



Prevalence of Malaria in Pregnant Women Attending Antenatal Clinic in Primary Health Centres in Lagos, South West, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author AO designed, carried out the field work and wrote manuscript. Author AB participated in the designing and manuscript writing. Author AB participated in carrying out the field work and writing manuscript. Author AC participated in manuscript writing and statistical analysis. Author SM participated in the manuscript writing. Author RO participated in carrying out the field work and writing manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2018/39620

Editor(s):

(1) Sevgul Donmez, Faculty of Health Sciences, Gaziantep University, Turkey.

Reviewers:

(1) Olapeju Esimai, Obafemi Awolowo University, Nigeria.

(2) Taratisio Ndwiga, Moi University, Kenya.

(3) Amala, Smart Enoch, Rivers State University, Nigeria.

Complete Peer review History: <http://www.science-domain.org/review-history/23935>

Original Research Article

Received 19th December 2017

Accepted 27th February 2018

Published 2nd April 2018

ABSTRACT

Introduction: Malaria infection during pregnancy is a significant public health problem, and pregnancy is known to alter the immune response of women to malaria primarily in tropical and sub-tropical regions; with substantial risks for the mother, her foetus and the newborn. The study investigated the prevalence of malaria infection in pregnant women attending an antenatal clinic in primary health care centers in Lagos State.

Methods: Malaria test was carried out on the participants, using Malaria Rapid Diagnostic Test

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RDT (Pf Pan kits) and thick and thin blood films were made from each participant on a slide for parasitaemia.

Results: A total of 202 participants were screened for the malaria parasite. The prevalence of malaria in the study participants was 4(2%). Out of the 4 participants that were infected with malaria 3 had *Plasmodium falciparum* and 1 had *Plasmodium ovale* species. The geometric mean parasite density was 309.5 parasite/ μ l of blood while the mean body temperature was $36.4\pm 0.28^{\circ}\text{C}$. None of the participants had fever. Haematocrit was standard for most of the participants 186 (94.0%) while mild and moderate anaemia was observed in 8(4.0%) and 4(2.0%) of the participants respectively.

Conclusion: In conclusion, malaria prevalence was very low among the pregnant women attending antenatal clinic in Lagos, the Participants had good knowledge that the transmission of malaria is by mosquitoes.

Keywords: Prevalence; Malaria; pregnancy plasmodium species.

1. INTRODUCTION

Malaria is a life-threatening public health parasitic disease. Globally, 25 million pregnant women are at risk of malaria every year in sub-Saharan Africa, the area most burdened by malaria. The disease is thought to cause as many as 10,000 cases of malaria-related deaths in pregnancy, mainly due to severe maternal anaemia, between 75,000 and 200,000 infants (children under the age of 12 months) are estimated to die annually as a result of malaria infection during pregnancy. Approximately 11% (100,000) of neonatal deaths are due to low birth weight resulting from *P.falciparum* infections in pregnancy [1].

The principal impact of malaria infection during pregnancy is due to the presence of parasites in the placenta, which causes maternal anaemia and low birth weight [2,3]. Beyond the post-partum period, the long-term consequences of malaria during pregnancy on the infant include poor development, behavioural problems, short stature and neurological deficits [3,4].

Protection of pregnant women living in malaria-endemic countries has been of particular interest to many malaria control programmes because of this group's higher susceptibility and reduced immunity. Nigeria, accounts for one-quarter of all malaria cases in the 45 endemic countries in Africa [5] and 11% of maternal deaths in the country are attributed to malaria [6,7]. Positively, malaria control measures have received a more significant attention in the last decade as increased funding has resulted in the scaling up of malaria control programmes. Use of Long Lasting Insecticidal Nets (LLINs) is one of the key components of malaria prevention and

control as recommended by the World Health Organization [8]. In a study carried out in North-western Nigeria, use of ITNs was found to be associated with malaria infection; pregnant women who did not use ITNs frequently were more affected by malaria as compared to those who did [9]. A previous study conducted in Otukpo also indicated that the rate of malaria increases with a proportionate decrease in the use of ITNs [10].

Another key intervention for controlling malaria and its effects during pregnancy is the administration of intermittent preventive treatment of malaria in pregnancy (IPTp). This consists of a full therapeutic course of antimalarial medicine given to pregnant women at routine ante natal visits, regardless of whether they are infected with malaria or not [6].

