UKR Journal of Medicine and Medical Research (UKRJMMR)
Homepage: https://ukrpublisher.com/ukrjmmr/
Email: submit.ukrpublisher@gmail.com
Volume 2, Issue 1, Jan-Feb 2026
ISSN: 3107-5061 (Online)

Prevalence of Malaria in Pregnancy and Associated Factors Among Pregnant Women in Rivers East Senatorial District, Rivers State

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DOI: *https://doi.org/10.5281/zenodo.18478056*

Article History

Original Research Article

Received: 14-01-2026

Accepted: 25-01-2026

Published: 04-02-2026

Citation: Peter-Kio, Opirite Boma, & Nseobong, Ofonime. (2026). Prevalence of malaria in pregnancy and associated factors among pregnant women in Rivers East Senatorial District, Rivers State. *UKR Journal of Medicine and Medical Research (UKRJMMR), 2*(1). 71-81.

Abstract

Malaria in pregnancy remains a significant public health concern due to its detrimental effects on both maternal and fetal health. This study assessed the prevalence of malaria and its associated factors among pregnant women in the Rivers East Senatorial District of Rivers State using a descriptive cross-sectional design. The study population comprised 133,545 registered pregnant women, from which 360 respondents were selected through a multistage sampling technique. Data were collected using the Assessment of Malaria and Associated Factors Proforma (AMaaFP) and analyzed with the Statistical Package for Social Sciences (SPSS) version 27.0, employing descriptive statistics and logistic regression at a 0.05 level of significance. The findings revealed that 26.4% of the respondents tested positive for malaria, while 73.6% were malaria-negative, with higher prevalence observed among women in the first and second trimesters, those younger than 20 years, primigravidae, users of intermittent preventive treatment with sulfadoxine–pyrimethamine, and women with multiple gestations. Bivariate analysis showed statistically significant associations between malaria in pregnancy and gestational age, maternal age, use of intermittent preventive treatment with sulfadoxine–pyrimethamine, and multiple gestation ($p < 0.05$). The study concluded that malaria prevalence among pregnant women in the Rivers East Senatorial District remains high and recommended that the State Ministry of Health strengthen malaria prevention strategies, particularly through the routine free distribution of insecticide-treated bed nets at antenatal clinics to ensure early and consistent use by pregnant women.

Keywords: *Associated factors, Malaria, Prevalence, Pregnant Women.*

Introduction

Infected female Anopheles mosquitoes transmit the Plasmodium parasites that cause malaria, an acute fever sickness. According to Sato (2021) and the World Health Organization (2023), the disease is caused by parasites called Plasmodium. The most dangerous ones for humans are Plasmodium vivax and Plasmodium falciparum. Clinical outcomes can vary from moderate symptoms to severe sickness or death, and it is transmitted through the bite of infected female Anopheles mosquitoes (Al-Awadhi et al., 2021). The combination of a weakened immune system during pregnancy (allowing for higher parasitemia levels) and the placenta's ability to trap parasites makes pregnant women an easy target for malaria (Gontie et al., 2020; Chua et al., 2021; Ahadzie-Soglie et al., 2022; Almaw et al., 2022). According to Wylie and Rogerson (2024), in regions where malaria is prevalent during pregnancy, it is a leading cause of maternal mortality, maternal anemia, and adverse pregnancy outcomes such as miscarriage, preterm birth, fetal growth restriction, low birth weight, stillbirth, congenital infection, and neonatal mortality. Despite the fact that malaria may be prevented and even cured, the damage it does to maternal health is irreparable.

Because of the potential harm it can do to both mother and child, malaria infection during pregnancy is an ongoing issue in public health. Everyone agrees that malaria during pregnancy is a major problem for world health (Whittaker et al., 2021). Worldwide, 229 million people fell ill with malaria in the past year, making it the top cause of death

