferricyanide and potassium cyanide; the haemoglobin is oxidized to methaemoglobin (fe^{3+}) by the potassium ferricyanide; $K_3fe(N)_6$ the potassium cyanide (KCN); then converts the methaemoglobin to cyanmethaemoglobin. The absorbance of the cyanmethaemoglobin at 540nm is directly proportional to the haemoglobin concentration.

Method, Into 4ml of Drabkin's solution in test tubes were dispensed 0.02ml of blood samples. The tubes were stoppered (i.e covered with cotton wool) and the constituents were mixed well. The tubes were allowed to stand at room temperature for five minutes. The wavelength of the colorimeter was set at 540nm; the colorimeter was zeroed with Drabkin's solution and absorbance of the positive samples were read.

Reference Ranges (g/l),

Children at birth	135–195
Children 2–5 years	110–140
Children 6–12 years	115–155
Adult men	130–180
Adult women	120–150

Results

Table 1 showed the age distribution of malaria parasitaemia among pregnant women. There are 10 pregnant women within the age range of 16–20; 7(70%) of them tested positive to malaria parasitaemia (MP); 3(30%) were negative; those within the age range of 21–25 were 28 and 17(60%) of them were positive to MP; 26–30 age range were 42 in number; 31(73.8%) were positive to MP; 31–35 and 36 –40 were 25 and 15 in numbers they had 16(64.0%) and 9(60%) positive to MP respectively.

Table 1 Socio Demographic Data of Subjects (n = 120)

Variable	No. of Cases Frequency	Mp + ve%	Mp–ve%
Age/years			

Citation: Frank MD, Robinson–Bassey GC, Akaeze GO. Prevalence of malaria parasitaemia among pregnant women attending three selected health centers in ideato south local government area, imo state. *Obstet Gynecol Int J.* 2016;4(3):103–106. DOI: 10.15406/ogij.2016.04.00111

Table continued...

Variable	No. of Cases Frequency	Mp + ve%	Mp–ve%
16–20	10	7 (70%)	3(30%)
21–25	28	17(60.7%)	11(37.3%)
26–30	42	31(73.8%)	11(26.2%)
31–35	25	16(64.0%)	9(36.0%)
36–40	15	9(60.0%)	6(40.0%)

Table 2 showed that 80(66.7%) of the pregnant women tested positive while 40(33.3%) tested negative.

Table 2 Prevalence of malaria parasitaemia among pregnant women (n = 120)

Variable	Frequency	Percentage	Prevalence
Malaria parasitaemia present	78	66.7%	65.0%
Malaria parasitaemia absent	42	33.3%	

Table 3 showed the percentage occurrence of malaria parasitaemia among women of various gravidity; 44 (71.0%) of the primigravidae were positive; followed by the secundigravidae 24(63.2%) then the multigravid 10(50%).

Table 3 Malaria parasitaemia among pregnant women by Gravidity (n = 120)

Variable	MP Present	MP Absent	Total
Gravida 1	44 (71.0%)	18 (29.0%)	62
Gravida 2	24 (63.2%)	14 (36.8%)	38
Gravida 3 and above	10 (50.0%)	10 (50.0%)	20
Total	78	42	120

Table 4 showed that 12(40%) of the pregnant women in their first trimester tested positive and 18(60%) were negative; 28(66.7%) of the pregnant women in their second trimester tested positive while 14(33.3%) were negative and 38(79.2%) of the pregnant women in their third trimester tested positive while 10(20.8%) were negative.

Table 4 Malaria parasitaemia among pregnant women by trimester with their PCV (%) and HB (g/dl) (n = 120)

Variable	MP Present %	Mp Absent %	Total	PCV(%)/HB (g/dl)
1st trimester	12(40.0)	18(60.0)	30	32.1± 5.8/10.7±1.9
2nd trimester	28(66.7)	14(33.3)	42	29.7± 4.4/9.8±1.5
3rd trimester	38(79.2)	10(20.8)	48	30.8±3.9/10.2±1.4
Total	78	42	120	

Table 5 Relationship between age and malaria parasitaemia among pregnant women

Variable	MP+ve	MP–ve	Total	Cal.x^2	Tab.x^2	Decision
Age/years				1.84	0.55	NS
16–20	7	3	10			
21–25	17	11	28			
26–30	31	11	42			
31–35	16	9	25			
36–40	9	6	15			

Cal x^2 =1.84; tab x^2=0.55; df=4; p=0.05.
NS= not significant

Since cal.x^2 =1.84 is greater than tabulated tab x^2 =0.55 at df =4; p =0.05; we reject the null hypothesis and accept the alternate hypothesis that ''there is significant relationship between age and occurrence of malaria parasitaemia in pregnancy".

