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Prevalence of Malaria Parasite among Pregnant Women Attending Different Antenatal Clinics in Two Districts of Jos South LGA Plateau State

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Abstract

Malaria infection during pregnancy can lead to adverse outcomes such as miscarriages, premature delivery, low birth weight and perinatal death. Pregnant women are three times more likely to develop severe malaria infections than non-pregnant women who acquire malaria in the same geographical area. This study was to determine the prevalence of malaria parasite among pregnant women attending antenatal clinics in two districts of Jos south LGA Plateau state. A total of 194 consented pregnant women from three different hospitals: Primary health care Bukuru, Primary health care Vwang and Vom Christian hospital were enrolled. Venous blood was examined for malaria parasites by microscopy using Giemsa stain technique. 134 (69.1%) pregnant women were positive for malaria parasite with the highest prevalence 76 (39.2%) among 20 – 29years age group while 50 years and above age group had the least prevalence 02 (1.0%). The prevalence according to parity was more on multigravidae 90 (46.4%) when compared with primigravida with a prevalence of 44 (22.7%). The finding of this study shows a high endemicity of malaria parasite among pregnant women in the studied area which can result in undesirable outcomes such as maternal anemia or miscarriages.

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Antenatal program should incorporate proper education on effective prevention and treatment of malaria parasite by the use of insecticide treated nets and prophylactic malaria therapy during pregnancy.

Keywords: Pregnant women; Malaria parasite; Antenatal clinics; Microscopy; Giemsa stain; and ITNs.

1. Introduction

Malaria is an acute febrile illness caused by Plasmodium parasites, which are spread to people through the bites of infected female Anopheles mosquitoes [1].

Malaria infection in pregnancy is a major cause of maternal death, maternal anemia, and adverse pregnancy outcome such as spontaneous abortion, preterm delivery, growth restriction/low birth weight, stillbirth, congenital infection, neonatal mortality in areas where malaria infection occurs commonly in pregnant women [2].

Pregnancy increases the chances of developing malaria infection and severe disease when infected. Pregnant women are particularly vulnerable to Plasmodium falciparum infection because red cells infected with the parasite can sequester in the placenta, and thereby cause adverse fetal effects. If anti-malarial drugs do not achieve therapeutic levels in the placenta, parasites sequestered there may be released intermittently into the peripheral blood and cause recurrent maternal infection [2].

While the average adult citizen of an endemic region possesses some immunity to the parasite, pregnancy causes complications that leave the woman and fetus extremely vulnerable. The parasite interferes with transmission of vital substances through the fetal placental, often resulting in stillbirth, spontaneous abortion, or dangerously low birth weight [3].

Lower birth weight of infants born from mothers with malaria in pregnancy can be attributed to placental infection, as well as other complications such as anemia and malnutrition, since the malaria parasite can be passed vertically from mother to the infant via infected red blood cells. Children who are born with a below-average birth weight are at risk for other health problems, including increased risk of mortality [4].

Anemia is one of the adverse effects of pregnancy-associated malaria, since it can be life-threatening to the mother. Its cause is often compounded with other factors, such as nutrition and genetics. Maternal death is one of the biggest complications of malaria in some areas during epidemics [4].

According to the latest world malaria report, there were 249 million cases of malaria in 2022 compared to 244 million cases in 2021. The estimated number of malaria deaths stood at 608 000 in 2022 compared to 610 000 in 2021.

The WHO African Region continues to carry a high share of the global malaria burden. In 2022 the Region was home to about 94% of all malaria cases and 95% of deaths.

Four African countries accounted for just over half of all malaria deaths worldwide: Nigeria (26.8%), the Democratic Republic of the Congo (12.3%), Uganda (5.1%) and Mozambique (4.2%) [5, 6, 7, 8].

Globally, an estimated 3.2 billion people in 97 countries are at risk of being infected with malaria and developing the disease, of which 1.2 billion are at high risk [9, 10, 11].

