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www.eajbs.eg.net

Egypt. Acad. J. Biolog. Sci., 9(1): 41 –58 (2017)

Egyptian Academic Journal of Biological Sciences
E. Medical Entom. & Parasitology

ISSN: 2090 – 0783
www.eajbs.eg.net

Parasitologic Investigation of Malaria in Pregnant Women and the Use of Herbal Remmedies in lagos West Senatorial District

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ARTICLE INFO

Article History
Received:1/3/2017
Accepted:20/4/2017

Key words:
Malaria , pregnant women. Lagos, Nigeria.

ABSTRACT

Background: Malaria infection during pregnancy is a significant public health problem especially in an area of stable malaria transmission like Lagos, Nigeria. In the nation's state of various economic predicaments and in respect to the culture of the people, the knowledge, attitude, and treatment practices of individuals about malaria causation, symptoms identification, are essential for effective control measures. This study assessed the knowledge, attitude and practice of pregnant women on the use of herbal remedies for malaria treatment in pregnancy in Lagos State.

Method: Thick and thin films slides prepared from venous blood of participants were examined on the microscope to determine the level of parasitaemia of pregnant women after which structured questionnaire was administered to determine the knowledge attitude and practice of pregnant women on the use of herbal remedies for treating malaria in pregnancy. The epi-info statistical software was used to compare factors associated with the knowledge, attitude and practice of pregnant women and malaria infection.

Results: The prevalence of malaria using pheripheral blood from 207 pregnant women that participated in the study was 5.31% with 90.9% cases of *Plasmodium falciparum* and 9.1% of *Plasmodium ovale* among the infected participants. There was a significant association ($P< 0.05$) between Malaria infection with socio-demographic factors such as educational level, ($X^2 = 10.05$; [df] = 3; $P = 0.018$), geo-political zone ($X^2=47.8$; [df] = 13; $P = 0.0001$) and the hospital type used ($X^2 = 5.7$, $P = 0.026$). Good Perception about use of herbal remedies was significantly associated educational level ($X^2= 25$, $P=0.003$), and gravidity ($X^2 = 24.3$, $P = 0.018$). It was observed that 60.9% of the respondents had a positive perception about herbal treatment while only 32.9% used herbal remedies in the treatment of malaria in pregnancy.

Discussion and Conclusion: There was low prevalence of parasitaemia among the pregnant women which may be connected with the current policy of intermittent preventive treatment of malaria among the pregnant women. Study participants were found to be infected with two main species of *Plasmodium spp*. of which the dorminant species was *Plasmodium falciparum*. The respondents had a high level of knowledge about malaria. The perception, preference and use of herbal remedies by pregnant women in Lagos-West Senatorial district of Lagos State in the treatment of malaria were influenced by cultural, socio-economic realities of the present time. There was no proof of effectiveness of herbal remedies in the treatment of malaria as those who used herbal remedies in the treatment of malaria in pregnancy were in highest proportion of those infected with malaria than the non-users.

INTRODUCTION

Malaria is a life threatening parasitic disease transmitted by female *Anopheles* mosquitoes. It is one of the most severe public health problems worldwide. It is a leading cause of death and disease in many developing countries, where young children and pregnant women are the groups most affected (WHO, 2013).

Half the world's populations live, 3.4 billion people who are in areas at risk of malaria transmission in 106 countries and territories (WHO, 2013). In 2012, malaria caused an estimated 207 million clinical episodes, and 627,000 deaths (WHO, 2013). An estimated 91% of deaths in 2010 were in the African Region (WHO, 2013). In Nigeria, 100 million reported cases of malaria has been estimated with over 300,000 deaths per year, which accounts for 60% of outpatient visits, 30% of hospitalizations among children under 5years of age, and 11% maternal mortality (Rupashree, 2014).

Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her foetus, and the newborn child (WHO, 2014). Pregnancy is a special physiological state where medication intake presents a challenge and a concern due to altered drug pharmacokinetics and drug crossing the placenta possibly causing harm to the foetus (Banhidy *et al*., 2005). Malaria-associated maternal illness and low birth weight is mostly the result of *Plasmodium falciparum* infection and occurs predominantly in Africa (WHO, 2014). The symptoms and complications of malaria in pregnancy vary according to malaria transmission intensity in the given geographical area, and the individual's level of acquired immunity (WHO, 2014).

In Africa, particularly West Africa, new drugs are not often affordable thus up to 80% of the population use medicinal plants as remedies (Kirby, 1996; Hostettmann and Marston, 2002). The condition and the fact that international commercial orthodox medicines are becoming increasingly out of reach for most Nigerians contributed to the dependence of a large percentage of the Nigerian people on local herbal medicine (Sofowora, 1992).

Few studies on the pattern of use of herbal remedies during pregnancy showed that more than 10% of pregnant women reported the use of herbal medicinal products in Finland, Australia, and United States (Pastore, 2000, McLennan *et al.,* 2002, Nordeng & Havnen, 2004 and Forster *et al.,* 2006). In Nigeria very limited research has been carried out to evaluate the use of herbal medicines among pregnant women (Gharoro & Igbafe, 2000). Despite the fact that knowledge of potential side effects of many herbal medicines in pregnancy is limited (Mabina *et al.,* 1997, Lacroix *et al.,* 2000, Tsui *et al.,* 2001, Maats & Crowther, 2002 and Ernst, 2002), some herbal products may be teratogenic in human and animal models (Goel *et al.,* 2006, Seely *et al.,* 2008, Dogoua *et al.,* 2008,), data on the extent of women's use of herbal medicines during pregnancy is scanty especially in sub-Sahara Africa, where the legislation for distribution and purchase of herbal medicines is not as stringent as it is for conventional medicines (Adisa & Fakeye, 2006).

According to Fakeye *et al.,* (2009) only few studies had provided data evaluating some aspects of the use of herbal medicine during pregnancy in southwestern region of Nigeria.

Therefore this study will elucidate the knowledge, attitude and practice of pregnant women on the use of herbal remedies in the treatment of malaria taking into cognizance the fact that transmission of malaria is perennial in this part of the country with corresponding morbidity and mortality among this vulnerable group.

MATERIALS AND METHODS

Study Design and Population:

The study was conducted in Lagos West Senatorial district of Lagos State. Nigeria. The Senatorial district consists of two divisions of the five divisions of Lagos State. The two divisions are Ikeja division and Badagry division. It is a region rich in diversity of different tribes, ethnic and religious people. Lagos State is arguably the most economically important state of the country, Nigeria's largest urban area. Lagos State is located in the south-western part of the Nigerian Federation. On the North and

East it is bounded by Ogun State. In the West it shares boundaries with the Republic of Benin and its southern borders lay the Atlantic Ocean.

