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PREVALENCE OF MALARIA PARASITES AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT GENERAL HOSPITAL DUTSE, DUTSE, JIGAWA STATE, NIGERIA

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Abstract

This study was conducted to determine the prevalence of malaria parasites among pregnant women attending antenatal clinic at General Hospital Dutse, Dutse, Jigawa State, Nigeria between November and December, 2016. A total of 150 blood samples were collected from pregnant women attending antenatal clinic of the hospital selected using purposive sampling technique. The blood samples were collected by venepuncture and stored in EDTA bottles and were examined for presence of malaria parasites using Rapid Diagnostic Test (RDT) kit "Care Start Malaria HRP (pf)" that specifically detects Plasmodium falciparum. A questionnaire was designed and administered on the participants immediately after the collection of samples to record the biodata, status of infection and risk factors associated with malaria infection. Prevalence rates according to age group and gestational age of pregnancy revealed that in 1st trimester the highest was found in 26 -32 year age group, 2nd trimester was 9(6.03%) in 12 – 18 year age group and 3rd trimester was 5(3.35%) in 19 -25 year age group. Base on parity status of the pregnancy, multigravidae had the highest prevalence of 19(12.6%) than primigravidae with 6(4%). In term of preventive measures against malaria, pregnant women that do not apply indoor residual spray and do not use Insecticides Treated Bed Nets (ITNs) in their homes had the prevalence of 22(14.47%) and 17(11.38%) respectively. Also those pregnant women that had no netting in their doorways and windows in their houses had the highest prevalence of 19(12.66%). This clearly demonstrates the efficacy of preventive measures in reducing malaria infection. In spite of the

current malaria control program, this study showed that malaria in pregnancy is still endemic among pregnant women attending General Hospital Dutse. Therefore, there is need to sustain and improve the current control effort with emphasis on educating the pregnant women to adopt control measures such as sleeping under ITNs and netting of windows and doorways in houses.
Keywords: Prevalence, malaria, gestational age, trimester, primigravidae, multigravidae

INTRODUCTION

Malaria in pregnancy is an enormous public health problem particularly in malaria endemic areas in Africa. In sub-Saharan Africa alone, there are about 25 to 30 million pregnant women at risk of malaria infection due to *Plasmodium falciparum* that causes multiple adverse consequences for the pregnant women, the foetus and the newborn (Dellicour *et al*., 2010; WHO, 2004). Infection with *P. falciparum* that causes severe malaria in areas of high transmission is most common and associated with; maternal anaemia, low birth weight, spontaneous abortion, still birth and preterm labour (Bernard *et al.,* 2008). Although malaria during pregnancy puts all pregnant women at risk, clinical evidence shows that primigravidae are particularly more susceptible to severe forms of *P. falciparum* infection than multigravidae (Menendez, 1995). Nevertheless, recent evidence also suggests that consequences for infants of multigravidae women may be greater than previously expected (Desai *et al*., 2007). The burden of malaria infection during pregnancy is ever bigger with HIV coinfection (Ter Kuille *et al*., 2004).

In sub-Saharan Africa, where the burden of malaria during pregnancy is the greatest, malaria transmission is predominantly stable (WHO, 2003). Characteristic of malaria infection during pregnancy in stable transmission areas is that it is often asymptomatic due to the pre-existing immunity that has been acquired through frequent exposure to *P. falciparum* malaria infections since childhood. Absence of clinical symptoms such as fever makes it difficult to recognize the disease which therefore often remains untreated. Findings from clinical studies suggest that placental malaria is common and approximately one in four pregnant women has evidence of malaria infection at the time of delivery (Desai *et al*., 2007). For example, studies by Eneanya *et al.* (2009) reported low birth weights among women with placental malaria in Awka, Anambra State, Nigeria.

The burden of malaria in pregnancy has been an invisible public health problem for a long time because of its asymptomatic nature and therefore received relatively little attention among international organizations. Only recently the vulnerability of pregnant women and severe consequences of the disease for pregnant women and their infants have been recognized and efforts have been made to develop effective prevention and control strategies to mitigate the impact of the disease. At least 30 million women in malarious areas of Africa become pregnant with up to 200,000 new born deaths each year as a result of malaria in pregnancy (WHO, 2003). Through several global initiatives and summits to accelerate the control of malaria and efforts to build up partnership with maternal health programmes, there is now malaria control programme in pregnancy through focused antenatal care (FANC) and the WHO Making Pregnancy Safer Programme (Yartey, 2006 and WHO, 2008).

