Original Research Article

PREVALENCE OF MALARIA AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN ATTENDING UNIOSUN TEACHING HOSPITAL OSOGBO OSUN STATE, NIGERIA.

ABSTRACT

Pregnancy-related malaria is still a public health issue, as it contributes to a high infant mortality rate, low birth weight, and maternal mortality. Over 80% of the world's malaria cases were found in sub-Saharan Africa and India. More than 500,000 cases were reported in Nigeria, Madagascar, and the Democratic Republic of Congo. Pregnant women in sub-Saharan Africa, particularly in Nigeria, are most at risk of malaria infection each year, with about 50 million pregnancies at risk. Therefore, the objective of this study was to determine malaria prevalence and associated risk factors among pregnant women in Osun State, Nigeria.

The study was retrospective of five-year period between January 2017- December 2021. The medical records of 277 pregnant women who were tested positive for malaria were retrieved to examine the contributing factors and malaria-related complications. Data was analysed using the SPSS statistical software package, version 23. Chi-square test was used to determine statistical significance. Data were presented in its simplest form and P - value < 0.05 to be statistical significance.

The prevalence of malaria reported among pregnant women were found to be 98.9% caused by Plasmodium falciparum. While most pregnant women who were tested positive for malaria parasite had no complications, low birth weight was the most common complication among pregnant women who were infected with malaria, Proportion of malaria in pregnant women during the gestational period was found, according to the findings - 1st Trimester 33.2%, 2nd Trimester 47.3%, and 3rd Trimester 19.5%. There was no significant association between the prevalence of malaria and Genotypes (P=0.498).

It was discovered that the prevalence of malaria among pregnant women was high with P. falciparum being the most common malaria parasite found in the stud. Prenatal care was found to be a major factor in the early detection of signs and symptoms associated with pregnancy.

Keywords: Prevalence, Malaria, Pregnant Women, Associated Factors.

Introduction

The Plasmodium genus of protists (a type of microorganism) causes malaria, a disease spread by mosquito bites that affects both humans and animals. Female Anopheles mosquitoes transmit malaria which is also a life-threatening parasitic disease. Around the world, more than 40% of the population is confined to dreadful places (WHO, 2010). "Marsh fever" and "ague" were both previously used to describe the illness, which was originally known as "mala-aria" in Medieval Italian because of its connection to swamps and marshes. After being bitten by an infected female mosquito, protists (microorganisms) are released into the circulatory system and eventually develop and proliferate in the liver. As far as the health zone is concerned, malaria is still a major factor in maternal mortality and morbidity around the world and is regarded as a contamination linked to poverty (Moya-Alvarez *et al.,* 2015; Ricci, 2016). According to the World Health Organisation (WHO, 2016), there were approximately 216 million new cases of malaria around the world. In addition, 90% of the malaria cases occurred in Africa, followed by Southeast Asia (7%), and the Eastern Mediterranean region (2%).

The tropics have long been a hotbed for malaria, which is spread by female Anopheles mosquitoes that are infected with parasites of the genus Plasmodium and reproduce in warm and humid conditions. P. falciparum, P. vivax, P. malariae, P. knowlesi, and P. ovale are just a few of the five distinct malaria parasite species that can infect humans. A total of 216 million cases of malaria were reported worldwide in 2016, and 445,000 people died from the disease (WHO, 2017). The WHO's African Region reported (90%) of all malaria cases in 2015 and (91%) of all malaria-related deaths in 2016. Despite the fact that malaria can be prevented, it remains the primary cause of maternal, in-utero, and infant morbidity and mortality. 1.2 billion of the 3.4 billion persons who are at high risk of contracting malaria are pregnant women. About 88% of cases and 90.0% of deaths were linked to malaria in the sub-Saharan Africa region, with more than 35.0% of these cases occurring in Nigeria and DRC (Democratic Republic of Congo) area (National Multiple Indicator Cluster Survey [NMICS] & Federal Ministry of Health [FMOH], 2015; WHO, 2018, 2019). About 50 million times a year, pregnant women in sub-Saharan Africa, notably in Nigeria, are at danger of contracting malaria. Approximately 70% of pregnant women in Nigeria suffer from malaria, and 11% die as a result of the ailment (NMICS, 2015; Noland *et al.,* 2018). While pregnant

women in areas with high rates of malaria transmission are particularly vulnerable to infection, there is no better time than during the first trimester to start building immunity against the disease (Eijk *et al.,* 2015).