Most of malaria cases and deaths occur in Sub-Saharan Africa, but Asia, Latin America and to a lesser extent the Middle East and part of Europe are also affected. Approximately 25 million pregnant women are at risk of infection by P. falciparum annually in Africa [9, 10, 11].

In areas of stable transmission in Sub-Saharan Africa, 1 in every 4 pregnant women has evidence of peripheral or placental infection with malaria parasites [12]. In low transmission areas of the African continent, peripheral and placental parasitaemia have been shown to be 13.7% and 6.7% respectively, while in low transmission areas outside Africa, placental infection is slightly higher (9.6%) than peripheral (6.2%) [12].

Parity and age are important determinants of risk of infection among pregnant women. Primigravidae and younger maternal age (adolescents) have poorer immunity to malaria compared to their older and Multigravidae counterparts. The risk of infection is also highest during the second trimester. In Africa, a quarter of cases of severe anemia in pregnancy are attributable to malaria. The percentage of maternal deaths attributed directly or indirectly to malaria is approximately 10% in both hospital studies (0.5% to 23.0%) and community-based studies (2.9% to 17.6%). This does not differ much from estimates in low-transmission regions outside Africa (0.6 to 12.5%) [12].

Placental malaria doubles the risk of low birth weight. Compared to multiparous women, primigravid women have a two to seven times the risk of low birth weight deliveries. Low birth weight in itself is a major risk factor for neonatal mortality but Malaria-induced low birth weight is estimated to be responsible for 3 to 17 deaths per 1000 live births. It is also estimated that 11.4% of neonatal deaths and 5.7% of all infant deaths in malaria endemic areas of Africa may be caused by malaria in pregnancy-associated low birth weight. Malaria may lead to low birth weight through causation of fetal growth restriction or preterm delivery. In high-transmission areas, malaria-related fetal growth restriction may be twice as high as malaria-related preterm delivery. Contrastingly, in low-transmission settings, the predominant cause of low birth weight is preterm delivery [12].

Pregnant women are 3 times more likely to suffer from severe disease as a result of malaria infection compared with their non pregnant counterparts, and have a mortality rate from severe disease that approaches 50% [13].

In areas endemic for malaria, it is estimated that at least 25% of pregnant women are infected with malaria, with the highest risk for infection and morbidity in primigravidae, adolescents, and those co-infected with HIV. The second trimester appears to bring the highest rate of infection, supporting the need for antenatal care as part of malaria prevention and treatment efforts. It is hypothesized that the majority of sequelae in pregnancy results from 2 main factors: the immunocompromised state of pregnancy and placental sequestration of infected erythrocytes [14].

Adults who live in malaria-endemic regions generally have some acquired immunity to malaria infection as a result of immunoglobulin production during prior infections in childhood. This immunity diminishes significantly in pregnancy, particularly in primigravidae.

Splenic sequestration of malaria infected erythrocytes leads to folic acid deficiency and microcytic anemia in adults. In pregnant women, additional sequestration of malaria infected erythrocytes occurs in the placenta. Pregnant women therefore suffer disproportionately from severe anemia as a result of infection. In Africa, it has been estimated that malaria is responsible for 25% of severe anemia during pregnancy (defined as hemoglobin less than 7 gm/dL) [14].

Women with severe anemia are at higher risk for morbidities such as congestive heart failure, fetal demise, and mortality associated with hemorrhage at the time of delivery.

Interestingly, the greatest degree of placental infestation is seen in women who have the highest level of immunity, leading to milder maternal symptoms and a disproportionate increase in fetal complications [14].

It could be hypothesized, therefore, that although primigravidae may develop the clinical symptoms of malaria, women with higher immunity may not demonstrate symptoms, will not receive treatment, and will build a higher placental parasite burden. Fetal complications result from this placental inflammation, as well as maternal anemia, and manifest as stillbirth, intrauterine growth restriction, and low-birth-weight neonates [14].