and illness overall, particularly among pregnant women (World Health Organization, 2020). As each year, about 95% maternal deaths were due to malaria (WHO, 2020). In Southeast Asia and Latin America, the prevalence is less than 15%, and lower compared to sub-Saharan Africa, partly due to the presence of Plasmodium vivax, which tends to cause less severe disease (Menéndez et al., 2021). In Uganda, Nankabirwa et al. (2019) reported that, approximately 15% of pregnant women were found to be infected with malaria parasites. These high prevalence rates highlight the substantial burden of malaria in pregnancy in sub-Saharan Africa, which is exacerbated by the region's weak healthcare infrastructure and limited access to preventive interventions. Sub-Saharan Africa is the region that bears the brunt of global malaria-related morbidity and mortality (van Eijk et al., 2015). In African region, report showed that, 35% of pregnancies were exposed to malaria infection; and prevalence of 23% was reported in Nigeria (WHO, 2020). Malaria in pregnancy is often fatal if not attended to in time.

According to Bakken and Iversen (2021) and Reddy et al. (2020), malaria during pregnancy poses significant dangers to the mother's health. Parasitemia, spleen rates, morbidity, anaemia, febrile illness, cerebral malaria, hypoglycemia, puerperal sepsis, mortality, severe disease, and hemorrhage are some of the problems that pregnant women can have due to malaria (Farea et al., 2020). Cerebral malaria is another problem that can affect mothers. It happens when the parasite Plasmodium falciparum invades the blood vessels in the brain, which can cause symptoms such as disorientation, convulsions, coma, and even death. Despite the rarity of cerebral malaria, pregnant women are at a higher risk of contracting it because of their compromised immune systems (Bardají et al., 2020). In addition, Desai et al. (2018) found that malaria during pregnancy increases the risk of several life-threatening complications, including renal failure, disseminated intravascular coagulation (DIC), and acute respiratory distress syndrome (ARDS). In regions where malaria is prevalent, mothers who contract the disease during their pregnancies may develop anemia, which worsens an already difficult experience during pregnancy and childbirth and greatly increases the risk of maternal mortality (Fondjo et al., 2020; Ssentongo et al., 2020; Nkwabong et al., 2020). Malaria causes maternal anemia, the most prevalent consequence, by destroying red blood cells. Maternal outcome is operationally defined as anemia.

Several factors affect the frequency of malaria in pregnant women. These include the woman's gravidity, her immune state, and her ability to take preventative measures, including using an insecticide-treated net. Details such as gestational age, maternal age, parity, and use of intermittent preventative therapy (SP) were considered contextually. A further preventative approach that can considerably decrease malaria transmission and, by extension, the risk of malaria during pregnancy is the use of insecticide-treated bed nets (ITNs), according to Nguyen et al. (2018). Out of 390 women surveyed in Rivers State, only 59 (18.2%) regularly used their insecticide-treated bed nets (ITNs) (Tobin-West & Kanu, 2016). As a potent vector control technique, intermittent preventative therapy (SP) can reduce the prevalence of malaria in countries where it is endemic by preventing transmission of the disease. Only 20.4% of respondents had insecticide-treated nets in their homes (Duguma et al., 2022). However, having an ITN does not necessarily mean that you will use it; in fact, the study found that 82.5% of participants did not use a bed net, and the prevalence of malaria was significantly higher in the non-users (17.5% vs. 20.4%). Although insecticide-treated nets (ITNs) can prevent miscarriage, they can be uncomfortable for women who are far along in their pregnancies.

Gestational age plays a crucial role in the impact of malaria during pregnancy. The stage of pregnancy significantly influences how both the maternal and fetal systems respond to malaria infection. Shao et al. (2020) stated that, in the first trimester, the risks associated with malaria infection are particularly high, as the immune system is still adapting to the changes in maternal physiology, and this period is characterized by increased susceptibility to infections like malaria. In a similar vein, Hunt (2020) stated that, malaria at the second trimester is strongly associated with placental malaria, because the placental tissue provides a favorable environment for malaria parasites to replicate. However, Mabunda et al. (2019) posited that, in the third trimester, the risks of malaria infection are still present but may be less pronounced than in earlier stages of pregnancy, particularly due to the partial immune adaptations that occur as the pregnancy progresses. However, malaria during this stage can lead to severe maternal complications, including acute respiratory distress syndrome, and can significantly increase the risk of preterm birth, especially among older maternal-aged women.