Jigawa State is one of the states with stable malaria transmission and despite efforts geared towards its control, the disease is still endemic in parts of the states including Dutse town. For instance, Ruqayyah *et al.* (2017) reported a prevalence of malaria due to *P. falciparum* of 13% and 50.6% using Rapid Diagnostic Test (RDT) and Microscopy (MIC) respectively in certain parts of Jigawa State. Ocheje and Dogara, (2016) reported a prevalence of 51% among patients of all age groups attending General Hospital Dutse while Salisu and Abdulhamid, (2015) in the same hospital reported a prevalence of 35.5% among children (0 – 15 years). These findings suggest that pregnant women may also have a share burden of infection with malaria in Dutse town. However, there are no documented reports on the prevalence of malaria in pregnancy in Dutse town, hence the need to carry out an investigation of this nature in order to provide information that could be useful in the state's effort to control malaria among pregnant women as enshrined in the Sustainable Development Goals (SDG).

MATERIALS AND METHODS

The study area

The research was carried out in the General Hospital Dutse, Jigawa State. Dutse is located in the Northwest geopolitical part of Nigeria, between longitudes 11.00^0N to 13.00^0N and latitudes 8.00^0E to 10.15^0E. It has an estimated population of 153,000 people in 2009. It currently has the highest population in Jigawa State followed by Hadejia (111,000), Gumel (43,000), and Birnin Kudu (27,000) (National Bureau for Statistics, 2006). The town is situated in Sahelian Savannah region.

Study design

The study design is descriptive and specifically cross sectional in approach that involves studying a representative population of pregnant women in a hospital setting within specific period of the year. It is also relational or co-relational in approach as it tries to establish association between certain variables such as gestational age and parity of the pregnancy, age of the pregnant women etc and malaria prevalence.

Study population, sample size and sampling technique

This study was carried out on 150 blood samples collected from pregnant women attending antenatal clinic of the General Hospital Dutse, Jigawa State between November and December, 2016. The subjects were selected using purposive sampling technique. The inclusion criteria were the consent approvals obtained from each of the participant while the exclusion criteria were from those who declined to participate. The sample size was obtained according to the following equation:

$$n = \frac{Z2pq}{d2}$$

Where: n = sample size

z = the normal standard deviate (z = 1.96)

p = the frequency of occurrence of malaria (1.6%)

q = 1-p
d = degree of precision (0.05%)

METHOD OF DATA COLLECTION

Procedure of sample collection and processing

One hundred and fifty blood samples were collected from all participants. The blood samples were collected by venepuncture, stored in EDTA bottles and examined for malaria parasite using Rapid Diagnostic Test (RDT) kit "Care Start Malaria HRP (*pf*)" that specifically detects *P. falciparum*. A drop of blood was added into the sample well and two drops of assay buffer were added into the developer well. Then the results were read after 20 minutes as follows: the presence of two bands "C" for control and "I" for test indicates a positive result while the presence of only one band "C" within the result window indicates a negative result according to manufacturer's instruction.

Questionnaire administration

A questionnaire was designed and administered on each of the 150 participants immediately after the collection of sample from each of them. The questionnaire was divided into two parts; with first for recording the biodata of the subject and the second for status of infection with *P. falciparum* as well as the risk factors (age, level of education, age of pregnancy, previous infection, previous treatment and type of preventive measures) associated with infection.

Method of data analysis

Statistical Package for Social Science (SPSS) software, version 22 was used to analyze data and Chi square was used to determine possible association between infection and exposure to different risk factors. Values were considered to be statistically significant when the p-value obtained was less than 0.05.

Ethical clearance

Ethical approval was obtained from Research Board, Department of Microbiology and Biotechnology, Federal University Dutse, Jigawa State and the Ministry of Health, Jigawa State. Consent to participate was obtained from all participants before being enrolled in the study. All participants were informed on the nature of the study.

RESULTS

General characteristics of the study population

The ages of the 150 pregnant women were between 12- 46 years with a mean of 29 years. Study subjects were divided into 3 gestational groups, trimesters (in months) as follows: 0 – 3, 4 – 6 and 7 – 9. The frequency of each gestational group was 8, 95 and 47 respectively (Table, 1). The age groups into which the participants were grouped are 12-18, 19-25, 26-32, 33-39 and 40-46 as shown in Table, 2.

Prevalence of malaria according to gestational age of the pregnant women

Out of the 150 pregnant women screened for *P. falciparum* malaria infection, 25 were positive representing 16.67%. From the number that were positive 2 (1.33%) were in their first trimester, 16(10.67%) in second trimester and 7(4.67%) in the third trimester. The difference in prevalence between the three trimesters was not significant at P = 0.776 (Table, 1).