Intermittent preventive treatment reduces incidences of maternal malaria episodes, maternal and foetal anaemia, placental parasitaemia, low birth weight and neonatal mortality. Therefore, the WHO recommends IPTp with sulfadoxine-pyrimethamine in areas with moderate to high malaria transmission in Africa [11,6]. The last prevalence of malaria in pregnancy in Lagos and South Western Nigeria was reported in 2009 [12]. This is according to the literature search, that is about seven years ago. The government has not relented in the malaria control since then. This increase in malaria control measure the government had put in place now necessitated this study to determine the prevalence of malaria and assess the knowledge of pregnant women on a transmission of malaria infections in two Primary Health Centres in Mainland Local Government Area of Lagos State.

2. METHODS

A cross-sectional survey was carried from June to October 2016 at two different health centers (Iwaya and Simpson Primary Health Centers) located in Lagos Mainland Local Government, Lagos, Nigeria. Pregnant women attending antenatal clinics (ANCs) whose consent were sought to participate in the study were recruited during visit to the clinic. The study participants were given study numbers and personal identities were removed to ensure confidentiality after which questionnaire was also administered to each participant. Malaria test, temperature and Packed Cell Volume (PCV) was carried out on the Participants, their fingers were cleansed with an alcohol-moistened swab, allowed to air dry and pricked with a disposable blood lancet. Malaria Rapid Diagnostic Test was carried out using the RDT (Pf Pan kit), thick and thin blood films were made from each participant on a slide, allowed to dry and the thin film was fixed with absolute methanol, it was allowed to dry and the slides were stained immediately with 3% v/v Giemsa stain solution for 45 minutes. The stained slides were read under light microscope using x100 objective lens (immersion oil). Parasite densities were recorded as a ratio of parasites to White Blood Cells in thick films. *Plasmodium* parasites were counted against 200 White Blood Cells on the thick film. 500 White blood cells will be counted where less than nine parasites were counted after counting against 200 White Blood Cells. The Participants that test positive were referred to the doctor for antimalarial medication. Temperature of each participant was taken using thermometer. Blood was also collected into heparinized capillary tubes for the estimation of Packed Cell Volume (PCV).

Parasite density per μ L =

$$\frac{\text{Number of parasites counted} \times 8000}{200 \text{ WBC}}$$

2.1 Study Area

Lagos is the smallest state and former capital city of Nigeria. It is densely populated. 22% of the 787 square miles of the state is made up of lagoons and creeks. It stretches over 180km along the coast of the Atlantic Ocean. It extends westward to Badagry and eastwards to Epe, terminating in the riverine area of Lekki. Lagos is a socio-cultural melting point attracting both Nigerians and non- Nigerians alike, because of

its economic and sociopolitical importance. This has led to migration from the rural areas within the country to the city, hence the diversified ethnic composition of inhabitants of the state. The indigenes of Lagos are mostly Aworis, Eguns and Ijebus.

2.2 Inclusion Criteria

Inclusion criteria included; age ≥ 18 years, apparently healthy pregnant women, residence in Lagos State and willingness to give a written informed consent after which questionnaires were administered to them to participate in this study.

2.3 Sample Size Determination

The required sample size for this study was calculated based on 95% confidence level and 5% marginal error; sample size (n) was determined using the formula as described by Araoye [13] Malaria prevalence of 14.7% from a previous study in Lagos state [14] will be used at a 95% confidence interval (CI) and a 5% margin of error.

2.4 Data Analysis

Data were double-entered and cross-checked in Microsoft Excel version 2013. Statistical analysis was done using SPSS version 16 for windows. For the analysis of demographic data descriptive statistics was employed.

2.5 Ethical Consideration

Ethical approval for the study was obtained from the Ethical Committee of the Nigerian Institute of Medical Research Lagos. Written informed consent from all the participating pregnant women were obtained.

3. RESULTS

A total of 202 pregnant women were interviewed and screened for malaria and anaemia. The mean age of the study population was 28.16 ± 0.379 years (range 18–42 years) while the mean weight was 70.4 ± 0.961 kg (47–127 kg).