This research work is a cross sectional study which involve all pregnant women attending ante-natal in a purposively selected Government primary health centre and a Private maternity centre in Lagos West Senatorial District of Lagos State, and the pregnant women were selected randomly without prior knowledge of their clinical and family history. This research work was carried out from September to November 2015. All participants were consecutively recruited and received written and oral information about the study and written informed consent was also obtained.

Data Collection:

Data was collected by means of a semi structured questionnaire developed in English language, which was administered to the pregnant women. The team of researchers provided aid to illiterate women in interpreting, explaining and filling the questionnaire. The purpose of the study was carefully explained to them and their consents were obtained individually before the questionnaire was administered. The questionnaire is composed of 36 items, with close and open ended questions, divided into four sections. The four sections of the questionnaire comprised of participants demographic data, knowledge of malaria, attitude towards use of herbal remedies and malaria treatment during pregnancy. All answers were numerically coded on each questionnaire and data analysis was done using EPI-INFO version 7.1.5.2

Sample Collection:

Careful procedures was adopted in the collection of finger-prick blood samples by ensuring the use of gloves and the use of disposable lancets, washing of hands, handling and disposing of sharp instruments and other materials contaminated with blood was done carefully to avoid injury. The finger lobe was disinfected using a swab moistened with 70% alcohol and the area was allowed to dry. Sterile lancet was used to prick the finger lobe, squeezed gently to obtain two large drops of blood for thick and thin smears respectively.

Procedure for Preparation of Slides:

The blood of the thin film was spread using the ground edge of the spreader slide, A new clean slide with smooth edges was used as a spreader to make the thin smears for the identification of parasites species and another drop of blood was dropped 1cm apart from the first drop of blood for the thick film. While the thick films were made using the beveled corner of the spreader slide to make an entire circle of 12 mm diameter to ensure the slide was evenly covered.

The small drop of blood at the centre was used for thin film while the larger drop about 15mm to the right was for the thick film, using a smooth edge slide spreader. The thick film covered an area of about 15 by 15mm. The thick film was mixed as little as possible to avoid the red cells forming marked rouleaux, which can cause the blood to be easily washed from the slide during staining.

Each slide was coded using permanent marker, with the code corresponding to the code on the questionnaire of each study participants from whom the sample was taken. The films were air dried without allowing dust or insect to compromise the quality of films.

Procedure for Fixing of Thin Films:

Each thin film was fixed with absolute methanol without touching the thick films. This was done by dipping it in absolute methanol for a few seconds and dried at an acute angle on the staining rack, with the thick film-side of the slide facing up and the thin film downwards which protected the thick film from being fixed by methanol. The thin film was fixed so as to preserve the morphology of the parasites for proper identification of the parasite species.

Procedure for Giemsa Staining of Films:

The slide was allowed to dry and it was stained immediately with 3% v/v Giemsa stain solution for 30 minutes, which is the slow staining method as it results in better staining and helps reduce parasite loss during

staining. 620ml of buffered water was measured and poured into a clean plastic container and 3% of the volume of water was measured as the giemsa stain solution needed that is 18.6ml. The giemsa stain was measured using a dry graduated plastic bulb pipette.

The slides were laid down on a staining rack, which was placed on a shallow tray with all the films facing up for immersion with the giemsa stain after ensuring that the thick films were thoroughly dried and the thin films had been fixed with absolute ethanol, which is necessary in preventing fine particles of stain being deposited on the films. The slides were covered evenly with the giemsa stain using a plastic bulb pipette and bubbles were avoided during the staining of the slides. The giemsa stain was allowed for 30 minutes for proper staining, after which, the stains was washed off each slide in a running clean water to avoid the films from being deposited with fine deposits of stains.

Microscopic Examination:

A drop of immersion oil was applied on the thick film round the edges and spread to cover an area of about 10mm in diameter to enable the films to be examined first at a lower magnification. The thick films were used to determine the parasite densities while thin films was used to identify the parasite species and infective stages, Stained slides were examined under the light microscope using x100 objective lens (immersion oil).

Estimation of Parasite Density:

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 were counted where less than nine parasites were counted after counting against 200 White Blood Cells. Where the parasite counts in the thin film against 2,000 red blood cells as a result of heavy parasitaemia (greater or equal to 100 parasites per thick smear high power field), parasites counted will be recalculated with 200 WBC. Parasite densities (parasite/µl of whole blood) will then be calculated as follows:

$$\textit{Parasite density per } \mu L = \frac{\textit{Number of parasites counted} \times \textit{WBC count per } \mu L}{\textit{Number of leukocytes counted}}$$

Also, parasite densities for all participants were calculated using assumed WBC of $8.0 \times 10(9)/L$, of blood; all set by WHO to be used.

Statistical Analysis

Data analysis was based on Chi-square test to assess linear tendency, association between various factors in the questionnaire and compare proportions and it was done using EPI INFO 7.1.5.2

Ethical Considerations and Approval:

The informed consent of the participants was obtained in writing to signify their willingness to participate in the study after a thorough explanation of the procedures for study in either English or interpreted to local language for participants who do not understand English Language. The participants were informed during the informed consent procedure about the possible benefits and risk involved in participating in the study. Participants were assured of the confidentiality of the information given and the possible benefits and risk of participation. Also their rights to decline to participate or withdraw at any time without penalty were made known to the participants. No personal identifiers was used in the collection, analysis or reporting of data. Ethical approval for the study was granted by the Institutional Review Board of the Nigerian Institute of Medical Research.

RESULTS

Socio-Demographic Characteristics of Study Participants:

A total of 207 pregnant women participated in the study with the age ranged from 15 to 45 years with their mean age being 30years. The participants were of

different educational level; with majority (55.6%) of them having secondary school level of education, and only a few of them (3.4%) were without formal education (Table 1). The participants were of different occupational sectors with preponderance of traders (45%) and among them, few (2.1%) were into fishing. Despite the fact that all the women were pregnant about 2% were single while 3.4% were separated (Table 1).

