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PREVALENCE OF MALARIA PARASITES AMONG PREGNANT WOMEN ATTENDING GENERAL HOSPITAL GARAKU, KOKONA LOCAL GOVERNMENT, NASARAWA STATE

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Abstract

Malaria remains a significant health concern, particularly among pregnant women in various regions of Nigeria, including the Kokona metropolis. This study aimed to determine the prevalence of malaria among pregnant women in Garaku, Kokona LGA, Nasarawa State, and to assess the diagnostic accuracy of Microscopy versus Rapid Diagnostic Test (RDT). Blood samples were collected from 150 pregnant women in the Kokona Local Government Area and analyzed using both Microscopy and RDT. Data were analyzed using SPSS software version

Key words: Malaria prevalence, pregnant women, microscopy, Rapid Diagnostic Test (RDT), kokona local government area, diagnostic accuracy, trimester

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23.0, with statistical significance set at $P < 0.05$. The overall prevalence of malaria was found to be 31.33%, with the highest prevalence observed among women in their first trimester (36.71%). Microscopy demonstrated a higher positivity rate compared to RDT. Additionally, women aged 31-40 years exhibited the highest susceptibility, with a prevalence of 42.11%. However, no significant difference was noted in malaria prevalence based on the usage of mosquito nets or parity status. The study underscores the high prevalence of malaria among pregnant women in the region, emphasizing the need for enhanced intervention strategies. Microscopy remains a more reliable diagnostic tool than RDT. Early antenatal booking and regular preventive measures are crucial to mitigating the adverse effects of malaria during pregnancy. Furthermore, environmental sanitation efforts should be intensified to reduce mosquito breeding and subsequent malaria transmission.

Introduction

Malaria remains a life-threatening parasitic disease transmitted by female Anopheles mosquitoes, affecting millions worldwide. More than 40% of the global population lives in malaria-prone areas WHO (2010), and in 2015 alone, over 212 million new cases were recorded, with the majority of cases (90%) occurring in the WHO African Region, followed by the South-East Asia Region (7%) and the Eastern Mediterranean Region (2%) (WHO, 2016). During the same period, there were an estimated 429,000 malaria-related deaths globally (WHO, 2016). Malaria causes over 300 million acute illnesses and at least one million deaths annually, making it one of the most significant public health threats, particularly in tropical and subtropical regions (WHO, 2015). Young children and pregnant women are the most vulnerable populations, with malaria contributing to 40% of outpatient visits and 30% of hospital admissions in Nigeria (FMoH, 2009). Each year, malaria is responsible for nearly 110 million clinical cases and approximately 300,000 deaths in the country, with 25% of infant mortality, 30% of childhood mortality, and 11% of maternal deaths attributed to the disease.

The malaria parasite, primarily Plasmodium falciparum, is transmitted by female Anopheles mosquitoes, with variations in species depending on geographical location (Chen *et al*., 2011). While P. falciparum is the most

prevalent strain in sub-Saharan Africa, other species, including *P. malariae, P. ovale, and P. vivax*, also contribute to the disease burden. Malaria infection during pregnancy poses a major public health challenge in endemic regions like sub-Saharan Africa, as P. falciparum can lead to severe maternal anemia, intrauterine growth restriction, and low birth weight (Rogerson *et al*., 2007). Pregnant women, due to physiological changes that reduce their immunity, are particularly susceptible to malaria, leading to adverse outcomes such as premature delivery, increased perinatal mortality, and low birthweight (WHO, 2010).

Despite efforts to combat malaria, it continues to exert a heavy toll on developing countries, especially in Africa where 45 countries remain endemic, putting approximately 588 million people at risk (WHO, 2013). Nigeria, in particular, bears a substantial portion of the global malaria burden, with 97% of its population at risk of infection (Dawaki *et al*., 2016). Malaria accounts for 11% of maternal deaths in the country, making it a pressing issue for national health authorities (Rupashree *et al*., 2014). Control measures, including the use of Long-Lasting Insecticidal Nets (LLINs) as recommended by the World Health Organization, have received increased attention in the past decade due to expanded funding and program implementation.

Given the burden of malaria in pregnancy, this study focuses on the prevalence of malaria among pregnant women attending General Hospital Garaku in Kokona Local Government Area, Nasarawa State. The presence of mosquito vectors, limited diagnostic and treatment facilities, and inaccessibility to preventive services contribute to the high prevalence of malaria in rural areas (Snow *et al*., 2005). This study aims to assess the current prevalence of malaria parasites among pregnant women in the region, providing updated data that can inform health workers and stakeholders on necessary control measures. The outcome of this research will offer valuable insights into the health status of pregnant women in Garaku and aid in improving safe motherhood in the area.

The overall aim of the study is to determine the prevalence of malaria parasites among pregnant women attending General Hospital Garaku. Specific objectives include determining prevalence by age group, gestational age, and use of mosquito nets, and assessing the reliability of Rapid Diagnostic Tests

(RDTs) compared to microscopy. These objectives will address the hypotheses that there is no significant difference in the overall prevalence, age-related prevalence, and the reliability of diagnostic tools.