Discussion

Prevalence occurrence of malaria parasitaemia among pregnant women

This study observed a prevalence occurrence of 65.0% of malaria parasitaemia. This is comparable to other works done in other areas; 63.5% in awka; Nigeria 2; 58.4% in Enugu; Nigeria 10; 17.4% in pregnant women versus 5.6% in non–pregnant women6. Similarly; studies from other malaria endemic parts of Africa have also reported significant variations in the prevalence of malaria parasitaemia among pregnant women. In Kenya; a prevalence of 26.1% was reported;[10] in Cameroun; 82.4%[11] while in Burkina; 21.5%.[12]

The wide ranges in the reported prevalence of malaria parasitaemia may be due to multiple factors; including; method of diagnosis either Polymerase chain reaction (PCR) or microscopy; seasonal changes; intensity of transmission; characteristics of the study population (knowledge of the cause of malaria and preventive measures against mosquito bite; parity; HIV status) and environmental conditions. The Human chorionic Gonadotrophin and prolactin are known to suppress the immune response of pregnant women; thus making them susceptible to malaria infection compared to non–pregnant women.[3]. This could also explain the reason for the high prevalence observed in most of these studies.

Malaria parasiteamia among pregnant women in their first; second and third trimesters; +ve and –ve

It was observed that women in their first trimester 12(40%) had lesser prevalence than those in their second 28(66.7%); and third 38(79.2%) trimesters respectively. This finding is supported by other findings which reported that over 70% of the infections were in the third trimester[6] and that the highest prevalence was second trimester as compared to third trimester.[1] In contrast; other findings observed that the prevalence of infection was higher during the first trimester of pregnancy and decreased steadily during the second and third trimesters. The reason may be because pregnant women generally do not attend antenatal clinic early in pregnancy and a large proportion of them might have unrecognised and untreated malaria infection as most infections are asymptomatic;[13] another reason could be because of peak prevalence of *P. falciparum* infection occurring between 9 and 16 weeks of gestation.[10]

Gravidity and occurrence of malaria parasitaesmia

The result of this study showed that the prevalence of MP is more in primigravida 44(71.0%); followed by secundigravida 24 (63.2%) while multigravida had only 10(50.0%). This was supported by the observations from other studies; susceptibility to MP was more in primigravida.[14] Primigravidae have been reported to be at greatest risk of malaria in pregnancy because of the lack of specific immunity to malaria which is acquired from exposure to malaria parasites during pregnancy.[13;15] There is a high prevalence of MP among primigravida which was attributed to the substantial reduction in levels of immunity associated with first and second pregnancies.[7] At higher parities; there appear to be a boosting of immunity with successive pregnancies provided there is exposure to malaria parasite. In areas of stable malaria transmission in sub– Saharan Africa; primigravida and to a lesser extent secundigravida are at higher risk of malaria infection and low birth weight.[16]

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PCV and HB values among pregnant women

Malaria parasite induces anaemia in pregnancy through several ways such as haemolysis of parasitized red blood cells. The result shows a greater reduction in both the PCV and HB levels of the pregnant women in their third trimester. This is supported by other findings which observed that there is anaemia due to malaria in pregnancy and it is more common and severe between 16–29 weeks.[17] Also; other studies reported a drop in Packed Cell Volume (PCV) as a result of the extra–vascular destruction of both parasitized and unparasitized erythrocytes that takes place in the spleen during malaria infection.[15]

Relationship between age and malaria parasitaemia among pregnant women

The chi–square statistics indicated that there is significant relationship between age and occurrence of malaria parasitaemia in pregnancy (x^2=1.84; df=4; p=0.05). The null hypothesis was rejected at 0.05 alpha level. This is compatible with the reports of other studies which reported that; prevalence of malaria parasitaemia according to age distribution of the volunteers showed the highest prevalence of infection (86.2%) occurring within the age group 36–40; also other studies observed that the highest prevalence of Plasmodium infection were among the age 36–39 years; younger maternal age had significant association with malaria parasitaemia.[18;19]

Conclusion

The pregnant women in the studied area have high prevalence (65.0%) of MP. The most vulnerable group is the primigravida while those in their first trimester had lesser prevalence.

The consequences of malaria in pregnancy are severe both on the mother; foetus and neonate; therefore concerted efforts are highly required to prevent the occurrence of malaria infection or curb its consequences. Some of these necessary efforts required to avert the problems associated with malaria infection in pregnancy include, timing of peak suppression as an intervention to reduce the severe adverse effects; training and re–training of health care workers especially at the primary health care level on the concepts; principles and practice of preventive measures as well as chemoprophylaxis; continuing education; specific counseling and health education on the problems associated with malaria in pregnancy; the various ways it can be prevented in order to increase acceptability of the recommended preventive measures. The women should also be encouraged to keep their surroundings clean to prevent mosquitoes from breeding around their homes.

Insecticide treated nets (ITNs) should be provided to the pregnant women free or at affordable prices as a way of encouraging them to practice preventive measures. Various studies have shown that ITNs is effective in the control of malaria among pregnant women and that the use of ITNs significantly reduced prevalence and mean parasite load of malaria parasitaemia in villages where it was used.

The current treatment with sulphadoxine–pyrimethamine (SP); which has gradually replaced chloroquine (CQ); as the first line treatment is already beginning to show reasonable failure rate; it therefore becomes necessary that efforts to identify the most effective drug or drug combination to use for chemoprophylaxis in pregnancy be intensified.

Acknowledgments

None.

Conflicts of interest

None.

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