Table 1: Socio-Demographic Characteristics of Study Participants

	Frequency	Percentage
Age Groups		
15-20	10	4.8
21-25	29	18.8
26-30	85	59.9
31-35	53	85.5
36-40	25	12.1
41-45	5	2.4
Marital Status		
Single	4	1.9
Married	189	91.3
Separated	7	3.4
Divorced	1	0.5
Education Level		
Primary	21	10.1
Secondary	115	55.6
Tertiary	64	30.9
No Education	7	3.4
Occupation		
Unemployed	41	19.8
Trading	93	44.9
Artisan	15	7.2
Civil servants	32	15.5
Farming	7	3.4
Fishing	3	1.5
Corporate worker	16	7.7

Prevalence of malaria in pregnant women:

Among the 207 pregnant women, 97 (46.9%) were attending private hospital while 110 (53.1%) were attending government hospital.

The prevalence of malaria infection among the 207 pregnant women in Lagos West Senatorial district was 5.31% (11). Among the eleven pregnant women positive for malaria infection, ten (90.9%) of them were infected with *Plasmodium falciparum*, while one (9.1%) was infected with *Plasmodium ovale*. The mean parasite density of the infected proportion of the pregnant women was 3315.1 parasites/µl. There was no significant association between prevalence and gravidity. (X^2 = 4.46; [df] = 4; P = 0.35), though there was increase in the mean of parasitaemia as the gravidity increased (Fig. 1).

Majority (81.9%) of participants positive for infection were those attending the private clinics, compared to 18.2% of those attending government hospitals (Table 2). There was a significant association between the hospital type used by pregnant women for antenatal and the proportion of those infected (X^2 = 5.7, P = 0.026, P < 0.05). There was no significant association between malaria infection, age group (P = 0.71), Occupation (P = 0.73), Marital status (P = 0.33), and age of pregnancy (P = 0.22) (Table 2).

The pregnant women in their second trimester had the highest rate of infection and the first trimester had the lowest rate of infection. (Fig. 2). There was no significant association between trimester and proportion of those infected (X^2 = 3.02; [df] = 2; P = 0.220; P> 0.05). The South-West geopolitical zone which was the highest population in the study participants had the highest rate of infection among the pregnant women (Table 3). There was a significant

association between geopolitical zone of the pregnant women and proportion of those infected (X^2=47.8; [df] = 13; P = 0.0001; P< 0.05).

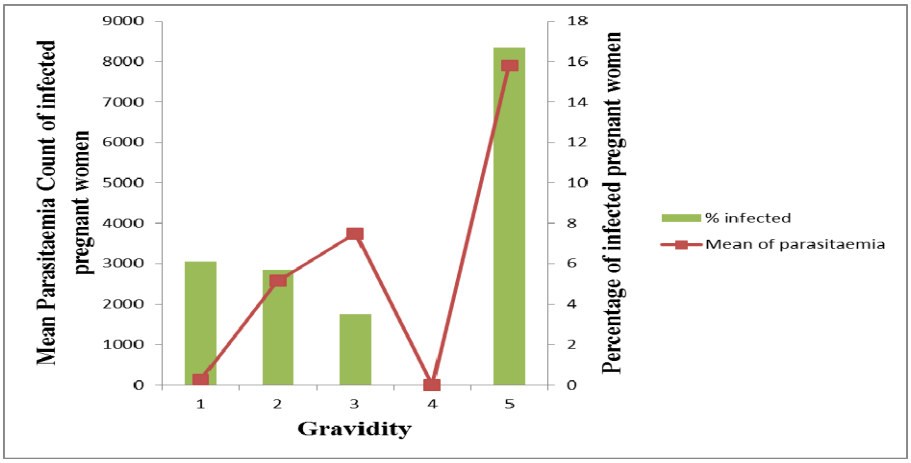

Fig. 1: Comparison of mean parasitaemia and proportion of infected pregnant women by gravidity. X^2 = 4.5, P = 0.35, P > 0.05.

Table 2: Prevalence of Malaria in Pregnant Women According to Socio Demographic Characteristics

Characteristics	Prevalence of Malaria in Pregnant Women			
	Positive	Negative	Total (%)	Statistic
	No (%)	No. (%)	n = 207	P-value (Fisher exact)
Age group				
15-20	1 (9.1)	9 (4.6)	10 (4.8)	X^2 = 2.94
21-25	1 (9.1)	28 (14.3)	29 (14.0)	
26-30	4 (36.4)	81 (41.3)	85 (41.1)	p = 0.71
31-35	3 (27.3)	50 (25.5)	53 (25.6)	
36-40	1 (9.1)	24 (12.2)	25 (12.1)	
41-45	1 (9.1)	4 (2.0)	5 (2.4)	
Educational Level				
No education	0 (0.0)	7 (3.6)	7 (3.4)	X^2 = 10.05
Primary	4 (36.4)	17 (8.7)	21 (10.1)	
Secondary	3 (27.3)	112 (57.1)	115 (55.6)	p = **0.018**
Tertiary	4 (36.4)	60 (30.6)	64 (30.9)	
Occupation				
Unemployed	2 (18.2)	39 (19.9)	41 (19.8)	X^2 = 3.60
Trading	6 (54.5)	87 (44.4)	93 (44.9)	
Artisan	0 (0.0)	15 (7.7)	15 (7.2)	p = 0.73
Civil servant	3 (27.3)	29 (14.8)	32 (15.5)	
Farming	0 (0.0)	7 (3.6)	7 (3.4)	
Fishing	0 (0.0)	3 (1.5)	3 (1.5)	
Corporate worker	0 (0.0)	16 (8.2)	16 (7.7)	
Marital status				
Single	1 (9.1)	3 (1.6)	4 (1.9)	X^2 = 3.4
Married	10 (90.9)	179 (94.2)	189 (91.3)	
Separated	0 (0.0)	7 (3.7)	7 (3.4)	p = 0.33
Divorced	0 (0.0)	1 (0.5)	1 (0.5)	
Religion				
Christianity	6 (54.6)	145 (73.9)	151 (72.9)	X^2 = 9.29
Islam	4 (36.4)	47 (23.9)	51 (24.6)	
African traditional	0 (0.0)	3 (1.5)	3 (1.4)	p = **0.0256**
Trimester				
First	2 (18.2)	14 (7.3)	16 (7.7)	X^2 = 3.024
Second	3 (27.3)	96 (50.3)	99 (47.8)	
Third	6 (54.5)	81 (42.4)	87 (42.0)	P = 0.221
Gravidity				
1	2 (18.2)	31 (15.8)	33 (15.9)	X^2 = 0.347
2	5 (45.5)	83 (42.4)	88 (42.5)	
3	2 (18.2)	55 (28.1)	57 (27.5)	P = 0.347
4	0 (0.0)	17 (8.7)	17 (8.2)	
5	2 (18.2)	10 (5.1)	12 (5.7)	
Hospital Type				
Government	2 (18.2)	108 (55.1)	110 (53.1)	X^2 = 5.70
Private	9 (81.8)	88 (44.9)	97 (46.9)	**p = 0.026**