Low-birth-weight neonates, in turn, are at higher risk for neonatal and newborn death. Congenital malaria is a relatively rare complication in areas with endemic malaria; however, newborn parasitaemia may present 2 to 3 months after delivery when maternal antibodies wear off. It is also thought that infected erythrocytes collected in the placenta stimulate pancreatic -cell production of insulin, leading to hyperinsulinemia and hypoglycemia during infection [14].

This contributes to the severity of disease during pregnancy. Other maternal effects of malaria infection result from the “stickiness” of the infected erythrocytes that become trapped in small vessels, resulting in cerebral malaria, renal failure, and thrombocytopenia [14]. According to the 2021 World Malaria Report, Nigeria had the highest number of global malaria cases (26.6 % of global malaria cases) and the highest number of deaths (31 % of global malaria deaths) in 2021. The country accounted for an estimated 54 % of malaria cases in West Africa [15]. In Africa, 30 million women living in malaria-endemic areas become pregnant each year. For these women, malaria is a threat both to their lives and their unborn babies with up to 200 000 newborn deaths each year as a result of malaria in pregnancy. Pregnant women are particularly vulnerable to malaria as pregnancy reduces a woman’s immunity to malaria, making her more susceptible to malaria infection and increasing the risk of illness, severe anaemia and death. For the unborn child, maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery and low birth weight - a leading cause of child mortality [16].

2. Material and Methods

Study Area: This study was carried out in three hospitals/clinics in two districts of Jos South LGA, Plateau State Nigeria namely Vom Christian hospital, Primary Health Care Vwang which are located in Vwang district and Primary Health Care Bukuru which is located in Gyel district. These two districts made up our studied districts in Jos South L.G.A. The local government area has a population of 306,716 people from the last 2006 National Census though had been projected to have a population of 458,100 as of 2022 [17]. The region has a subtropical climate, with moderate temperatures and heavy rainfall during certain times of the year, which creates ideal conditions for the transmission of malaria.

Study Population: Pregnant women attending different hospitals and clinics were used for this study. These women were eligible to participate in the study because they are residents of this area, and have been confirmed to be pregnant.

Sample Size Determination: A suitable sample size of pregnant women in Jos South LGA was selected within the target population. Thus sample size was derived as follows: A prevalence rate of 29.1% [18] was taken from their studies. Margin of a sampling error or precision was set at 5%, and 95% confidence interval, using the formula:

$N = Z^2P(1-P)/d^2$

Where;

N=sample size

Z=Confidence interval at 95% (1.96)

P =29.1%(Local prevalence)

d= 5%(marginal error or precision)

$N = (1.96)^2 \times 0.291\ (1-0.291)/(0.05)^2$

= 3.8416 x 0.291 x 0.709/0.0025 = 317.03802816 =317

Plus 10% attrition =31.7+317= 348.7 samples. It should be noted that Jos South L.G.A has four districts whereas the study was carried out in two districts which will half the minimum samples to be used to be 174 samples.

Inclusion and Exclusion Criteria

Inclusion Criteria

1) Pregnant women attending hospitals/Clinics in the studied area of Jos South Local Government Area.
2) Pregnant women who are resident of Jos South LGA Plateau State.

Exclusion Criteria

1) Pregnant women who attend antenatal clinics but are not residents of Jos South L.G.A Plateau State.

Permission/Ethical Clearance

Approval was obtained from Director, Local Government Health Authority Jos South L.G.A for the purpose of this study. Also informed consent was obtained from the pregnant women.

Sample Collection: A venous blood sample of 2ml was collected from the pregnant women using needle and syringe. Standard and careful laboratory procedures were adopted in collecting blood samples from the pregnant women.

Instrument for Sample Collection: Needle and syringe, cotton wool, Methylated spirit, EDTA container, tourniquet, markers. Also, a questionnaire was used to collect oral information from selected participants.

Method of Laboratory Analysis: Thick and thin blood films as described by [19] was made on clean slides and labeled accordingly.

Thick Blood Film: Thick films were prepared by placing a drop of blood on a clean grease free slide using a Pasteur pipette. It was smeared to obtain round shaped smear and allowed to air dry ready for staining.

