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Rapid Diagnostic Test Kits Detection of Malaria Parasites among Pregnant Women Attending Antenatal in Selected Hospitals in Anyigba, Kogi State, Nigeria

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Abstract

A study was carried out to determine the status of malaria in four (4) selected hospitals in Anyigba, Dekina Local Government Area, Kogi State. A total of 300 pregnant women attending antenatal were tested for malaria parasite using rapid diagnostic test kits. Blood samples were obtained from finger by pricking and tested for malaria parasites. Structured questionnaires were administered to the pregnant women to obtain relevant information on the clinical and social aspects of malaria. A prevalence of 13.0% (39 women) was observed among pregnant women in Anyigba. Grimard Hospital and Egume General Hospital had the highest prevalence of 14.7% each; Maria Goretti Hospital had a prevalence of 13.3%, while KSUTH had the least prevalence of 9.3%. Age prevalence revealed that women with age < 20 years had the highest prevalence of 29.4% which was significant ($p > 0.05$) from the other age categories. Unemployed and women in their second trimester had the highest prevalence of 17.1% and 16.0% respectively. On the gravidity of the pregnant women, primigravidae (21.9%) was higher than multigravidae (10.6%) significantly ($p < 0.05$). Women from a polygamous family had a prevalence of 15.2% higher than those from monogamous family with a prevalence of 12.4%. The findings of this study revealed that malaria continues to exert significant public health and economic burden among pregnant women in parts of Dekina Local Government Area of Kogi State. Continuous efforts at providing necessary information by relevant health organizations are needed to control and reduce incidence of malaria in this area.

Keywords

Malaria, Pregnant Women, Anyigba, Kogi State

1. Introduction

Malaria is a completely preventable disease; however, about 3.4 billion people are at risk of the disease globally with 1.2 billion people at high risk [1]. In 2012, malaria was responsible for the death of approximately 482,000 even though an estimated 136 million Insecticide Treated Nets (ITNs) were distributed to endemic countries the same year [1]. Malaria remains a major public health concern particularly in sub-Saharan Africa and other parts of the developing world [2] [3].

In Nigerian, malaria is responsible for about 60% of the out-patient visit to health facilities, 30% of childhood death, 25% of death among children less than one year and 11% of maternal deaths [4] [5]. Approximately, about 70% of pregnant women suffer from malaria, which contributes to maternal anaemia, low birth weight, still births, spontaneous abortion and other pregnancy related complication [6].

Malaria control is a major challenge in Africa where over 588 million people in the 45 endemic countries are at risk especially children and pregnant women [7] [8] [9]. Statistics indicate that Nigerian alone accounts for 45% prevalence in the Africa continent; a fact not far-fetched when the population of the country is considered [10] [11]. Reports by FMoH [12] and Agomo *et al.* [9] stated that the prevalence of malaria parasitaemia has shown significant reduction in other African countries except Nigeria, a position which presents a gloomy future for malaria eradication in Nigerian amidst the huge efforts by the government and non-governmental agencies at combating the menace. Okpere *et al.* [13] reported that pregnancy results in increased incidence and severity of malaria which has been implicated for complications in pregnancy. In sub Saharan Africa, anaemia, spontaneous abortion, prematurity and stillbirths are common symptoms of the disease [13].

Pregnant women are more susceptible to malaria infections than the general populace to malaria. They are more likely to become infected, suffer a recurrence, develop severe complication and die from the disease [14]. Malaria in pregnancy is a significant contributor to maternal and neonatal mortality. It is a major cause of anaemia in pregnant women, which contributes to maternal death at delivery due to haemorrhage, and causes stillbirths, preterm birth, and low birth weight increasing the risk of neonatal death. In Sub-Sahara Africa, it was estimated to account for: 400,000 cases of severe anaemia in pregnant women, approximately 35% of preventable low-birth weight, approximately 5% of infant mortality and 75,000 and 200,000 infants (children under the age of 12 months) are estimated to die annually [15]. These outcomes are entirely preventable and optimizing the delivery of malaria in pregnancy interventions will lead to direct improvements in maternal, newborn and infant health.

Improper diagnosis may result into reoccurrences of the disease months later [16]. According to Ogboi *et al.* [17] who explored the phenomenon of using the wrong buffer vial (often a kit from another brand or buffer from HIV rapid test

kits) will not give an expected result. This study will evaluate malaria parasitaemia among pregnant women attending antenatal services in some selected hospital in Anyigba Dekina L.G.A Kogi State, Nigeria.

2. Materials and Methods

2.1. Study Area

Anyigba is a town in Dekina Local Government Area of Kogi State. It is Located on Latitude 7˚15" - 7˚29"N and Longitude 7˚11" - 7˚32"E and on an altitude of 420 m above sea level (**Figure 1**) [18]. The type of settlement here is linear with most of the houses along the road side. Major lakes and streams found in Anyigba include Lake Abuja in Ojofu, Oganeji River, and Ofejiji River.