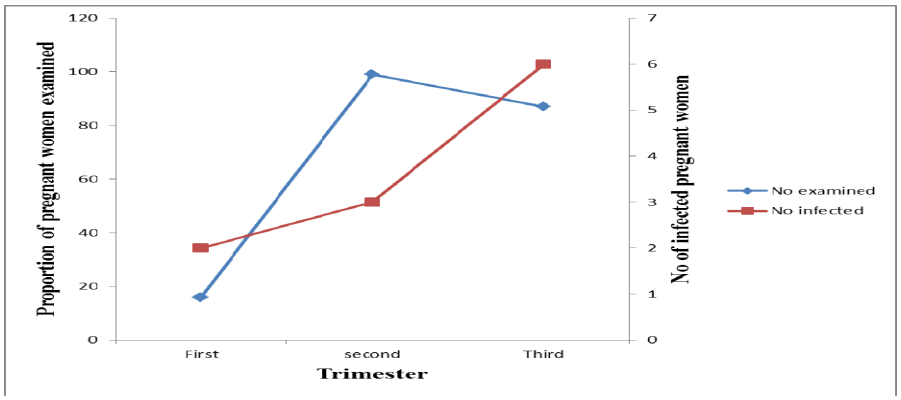

Fig. 2: Prevalence of malaria in proportion with trimester

Knowledge of Pregnant Women about Malaria:

Majority (85.5%) of the respondents had knowledge about the cause of malaria indicating it as mosquito bites, while the rest gave other reasons such as witchcraft (5.3%) and eating bad food (1.9%) as the cause of malaria. Some of the symptoms of malaria that were identified by the respondents were Headache (50.7%) Fever (46.4%) body ache (36.2%) lack of appetite (26.6%) vomiting (22.2%) and fatigue (9.6%).

Perception about herbal remedies for malaria treatment:

All the people in the geopolitical zones of Nigeria were represented in the study with majority (36.4) from the South-West zone. Majority (60.6%) of the participants perceived the use of herbal remedies for treating malaria as a good practice. While 26.6% were undecided, 11.8% regarded it as a bad practice. The South-west participants formed the majority (47.9%) of those that perceived the use of herbal remedies as good practice followed by participants from the South-eastern part of the country. Chi-square analysis shows that there is a significant association between the geo-political zones and their perception about herbal remedies (X^2= 82.3, P= 0.0001, P-value<0.05) (Table 3).

Table 3: Geo-political Zone In Relation To Perception on the Use of Herbal Remedies

	Perception About Herbal Remedies			
Geopolitical zone	Good (%)	Bad (%)	Advisable (%)	Don't know (%)
South-West	59 (47.9)	6 (25)	1 (50)	9 (16.6)
South-East	30 (24.4)	9 (37.5)	0 (0)	32 (59.2)
South-South	15 (12.2)	5 (20.8)	0 (0)	9 (16.6)
North-West	11(8.9)	0 (0)	0 (0)	3 (5.5)
North- Central	8 (6.5)	4 (16.6)	1 (50)	0 (0)
North- East	0 (0)	0 (0)	0 (0)	1 (1.8)

X^2= 82.3, P= 0.0001, P-value<0.005

The secondary educational level among the pregnant women had the highest positive and negative perception about herbal remedies (Table 4). There was a significant association between the educational level of pregnant women and perception about herbal remedies in the treatment of malaria (X^2= 25, P=0.003, P< 0.05).

More pregnant women have good perception about herbal remedies. There is a significant relationship between the age groups and good perception about herbal remedies. The perception increased with increased age. The age group 26-30 had the highest positive and negative perception about herbal remedies (Table 4). There was a significant association between age groups of pregnant women and perception about herbal remedies in the treatment of malaria (X^2 = 29, P= 0.016, P< 0.05).There was significant association between the perceptions of respondents and their ages. Preponderance of the older age groups have good perception of herbal remedies.

Also there is significant relation between the occupational groups and perception of herbal remedies. Majority (60.9%) of participants in the occupational group have good perception about herbal remedies though some traders (27.9%) were undecided about their perception. Just like the traders some Christians (30.5%) were undecided about their perception though most of them (53.6%) had good perceptions about herbal remedies. Perception about herbal remedies has no significant association with age of pregnancy. There is significant association between perception about herbal remedies and the type of hospital the respondents attended. More respondents (61.9%) in private hospital have good perception about herbal remedies than respondents who attend the government hospital and a large proportion who attend government hospital were undecided.

The second gravida had the highest positive perception about herbal remedies (Table 4). There was a significant association between gravidity of pregnant women and perception about herbal remedies in the treatment of malaria ($X^2 = 24.3$, $P = 0.018$, $P < 0.05$). The good perception about herbal remedies increased up to the third gravida.

Table 4: Perception of Herbal Remedies According To Socio-demographic Characteristics of pregnant Women