Staining of Thick Blood Film: The slide was flooded with working Giemsa stain diluted with buffered distilled water in the ratio of 1:10, and then allowed to stain for 45 minutes, rinsed and allowed to air dry.

Examination of the Stained Thick Film: Stained slides were examined under the light microscope using x100 objective lens (oil immersion). The thick films were used to measure the parasite densities and quantification. A slide was considered positive if it contained any of the asexual stages of malaria parasite or the sexual stage (gametocyte) of malaria parasite.

Thin Blood Film: Thin blood films were prepared by placing a drop of blood on a clean grease free slide using a Pasteur pipette. Using a spreader held at an angle of 45^0 and allowed the blood to spread from one end of the spreader to the other end. The spreader was moved to the opposite end of the slide to which the blood was dragged to form tongue shaped film containing head, body and tail. The smear was allowed to air dry.

Staining of the Thin Blood Film: The thin film was briefly fixed using absolute methanol and allowed to air dry. The smear was flooded with working Giemsa stain diluted with buffered distilled water in the ratio of 1:10 and allowed to stain for 45 minutes, rinsed and allowed to air dry ready for microscopy.

Examination of the Stained Thin Film: Stained slides were examined under the light microscope using x100

objective lens (oil immersion). The thin films were used to identify the parasite species. A slide was considered positive if it contained any of the asexual stages of malaria parasite or the sexual stage (gametocyte) of malaria parasite.

Estimation of Parasite Density: The parasite density of the pregnant women were estimated with reference to [20] as follows;

Light infection: + = 1–10 parasites per 100 oil-immersion thick film fields

Moderate infection: ++ = 11–100 parasites per 100 oil-immersion thick film fields

Heavy infection: +++ = 1–10 parasites per single oil-immersion thick film field

Very heavy infection: ++++ = more than 10 parasites per single oil-immersion thick film field

Statistical Analysis: Data were analyzed using excel spread sheet and the number of positive samples were presented in percentages.

3. Results

This study investigated the prevalence of malaria parasite among pregnant women attending ante-natal care in Vwang and Gyel districts of Jos South L.G.A, Plateau State. A total of 194 consented pregnant women from three different hospitals comprising Vom Christian Hospital 44 (22.7%), Primary Health Care Vwang 56 (28.9%) from Vwang districts and Primary Health Care Bukuru 94 (48.4%) from Gyel district were enrolled in the study. The prevalence of malaria parasite in relation to age groups of the pregnant women is shown in table 1. The 50 & above years age group recorded the least prevalence of 02(1.0%), closely followed by less than 40-49years age group 22(4.1%). The 20-29, 30-39, <20 years age group recorded 76(39.2%), 32(16.5%), and 16(8.2%) prevalence rates respectively with an overall prevalence of 69.1%. The 20-29years age group has the highest number of participants 106(54.6%).

Table 1: Prevalence of malaria parasite in pregnant women attending ante-natal care in two districts of Jos South LGA in relation to age groups

Age ranges (years)	Nos Examined	Nos of Positive	% Positive
<20	22	16	8.2
20-29	106	76	39.2
30-39	46	32	16.5
40-49	18	08	4.1
50 & above	02	02	1.0
Total	194	134	69.1

Nos: Number

The prevalence of malaria parasite in relation to parity of the pregnant women is shown in table 2.The prevalence was higher in multigravida 90(72.6%) when compared to primigravida 44(62.9%) though with a higher number of participants 124(63.9%).

Table 2: Prevalence of malaria parasite in pregnant women attending ante-natal care in two districts of Jos South LGA in relation to parity

Parity	Nos Examined	Nos of Positive	% Positive
Primigravida	70	44	22.7
Multigravida	124	90	46.4

Nos: Number

Table 3 present the educational status of the pregnant women in relation to the level of awareness on treatment of malaria during pregnancy. Their educational status ranges from first school leaving certificate, SSCE, Diploma, Degree to no formal education acquired. Among those that responded to the question on the level of awareness about treatment of malaria during pregnancy, those with diploma and degree certificates, and no

formal education acquired have one hundred percent awareness that malaria can be treated during pregnancy while those with FSLC and SSCE have 90 and 91.4% awareness that malaria can be treated during pregnancy. Those with SSCE certificate have the highest number of respondents 116(62.4%).