Majority of the study group 94 (46.5%) were 25 – 30 years old while the age group 37–42 years were the lowest 13(6.4%). Most of the pregnant women were Yoruba 158 (78.2%), 23 (11.4%) were Igbo, 10 (5.0%) were Hausa, while 11 (6.0%) were from other tribes. The number of the

respondents that attended secondary school was the highest, 124 (61.4%), followed by those that had Tertiary education 47(23.3%) and then primary school 26 (12.9%). Only 5 (2.5%) of the respondents had no formal education. Muslim was the most predominant among the pregnant women 110 (54.5%) followed by Christians 92 (45.5%). Most of the participants were married 190 (94.1%), followed by women that were never married 8 (4.0%), 3 (1.5%) were separated while 1 (0.5%) was engaged. Most of the participants were traders 86 (42.6%), followed by 39 (19.3%) that were unemployed housewives, 27 (13.3%) were artisans, Civil Servants were 13 (6.4%) while 34 (16.8%) were self-employed. Only 3 (1.5%) did other occupations (Table 1.)

The prevalence of malaria in the study participants was 4 (2%). Out of the 4 participants that were infected with malaria 3 had *Plasmodium falciparum* and 1 had *Plasmodium ovale* species. The geometric mean parasite density was 309.5 parasite/ μ l of blood while the body temperature was 36.4 \pm 0.3°C. None of the participants had fever { \leq 37.5°C; 202 (100%)}. PCV was normal for most of the participants 186 (94.0%) while mild anemia 8 (4.0%) and moderate anemia 4 (2.0%) was observed in other participants (Table 2).

The married women that were infected with malaria were 4 (2.0%) while others within the study group had no infection. The Yoruba tribe 3 (1.5%) had higher malaria infection than Hausa 1 (0.5%) while Igbos and others had no infection. Malaria prevalence was the same in the Christians and Muslim 2 (1.0%). None of the participants that were privately employed had

malaria, however the highest prevalence was recorded among the traders 3 (1.5%) and the least which 1 (0.5%) was recorded in unemployed respondents (Table 3).

Two hundred (99%) of the 202 pregnant women have heard about malaria, however 4 (2%) of these women were positive to malaria, those that have not heard about malaria 2 (1%) were not infected. Participants that indicated that malaria can kill if it is untreated were 186 (92%), however 4 (2%) of them were also infected. Knowledge of malaria transmission depicts that 184 (91%) of the participants indicated that malaria can be caused by mosquito bite with 2 (1%) of them being infected. Those that indicated that malaria can be caused by drinking contaminated water were 4 (2%) and eating contaminated food 11 (5%) were infected with malaria with prevalence of 1 (0.5%) each. Based on malaria prevention method; those that mentioned sleeping inside bed net were 113 (56%) and spraying insecticide 86 (43%).were infected with malaria 2(1%) and 2 (1%) respectively. Those that indicated that malaria can be controlled by making fire and smoke were not infected with malaria. Those that possessed LLIN were 108 (53%) and only 1 (0.5%) was infected with malaria while those that did not possess LLIN were 94 (47) with 3 (1.5) of them infected with malaria. Those that actually used LLIN were 84 (42%).and none of them were infected with malaria 0 (0%) while those that did not use LLIN were 118 (58%) of which 4 (2.0%) of them were infected with malaria. Table 4.

The prevalence of anaemia in the age group 18-24, 25-30 and 31-36 years were 44%, 50% and 6% respectively. Fig. 1.

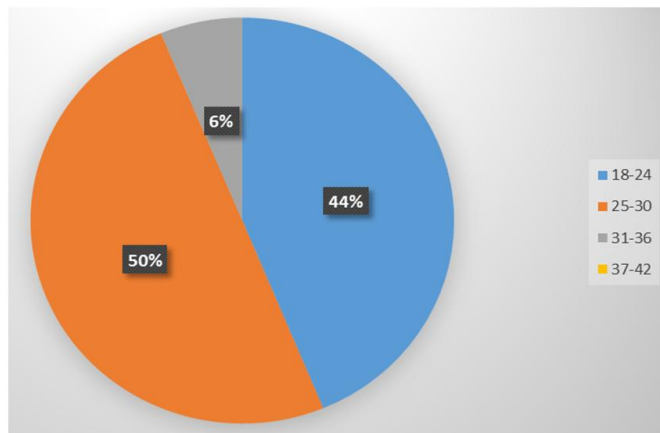


Fig. 1. Prevalence of anaemia with respect to age

Table 1. Socio demographic characteristics of respondents in Lagos mainland LGA, Lagos