	Perception about herbal remedies of Pregnant Women					
Characteristics	Good	Bad	Advisable	Don't know	Total (%)	Statistic
	No (%)	No. (%)	No. (%)	No. (%)		
Age group						
15-20	8 (6.4)	0 (0.0)	0 (0.0)	2 (3.7)	10 (4.8)	$X^2 = 29.01$
21-25	19 (15.1)	3 (12.0)	0 (0.0)	7 (12.9)	29 (14.0)	
26-30	48 (38.1)	11 (44.0)	1 (50.0)	25 (46.3)	85 (41.1)	**p = 0.016**
31-35	31 (24.6)	10 (40.0)	0 (0.0)	12 (22.2)	53 (25.6)	
36-40	16 (12.7)	1 (4.0)	0 (0.0)	8 (14.8)	25 (12.1)	
41-45	4 (3.17)	0 (0.0)	1 (50.0)	0 (0.0)	5 (2.4)	
Educational Level						
No education	16 (3.9)	1 (4.0)	1 (50.0)	0 (9.3)	18 (8.7)	$X^2 = 25.02$
Primary	64 (12.7)	0 (0.0)	0 (0.0)	5 (9.3)	69 (33.3)	
Secondary	41 (50.8)	20 (80.0)	0 (0.0)	31 (57.4)	92 (44.4)	**p = 0.003**
Tertiary	5 (32.5)	4 (16.0)	1 (50.0)	18 (33.3)	28 (13.5)	
Occupation						
Unemployed	21 (16.7)	7 (28.0)	0 (0.0)	13 (24.1)	41 (19.8)	$X^2 = 60.76$
Trading	53 (42.1)	14 (56.0)	0 (0.0)	26 (48.2)	93 (44.9)	
Artisan	9 (7.1)	0 (0.0)	0 (0.0)	6 (11.1)	15 (7.2)	**p = 0.0000**
Civil servant	29 (23.0)	1 (4.0)	0 (0.0)	2 (3.7)	32 (15.5)	
Farming	6 (4.8)	0 (0.0)	0 (0.0)	1 (1.8)	7 (3.4)	
Fishing	1 (0.8)	0 (0.0)	1 (50.0)	1 (1.8)	3 (1.4)	
Corporate worker	7 (5.6)	3 (12.0)	1 (50.0)	5 (9.26)	16 (7.7)	
Marital status						
Single	3 (2.5)	0 (0.0)	0 (0.0)	1 (1.9)	4 (1.9)	$X^2 = 17.92$
Married	111 (91.7)	25 (100.0)	1 (50.0)	52 (98.1)	189 (91.3)	
Separated	6 (4.9)	0 (0.0)	1 (50.0)	0 (0.0)	7 (3.4)	**p = 0.036**
Divorced	1 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	
Religion						
Christianity	81 (64.3)	23 (92.0)	1 (50.0)	46 (85.2)	151 (72.9)	$X^2 = 47.37$
Islam	41 (32.5)	2 (8.0)	0 (0.0)	8 (14.8)	51 (24.6)	
African traditional	2 (1.6)	0 (0.0)	1 (50.0)	0 (0.0)	3 (1.5)	**p = 0.0000**
Trimester						
First	11 (8.7)	3 (13.4)	0 (0.0)	2 (3.9)	16 (7.7)	$X^2 = 2.67$
Second	60 (47.6)	10 (45.5)	1 (50.0)	28 (53.9)	99 (47.8)	
Third	55 (43.7)	9 (40.9)	1 (50.0)	22 (42.3)	87 (42.0)	p = 0.848
Gravidity						
1	27 (21.4)	2 (8.0)	0 (0.0)	4 (7.4)	33 (15.9)	$X^2 = 24.33$
2	52 (41.3)	12 (48.0)	2 (100.0)	22 (40.7)	88 (42.5)	
3	35 (27.8)	6 (24.0)	0 (0.0)	16 (29.6)	57 (27.5)	**p = 0.018**
4	8 (6.6)	5 (20.0)	0 (0.0)	4 (7.4)	17 (8.2)	
5	4 (3.2)	0 (0.0)	0 (0.0)	8 (14.8)	12 (5.8)	
Hospital type						
Government	48 (38.1)	12 (48.0)	0 (0.0)	50 (92.6)	110 (53.1)	$X^2 = 5.70$
Private	78 (61.9)	13 (52.0)	2 (100.0)	4 (7.4)	97 (46.9)	**p = 0.026**

Preference of treatment for malaria in pregnancy:

Majority (34%) of pregnant women attending private hospital for antenatal care had preference for treating malaria with orthodox medicine (Table 5). There was a significant association between hospital type used by pregnant women and preference of treatment for malaria ($X^2 = 17.9$, $P = 0.0001$, $P < 0.05$). Generally, more pregnant women opted for orthodox medicine in the treatment of malaria than herbal remedies. This is closely followed by those who will treat malaria infection using both orthodox and herbal remedies. Also more women attending private clinics (51.8%) will use herbal remedies than those using government hospital (48.2%). There is no significant association between the preference of treatment for malaria infection with age groups ($P = 0.33$), educational level ($P = 0.27$) and marital status ($P = 0.1$) (Table 5).

Table 5: Preference of Treatment for Malaria in Pregnancy According To Their Characteristics

	Preference of treatment for Malaria in Pregnant Women				
Characteristics	Herbal Remedies	Orthodox	Combine Both	Total	Statistics
	No (%)	No. (%)	No. (%)	No. (%)	
Age group					
15-20	0 (0.0)	7 (6.6)	3 (5.6)	10 (4.8)	$X^2 = 11.31$
21-25	7 (14.9)	13 (12.3)	9 (16.7)	29 (14.0)	
26-30	22 (46.8)	42 (39.6)	21 (38.9)	85 (41.1)	p = 0.33
31-35	11 (23.4)	30 (28.3)	12 (22.2)	53 (25.6)	
36-40	4 (8.5)	14 (13.2)	7 (12.9)	25 (12.1)	
41-45	3 (6.4)	0 (0.0)	2 (3.7)	5 (2.4)	
Educational Level					
No education	4 (8.5)	3 (2.8)	0 (0.0)	7 (3.4)	$X^2 = 7.56$
Primary	5 (10.6)	11 (10.4)	5 (9.26)	21 (10.1)	
Secondary	21 (44.7)	61 (57.6)	33 (61.1)	115 (55.6)	p = 0.272
Tertiary	17 (36.2)	31 (29.3)	16 (29.6)	64 (30.9)	
Occupation					
Unemployed	2 (4.3)	39 (25.5)	12 (22.2)	53 (25.6)	$X^2 = 28.84$
Trading	17 (36.2)	48 (45.3)	28 (51.9)	93 (44.9)	
Artisan	3 (6.4)	9 (8.5)	3 (5.6)	15 (7.2)	**p = 0.004**
Civil servant	13 (27.7)	10 (9.4)	9 (16.7)	32 (15.5)	
Farming	4 (8.5)	2 (1.9)	1 (1.9)	7 (3.4)	
Fishing	2 (4.3)	1 (0.9)	0 (0.0)	3 (1.5)	
Corporate worker	6 (12.8)	9 (8.5)	1 (1.9)	16 (7.70	
Marital status					
Single	2 (4.4)	1 (0.9)	1 (1.9)	4 (1.9)	$X^2 = 10.41$
Married	39 (84.8)	101 (97.1)	49 (96.1)	189 (91.3)	
Separated	4 (8.7)	2 (1.9)	1 (1.9)	7 (3.4)	p = 0.108
Divorced	1 (2.17)	0 (0.0)	0 (0.0)	1 (0.5)	
Religion					
Christianity	25 (53.2)	88 (84.9)	38 (70.4)	151 (72.9)	$X^2 = 21.14$
Islam	19 (40.4)	16 (15.1)	16 (29.6)	51 (24.6)	
African traditional	3 (6.4)	2 (1.9)	0 (0)	5 (2.4)	**p = 0.001**
Trimester					
First	4 (8.5)	9 (8.9)	3 (5.6)	16 (7.7)	$X^2 = 4.07$
Second	28 (59.6)	44 (43.6)	27 (50.0)	99 (47.8)	
Third	15 (3.9)	48 (47.5)	24 (44.4)	88 (42.5)	p = 0.397
Gravidity					
1	8 (17.0)	14 (13.2)	11 (20.4)	33 (15.9)	$X^2 = 8.24$
2	25 (53.2)	43 (40.6)	20 (37.0)	88 (42.5)	
3	12 (25.5)	30 (28.3)	15 (27.4)	57 (27.5)	p = 0.410
4	2 (4.3)	10 (9.43)	5 (9.3)	17 (8.2)	
5	0 (0.0)	9 (8.5)	13 (5.6)	22 (10.6)	
Hospital Type					
Government	26 (48.2)	14 (29.8)	70 (66.0)	110 (53.1)	$X^2 = 17.91$
Private	28 (51.8)	33 (70.2)	36 (33.9)	97 (46.9)	p = **0.001**