Table 1: Prevalence of malaria according to gestational age of the pregnant women

Gestational Age	No. Examined	No. Positive	% Positive
1st Trimester (0 – 3)	8	2	1.33
2nd Trimester (4 – 6)	95	16	10.67
3rd Trimester (7 – 9)	47	7	4.67
Total	**150**	**25**	**16.67**

(X^2 = 0.508, df = 2, P =0.776)

Prevalence of malaria according to ages of the pregnant women

The prevalence according to age groups and gestational stage of the pregnancy revealed that out of the 2(1.33%) positive for 1st trimester, 1(0.67%) belonged to age group 26 – 32. Out of 16(10.67%) that were positive for 2nd trimester 9(6.03%) belonged to age group 12 – 18, 4(2.68%) were in 19 – 25, 2(1.34%) in 26 – 32, 1(0.67%) in 33 – 39 and none in 40 – 46. Among the 7 positive cases for 3rd trimester, 5(3.35%) belonged to age group 19 – 25, 1(0.67%) in 26 – 32 and 1(0.67%) in 40 – 46. The difference between prevalence rates among the different age groups in the 1st and 3rd trimesters was not significant, but in the 2nd trimester was significant at P = 0.040 (table 2).

Table 2: Prevalence of malaria according to age group of the pregnant women

Gestational Age (month)	Age group	No. Examined	No. Positive	%Positive
1st Trimester	12 – 18	4	0	0
(0 – 3)	19 – 25	1	1	0.67
	26 – 32	3	1	0.67
	33 – 39	0	0	0
	40 – 46	0	0	0
Subtotal		**8**	**2**	**1.34**
(X^2 = 4.44, df = 4, P = 0.108)				
2nd Trimester	12 – 18	25	9	6.03
(4 – 6)	19 – 25	35	4	2.68
	26 – 35	18	2	1.34
	33 – 39	9	1	0.67
	40 – 46	8	0	0
Subtotal		**95**	**16**	**10.72**
(X^2 = 9.537, df = 4, P = 0.040)				

3rd Trimester	12 – 18	3	0	0
	19 – 25	25	5	3.35
	26 – 35	10	1	0.67
	33 – 39	6	0	0
	40 – 46	3	1	0.67
Subtotal		**47**	**25**	**16.7**
Grand total		**150**	**25**	**16.7**

($X^2 = 3.083$, df = 4, P = 0.544)

Prevalence of malaria according to parity status of the pregnant women

Out of 25 positive samples, 6(4%) were primigravidae and 19(12.6%) were multigravidae. The difference between the prevalence rates among the two groups was not significant at P=0.114 (Table, 3).

Table 3: Prevalence of malaria according to parity of the pregnant women

Parity Status	No. Examined	No. Positive	% Positive
Primigravidae	21	6	4.0
Multigravidae	129	19	12.6
Total	**150**	**25**	**16.6**

($X^2 = 2.2.492$, df = 1, P = 0.114)

Prevalence of malaria according to application of Indoor Residual Spraying (IRS) by the pregnant women

Out of 25 positive cases, 1(0.67%) that had IRS in their locality 5 – 6 months ago was positive, 2(1.33%) that had IRS 7 months and above were positive and 22(14.47%) of those who never had IRS in their locality were positive. The difference between the prevalence rates in terms of application of IRS was not significant at P=0.155 (Table, 4).

Table 4: Prevalence of malaria according to application of indoor residual spraying (IRS) by the pregnant women

Last application of IRS (months)	No. Examined	No. Positive	%Positive
3 – 4	0	0	0
5 – 6	2	1	0.67
7 and above	5	2	1.33
Never	143	22	14.47
Total	**150**	**25**	**16.75**

($X^2 = 3.729$, df = 2, P = 0.155)

Prevalence of malaria according to use of Insecticide Treated Nets (ITNs) by the pregnant women

Out of 25 positive samples, the prevalence according to ITNs usage revealed that only 1(0.67%) were positive among those that always made use of ITNs, 3(2.01%) sometimes, 4(2.68%) rarely and 17(11.38%) never. The difference between the prevalence rates base on ITNs usage was significant at P=0.001 (Table, 5).

Table 5: Prevalence of malaria according to use of insecticide treated net (ITN) by the pregnant women

Frequency of ITNs use	No. Examined	No. Positive	% Positive
Always	23	1	0.67
Sometimes	43	3	2.01
Rarely	2	4	2.68
No use of ITN	82	17	11.38
Total	**150**	**25**	**16.75**

(X^2 = 17.542, df = 3, P = 0.001)

Prevalence of malaria according to use of doorway and window netting by the pregnant women

Out of 25 positive samples, 1(0.67%) of those that use window and doorway netting was positive, 4(2.67%) of those with only window net were positive, 1(0.67%) of those with only doorway net was positive, while 19(12.66%) with no netting on their window and doorway were positive. The difference in prevalence between the different groups was not significant at P=0.668 (Table, 6).