Residence	n (%)
Age groups	
18-24	50 (24.8)
25-30	94 (46.5)
31-36	45 (22.3)
37-42	13 (6.4)
Ethnicity	
Yoruba	158 (78.2)
Hausa	10 (5.0)
Igbo	23 (11.4)
Ibibio	1 (0.5)
Fulani	1 (0.5)
Others	9 (4.5)
Religion	
Islam	110 (54.5)
Christianity	92 (45.5)
African traditional	0 (0)
No religion	0 (0)
Occupation	
Unemployed	39 (19.3)
Trader	86 (42.6)
Artisan	27 (13.4)
Civil servant	13 (6.4)
Private employment	34 (16.8)
Others	3 (1.5)
Educational status	
No education	5 (2.5)
Primary school	26 (12.9)
Secondary school	124 (61.4)
Tertiary institution	47 (23.3)
Marital status	
Never married	8 (4.0)
Married	190 (94.1)
Separated	3 (1.5)
Others	1 (0.5)

4. DISCUSSION

Malaria infection with *P. falciparum* during pregnancy result in wide range of adverse consequences for pregnant women [15,12]. Children and pregnant women are the most affected by the infection of malaria [16]. This current study reported 2.0% of malaria infection among the pregnant women attending ante natal clinic in Lagos; this prevalence was lower than studies by Falade [17], Agomo [12] and Akanbi [18], who reported 8.4%, 7.7% and 23.1% respectively in South Western Nigeria. Other

studies on malaria in pregnancy outside Nigeria that had higher prevalence than this study include Yatich [19] and Amengor [20] which reported a 36.3% and 35.1% respectively among pregnant women in Ashanti region in Ghana.

Table 2. Malaria Indices

Malaria	
Prevalence	4 (2.0%)
Plasmodium species	
<i>P. falciparum</i>	3 (1.5%)
<i>P. ovale</i>	1 (0.5%)
<i>P. malariae</i>	0
Parasite density/ μl of blood	
Geometric Mean	309.5
Range	240 – 431
1-500	4 (2.0%)
501-1,000	0
1,001-5,000	0
>5,000	0
Body Temperature ($^{\circ}$C)	
MEAN \pm SD	36.4 \pm 0.28
Range	36.0 – 36.9
\geq 37.5	0
<37.5	202 (100%)
PCV (%)	
Mean \pm SD	30.5 \pm 3.65
Range	22-41
PCV group	
Normal (\geq 30)	186 (94.0%)
Mild anaemia (27-29)	8 (4.0%)
Moderate anemia (19-26)	4 (2.0%)

Malaria infection was only present within the age group 18-24 years and 25-30 years with prevalence of 2.0%. The age group 25-30 years, had the higher malaria infection in this study, which is in agreement with the study carried out by Agomo [12]. There was a no statistical significance within the age groups of the study population and malaria infection ($p>0.05$). This finding agrees with the [21] that highest proportion of malaria 45.9% was observed among the age group 25-34 years. This reflects that there is no significant association between malaria and age, which agrees with Lander [22], who mentioned that age didn't have any significant associate with malaria. The result showed no effect of education on prevalence malaria among pregnant women who had malaria.

The knowledge of malaria and the use of LLINs is very important in achieving the targets of programs like the roll back malaria program. Findings from this study showed that majority of the participants were either using LLINs or other prevention methods such as spraying of insecticide, or making fire and smoke. However, in this study, only 4 of the pregnant women had experienced malaria during their current pregnancy. The Participants had good knowledge of the cause of malaria with 91.1% of the women correctly choosing mosquitoes as the means of transmission. This is similar to the findings of 93% in Abuja, Nigeria [23]. The good knowledge about the means of transmission might indicate that malaria is a common disease in Nigeria.