The traders had the highest preference for herbal remedies. There was a significant association between occupation of pregnant women and preference of treatment for malaria (X^2=28.8, P= 0.0042, P < 0.05). The Islamic religion has the highest preference for herbal remedies (Table 5). There was a significant association between religion of pregnant women and preference of treatment for malaria (X^2 = 21.1, P = 0.0017, P < 0.05).

Use of herbal remedies for malaria treatment in pregnancy:

Majority (67.1%) of the pregnant women claimed they do not use herbal remedies for malaria treatment in pregnancy (Table 6). There was no significant association between the use of herbs for malaria treatment in pregnancy and malaria infection in the study (X^2 = 2.47; P = 0.18; P> 0.05)

Table 6: Use of Herbal Remedies for Malaria Treatment in Pregnancy According To Their Characteristics

	Use Of Herbal Remedies for malaria treatment in pregnancy			
Characteristics	Yes	No	Total (%)	Statistics
	Freq. (%)	Freq. (%)		
Age group				
15-20	3 (4.4)	7 (5.0)	10 (4.8)	X^2 = 3.11
21-25	11 (16.2)	18 (12.9)	29 (14.0)	
26-30	29 (42.6)	56 (40.3)	85 (41.1)	p = 0.682
31-35	14 (20.6)	39 (28.1)	53 (25.6)	
36-40	8 (11.8)	17 (12.2)	25 (12.1)	
41-45	3 (4.4)	2 (1.4)	5 (2.4)	
Educational Level				
No education	4 (5.8)	3 (2.2)	7 (3.4)	X^2 = 6.47
Primary	11 (16.2)	10 (7.2)	21 (10.1)	
Secondary	33 (48.5)	82 (58.9)	115 (55.6)	p = 0.090
Tertiary	20 (29.4)	44 (31.6)	64 (30.9)	
Occupation				
Unemployed	8 (11.8)	33 (23)	41 (19.8)	X^2 =10.49
Trading	30 (44.1)	63 (76.3)	93 (44.9)	
Artisan	5 (7.35)	10 (7.2)	15 (7.2)	p = 0.105
Civil servant	11 (16.2)	21 (15.1)	32 (15.5)	
Farming	5 (7.4)	2 (1.4)	7 (3.4)	
Fishing	2 (2.9)	1 (0.7)	3 (1.5)	
Corporate worker	7 (10.3)	9 (6.5)	16 (7.7)	
Marital status				
Single	2 (3.0)	2 (1.5)	4 (1.9)	X^2 = 7.70
Married	58 (87.9)	131 (97.0)	189 (91.3)	
Separated	5 (7.6)	2 (1.5)	7 (3.4)	p = 0.05
Divorced	1 (1.5)	0 (0.0)	1 (0.5)	
Religion				
Christianity	36 (52.9)	115 (82.7)	151 (72.9)	X^2 = 20.71
Islam	29 (42.6)	22 (15.8)	51 (24.6)	
African traditional	2 (2.9)	1 (0.7)	3 (1.4)	**p = 0.0001**
Trimester				
First	7 (10.2)	9 (7.3)	16 (7.7)	X^2 = 0.82
Second	33 (48.5)	66 (49.3)	99 (47.8)	
Third	28 (41.2)	59 (44.0)	87 (42.0)	p = 0.664
Gravidity				
1	13 (19.1)	20 (14.4)	33 (15.9)	X^2 = 0.224
2	33 (48.5)	55 (39.6)	88 (42.5)	
3	17 (15.0)	40 (28.8)	57 (27.5)	p = 0.224
4	4 (5.0)	13 (9.4)	17 (8.2)	
5	1 (1.5)	11 (7.9)	12 (5.7)	
Hospital Type				
Government	26 (38.2)	84 (60.4)	110 (53.1)	X^2 = 9.03
Private	42 (61.8)	55 (39.6)	97 (46.9)	**p = 0.003**

Majority (53.14%) of the pregnant women claimed they engage in self-medication when malaria is perceived. There was a significant association between self-medication as the first source of treatment in malaria and the use of herbal remedies in the treatment of malaria in pregnancy (X^2 = 12.95; P=0.0003; P<0.05). Only 32.9% used herbal remedies in the treatment of malaria in pregnancy which majority claimed they buy from the market while a few of them get their herbs from their compounds. The herbs were used for treatment by the pregnant women in different ways, majority of the pregnant women (58.8%) prepare the herbs for drinking, 6.4% for bathing while 27.2% use it for both drinking and bathing.

There was no significant association between the use of herbal remedies for malaria treatment during pregnancy and occupational groups (P=0.1), Level of education (P=0.09), Gravidity (P=0.2) and age of pregnancy (P=0.6). Though more patients in private hospital use herbal remedies than those attending government hospital (P=0.003). There is a significant association between the use of herbal remedies for malaria treatment and religion. More Muslims (56.8%) use herbal remedies compared to 23.8% among Christians (Table 6).

DISCUSSION

The great loss of lives, loss of useful man-hours of labour, the cost of treatment of patients and the negative impact of malaria make it a major social and economic burden, it is an infectious disease which is as old as man and as such demands a thorough investigation for effective prevention (Chaves *et al*., 2010).