Table 6: Prevalence of malaria according to use of doorway and window netting by the pregnant women

Type of netting	No. Examined	No. Positive	% Positive
Window & doorway	15	1	0.67
Window only	20	4	2.67
Doorway only	9	1	0.67
No netting	106	19	12.66
Total	**150**	**25**	**16.67**

(X^2 = 1.161, df = 3, P = 0.668)

DISCUSSION

In this study an overall prevalence rate of 25(16.6%) of malaria infection due to *P. falciparum* among the pregnant women. The lower prevalence reported among pregnant women may be due to health education campaign given to them at the antenatal clinic they attend and the special care offered to them at family and community levels which reduces the risk of infection among this group. In addition, the lower prevalence recorded in this study may be attributed to the improved malaria control strategies like the use of long lasting insecticide treated net (LLIN) or alternative intermittent preventive with Pyrimethamine-Sulfadoxine (SP). The lower prevalence observed in pregnant women might also be for the reason that this study was conducted during the dry season. According to Ayanda, (2009) prevalence of *P. falciparum* infection is higher in the wet season than the dry season.

The result of this study is also in contrast with many other reports among pregnant women where higher prevalences were reported. Examples include those by Obi *et al.* (2012) with a reported prevalence of 50(50%) in Ihetti Uboma Local Government area, Imo State, Obinumba (2012) obtained a prevalence of 131(53.9%) in Ozubulu, Anambra State and Ukibe *et al.* (2016) observed a prevalence of 73.1% in Anambra State, Nigeria among pregnant women. However, Banao *et al.* (2010) reported a prevalence of 36.52% among pregnant women in Maradi, Niger Republic, which has somewhat similar climatic conditions with Jigawa State. The differences between this and previous studies except that of Banao *et al.* (2010) could be largely due to

continuous sustained transmission in southern part of the country, where they have longer period of rainfall. Other reasons could include the state's level of commitment towards the current national effort in malaria control and the knowledge, attitude and perceptions of the pregnant women towards malaria control.

In this study, the prevalence was highest among pregnant women in their second trimester which is in line with the works of Menendez, (1995) and Nosten *et al*. (1991) where highest prevalence was recorded in second and early third trimesters. However, Banao *et al*. (2010) and Ukibe *et al.* (2016) reported higher prevalences among women in their first trimester of pregnancy.

Findings from this study showed that younger women appeared to be susceptible to malaria as prevalence was highest among age group 12 – 18 (5.03%) in their second trimester followed by age group 19 – 25 (3.03%) in their third trimester. This is in line with findings of Dicko *et al.* (2003), Banao *et al.* (2010) and Ukibe *et al.* (2016) who opined that adolescents and young adult pregnant women were more susceptible to malaria than older pregnant women, because of continuous development of malaria immunity in older women.

In this study, malaria infection is more common among women with multiple births (multigravidae) 19(12.6%) as compared with primigravidae 6(4.0%). The relationship between the different parity was statistically insignificant (P=0.23). This is in contrast with the works of Brabin (1991), Akanbi *et al.* (2009), Banao *et al.* (2010) and Ukibe *et al.* (2016) whose studies revealed primigravidae were more susceptible to malaria infection than multigravidae. This difference may be due to poor nutrition of this study subjects which may lead to poor development of immunity against malaria.

Results from this study also revealed increased awareness of malaria control strategies which at least reduced the risks of the pregnant women becoming infected with malaria. The prevalence of malaria in those that had no IRS was (14.47%) (P=0.17), those that do not use ITN was (11.38%) (P=0.19). This high prevalence may be attributed to poor malaria control measures which increased their risk of having malaria infection. From these findings, there is no relationship between malaria infection and the risk factors except for situations in which ITN was not used.

CONCLUSION

This study recorded low prevalence of malaria parasites among pregnant women attending antenatal clinic in General Hospital Dutse. The low prevalence of malaria parasite may be due to improved malaria control strategies or because this study was conducted in dry season when prevalence of *P. falciparum* is low as Jigawa State is located in the northern Nigeria which is known to be endemic of malaria especially in the rainy season.

RECOMMENDATIONS

(1) This study and some other earlier studies recorded highest prevalence in young pregnant women <20 years old, to stem this trend, awareness on malaria prevalence measures during pregnancy should target young women even before they get married.

(2) Regular environmental sanitation to dislodge mosquitoes from their breeding places will go a long way to reduce prevalence of malaria in localities commonly seen in the tropics.

(3) Early antenatal booking for effective monitoring and prompt treatment of malaria in pregnancy will contribute significantly in reducing maternal morbidity and mortality, and its prenatal mortality.

(4) Several studies have shown that protection against malaria contributes to the prevention of malaria in pregnancy, thus highlighting the importance and efficacy of chemoprophylaxis and use of other methods of malaria control like insecticide impregnated nets. There is need to sustain the current enlightenment on the importance of intermittent preventive treatment of malaria and use of Insecticide treated bed nets in pregnancy.

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