Until now, the reports of the prevalence of malaria in pregnancy were variable and high, especially in the South-West Nigeria where prevalence rates of between 36.5% and 72% [24, 25,26] have been reported. These reports contrast sharply with our findings in this same region with a prevalence rate of 2.0% among pregnant women attending antenatal clinics for the first time during current pregnancy. The differences in the reported prevalence rates of malaria may be attributed to the malaria control measures that had been deployed by the Federal Ministry of Health including intermittent preventive treatment of malaria in pregnant women (IPTp), LLINs distribution and prompt malaria treatment after the previous studies had been reported.

Table 3. Socio-demographic characteristics among pregnant women attending primary health centre in Lagos, 2016

Characteristics	Malaria positive n (%)	X²	P-value
Age groups			
18-24	2 (1.0%)	2.23	0.525
25-30	2 (1.0%)		
31-36	0 (0.0%)		
37-42	0 (0.0%)		
Education			
No education	0 (0.0%)	1.64	0.650
Primary school	1 (0.5%)		
Secondary school	3 (1.5%)		
Tertiary institution	0 (0.0%)		
Marital status			
Never married	0 (0.0%)	0.26	0.968
Married	4 (2.0%)		
Separated	0 (0.0%)		
Others	0 (0.0%)		
Ethnicity			
Yoruba	3 (1.5%)	4.01	0.549
Hausa	1(0.5%)		
Igbo	0 (0.0%)		
Fulani	0 (0.0%)		
Ibibio	0 (0.0%)		
Others	0 (0.0%)		
Religion			
Islam	2 (1.0%)	0.03	0.857
Christian	2 (1.0%)		
Occupation			
Unemployed	1 (0.5%)	2.63	0.757
Trader	3 (1.5%)		
Artisan	0 (0.0%)		
Civil servant	0 (0.0%)		
Private employment	0 (0.0%)		
Others	0 (0.0%)		

Table 4. Environment related (risk) factors among pregnant women attending Primary Health Centre in Lagos

Characteristics	Number (%)	Malaria positive n (%)	X ²	P-value
Heard about malaria				
Yes	200 (99%)	4 (2.0%)	0.04	0.840
No	2 (1%)	0 (0.0%)		
Can malaria kill if untreated?				
Yes	186 (92%)	4 (2.0%)		
No	6 (3%)	0 (0.0%)	0.35	0.839
Don't know	10 (5%)	0 (0.0%)		
Transmission of malaria				
Drinking contaminated water	4 (2%)	1 (0.5%)		
Eating contaminated food	11 (5%)	1 (0.5%)		
Eating a lot of mango	1 (0.05%)	0 (0.0%)	14.60	0.006*
Mosquito bite	184(91%)	2 (1.0%)		
Stress	2 (1.0%)	0 (0.0%)		
Malaria prevention measure				
Sleeping under net	113 (56%)	2 (1.0%)		
Making fire and smoke	1 (0.5%)	0 (0.0%)	0.11	0.990
Spraying insecticide	87(43%)	2 (1.0%)		
Don't know	1(0.5%)	0 (0.0%)		
When does mosquito feed?				
Daytime	5 (2%)	0 (0.0%)		
Night time	111(55%)	3 (1.5%)	0.725	0.867
Day and night	82 (41%)	1 (0.5%)		
Don't know	4 (2%)	0 (0.0%)		
LLIN possession				
Yes	108 (53%)	1 (0.5%)	1.33	0.249
No	94 (47%)	3 (1.5%)		
LLIN utilization				
Yes	84 (42%)	0 (0.0%)	2.91	0.088
No	118 (58%)	4 (2.0%)		

*Statistically significant ($P \leq 0.05$)

5. CONCLUSION

This current study shows a very low malaria infection among the pregnant women attending ante natal clinic in Lagos. The Participants had good knowledge that the transmission of malaria is by mosquitoes.

6. RECOMMENDATION

The malaria control measures in Lagos State including IPTp and giving of LLINs to pregnant women should continue especially at the ante natal clinic of the Primary Health Centres.

7. LIMITATION

The limitation of this study is that the pregnant women were not group into primigravida or multigravida and the gestation period was not stated.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

ACKNOWLEDGEMENT

We acknowledge Mr Samuel Akindele for reading the malaria slides and calculating the parasite density.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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