2.2. Study Subjects

The study subjects were pregnant women that are attending antenatal clinic in some selected hospitals which include; Kogi State University Teaching Hospital (KSUTH) Anyigba, Maria Goretti Hospital Anyigba, Grimard Hospital Anyigba and General Hospital Egume. The research was carried out from October, 2015 to February 2016. The pregnant women were given questionnaires without prior knowledge of their clinical and family histories. They were of varying ages and pregnancy stages.

2.3. Sample Size

The sample size calculation was based on the formula described by Araoye [19] for estimating sample size. We used a malaria prevalence of 41.6% from a previous study Fana *et al.* [20] at a 95% confidence interval (CI) and a 5% margin of error. A sample size of 373 pregnant women was required but this study sampled a total of 300 pregnant women that consented.

2.4. Ethical Approval

Ethical approval was obtained from all the Kogi State Ministry of Health, Lokoja and also from the selected hospitals. An inform consent from the pregnant women was obtained before sample collection.

2.5. Data Collection

Data collection was done with the use of questionnaires to obtain demographic data such as age, gravidity, pregnancy stage, level of education and location. Questionnaire used in this study was adopted from the studies of Fana *et al.* [21], Ogbu *et al.* [22] and Akaba *et al.* [22]. Pregnancy stage was categorized using gestational calendar, first trimester was define as (less than 14 weeks), second trimester (14 - 27 weeks) and third trimester (greater than 27 weeks). A total of three hundred (300) blood samples of pregnant women were collected and tested for the presence of malaria parasite using rapid diagnostic test kits.

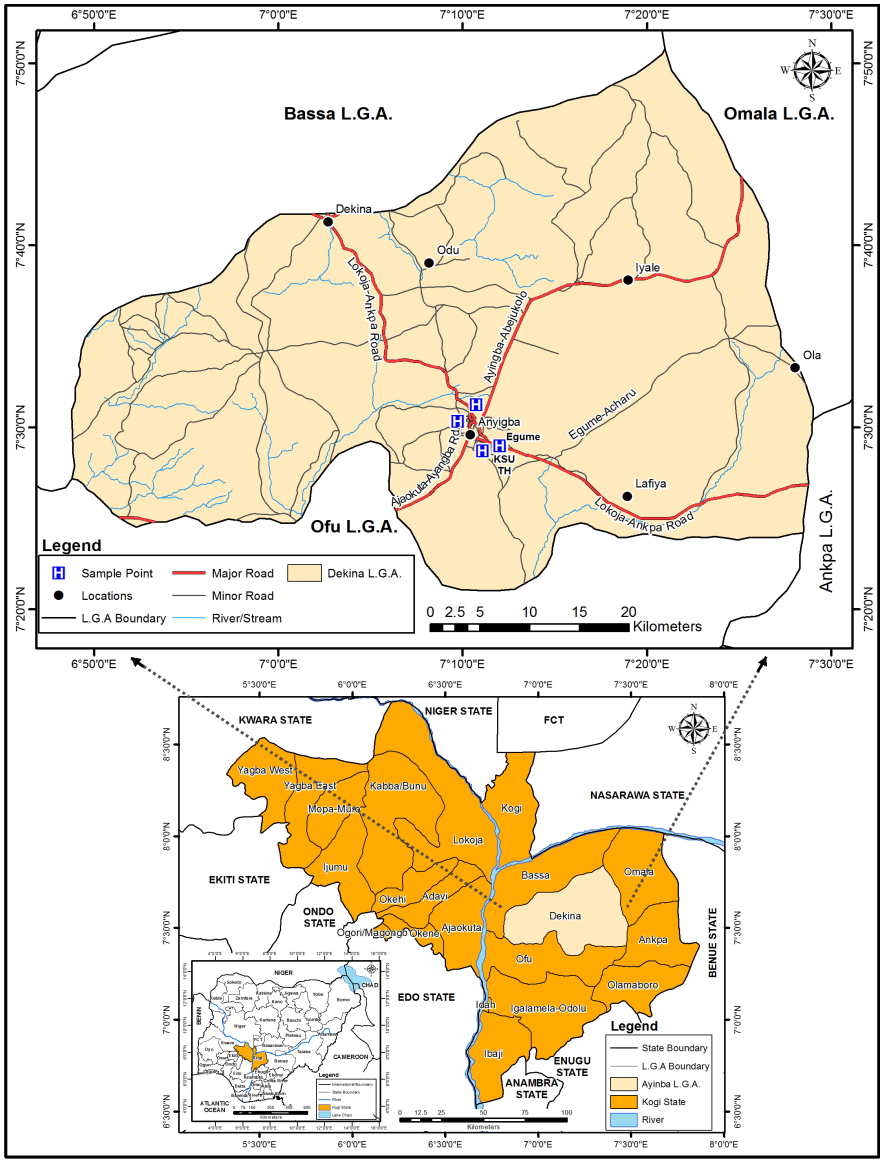

Figure 1. Map of the study area. Source: Department of Geography and Planning, Kogi State University, Anyigba.