Plasmodium falciparum, the parasite that causes malaria in pregnant women, is commonly overlooked as a public health issue by clinicians who treat such cases. More than 80% of malaria deaths occur in sub-Saharan Africa, according to the World Health Organisation in 2013. Nigeria Malaria Indicator Report (2012) revealed that over 40% of all malaria-related deaths occur in Nigeria and the Democratic Republic of the Congo. Due to this knowledge, the two most significant nations in the world have teamed up to fight the spread of malaria. Malaria during pregnancy is one of the more common chronic infections affecting pregnant women, unborn children, and children under the age of five in Nigeria (National Bureau of Statistics [NBS] & FMOH, 2016). Over 800,000 women in Sub-Saharan Africa had low birth weight due to malaria, according to the World Health Organisation (WHO, 2020). The health of pregnant women and their unborn children have suffered as a result of this contamination. Other issues include pregnancy loss, extreme anaemia, intrauterine growth restriction and foetal hypotrophy and maternal hypoglycaemia (Stephanie *et al.,* 2016).

The prevalence and risk factors of malaria among pregnant women in this part of the country need to be critically considered as a major public health issue with daily exposure to malaria parasite. Therefore, this study objective is to determine the prevalence of malaria and associated factors among pregnant women in Uniosun Teaching Hospital Osogbo Osun State Nigeria

Material and Method

Study design and area

Pregnant women were surveyed over a five-year period to determine the prevalence of malaria and its associated factors (January 2017- December 2021). Pregnant women with malaria were counted at the hospital's medical records coding unit from January 2017 to December 2021. Records were checked out from the library to identify what factors were

associated with each patient's coding unit number, as well as how malaria affected each patient's symptoms and overall health. This study was conducted at UNIOSUN Teaching Hospital Department of Obstetrics Clinic, Osogbo Osun State. The Hospital was established in 1997 as Ladoke Akintola University of Technology (LAUTECH) Teaching Hospital Complex, which is now acknowledged as Uniosun Teaching Hospital. Uniosun is a tertiary health organization located in Osogbo which is the capital of Osun State. Osogbo sits between Latitude 70º and 46º North and Longitude 40º and 36º East. The whole land area is 47km2. The town is positioned 88km northeast of Ibadan by road, 100km south of Ilorin via road, and 115km northwest of Akure. 48km from Ife, 32km from Ilesa , Iwo 46km, Ikire 48km and Ila-orangun 46km. The hospital serves the Osogbo Township where it is located and receives cases from other parts of the state.

Sample size determination and sampling technique

The Leslie-Kish formula was used to determine the sample size with a related prevalence of 82%, confidence level was 95% with margin of error of 5% which gives a total sample size of 277. Following approval from Uniosun Teaching Hospital, Osogbo Osun State Department of Obstetrics and Gynecology. Data on all pregnant women with malaria who visited an antenatal clinic during the study period was available through the coding system. The records of their cases were retrieved from the record library in order to gather the necessary information.

Data collection

The coding section of the hospital's medical records was used to gather the data. The patients who tested positive for malaria infection had their file numbers compiled, and the proforma was used to generate data for analysis.

Data analysis

Analysis was done using the Statistical Package for the Social Sciences (SPSS) version 23. The chi-square test was used to test for statistical significance for discrete and continuous data, respectively. The data was summarized and presented as tables and charts. Statistical significance was set at P – value < 0.05%.