Maternal age during pregnancy could also be associated with the prevalence of malaria. Maternal age refers to the number of days, weeks, months and years a pregnant mother had lived on earth, often measured in years. Cisse et al. (2014) revealed that there was an association between maternal age, and the occurrence of P. falciparum malaria infection during pregnancy. It is plausible that changes in the physiological activities of the body during gestation may likely affect the immune system which in turn cause morbidity to malaria and other infections. Dosoo et al. (2020) buttressed that 20.4 % of pregnant women who

reported malaria were aged 27.6 years while women ≥ 25 years were less likely to show signs and symptoms of malaria. The prevalence of malaria may be high among women who are pregnant and parasite density may be higher as women advances in their age and as their parity increases.

Multiple pregnancy is another factor that could explain for variations in the prevalence of malaria among pregnant mothers. Gamble et al. (2020) stated that, primigravidae (first-time mothers) are at a higher risk of malaria infection compared to multigravidae (women who have had multiple pregnancies), as they have not yet developed immunity to malaria. This gravidity-related risk has been observed in multiple studies across different malaria-endemic regions. More recently, Almaw et al. (2022) illustrated that primigravidae women reported symptoms of malaria infection and gravidae was positively associated with malaria infection. Additionally, Tamiru et al. (2022) reported that the prevalence of plasmodium falciparum was over 3 times higher among women who are at the first trimester of pregnancy and while others reported asymptomatic for malaria. Malaria in pregnancy is a critical health concern that poses significant risks to the mother, particularly in regions where healthcare infrastructure is weak in access and potency, like Rivers East Senatorial District.

In Rivers East Senatorial District, one of the most frequent reason for hospitalization or pharmaceutical patronage is malaria. The prevalence rate and outcomes reported by several studies need to be investigated in Rivers East Senatorial District, particularly among pregnant women because they are among the most vulnerable group. Aguzie (2018) stated that, despite continuous efforts to control and eradicate malaria, it remains a significant burden on pregnant women. Despite this, some pregnant women still take it lightly, shown in their late presentation of the condition, specifically those who resort to home care during pregnancy. In Rivers State where several women prefer to patronize quacks during pregnancy due to the financial involvement, observation has shown that, even cases where pregnant women feel feverish, they prefer to visit a nearby medicine shop for treatment, rather than visiting the healthcare facilities, except at a later or advanced stage of the sickness. However, when it is presented lately at a maternal health care facility, the pregnancy outcomes associated with it may not be totally avoided. Therefore, the researcher deemed it necessary to carry out this study on the assessment of malaria and associated risk factors among pregnant women in Rivers East Senatorial District of Rivers State.

Statement of the Problem

Anaemia, preterm birth, intrauterine growth restriction (IUGR), perinatal mortality, stillbirth, low birth weight, and maternal death are among the adverse fetal, neonatal, and maternal outcomes that are increased by malaria during pregnancy, making it one of the top causes of antenatal and perinatal morbidity and mortality among the obstetric population. Its toll on the health of pregnant women can be attributed to the fact that its prevalence has not been given the needed attention, particularly in Rivers East Senatorial District. However, its effect on maternal health outcomes are pronounced among women with an indication that there is an urgent need to unveil its prevalence and associated factors and, actions need to be taken in order to tackle it. However, malaria transmission has declined in many countries during the past decade due to global efforts to combat the disease. Pregnant women are still at risk, unfortunately.

Following the free distribution of ITNs mandated by the previous administration, it is imperative that this long-standing issue among pregnant women in the Rivers East Senatorial District be thoroughly probed. Problems with access to and implementation of preventative interventions, such as insecticide-treated nets (ITNs) and intermittent preventive treatment in pregnancy (IPTp), and resistance to antimalarial medications exacerbate this problem. The situation is made worse by the fact that, due to inadequate resources, providing effective prenatal care in the area is quite challenging. Although malaria during pregnancy is a known contributor to maternal morbidity and mortality, researchers have paid it very little attention. The dearth of research on the effects of malaria on pregnant women in the Rivers East Senatorial District is indicative of this. There is an immediate need for a comprehensive educational evaluation of the matter due to the inconsistent results across research and the significant effect of malaria on birth outcomes. Consequently, the purpose of this research was to examine pregnant women in the Rivers East Senatorial District of Rivers State for signs of malaria and risk factors related to the disease. Questions such as these were addressed by the study's findings:

1. What percentage of pregnant women in Rivers State's Rivers East Senatorial District have malaria?
2. In Rivers East Senatorial District, Rivers State, how often is malaria during pregnancy and what is the correlation between gestational age and its prevalence?
3. In the Rivers East Senatorial District of Rivers State, how often is malaria during pregnancy and what is the correlation between mother age and this prevalence?