The low prevalence observed in this study shows that this result is in consent with earlier study by Agomo *et al*., (2007), who attributed the reported high prevalence rates of malaria of most studies to the dearth in skill and experience of the laboratory personnel involved in blood film preparation, staining, and reading of the slides. In this study, sensitivity and specificity of the microscopists was ensured, strict adherence to standard procedures (WHO, 2015) for slide preparation and staining ensured the production of clear, well stained slides, thereby reducing errors due to artefacts. The inaccurate diagnosis of malaria is not peculiar to Nigeria. In Tanzania, Mwanziva *et al*. (2008) reported a very shocking case, where < 1% of the slides read by clinic microscopists as malaria positive were confirmed as positive by trained research scientists.

There was no significant association between rate of infected proportion and gravidity but there was increase in the mean of parasitaemia as the gravidity increased, this insinuates that pregnant women in these areas may have evidence of malaria infection at the time of birth if proper control and preventive measures are not taken. This statement agrees with that of Guyatt and Snow (2004); pregnant women in areas of stable transmission in Africa have evidence of malaria infection at the time of delivery. Thus the offspring of such mothers were prone or vulnerable to incidence of congenital malaria, low birth weight and mortality of new born infants in this locality.

As reported by Okonko *et al*., (2009), three different species of *Plasmodium* was observed to be responsible for malaria in Abeokuta, Nigeria, and *Plasmodium falciparum* was found to be the dorminant species with a higher prvalence followed by *Plasmodium ovale* and *Plasmodium malariae*. The higher prevalence of *Plasmodium falciparum* than *Plasmodium ovale* in this study among pregnant women is in agreement with the observation of Okonko *et al*., (2009) but different from the findings of Atif *et al*., (2009) who reported higher prevalence of infection of *Plasmodium vivax* than *Plasmodium falciparum* in Hyderabad, India. Hence different interventions may be optimal for the respective malaria species in certain settings; local intervention strategies will need to reconcile these differences to

ensure adequate impact against all species of malaria.

Though those educated were supposed to be more knowledgeable about malaria transmission and prevention methods (Adedotun et al., 2010), there was significant association between the educational level of the pregnant women and proportion of those infected observed in this study. According to Bawa *et al.,* (2014) who reported the absence of any significant difference between the prevalence of the infection among the educated and illiterate women in Kastina state, the prevalence of the malaria parasite in the area is not affected by education and stated that those who attended primary, secondary or post-secondary schools are not health educated.

Those attending private hospital are believed to be of higher economic strata but reverse may be the case when there is no close accessible government hospital. Pregnant women in private hospital were found to have higher rate of malaria infection. This may be connected with the cost of treatment which may reduce the frequency of visits of pregnant women to the hospital thereby reducing the rate of compliance to the Intermitent Preventive Treatment of malaria during pregnancy which was meant to protect the women and foetus against malaria infection thereby increasing the incidence rate of malaria among the women (Oyibo and Agomo, 2011). This is similar to the study of Ejima *et al*., (2013) at Minna, Niger State, where there was variation in the prevalence rate of malaria in the hospitals used for the study and that this was due to their economic status, which agrees with the fact that malaria goes hand in hand with poverty (Bremen *et al*., 2004).

The level of knowledge of pregnant women about malaria could be related to the fact that majority of the pregnant women were literate. This and other socio-economic conditions are known determining factors in the attitude of households to malaria (Baribwira *et al*., 1997). According to Ukpong (2005) this level of knowledge is necessary to enhance the development of community-based interventions programme. As shown from the results that knowledge about malaria is very high, recognizing mosquito bites and the realization of dirty and stagnant water as breeding sites for malaria vectors; the female *Anopheles* mosquito, this is comparable with the report of Panda *et al.* (2000) and Kyawtt-swe and Pearson (2004). With regards to the cause of malaria, most of the study subjects implicated mosquito bites as the possible cause of malaria. This is consistent with the reports of Deressa *et al*. (2002) and Klein *et al.* (1995). The awareness in the present study is much higher than those reported for Central Ethiopia and Kenya by Yaneneh *et al*. (1993) and Ongore *et al*. (1989), respectively but comparable to the study of Adedotun et al., (2010) in Nigeria. With the recorded appreciable level of formal education, the varied responses in favour of causes other than mosquito bites obviously signify the influence of another factor on their disposition which might be their local environment. This is in agreement with the finding of Matta *et al*. (2004) and Kyawtt-swe and Pearson (2004). However, other studies from Nigeria (Falade *et al., 2006*; Okeke, *et al, 2006*) and Tanzania (Comoro *et al., 2003*) have documented that gaps still exist in the knowledge of causation and treatment of malaria in rural areas and that these gaps have serious public health implications.

The results also revealed that the knowledge on malaria transmission of some of the respondents is poor and reflect ideas rooted in the custom and tradition of the people who believed that germs, witchcraft, working for too long, ingestion of contaminated food, cold, alcohol and high temperature exposure to sun predispose someone to malaria infection.

The results showed that knowledge about the symptoms of malaria was high, and the pregnant women were able to recognize the common symptoms of malaria that include general body pains, fever, headache, yellow urine, hot body, body ache, lack of

appetite, malaise, fatigue, frequent sweating cough and catarrh following their responses. Most of the participants had the knowledge of the symptoms of the disease. Similar results have been published by Deressa *et al.* (2002). This could be attributed to the high literacy level of the study participants and also the various health awareness campaign, being carried out intermittently by the Lagos state government in all nooks and crannies of the state.

Drugs play an important role in improving human health and promoting well-being. However, to produce the desired effect, they have to be safe, efficacious and have to be used rationally (Sharma *et al.,* 2006). The benefits of rational drug use during pregnancy are not only restricted to the recovery of maternal health, but are also helpful in the development of the foetus. The perception of pregnant women towards the use of herbal remedies in pregnancy influences the preference for its use for malaria treatment. This could be attributable to the fact that Africans even in urban areas often supplement the care they receive in clinics and hospitals with herbal remedies (Mafimisebi and Oguntade, 2010). The high prevalence of herbal medicines utilization may probably be attributable to the fact that average income in most sub-saharan Africa is extremely low therefore most households first line of treatment is home management of malaria in most instances using herbal remedies which are quite cheaper than the orthodox medicine (Adedotun et al., 2010; Mafimisebi and Oguntade, 2010) and which have been confirmed safe for the treatment of malaria (Sofowora, 1993). This confirmed the findings from previous studies where many women strongly believed in safety of herbal medicines use in pregnancy and perceived absence of side effects (Azriani *et al*., 2007; Azriani *et al*., 2008; Soon *et al*., 2009).