Ethical considerations

Uniosun Teaching Hospital Moral Committee Osogbo, provided ethical approval for the research. Adeleke University Ethical Committee, Ede, Osun State also provided ethical approval for the research with the reference number (AUERC/FBMS/IND/11). Knowledge obtained from this study has been processed and evaluated without revealing the participants' private details.

Results

Frequency Distribution of Patients by Socio-demographic Variable

The highest age range of the patients was 26-32 years 113 (40.8%) and the lowest age range was 47-53 years 4 (1.4%). The highest marital status of the patients was the married group 264 (95.3%) while the lowest was the single group 13 (4.7%). The highest religious practice was Christianity 138 (49.8%) and the lowest religious practice was Traditional religion 2 (0.7%). The majority of the patient's ethnicity was Yoruba 246 (88.8%) while the lowest ethnicity was Hausa 16 (5.8%). The highest level of education of the patients was tertiary education 167 (60.3%) while lowest level of education was primary 25 (9.0%). The occupational status of the majority of the patients was salary earner 105 (37.9%) while the lowest occupational status was apprentice 8 (2.9%). The frequency of each socio-demographic variable is shown in (Table 1).

Number of Pregnant Women Tested Positive to Malaria per Year

In terms of the number of pregnant women with malaria over the five-year period, there was a high prevalence of malaria in the year 2018 70 (25.3%) compared to the year 2017 59 (21.3%), there was also a decrease in the rate from the year 2019 58 (20.9%) compared to the year 2021 40 (14.4%) (Table 2).

Frequency Distribution of Patients by Malaria Symptom

The most prevalent symptoms of malaria among the patients was Fever (31.8%), 23.1% presented with Abdominal Pain, 22% had Spotting bleeding, 11.6% complained of Headache, 7.9% presented with Headache and Fever, 1.4% developed Dizziness, 1.4% had no symptoms, 0.4% presented Preterm Contraction and 0.4% had Vomiting (Table 3).

Table 1: Frequency Distribution of Patients by Socio-demographic Variable

Variable	Category	Frequency	Percentage
Age Group	19-25 years	62	22.4%
	26-32 years	113	40.8%
	33-39 years	69	24.9%
	40-46 years	29	10.5%
	47-53 years	4	1.4%
	Total	277	100%
Marital	Single	13	4.7%
Status	Married	264	95.3%
	Total	277	100%
Religion	Christianity	138	49.8%

	Islam	137	49.5%
	Traditional	2	0.7%
	Total	277	100%
Ethnicity	Yoruba	246	88.8%
	Igbo	15	5.4%
	Hausa	16	5.8%
	Total	277	100%
Highest level of education	Primary	25	9.0%
	Secondary	84	30.3%
	Tertiary	167	60.3%
	None	1	0.4%
	Total	277	100%
Occupational Status	Salary earners	105	37.9%
	Trader	59	21.3%
	Unemployed	52	18.8%
	Artisan	53	19.1%
	Apprentice	8	2.9%
	Total	277	100%

Table 2: Number of Pregnant Women Tested positive To Malaria per Year

Years	**Number of Pregnant Women**	**Percentage**
2017	59	21.3%
2018	70	25.3%
2019	58	20.9%
2020	50	18.1%

2021	40	14.4%
Total	**277**	**100**

Table 3: Frequency Distribution of Patients by Malaria Symptom

Variable	Category	Frequency	Percentage
Symptoms of Malaria	Vagina bleeding	61	22%
	Fever	88	31.8%
	Abdominal pain	64	23.1%
	Bleeding	22	7.9%
	Headache	32	11.6%
	Preterm Contraction	1	0.4%
	Vomiting	1	0.4%
	Dizziness	4	1.4%
	No symptom	4	1.4%

Frequency Distribution of Patients by Malaria complication

Most prevalent complications of malaria among patients was low birth weight (16.2%), followed by premature delivery (15.2%), abortion (12.3%), miscarriage (8.3%), stillbirth (6.9%), and 41.2% had no complication. The frequency of each complication is shown in (Table 4).