4. In the Rivers East Senatorial District of Rivers State, how common is malaria during pregnancy among pregnant women and how often do they take intermittent preventative treatment with Sulphadoxine Pyrimethamine (SP)?
5. In the Rivers East Senatorial District of Rivers State, how common is malaria during pregnancy and how many pregnancies do pregnant women typically have?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no substantial correlation between gestational age and malaria in pregnancy among pregnant women in the Rivers East Senatorial District of Rivers State.
2. There is no significant correlation between maternal age and malaria during pregnancy among women in the Rivers East Senatorial District of Rivers State.
3. There is no significant correlation between the utilization of intermittent preventive treatment with Sulphadoxine Pyrimethamine (SP) and malaria in pregnancy among pregnant women in the Rivers East Senatorial District of Rivers State.
4. There is no significant correlation between multiple gestation and the prevalence of malaria in pregnancy among women in the Rivers East Senatorial District of Rivers State.

Methodology

The study utilized a descriptive cross-sectional design, focusing on a population of 133,545 registered pregnant women in the Rivers East Senatorial District. A multi-staged sampling method was used to choose the 360 people who answered the survey. The process has three steps. In the first stage, four of the eight Local Government Areas in Rivers East were chosen at random using the simple random sampling method. The basic random selection method was used to choose two facilities from each LGA in the second round. The simple random selection method was employed to choose the people who would answer the study's questions at the third stage. The tool used to gather data was a proforma called the "Assessment of Malaria and Associated Factors Proforma (AMaaFP)." The proforma included the following details: mother age, gestational age, habitual drug use, and multiple pregnancies, along with an open-ended section for recording the malaria test results. The acquired data were analyzed using Statistical Product for Service Solution (SPSS) version 27.0, employing percentages to address research questions and logistic regression to evaluate hypotheses at a 0.05 level of significance.

Results

The results of the study are shown below:

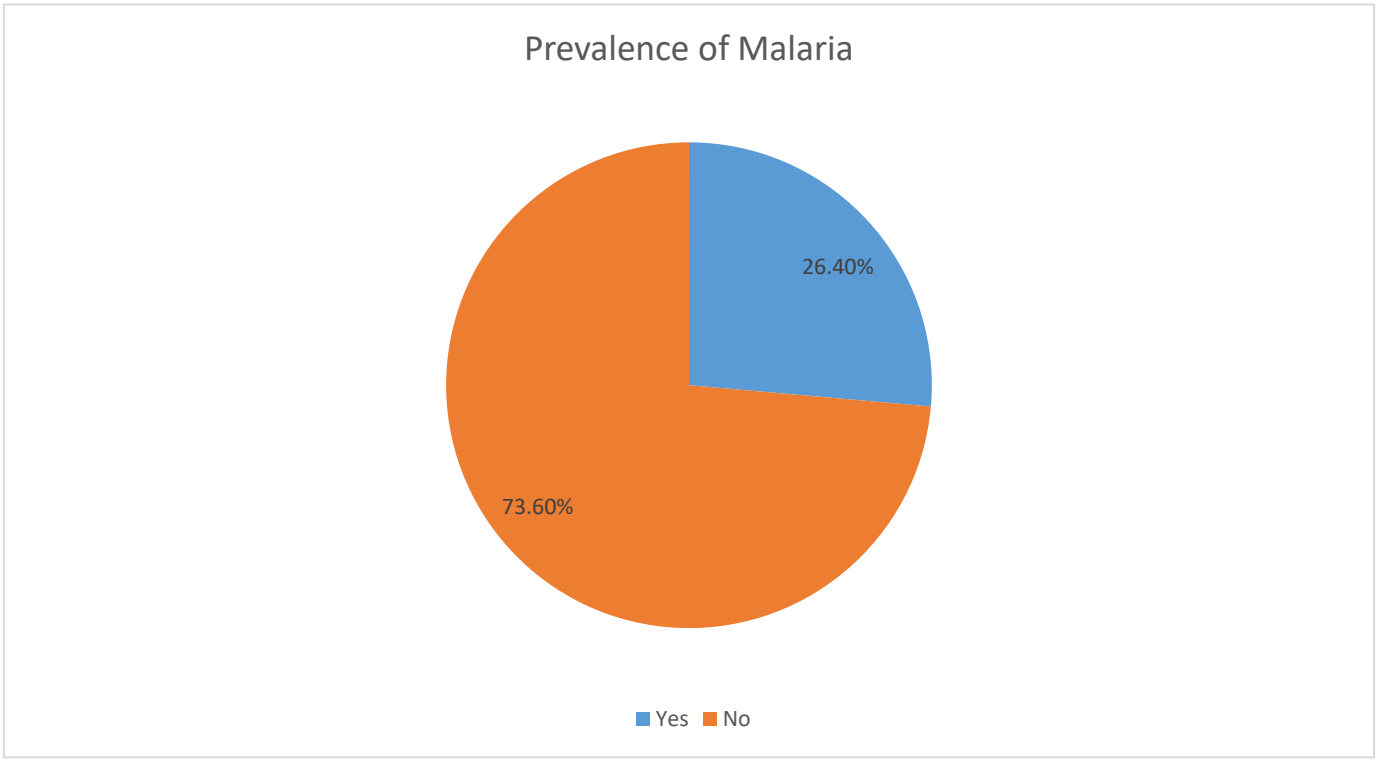

Fig 1: Bar chart showing the prevalence of malaria

Fig 1 revealed the percentage distribution showing the prevalence of malaria. The result showed that more than a quarter (26.4%) had malaria while 73.6% did not test positive for malaria. Thus, the prevalence of malaria in pregnancy among pregnant women in Rivers East was low.

Table 1: Prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District of Rivers State based on gestational age

Gestational age	Prevalence of Malaria		Total
	Yes	No	
	F(%)	F(%)	
1st trimester	57(28.1)	146(71.9)	203(100)
2nd trimester	35(27.1)	94(72.9)	129(100)
3rd trimester	3(10.7)	25(89.3)	28(100)
Total	95(26.4)	265(73.6)	360(100)

Table 1 showed the prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District of Rivers State based on gestational age. The result showed that among those who were in their third trimester 10.7% had malaria, among those in their second and first trimester 27.1% and 28.1% respectively had malaria. Thus, those who had younger gestational age had higher prevalence of malaria, which decreased with higher gestational age.

Table 2: Prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District of Rivers State based on maternal age

Maternal age	Prevalence of Malaria		Total
	Yes	No	
	F(%)	F(%)	
<20years	6(50.0)	6(50.0)	12(100)
20-29years	42(22.6)	144(77.4)	186(100)
30-39years	47(29.0)	115(71.0)	162(100)
Total	95(26.4)	265(73.6)	360(100)

Table 2 showed the prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District of Rivers State based on maternal age. The result showed that among those who were in aged <20 years 50.0% had malaria, among those aged 20-29 years, 30-39 years 22.6% and 29.0% respectively had malaria. Thus, those who had older in age had higher prevalence of malaria, which increased with increasing maternal age.

Table 3: Prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District of Rivers State based on use of SP

Use of intermittent preventive treatment with SP	Prevalence of Malaria		Total
	Yes	No	
	F(%)	F(%)	
Yes	8(7.6)	97(92.4)	105(100)
No	87(34.1)	168(65.9)	255(100)
Total	95(26.4)	265(73.6)	360(100)

Table 3 displayed the incidence of malaria during pregnancy among women in the Rivers East Senatorial District of Rivers State, contingent upon the utilization of SP. The findings indicated that 34.1% of individuals not use SP had malaria, in contrast to 7.6% of those using SP. Pregnant women who do not utilize intermittent preventative treatment with Sulphadoxine Pyrimethamine (SP) had a greater prevalence of malaria.