Table 3: Level of awareness malaria can be treated during pregnancy based on academic qualifications in two districts of Jos South LGA

Academic qualifications	Nos of Responses	Have Awareness	No Awareness
FSLC	20	18(90.0%)	02(10%)
SSCE	116	106(91.4%)	10(8.6%)
Diploma	38	38(100%)	0
Degree	10	10(100%)	0
None	02	02(100%)	0

Nos: Number

Table 4 present participant's response on barriers to effective prevention of malaria infection during pregnancy. Out of 110 responses obtained, the most identified barrier to malaria prevention during pregnancy is the cost of insecticide treated nets 52(47.3%) followed by non availability of materials like insecticide treated nets 32(29.1%). The least identified barrier was low awareness on the use of preventive materials to malaria infection during pregnancy 26(23.6%).

Table 4: Barriers to effective prevention of malaria infection during pregnancy

Barriers to effective prevention of malaria infection	Nos of Responses	% Responses
Non availability of ITNs	32	29.1
Costs of ITNs	52	47.3
Low awareness on the use of PMs	26	23.6

ITNs: Insecticide treated nets, Nos: Number

PMs: Preventive materials

Table 5 present participant's response on barriers to effective treatment of malaria infection during pregnancy. Out of 110 responses obtained, the most identified barrier to effective malaria treatment during pregnancy is the costs of malaria drugs 46(41.8%) closely followed by low awareness of malaria treatment due to poor antenatal care attendance 42(38.2%). The least identified barrier to effective malaria treatment was no provision of drugs during antenatal visit 22(20.0%).

Table 5: Barriers to effective treatment of malaria infection during pregnancy

Barriers to effective treatment of malaria infections	Nos of Responses	% Responses
No provision of drugs during antenatal visit	22	20.0
Costs of malaria drugs	46	41.8
Low awareness of treatment due to poor ANC attendance	42	38.2

ANC: Ante-natal care

Nos: Number

Table 6: Data obtained from Primary Health Care Bukuru-Gyel district

Variables	Nos Examined	Nos of Positive	% Positive
Age group (years)			
<20	10	04	4.3
20-29	52	36	38.3
30-39	24	14	14.9
40-49	08	02	2.1
Total	**94**	**56**	**59.6**
Parity			
Primigravida	26	08	8.5
Multigravida	68	48	51.1
Total	**94**	**56**	**59.6**
Awareness to malaria infection treatment during pregnancy based on educational status			
Academic qualifications	Nos of Responses	Have Awareness	No Awareness
SSCE	76	68(89.5%)	08(10.5%)
Diploma	08	08(100%)	0
Degree	08	08(100%)	0
None	02	02(100%)	0
Barriers to effective prevention of malaria infection		Nos of Responses	% Responses
Non availability of ITNs		04	20.0
Costs of ITNs		12	60.0
Low awareness on the use of PMs		04	20.0
Barriers to effective treatment of malaria infection		Nos of Responses	% Responses
No provision of drugs on ANC attendance		04	20.0
Costs of malaria drugs		12	60.0
Low awareness of malaria treatment due to poor ANC attendance		04	20.0

ITNs: Insecticide treated nets, PMs: Preventive materials, ANC: Antenatal care, Nos: Number