Frequency Distribution of Patients by Gestational Age & Gravidity

The majority of the pregnant women were in their 2nd Trimester (47.3%) and tested positive to malaria, 33.2% were in their 1st Trimester and 19.5% were in their 3rd Trimester. The highest Gravidity (35.7%) of pregnant women tested positive to malaria were Secundigradiva i.e. second pregnancy , 30.3% were Primigravida (First pregnancy), 17.7% were Multigravida with the 4th pregnancy or more while 16.2% were Multigravida with 3rd pregnancy. The frequency of each category is shown in (Table 5).

Frequency Distribution of Patients by ITN Utilisation & Antenatal Care Follow up

A few of the patients (28.9%) utilised Insecticide-Treated Net while 71.1% did not. The majority (63.9%) of respondents had antenatal care follow up while only 36.1% did not. The frequency is shown in (Table 6).

Table 4: Frequency Distribution of Patients by Malaria Complication

Variable	Category	Frequency	Cumulative Frequency
Complications of Malaria	Stillbirth	19	19
	Premature delivery	42	61
	Low birth weight	45	106
	Miscarriage	23	127
	Abortion	34	163
	No Complication	114	277

Table 5: Frequency Distribution of Patients by Gestational Age & Gravidity

Variable	Category	Frequency	Percentage
Gestational age	1st Trimester	92	33.2%
	2nd Trimester	131	47.3%
	3rd Trimester	54	19.5%
	Total	277	100%
Gravidity	Primigravida	84	30.3%
	Secundgradiva	99	35.7%
	Multigravida (3rd)	45	16.2%
	Multigravida (≥4th)	49	17.7%
	Total	277	100%

Table 6: Frequency Distribution of Patients by ITN Utilisation & Antenatal Care Follow up

Variable	Category	Frequency	Percentage
ITN Utilisation	Yes	80	28.9%
	No	197	71.1%
	Total	277	100%
Variable	**Category**	**Frequency**	**Percentage**
Antenatal Care Follow up	Yes	177	63.9%
	No	100	36.1%
	Total	27s	100%

Chi Square Test (Association between Prevalence of Malaria and Gestational Age, ITN Utilisation, Gravidity, Genotype, Symptoms and Complications)

1.There is higher risk of P. Falciparum and P. Ovale among Patients in 2nd Gestational age while P. Ovale had higher risk in1st Trimesters, however this association was not statistically significant (p value=0.37)

2. There is higher risk of P Falciparum, P. Vivax and P. Ovale among Patients without ITN, however this association was not statistically significant (p value=0.65)

3. There is higher risk of Falciparum Malaria, Vivax and Ovale Malaria among Patients are Secundigradiva, however this association was not statistically significant (p value=0.76)

4. There is higher risk of P. Falciparum and P. Ovale among Respondents in with Genotype AA while P. Ovale had higher risk among respondents with Genotype AS, however there was no statistically significant association between Prevalence of Malaria and Gestational age (p value=0.49)

5. The risk of symptoms is very high with malaria prevalence (0.99). However there is no statistically significant association between malaria prevalence and symptoms (P value=0.97)

6. The risk of complications is high with malaria prevalence (0.59). However there is no statistically significant association between malaria prevalence and complications (P value=0.24)

The result shows that, there is higher risk of symptoms among Patients with P Falciparum, P. Vivax and P. Ovale over the period of five years, however this association was not statistically significant (p value=0.97). There is also a higher risk of

complications among patients with P Falciparum and P. Ovale, however this association was not statistically significant (p value=0.24). The each frequency of each associated factors are shown on (Table 7).