Table 4: Prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District of Rivers State based on multiple gestation

Multiple gestation	Prevalence of Malaria		Total
	Yes F(%)	No F(%)	
Primigravidae	36(35.0)	67(65.0)	103(100)
Multigravidae	59(23.0)	198(77.0)	257(100)
Total	95(26.4)	265(73.6)	360(100)

Table 4 showed the prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District of Rivers State based on multiple gestation. The result showed that among those who were multigravidae mothers 23.0% had malaria, while 35.0% of primigravidae mothers had malaria. Thus, primigravidae mothers had higher prevalence of malaria.

Table 5: Logistic regression showing association between gestational age and prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District

Gestational age	Malaria		Total	df	$\chi 2$	p-value	Odds Ratio (OR)	95%CI
	Yes F(%)	No F(%)						Lower Upper
1st trimester	57(28.1)	146(71.9)	203(100)	2	68.39	0.00*	Ref.	
2nd trimester	35(27.1)	94(72.9)	129(100)				2.56	2.86 - 3.47
3rd trimester	3(10.7)	25(89.3)	28(100)				2.68	1.82 - 3.95
Total	95(26.4)	265(73.6)	360(100)					

Table 5 displayed the binary logistic regression analysis correlating gestational age with malaria in pregnancy among pregnant women in the Rivers East Senatorial District. The study's bivariate analysis revealed a strong correlation between gestational age and malaria in pregnancy ($p<0.05$). The outcome indicated that individuals in their second trimester were 2.56 times more likely to contract malaria (OR= 2.56, 95%CI: 1.82 – 3.95) in comparison to those in their first trimester. Individuals in their third trimester exhibited a 2.68-fold increased likelihood of contracting malaria (OR= 2.68, 95%CI: 1.82 – 3.95) in comparison to those in their first trimester. Consequently, the null hypothesis asserting no significant correlation between gestational age and malaria in pregnancy among women in the Rivers East Senatorial District of Rivers State was dismissed.

Table 6: Logistic regression showing association between maternal age and prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District

Maternal age	Malaria		Total	df	$\chi 2$	p-value	Odds Ratio (OR)	95%CI
	Yes F(%)	No F(%)						Lower Upper
<20years	6(50.0)	6(50.0)	12(100)	2	88.59	0.00*	Ref.	
20-29years	42(22.6)	144(77.4)	186(100)				2.44	1.74 – 3.43
30-39years	47(29.0)	115(71.0)	162(100)				3.42	2.43 – 4.83
Total	95(26.4)	265(73.6)	360(100)					

Table 6 displayed the binary logistic regression analysis correlating maternal age with malaria during pregnancy among women in the Rivers East Senatorial district. The study's bivariate analysis revealed a strong correlation between maternal age and malaria in pregnancy ($p<0.05$). The outcome indicated that individuals aged 20-29 years were 2.44 times more likely

to contract malaria (OR= 2.44, 95%CI: 1.74 – 3.43) in comparison to those under 20 years of age. Individuals aged 30 to 39 years were 3.42 times more likely to have malaria (OR= 3.42, 95%CI: 2.43 – 4.83) compared to those under 20 years. Consequently, the null hypothesis asserting no significant correlation between maternal age and malaria in pregnancy among pregnant women in the Rivers East Senatorial District of Rivers State was dismissed.

Table 7: Logistic regression showing association between use of intermittent preventive treatment with SP and prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District

Use of SP	Malaria		Total	df	$\chi 2$	p-value	Odds Ratio (OR)	95%CI
	Yes F(%)	No F(%)						Lower Upper
Yes	8(7.6)	97(92.4)	105(100)	1	88.99	0.00*	Ref.	
No	87(34.1)	168(65.9)	255(100)				12.12	5.89 – 24.93
Total	95(26.4)	265(73.6)	360(100)					

Table 7 displayed the binary logistic regression analysis regarding the association between the use of SP and malaria in pregnancy among pregnant women in Rivers East Senatorial District. The study's bivariate analysis revealed a strong correlation between the use of SP and malaria during pregnancy ($p<0.05$). The outcome indicated that individuals who do not utilize SP are approximately 12 times more likely to contract malaria (OR= 12.12, 95%CI: 5.89 – 24.93) in comparison to those who do use SP. Consequently, the null hypothesis asserting no significant correlation between intermittent preventive therapy with SP and malaria in pregnancy among women in the Rivers East Senatorial District of Rivers State was dismissed.