Table 7: Data obtained from Primary Health Care Vwang-Vwang district

Variables	Nos Examined	Nos of Positive	% Positive
Age group (years)			
<20	06	06	10.7
20-29	30	18	32.1
30-39	14	10	17.9
40-49	06	02	3.6
Total	**56**	**36**	**64.3**
Parity			
Primigravida	22	16	28.6
Multigravida	34	20	35.7
Total	**56**	**36**	**64.3**
Awareness to malaria infection treatment during pregnancy based on educational status			
Academic qualifications	Nos of Responses	Have Awareness	No Awareness
FSLC	18	18(100%)	0
SSCE	30	28(93.3%)	02(6.7%)
Diploma	08	08(100%)	0
Barriers to effective prevention of malaria infection		Nos of Responses	% Responses
Non availability of ITNs		06	10.7
Costs of ITNs		36	64.3
Low awareness on the use of PMs		14	25.0
Barriers to effective treatment of malaria infection		Nos of Responses	% Responses
No provision of drugs on ANC attendance		02	3.6
Costs of malaria drugs		24	42.9
Low awareness of malaria treatment due to poor ANC attendance		30	53.6

ITNs: Insecticide treated nets, PMs: Preventive Materials, ANC: Antenatal Care, Nos: Number

Table 8: Data obtained from Vom Christian Hospital-Vwang district

Variables	Nos Examined	Nos of Positive	% Positive
Age group (years)			
<20	06	06	13.6
20-29	24	22	50.0
30-39	08	08	18.2
40-49	04	04	9.1
50 & above	02	02	4.5
Total	**44**	**42**	**95.5**
Parity			
Primigravida	22	20	45.5
Multigravida	22	22	50.0
Total	**44**	**42**	**95.5**
Awareness to malaria infection treatment during pregnancy based on educational status			
Academic qualifications	Nos of Responses	Have Awareness	No Awareness
FSLC	02	0	02(100%)
SSCE	18	10(55.6%)	08(44.4&)
Diploma	22	22(100%)	0
Degree	02	02(100%)	0
Barriers to effective prevention of malaria infection		Nos of Responses	% Responses
Non availability of ITNs		22	64.7
Costs of ITNs		04	11.8
Low awareness on the use of PMs		08	23.5
Barriers to effective treatment of malaria infection		Nos of Responses	% Responses
No provision of drugs on ANC attendance		16	47.1
Costs of malaria drugs		10	29.4
Low awareness of malaria treatment due to poor ANC attendance		08	23.5

ITNs: Insecticide treated nets, PMs: Preventive materials, ANC: Antenatal care, Nos: Number

4. Discussion

In this study, an overall prevalence of 69.1% malaria parasite among pregnant women attending antenatal care in Primary Health care Bukuru, Primary Health care Vwang and Vom Christian hospital was recorded. This finding compared with the work of [21, 22, &23] who recorded 65.2% among pregnant women in Jos metropolis, plateau state, 78.4% in Gombe state, North East Nigeria and 53.9% in Jos North LGA of Plateau state.

This high prevalence may be attributed to the fact that this study was carried out during rainy season of June-July when malaria vectors are at their peak of breeding due to abundance of active breeding sites created by rainfall thus facilitating malaria transmission. The high prevalence can also be attributed to the fact that the study was carried out in Primary Health care centers where majority of low income earners who may not afford to procure and use malaria preventive material like insecticide treated nets (ITNs) to protect themselves during pregnancy or purchase malaria drugs for prophylactic purposes or proper treatment when the needs arises during antenatal program.

However, this prevalence was higher compared with previous findings of [24] in Gombe state, [25] in Plateau state, [26] in plateau state, [27] in Ibadan Oyo state, and [28] also in Ibadan who reported the prevalence of 29.1%, 21.09%, 9.0%, 8.7%, and 4.3% respectively.

Also, in this study prevalence according to age group reveals that <20, 20-29, 30-39, 40-49, 50& above years have prevalence of 8.2%, 39.2%, 16.5%, 4.1% and 1.0%. This shows that younger women were more affected by malaria than their older adult women, which is in conformity with the work of [22, 25, 26]. This low prevalence in older women might be due to the existence of natural immunity which the pregnant women acquired with increase in their ages.