Table 7: Chi Square Test (Association between Prevalence of Malaria and Gestational Age, ITN Utilisation, Gravidity, Genotype, Symptoms and Complications)

Variable	Option	Falciparum	Vivax	Ovale	Total	X^2 Value	Df	P Value
Gestational	1st	91	1	0	92	4.24	2	0.37
Age	2nd	129	0	2	131			
	3rd	54	0	0	54			
	Total	274	1	2	277			
ITN	Yes	79	0	1	80	0.84	2	0.65
	No	195	1	1	197			
	Total	274	1	2	277			
Gravidity	Primigravida	82	1	1	84	3.37	6	0.76
	Secundigradiva	98	0	1	99			
	Multigravida	45	0	0	45			
	Multigravida ≥4	49	0	0	49			
	Total	274	1	2	277			
Genotype	AC	29	0	1	30	5.36	6	0.49
	AA	143	0	1	144			
	AS	99	1	0	100			
	SC	3	0	0	3			
	Total	274	1	2	277			
Symptoms	Yes	270	1	2	273	0.04	2	0.97
	No	4	0	0	4			

	Total	274	1	2	277			
Complication	Yes	161	0	2	163	2.8	2	0.24
	No	113	1	0	114			
	Total	274	1	2	277			

Figure 1: Frequency Distribution of Patients by Number of Antenatal Care Visit

The majority (64.6%) of the patients visited Antenatal Clinic four times and more, 21.3% visited Antenatal Clinic three times, 10.1% visited Antenatal Clinic two times and 4% visited Antenatal Clinic only once (see Figure 2 below).

Figure 2: Prevalence of Malaria among Pregnant Women by Plasmodium Species

Prevalence of Falciparum Malaria was 98.9%, Prevalence of Ovale Malaria was 0.7% and Prevalence of Vivax Malaria was 0.4% (Figure 3) below.

Figure 3: Frequency Distribution of Patients by Genotype

Note: AC – Hemoglobin C trait, AA – Homozygous dominant. AS –Sickle-cell gene, SC – Hemoglobin (HB)

More than half (52%) of Patients had AA Genotype, 36.1% had AS Genotype, 10.8% had AC and only 1.1% had the SC Genotype (Figure 4) below.