2.6. Test Procedure

Using the manufacturer's guard line for the rapid qualitative detection of malaria using Care Start[tm] Malaria HRP2 (histidine rich protein 2) in human blood (*Pf*).

2.7. Results Interpretation

1) Invalid: The test is invalid if the line in the control area dose not appears. If this occurs, the test should be re-run.

2) Positive: Appearance of two color bands, one on the control region and the other on the test region indicate a positive.

3) Negative: Appearance of only one band of color appears in the control area.

2.8. Statistical Analysis

Descriptive statistics was used to calculate the prevalence. Chi-square test was used to determine significant difference between demographic parameters of the pregnant women. All analysis was performed at 95% confidence interval.

3. Results

A total of 300 pregnant women were examined for malaria parasite of which 13% (39 women) were positive for the parasite with the highest prevalence observed in Grimard Hospital and General Hospital Egume with both having a prevalence of 14.7% (11 women), followed by Maria Goretti 13.3% (10 women) while Kogi State University Teaching Hospital (KSUTH) had the least prevalence of 9.3% (7 women) (Table 1). Although, comparison of the prevalence among the hospitals revealed no significant difference ($p > 0.05$).

Age specific prevalence revealed that women with age < 20 years had the highest prevalence of 29.4% (10 women), followed by age of 20 - 29 years with prevalence of 11.7% (19 women) while age of 30 - 39 had the least prevalence of 11.0% (10 women). Meanwhile, women with age > 40 years had no malaria parasite detected. Comparison of the prevalence among the age categories revealed significant difference ($p < 0.05$).

Based on the level of education of the pregnant women, women with primary level of education had the highest prevalence of 16.3% (7 women), followed by those with secondary education (15%, 22 women), tertiary education (9.2%, 7 women) while women with no formal education has the least of 8.8% (3 women). Comparison of the prevalence among the educational level revealed no significant difference ($p > 0.05$).

Prevalence of malaria based on the occupation of the pregnant women, the highest prevalence of 17.1% (13 women) for unemployed women, followed by Civil Servant with 12.2% (6 women) and traders 11.5% (18 women) while farmers had the least prevalence of 11.1% (2 women).

Although, comparison of the prevalence among the occupational status revealed no significant difference ($p > 0.05$).

According to the stages of pregnancy, the highest prevalence was observed in women that are in their second trimester 16.0% (19 women), followed by first trimester with 14.6% (7 women) while the third trimester had the least prevalence of 9.8% (13 women). No significant difference ($p > 0.05$) based on the stages of pregnancy.

Women in their first pregnancy had a higher prevalence of 21.9% (14 women) than multigravidae women with 10.6% (25 women). Significant difference ($p < 0.05$) in terms of gravidity was observed.

Polygamous family had the highest prevalence of 15.2% (10 women) than monogamous family with a prevalence of 12.4% (29 women). No significant difference ($p > 0.05$) in prevalence.

Table 1. Prevalence of malaria parasites among selected hospitals in Dekina Local Government Area.

Hospitals	Number Examined	Status		Chi-Square	df	P Value
		Positive (%)	Negative (%)			
Hospitals						
Maria Goretti Hospital	75 (25.0)	10 (13.3)	65 (86.7)	1.267	3	0.737ns
Grimard Hospital	75 (25.0)	11 (14.7)	64 (85.3)			
KSUTH	75 (25.0)	7 (9.3)	68 (90.7)			
General Hospital, Egume	75 (25.0)	11 (14.7)	64 (85.3)			
Age (Years)						
Less than 20	34 (11.3)	10 (29.4)	24 (70.6)	10.597	3	0.014*
20 - 29	162 (54.0)	19 (11.7)	143 (140.9)			
30 - 39	91 (30.3)	10 (11.0)	81 (89.0)			
>40	13 (4.3)	0 (0.0)	13 (100.0)			
Education						
No Formal Education	34 (11.3)	3 (8.8)	31 (91.2)	2.400	3	0.494ns
Primary	43 (14.3)	7 (16.3)	36 (83.7)			
Secondary	147 (49.0)	22 (15.0)	125 (85.0)			
Tertiary	76 (25.3)	7 (9.2)	69 (90.8)			
Occupation						
Trading	157 (52.3)	18 (11.5)	139 (88.5)	1.541	3	0.673ns
Farming	18 (6.0)	2 (11.1)	16 (18.9)			
Civil Servant	49 (16.3)	6 (12.2)	43 (87.8)			
Unemployed	76 (25.3)	13 (17.1)	63 (82.9)			
Stages of Pregnancy						
First Trimester	48 (16.0)	7 (14.6)	41 (85.4)	2.256	2	0.324ns
Second Trimester	119 (39.7)	19 (16.0)	100 (84.0)			
Third Trimester	133 (44.3)	13 (9.8)	120 (90.2)			
Gravidity						
Primigavidae	64 (21.3)	14 (21.9)	50 (78.1)	5.666	1	0.017*
Multigravidae	236 (78.7)	25 (10.6)	211 (89.4)			
Family Type						
Monogamous	234 (78.0)	29 (12.4)	205 (87.6)	0.346	1	0.556ns
Polygamous	66 (22.0)	10 (15.2)	56 (84.8)			
Number of Children						
0 - 2	174 (58.0)	26 (14.9)	148 (85.1)	2.610	2	0.271ns
3 - 4	95 (31.7)	8 (8.4)	87 (91.6)			
>5	31 (10.3)	5 (16.1)	26 (83.9)			
Total	**300 (100.0)**	**39 (13.0)**	**261 (87.0)**			