Though, this finding contradicts the earlier finding of [24] who reported that older pregnant women had the highest malaria prevalence in their study.

In this study, prevalence according to parity indicates that multigravida have higher malaria prevalence of 46.4% as against prevalence of 22.7% in primigravida. This finding was in conformity with the work of [25] who found a prevalence of 18.8% for multigravida as against 10.3% for primigravidae. Also, [29] found a higher prevalence in multigravidae than primigravida. The work of [24] equally recorded higher prevalence of malaria in multigravida when compared with primigravida.

This finding of higher prevalence in multigravida contracts the work of [27] whose result revealed a higher prevalence with primigravida than multigravidae. They attributed this finding to the acquired immunity that develops with increasing parity reducing susceptibility to malaria infection in multigravidae. The work of [23] in Plateau state noted that prevalence was highest among primigravida (65.8%) and malaria positivity decreased as parity increases. This finding equally contradicts the work of [26] who noted that primigravida had higher malaria parasitaemia than the multigravidae and this is probably due to the suppressive action of hormones on cell mediated immunity.

On malaria prevalence based on the two districts studied, Gyel district had a lower prevalence (59.6%) when compared with Vwang district with a prevalence of (79.9%). Gyel district having a lower prevalence may be to the fact that Gyel is a more developed district compared to Vwang. The residence of Gyel has more knowledge on how to prevent malaria infection during pregnancy and lesser mosquito breeding sites like mining ponds and other potholes that exist in Vwang district. It can also be attributed to antenatal attendance by women of these two districts. During antenatal visit women are educated on different methods of malaria prevention during pregnancy which will help them have knowledge on how to avoid coming in contact with malaria vectors.

From the data gathered on this study women from Vwang district recorded lower antenatal attendance when compared with women from Gyel district. Women from Vwang are more of indigenes who engage more on farm work, mining and petty trading who prefer to pursue their businesses than going for antenatal visit as at when due.

On awareness about malaria treatment during pregnancy based on educational status those with Diploma and Degree certificate had one hundred percent (100%) awareness that malaria can be treated during pregnancy those with senior school certificate examination (SSCE) certificate have 91.4% awareness when compared with those that have first school leaving certificate (FSLC) who had 90.0% awareness on malaria treatment during pregnancy.

On barrier to effective prevention of malaria during pregnancy the studied subjects stated that costs of insecticide treated nets (47.3%) is the major barrier of malaria prevention during pregnancy followed by non availability of insecticide treated nets (29.1%) to be used during pregnancy.

Also, on barriers to effective treatment of malaria during pregnancy participants stated that the costs of malaria drugs (41.8%) is the major barrier to treatment of malaria infection closely followed by low awareness of malaria treatment during pregnancy due to poor attendance to antenatal care by the women especially the indigenes that resides in semi-urban area of Vwang district.

5. Conclusion

This study showed a malaria prevalence of 69.1% among the studied population. This high prevalence shows the high endemicity of malaria parasite in the studied area which can result in undesirable pregnancy outcomes. It is evident that majority of the studied participants do not use preventive measures such as the use of insecticide treated nets (ITNs) either due to the costs of the nets or non availability of the nets for use to protect themselves' during pregnancy which resulted in high prevalence rate recorded in this study.

Also, participants complained about barriers to effective prophylaxis or better treatment during malaria infection due to high costs of malaria drugs and low awareness of malaria treatment due to poor antenatal attendance which equally contributed to the high prevalence rate recorded. Malaria in pregnancy is a serious public health concerns because of its effects on both mothers and their unborn children alike. It is evident that asymptomatic malaria parasite is common among the pregnant women since none of the pregnant women studied were on hospital admission at the point of contact.

6. Author contributions

All authors made a significant contribution to this work, from the conception through the study design, execution, and acquisition of data, analysis and interpretation of results. They equally took part in drafting, revising and critically reviewing the manuscript, gave final approval of the version to be published.

7. Conflict of interest

There is no conflict of interest between and among authors in any aspect of this work either financially or otherwise.

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