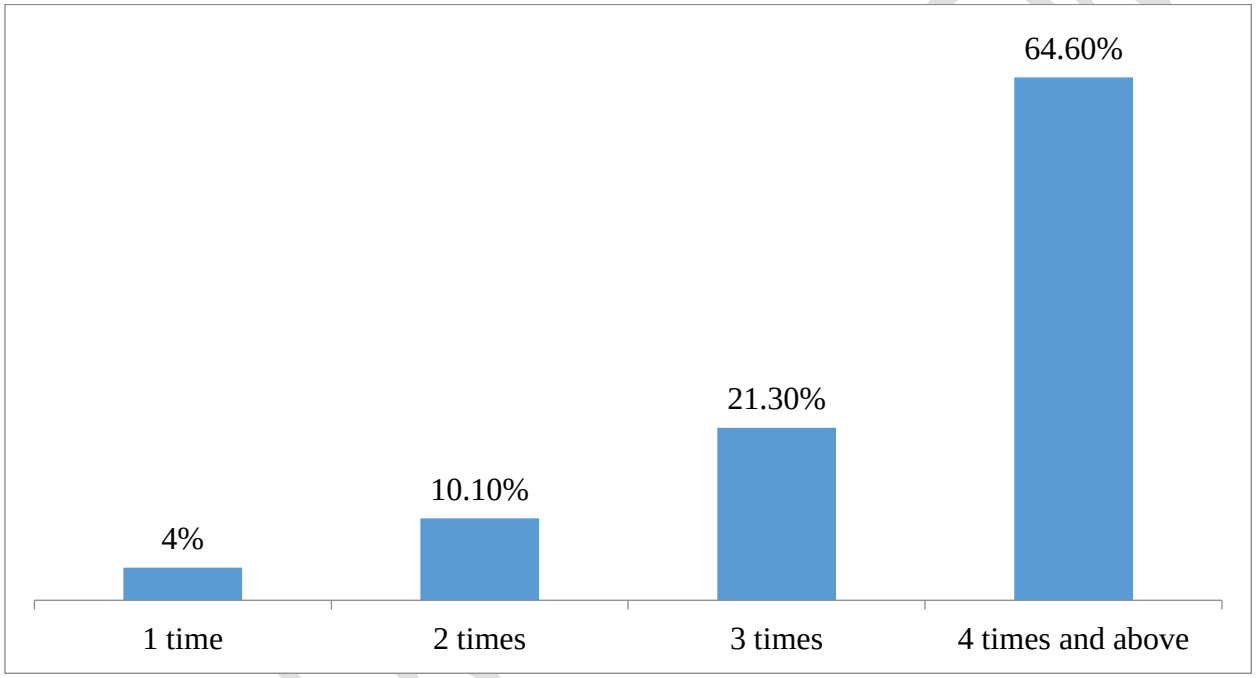

Figure 1: Frequency Distribution of Patients by Number of Antenatal Care Visit

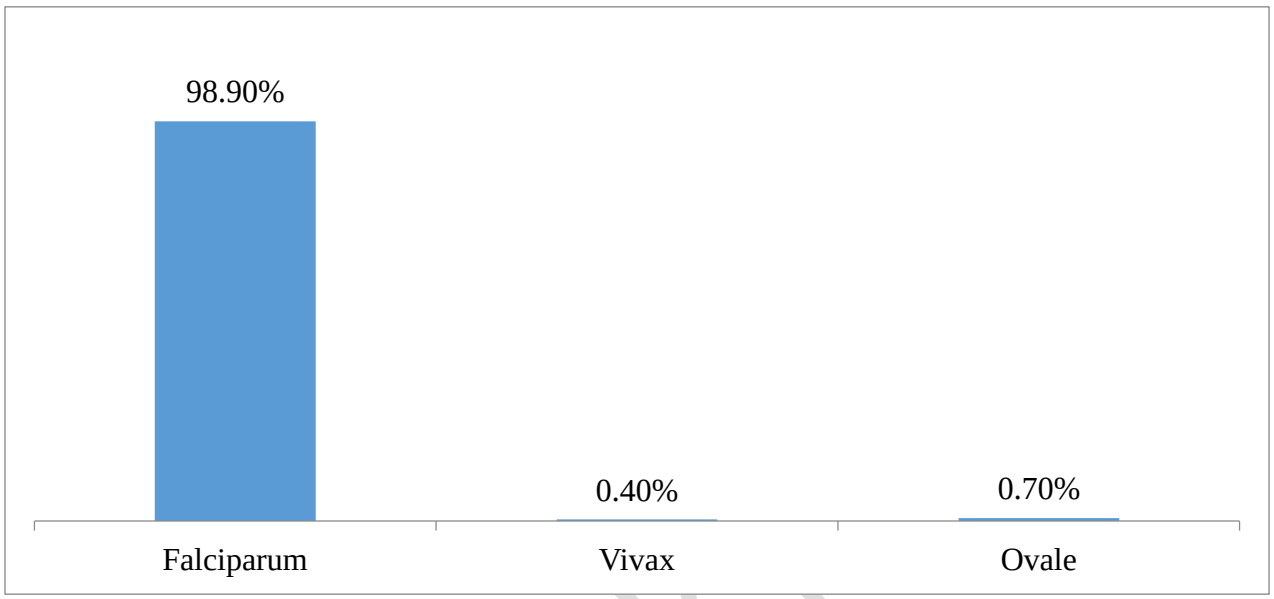

Figure 2: Prevalence of Malaria among Pregnant Women by Plasmodium Species

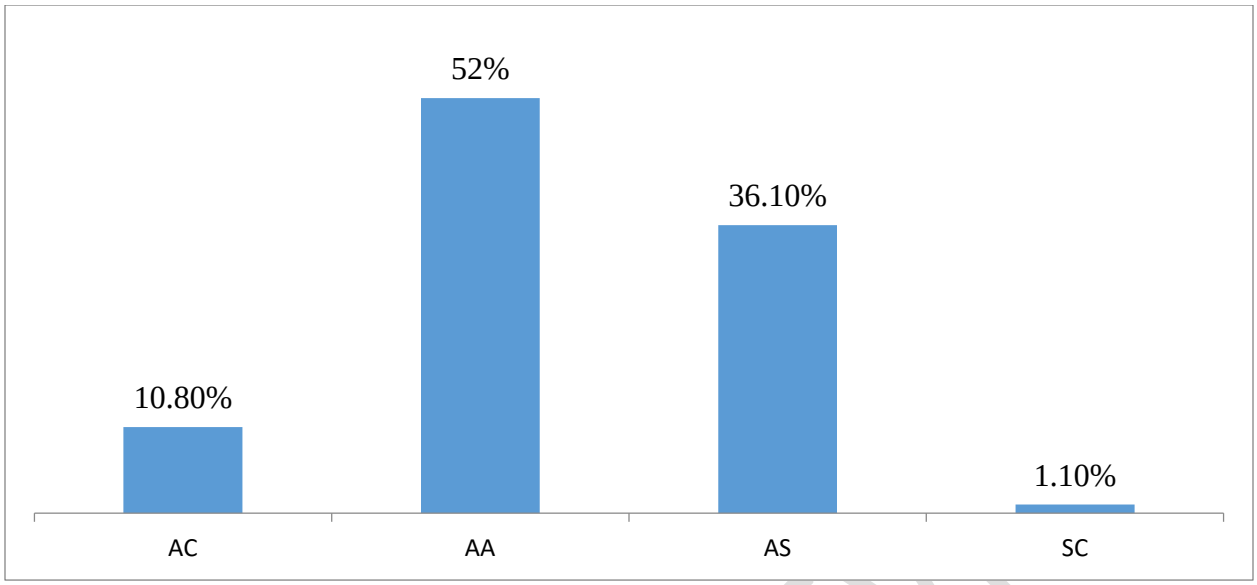

Figure 3: Frequency Distribution of Patients by Genotype

DISCUSSION

Due to their weaker immune systems, pregnant women are more susceptible to malaria infection, which makes it a major problem for the country as a whole, particularly in Nigeria. More than half of all pregnant women in the study are married (95.3%), and the largest ethnic group is Yoruba (88.8%).

Most patients had Falciparum Malaria (98.9 %), followed by Ovale Malaria (0.7 %) and Vivax Malaria (0.4%). A higher prevalence of Falciparum Malaria among pregnant women who visited antenatal care facilities at Uniosun Teaching Hospital, in response to the first question of the study could be observed. Plasmodium Falciparum is an endemic disease in sub-Saharan Africa, and pregnant women's low immunity makes them vulnerable to Falciparum Malaria (Awosolu *et al.,* 2021).

A total of 52% of patients have the AA genotype, 36% of patients have the AS genotype, 10.8% of patients have the AC genotype, and 1.1% of patients have the SC genotype, according to the research. Pregnant women in the antenatal care clinic at Uniosun Teaching Hospital Osogbo have the AA Genotype, followed by AS Genotype, AC Genotype, and SC Genotype. This report agrees with that of Albiti and Nsiah (2014) in many ways. In comparison to AA, the prevalence of individuals with AS and AC is quite low. A stronger resistance to malaria may exist in people with AS, AC, or SC. Archer *et al.* (2018) findings support this conclusion. The level of susceptibility to malaria has been pronounced to be greater in individuals with AA when compared with those with AS, AC and SC. Thus, the high frequency of AC and AS in malaria endemic areas has been attributed to and reduce in malaria morbidity and mortality in malaria endemic areas (Archer *et al.,* 2018). When compared to those with AS, AC, and SC, those with AA are more susceptible to malaria. A decrease in malaria-related morbidity