Table 8: Logistic regression showing association between multiple gestation and prevalence of malaria in pregnancy among pregnant women in Rivers East Senatorial District

Multiple gestation	Malaria		Total	df	$\chi 2$	p-value	Odds Ratio (OR)	95%CI
	Yes F(%)	No F(%)						Lower Upper
Multigravidae	59(23.0)	198(77.0)	257(100)	1	9.47	0.00*	Ref.	
Primigravidae	36(35.0)	67(65.0)	103(100)				1.86	1.24 – 2.79
Total	95(26.4)	265(73.6)	360(100)					

Table 8 displayed the binary logistic regression analysis concerning multiple gestation and malaria in pregnancy among pregnant women in Rivers East Senatorial District. The study's bivariate analysis revealed a strong correlation between multiple gestation and malaria in pregnancy ($p<0.05$). The outcome indicated that primigravidae women were 1.86 times more susceptible to malaria (OR= 1.86, 95%CI: 1.24 – 2.79) in comparison to those with multigravidae. Consequently, the null hypothesis positing no significant correlation between multiple gestation and malaria during pregnancy among women in the Rivers East Senatorial District of Rivers State was rejected.

Discussion of Findings

The findings of the study are discussed below:

Figure 1 shows that 26.4% of the participants tested positive for malaria, while 73.6% did not. Although the prevalence is low, it is significant enough to warrant proper attention about malaria during pregnancy. Pregnant women have lowered immunity to malaria, which allows increased parasitemia levels, and the placenta sequesters parasites, so it's not hard to see how this finding could be explained. As a result, without proper interventions, these women may have a higher risk of unfavorable pregnancy outcomes. Both the mother and the unborn child are put at serious risk when malaria is prevalent during pregnancy. This study's results corroborate those of Anjorin et al. (2023), who examined the profile and determinants of malaria in nations across Sub-Saharan Africa and found a prevalence of 24.2%. This study's results corroborate those of Almaw et al. (2022), who examined the incidence of malaria and its risk factors among pregnant women experiencing symptoms who sought prenatal care at three health centers in northwestern Ethiopia. Their findings indicated that 20.8% of pregnant women in that region had malaria. The resemblance could be attributed to the fact that the research population was quite homogeneous. This study's results contradict those of Ali (2022), who found a significantly

higher prevalence of malaria among pregnant women in Gombe, North Eastern Nigeria, at 78.4 percent. Possible explanation for this discrepancy between our study and others is that we conducted ours in a different place.

The result in Table 1 revealed that among those who were in their third trimester 10.7% had malaria, among those in their second and first trimester 27.1% and 28.1% respectively had malaria. On bivariate analysis, the findings of the study showed a significant association between gestational age and malaria in pregnancy ($p<0.05$). This finding is not surprising because the stage of pregnancy significantly influences how both the maternal and fetal systems respond to malaria infection. The higher prevalence of malaria observed at advanced gestational stages may be attributable to placental malaria, as placental tissues provide a conducive environment for parasite sequestration and replication. The findings of the present study are consistent with those of Gontie et al. (2020), whose research among pregnant women in the Sherkole District of Benishangul-Gumuz Regional State, Western Ethiopia, reported a significant association between gestational age and malaria infection during pregnancy. Similarly, Almaw et al. (2022), in a study conducted among symptomatic pregnant women attending antenatal clinics in north-west Ethiopia, documented a significant relationship between gestational age and malaria in pregnancy. The observed consistency between these studies and the present findings may be explained by similarities in population characteristics, malaria transmission patterns, and maternal health profiles across the study settings.