MATERIALS AND METHODS

Study Area

This study was conducted at the Nasarawa State University Health Center in Keffi, located in the Middle Belt region of Nigeria. Geographically, Keffi is situated at a latitude of 8.5° N and a longitude of 7.52° E. The town is 850 meters above sea level and lies northwest of Lafia, the capital of Nasarawa State. It is 53 km from Abuja, the capital of Nigeria, and is located in the Guinea Savannah region of the country (Akwa *et al*., 2006).

Sample Collection

The pregnant women's arms were tied with an elastic band (tourniquet) to make the veins more visible. The target vein was cleaned with an alcohol pad, and 2 ml of blood was drawn using a syringe and transferred into EDTA sample bottles. The samples were then transported in a cold ice pack to the Zoology Laboratory at Nasarawa State University, Keffi, for analysis.

Microscopy Analysis

Thick and thin blood films were prepared on clean, grease-free slides and labeled. The thin films were fixed with methanol, and all films were stained with 3% Giemsa stain at pH 7.0 for 30 minutes. The films were examined under a light microscope using the x100 objective with immersion oil.

Rapid Diagnostic Test

Blood samples were taken from the EDTA sample bottles using a specimen device provided in the test kit. The collected blood was dropped into the section labeled "S" on the cassette, followed by 2 drops of buffer solution in the section labeled "A." After 20 minutes, the results were read.

Data Analysis

Data were analyzed using SPSS software version 23.0 at a significance level of $P < 0.05$. The Chi-square (χ^2) test was used to determine significant differences at the 0.05 probability level.

RESULTS

Prevalence of Malaria Parasite among Pregnant Women According To Gestational Age

Based on the pregnancy's gestational age, women in their first trimester had the highest occurrence at 36.71% (29 out of 79). This was succeeded by the second trimester at 28.00% (14out of 50), with the lowest figure of 18.18% observed in the third trimester. These findings are detailed in Table 1. The differences were statistically significant (P <0.05).

Prevalence of Malaria Parasite among Pregnant Women According To The Usage Of Mosquito Net

A slightly higher percentage of those who did not use mosquito nets tested positive for both RDT and Microscopy comnpared to those who did use mosquito nets. However, the overall positivity rate (both tests combined) is higher among those who did not use mosquito nets (27.33%) compared to those who did (12.00%). The differences were not statistically significant (P>0.05).

Table 1: Prevalence of malaria parasite among pregnant women according to gestational age.

Trimester	No Examined	RDT Positive (%)	Microscopy Positive (%)
1st trimester	79	8(10.13)	29(36.71)
2nd trimester	50	8(16.00)	14(28.00)
3rd trimester	21	3(13.64)	4(18.18)
Total	150	19(12.67)	47(31.33)
x^2		8.895	20.213
sig.		0.003	0.001

Table 2: Prevalence of malaria parasite among pregnant women according to the usage of mosquito net.

Use of mosquito net	No Examined	RDT Positive (%)	Microscopy Positive (%)
Yes	65	8(12.30)	18(27.69)
No	85	11(12.94)	29(34.12)

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Total	150	19(12.67)	47(31.33)
x^2		**8.895**	**20.213**
sig.		**0.003**	**0.001**

Prevalence of Malaria Parasite among Pregnant Women According to Age Groups

The results showed that, according to age, patients between 21 and 30 years had the highest infection rate, with 34 cases. Microscopy revealed higher infection rates of 42.11% (8/19) for the age group above 30 years, 32.38% (34/105) for the age group 21–30 years, 38.10% (8/21) for the age group under 20 years, and 40.00% (2/5) for the age group 41 years and above, compared to the results obtained using RDT, as shown in Table 4.3. The differences were statistically significant (P < 0.05).

Prevalence of Malaria Parasite Among Pregnant Women According to Weight

According to weight categories, those in the 40–60 kg range had the highest infection rate, with 35.71% (15/42) being infected, as observed under microscopy. Women weighing more than 100 kg showed zero prevalence using both methods. The results are shown in Table 4. The differences were statistically significant (P < 0.05).

Table 3: Prevalence of malaria parasite among pregnant women according to age groups

Age group	No Examined	RDT Positive(%)	Microscopy Positive (%)
<20	21	24(19.05)	8(38.10)
20-30	101	14(13.33)	34(32.38)
31-40	19	4(21.05)	8(42.11)
> 40	5	1(20.00)	2(40.00)
Total	150	23(15.33)	52(34.67)
χ^2		**11.043**	**29.692**
sig.		**0.004**	**<0.001**

RDT = Rapid Diagnostic Test.
% = Percentage.