and mortality has been linked to an increase in the prevalence of AC and AS, which are common in malaria-endemic regions (Archer *et al.,* 2018). AC and AS take a defensive stance against malaria infection as a result of reduced cytoadhesion of infected red blood cells to microvasculature and impaired rosette formation as a result of the presence of strange parasite falciparum erythrocyte membrane protein 1(PfEMP1) antigen on AC and AS (Fairhurst *et al.,* 2012).

Pregnant women at Uniosun Hospital Osogbo Teaching use ITNs at a very low rate in the past (28.9 %). Availability, affordability, and acceptance of ITN may be to blame for this low utilization. According to the National Demographic Health Survey (NPC Nigeria and ICF, 2019), 37.1% of the population was found to be in poor health. The findings are also in line with findings from a study in Edo State (Wagbatsoma *et al.,* 2010). Pregnant women attending an antenatal care clinic at Uniosun Teaching Hospital Osogbo ranged in gestational age from 47.3% in the 2nd trimester to 33.2% in the 1st trimester to 19.5% in the 3rd trimester. Pregnant women in the second trimester are more likely to volunteer for the study because they have had a reasonable amount of time to adjust to their pregnancy, unlike those in the first trimester, who may still be experiencing nausea and vomiting. Pregnant women in their third trimester may also be extremely obese at this time.

More than one-third (35.7%) of the women who took part in this study are classified as Secundigradiva, while 30.3% are classified as Primigravida, and 17.7% are classified as Multigravida with four or more pregnancies. Meanwhile, 16.2% are classified as Multigravida with only their third pregnancies. This is expected, as most women prefer to have a small family of two or three, so it is common to see women who are pregnant

for the first or second time. It's odd, though, that there were more Multigravida with their fourth or subsequent pregnancies than there were with their third.

Patients had from one to four prenatal visits, with an average of 3.4 visits. According to the National Health and Nutrition Examination Survey [NDHS] 2018, 56.8% of pregnant women in the United States had at least four antenatal visits. The study also found that the majority of respondents (63.9 %) received Antenatal Care. More than 96% of pregnant women in Osun State were not receiving prenatal care (National Demographic Health Survey (NDHS), 2018).

Although there is a higher risk of Falciparum Malaria among Patients with Genotypes AA (AS), AC (AC), and SC (p value=0.498), there is not a significant association. There is no significant correlation between pregnant women's genotypes and their likelihood of being infected with malaria in Osogbo, Nigeria, according to the first hypothesis.

ITN use is less common among those with the genotypes AA-SC than among those without, and thus no link can be drawn between the two variables. There appears to be no correlation between genotypes and use of Insecticide Treated Nets (ITN) among pregnant women attending the antenatal care clinic at Uniosun Teaching Hospital Osogbo. .

In the first, second, and third trimesters, women are more likely to contract Falciparum malaria than Vivax or Ovale malaria, but there is no link (p value=0.373) between the prevalence of malaria and gestational age. In other words, this supports the hypothesis that pregnant women attending the antenatal care clinic at Uniosun Teaching Hospital Osogbo are not at increased risk of malaria because of their gestational age.

Conclusion

Within a five-year period, the prevalence of malaria among expectant mothers is reportedly low, making it simpler to further educate them. Due to a lack of use of insecticide-treated nets, which also contributed to greater complications, the prevalence of malaria symptoms among pregnant women is high. The majority of pregnant women go for antenatal care, which will also aid in the early identification of associated factors such genotypes, gestational age, gravidity, and ITN use.

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