The results presented in Table 2 show that malaria prevalence was highest among pregnant women younger than 20 years, with 50.0% testing positive, compared with prevalence rates of 22.6% and 29.0% among women aged 20–29 years and 30–39 years, respectively. Bivariate analysis further revealed a statistically significant association between maternal age and malaria in pregnancy ($p < 0.05$). These findings are consistent with those reported by Awosolu et al. (2021) in Southwestern Nigeria, who documented a significant relationship between maternal age and malaria prevalence. Similarly, Ali (2022) reported higher malaria prevalence among younger pregnant women in a study conducted in Gombe State, North-Eastern Nigeria. Comparable results were also observed by Anjorin et al. (2023) in their analysis of malaria patterns and predictors across Sub-Saharan Africa, which identified maternal age as a significant determinant of malaria in pregnancy. In addition, Almaw et al. (2022) reported a significant association between maternal age and malaria infection among symptomatic pregnant women attending antenatal clinics in north-west Ethiopia. The consistency of these findings across different settings may be attributed to similarities in population characteristics, exposure risks, and maternal immunity profiles between the study populations.

The results presented in Table 3 indicate that malaria prevalence was higher among pregnant women who did not use sulfadoxine–pyrimethamine (SP), with 34.1% testing positive, compared with 7.6% among those who reported SP use. Bivariate analysis revealed a statistically significant association between the use of SP and malaria in pregnancy ($p < 0.05$). This finding underscores the importance of intermittent preventive treatment with SP as an effective strategy for reducing malaria risk during pregnancy. However, the detection of malaria among some SP users may be explained by the possibility that SP intake coincided with pre-existing or incubating infections, thereby unmasking malaria symptoms rather than preventing initial infection. The findings of this study are consistent with those of Almaw et al. (2022), who reported a significant association between intermittent preventive malaria measures and malaria infection among symptomatic pregnant women attending antenatal clinics in north-west Ethiopia. Similar results were also documented by Ilo et al. (2020) in a study conducted among pregnant women in Enugu Urban, Nigeria, which demonstrated a significant relationship between the use of malaria preventive measures and malaria in pregnancy. The observed consistency between these studies and the present findings may be attributed to similarities in population characteristics, malaria exposure patterns, and antenatal care practices across the study settings.

The results presented in Table 4 indicate that malaria prevalence was higher among primigravidae mothers (35.0%) compared with multigravidae mothers (23.0%). Bivariate analysis further demonstrated a statistically significant association between gravidity and malaria in pregnancy ($p < 0.05$). This finding is expected, as first-time pregnancies are often associated with reduced acquired immunity to placental malaria, given that the maternal immune system is still adjusting to pregnancy-related physiological changes, thereby increasing susceptibility to infections such as malaria. The present finding is consistent with the study by Gontie et al. (2020), which reported a significant relationship between gravidity and malaria infection among pregnant women in Sherkole District, Benishangul-Gumuz Region, Western Ethiopia. Similarly, Ai et al. (2022) observed a higher prevalence of malaria among primigravidae women, further supporting the current results. Almaw et al. (2022) also reported a significant association between gravidity and malaria among symptomatic pregnant women attending antenatal clinics in north-west Ethiopia. However, the present finding contrasts with that of Ali (2022), who reported a higher

malaria prevalence among multigravidae women in Gombe State, North-Eastern Nigeria. This variation may be attributed to differences in study populations, malaria transmission intensity, and levels of acquired immunity across the study settings.

Conclusion

Based on the findings of the study, it was concluded that malaria prevalence among pregnant women in the Rivers East Senatorial District of Rivers State remains high. The study further identified gestational age, maternal age, use of intermittent preventive treatment with sulfadoxine–pyrimethamine, and multiple gestation as significant factors associated with malaria in pregnancy.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. The State Ministry of Health should intensify interventions against malaria such as the free distribution of insecticide treated bed net by ensuring its availability in every antenatal clinic so that, upon registration every pregnant woman can have hers to use to prevent malaria.
2. Women in their late trimester should make conscious effort to ensure they prevent themselves from malaria by using insecticide treated nets or other preventive measure.
3. The maternal healthcare practitioners should from time to time organize health talk aimed at enlightening as well as reminding pregnant women about malaria prevention, particularly younger pregnant women.
4. Health agencies should collaborate with primary healthcare workers to ensure adequate availability of SP for pregnant women.
5. The pregnant women both multigravidae and primigravidae mothers should ensure that the compliance to malaria prevention by incorporating different preventive measures.

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