The study recorded participants from all the geopolitical zones of Nigeria, this was due to the location of the study, Lagos which is a cosmopolitan city and its richness in diversity of ethnic groups. The observed significant association between the ethnic groups and their perception about herbal remedies pointed out the Yoruba ethnic group among the pregnant women with the highest positive perception about herbal remedies for the treatment of malaria and this correlates with the study of Ologe *et al*., (2008) carried out in Ilorin Kwara State, where it was reported that the Yoruba tribe have always demonstrated high use of herbal drugs and use of kolanut by pregnant women in Ilorin and the reason for the use of herbal drugs was for the treatment of fever and for the prevention of fever during pregnancy (Ologe *et al*., 2008). The use of herbs for malaria is a long standing practice in Nigeria, especially among the Yoruba tribe (Idowu *et al*., 2006).

It is also of concern that herbal drugs could be prescribed by healthcare provider inspite of numerous orthodox formulated anti-malaria that are readily available in the country (Ologe *et al.*, 2008). Therefore, knowledge of its use might continue to be passed down from generation to generations. This indicates a need for more evidence-based research related to the safety of herbal medicines.

The significant association observed between the educational level of pregnant women and perception about herbal remedies in the treatment of malaria with the secondary educational level among the pregnant women having the highest positive perception about herbal remedies, which implies that information about the effectiveness of herbal remedies might have influence on their perception.

The significant association between age groups of pregnant women and perception about herbal remedies in the treatment of malaria with the age group 26-30 having the highest positive perception about herbal remedies correlates with the study conducted by Mohammadreza *et al*., (2012) in Iran, where a significant relationship between age and use of herbal medicines, where subjects aged between 20 and 29 years reported the highest use of herbal medicines.

The significant association between gravidity of pregnant women and perception about herbal remedies in the treatment of malaria reveals that the secundgravida had the highest positive perception about herbal remedies which consented with the study of Mohammadreza *et al*., (2012) where he reported that the number of pregnancy and children also had a significant relationship with herbal medicine use, as women in their first pregnancy were mostly non-users. This may be due to fear of teratogenicity of the herbal remedies and the sensitive cares attributed to first pregnancy in women.

The traders had the highest preference for herbal remedies and this was because of their proximity and exposure to herbal remedies seller in the market where they trade might have influence on their perception towards the use of herbal remedies.

The significant association between religion of pregnant women and preference of treatment for malaria with the Islamic religion having the highest preference for herbal remedies may be attributed to influence of religious leaders on the populace. The significant association between hospital type used by pregnant women and preference of treatment for malaria reveals that pregnant women attending private hospital for antenatal care had more preference for herbal remedies. This is not to say that patients in government hospitals use it less. This may not be unconnected with the fact that the use of herbal remedies are discouraged in most government hospitals and the personnel are more strict with standards than the private hospitals where patients are more free to express their opinions than their counterparts in the government hospitals.

It is worthy to note that in this study that higher percentage of the respondents had a positive perception for herbal treatment, and average percentage prefer either herbal remedies only or both herbal remedies and orthodox medicine combined together but few used herbal remedies in the treatment of malaria in pregnancy. There is a remarkable difference in the positive perception, preference and the use of herbal remmedies; this may be due to fear of teratogenicity of herbal remedies. This correlates with the multi-centre study carried out by Fakeye *et al*., (2009) where the Ibadan centre had a proportion of those who use herbal remedies in pregnancy was less than average and also same thing was reported for the North Central region of Nigeria, while other regions had much higher values. Comparatively, the proportion in this study stands within the proportions reported by workers in Australia (wambebe, 2009) and Norway (Dogoua, 2008). The significant association between self-medication as the first source of treatment in malaria and the use of herbal remedies in the treatment of malaria in pregnancy insinuates that those who use herbal remedies have always self-medicate, this correlates with the study of Tamuno, (2011) which reported that about forty percent of those using herbal medicine admitted to have been engaged in self-medication of orthodox drugs during pregnancy and there was a statistically significant association between use of herbal medicine during pregnancy and self-medication with orthodox drugs during pregnancy (Tamuno, 2011).

The various mixtures of herbs reportedly used by the respondents include leaves of *Carica papaya,* lime, Bark of dongoyaro, Lemon grass, root of mango, Grape fruit, Orange fruits and its leaves, Bitter leaf, Moringa Leaf, Root of Guava, Kolanut, Coconut water, Ginger, Bark of Cashew tree, Scent Leaf, water leaf, and plantain leaf.

While some don't know the content of the herbal remedies because they bought it already prepared, some of the respondents, self-prepared it by cooking, boiling or squeezing and some add alcohol to soak the herbs for hours before it was used. Majority of the respondents get their herbs from the market while few of them get their herbs from their compounds. The study indicated that majority of those who use herbal remedies in malaria treatment in pregnancy

drink the herbs after preparation while very few use it for bathing and some of the respondents use it for both drinking and bathing.

From this study, there is no proof of effectiveness of herbal remedies as the number of those who use herbal remedies in the treatment of malaria in pregnancy had the highest proportion of those infected with malaria than the non-users.

There is evidence from this study where some of the respondents claim that herbal medicine is their choice of treatment for malaria in pregnancy even in the face of uncertain efficacy, unknown dosage and its possible harmful effects on the foetus. This finding agrees with other reports on this study (Fakeye *et al*., 2009; Tamuno, 2011). This reluctance to part ways with herbal medicine in the midst of poor scientific evidence of safety is probably a reason for the lax in the regulatory framework for traditional herbal practitioners in many countries including Nigeria, making it possible for patients to purchase and use herbal medicine without due control (Wambebe, 2009).

CONCLUSION

Malaria prevalence in the studied population was low and this could be due to the high scaling up of health awareness, malaria interventions, and high competency in malaria microscopy and possibly due to the urban nature of the study location and participants' habitation. The knowledge of the pregnant women was very high due to the fact that they live within a city where there is continuous health awareness campaigns and various malaria intervention programmes being carried out continuously to achieve the elimination target of malaria infection by the Malaria Elimination Programme. The perception, preference and use of herbal remedies by pregnant women in the treatment of malaria was influenced by cultural, and socio-economic factors. From this study, there is no proof of effectiveness of herbal remedies as the number of those who use herbal remedies in the treatment of malaria in pregnancy had the highest proportion of those infected with malaria than the non-users.

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