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Table 4: Prevalence of malaria parasite among pregnant women according to weight

Weight(Kg)	No Examined	RDT Positive (%)	Microscopy Positive (%)
41-60	42	4(9.52)	15(35.71)
61-80	77	14(18.18)	27(35.07)
81-100	27	1(3.70)	5(18.52)
101 and above	4	0(0.00)	0(0.00)
Total	150	19(12.67)	47(31.33)
χ^2		**14.632**	**15.489**
sig.		**0.001**	**0.001**

RDT = Rapid Diagnostic Test.
% = Percentage.
Kg = Kilogram

Prevalence of Malaria According to Gravidity/Parity among Pregnant Women

Out of the 150 pregnant women whose blood samples were examined for malaria parasites, 31.33% (47/150) tested positive using microscopy, while 12.67% (19/150) tested positive using the RDT method (Table 1). According to parity, primigravids women had the highest infection rate, with 36.96% (17/48) testing positive using microscopy, compared to an infection rate of 16.67% (8/48) with RDT. This was followed by multigravida women, with a prevalence of 30.26% (15/46) for microscopy and 15.22% (7/46) for RDT. Secundigravids women had the lowest prevalence, with 3.85% (1/26). The results are shown in Table 5. The differences were not statistically significant using either method (P > 0.05).

Table 5: Prevalence of malaria among pregnant women according to gravidity in Garaku, Kokona L.G.A.

Gravidity	No Examined	RDT Positive (%)	Microscopy Positive (%)
Primigravida	48	8(16.67)	17(36.96)
Secundigravida	26	1(3.85)	7(26.92)
Multigravida	76	10(13.15)	8(30.26)
Total	150	19(12.67)	47(31.33)
χ^2		**6.895**	**0.125**

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sig.	**0.075**	**0.939**

RDT = Rapid Diagnostic Test.
% = Percentage.

DISCUSSION, CONCLUSION, AND RECOMMENDATION

Discussion

The overall malaria prevalence of 31.33% among pregnant women recorded in this study aligns with previous research. Mockenhaupt *et al*. (2000) reported a prevalence of 42.0% among pregnant women in Ghana, Ejike *et al*. (2017) reported a prevalence of 40.1% in Abia South LGA, Abia State, and Maina *et al*. (2017) noted 39.7% in Kaduna Metropolis, Nigeria. However, the prevalence observed in this study is lower than the 60.5% reported in Dutsin Ma, Katsina State (Eberemu and Magaji, 2019) and the 69.5% in selected LGAs in Kaduna State (Osagiede *et al*., 2017), but higher than the 27.0% reported in Rivers State (Wogu and Nduka, 2017). These differences may be attributed to varying levels of insecticide-treated net (ITN) usage among the women and the seasonal timing of the studies. According to Ayanda (2009), the prevalence of *P. falciparum* infection is higher during the wet season compared to the dry season. Minakaw *et al*. (2002) also opined that the rainy season provides favorable environmental conditions for mosquito breeding and survival, increasing larval habitats and improving humidity.

Regarding gravidity, primigravid women exhibited a higher malaria prevalence, consistent with findings by Odikamnoro *et al*. (2014) and Eberemu & Magaji (2019), which they attributed to pregnancy-specific *P. falciparum* variants. This study also found that the first trimester had the highest malaria prevalence at 36.71%, similar to findings in Ebonyi State (Ivoke *et al*., 2013) and Dutsin Ma (Eberemu & Magaji, 2019), but differing from other studies such as those by Dicko *et al*. (2003) and Abe and Olusi (2014), which reported higher prevalence during the second trimester. In contrast, Adam *et al*. (2005) found that in Eastern Sudan, the risk of malaria infection was significantly associated with the third trimester.

This study also showed that pregnant women who used Long-Lasting Insecticide-Treated Nets (LLINs) or ITNs had a lower level of malaria infection

compared to those who did not use the nets for personal reasons. This finding aligns with Odoemene *et al*. (2017), who reported that the majority of respondents with malaria infections in five major communities in Ikenne LGA, Ogun State, Nigeria, were not using LLINs. In this study, older women appeared to be more susceptible to malaria, with the highest prevalence (42.11%) observed in the 31–40 years age group. This finding is similar to that of Adefioye *et al*. (2007), who reported a prevalence of 88.2% in the 36–39 years age group. However, it contrasts with Dicko *et al*. (2003), who suggested that adolescents and young adult pregnant women were more susceptible to malaria than older pregnant women due to the continuous development of immunity in older women.

Conclusion

The overall prevalence of malaria parasites among pregnant women reported in this study was 31.33%. This high prevalence was attributed to an inadequate understanding of mosquito biology, leading to continued maternal morbidity and mortality among pregnant women in Kokona Local Government Area, Nasarawa State. The study also shows that microscopy remains a more reliable method of diagnosing malaria compared to Rapid Diagnostic Tests (RDT).

Recommendations

1. Health education and media enlightenment on the dangers of mosquitoes as vectors for malaria transmission are critical and cannot be overemphasized.
2. Early antenatal booking for effective monitoring and prompt treatment of malaria during pregnancy will significantly reduce maternal morbidity and mortality.
3. Routine intermittent preventive treatment of malaria should be recommended for pregnant women in this area.
4. Proper and regular environmental sanitation to eliminate mosquito breeding sites will significantly reduce the prevalence of malaria.

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