*Significantly ($p < 0.05$). ns: Not Significant ($p > 0.05$).

The highest prevalence of 16.1% (5 women) was observed with pregnant women with children > 5, followed by those with children number of 0 - 2 (14.9%, 26 women) while those with children number of 3 - 4 had the least prevalence of 8.4% (8 women). No significant difference ($p > 0.05$) in prevalence according to number of children.

4. Discussion

This study was carried out in Dekina Local Government Area to ascertain the prevalence of malaria parasite among pregnant women attending antenatal in some selected hospital in Dekina Local Government Area. The study revealed that 300 pregnant women examined for the malaria parasite attending antenatal four (4) selected hospital in Dekina 39 (13.0%) were infected with the parasite. This finding was not correlating with similar study of Adefioye *et al.* [11] who recorded high prevalence rate of 72%. This may be due to the fact that their study was carried out between April-June during the rainy season with much breeding site of the mosquito, against the time of this research which was carried out in October-February (2015-2016).

Pregnant women with age of less than 20 years had the highest malaria parasite of 29.4%. This is correlating with a similar findings by Ohalete *et al.* [23], Volkman *et al.* [24] and Tay *et al.* [25], who stated that age related prevalence showed a decreased in malaria parasite with increased in age.

In this study, pregnant women with primary level of education had the highest prevalence and prevalence decrease with increase in level of education. Although, those without education had the least prevalence. This is contradicting with previous study by Alaku *et al.* [26] whose finding revealed that illiterate pregnant women had the highest prevalence 192 (97.3%).

For the occupation of pregnant women, the unemployed were observed to have the highest prevalence in this study. This agree with similar report of Usip and Opara [27], who stated that unemployed spend most of their time in open places such as shops, open shade etc. which exposes them to vector bites and transmission of malaria parasite than other occupation.

Second trimester had the highest prevalence in this study according to the stages of pregnancy. This finding is in line with similar studies carried out by Brabin [28], Nosten *et al.* [29], Menendez [30] and Nwagha *et al.* [31]. Their finding revealed that susceptibility is more marked in second trimester and early third trimester than first trimester. Other studies by Ohalete *et al.* [23], Brabin [28], Nwagha *et al.* [31] and Bouvon-Akotet *et al.* [32]; also recorded high prevalence rate in second trimester.

According to the number of pregnancy, primigravidae (women in their first pregnancy) had higher prevalence which was significant from those in second or more pregnancy (multigravidae). This corresponds to the studies of Ogbodo *et al.* [33] whose finding revealed that women in their second or more pregnancy develop some level of immunity to malaria parasite and tends to be less suscepti-

ble than those in their first pregnancy. This report also is line with the studies of Volkman *et al.* [24], Nwagha *et al.* [31], Nair and Nair [34], Rogerson *et al.* [35] and Anorlu *et al.* [36].

In the present study, pregnant women from polygamous homes had higher prevalence than those from monogamous home. Also, pregnant women with higher number of children had the parasite more compared to those from family with few children. This may be due to the availability of fund by a monogamous family and family with few children compared to those from a polygamous family and family with larger number of children in the purchase of preventive and control materials.

RDTs have been recommended to improve diagnostic efficiency but reports from previous studies revealed the low sensitivity of RDTs in the detection of malaria parasites. The inability to quantify the density of infection by this diagnostic method is also a disadvantage [37].

5. Conclusion

Malaria is not endemic among pregnant women in Dekina Local Government Area, Kogi State, Nigeria. The continuous use of integrated management will further help to reduce the burden in this area.

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