Knowledge and Risk Factors Associated with Spread of Malaria Infection among Pregnant Women in Bwari Area Council, Abuja

Dr. Ambrose W. Ogidi
Department of Sociology Nasarawa State University, Keffi
Oparaugo Precious Chiamaka
Department of Sociology Nasarawa State University, Keffi
Dauda Yusuf Wotu
Department of Sociology Nasarawa State University, Keffi

Abstract
Malaria remains a major public health challenge, particularly among pregnant women in endemic regions, due to its contribution to maternal and neonatal morbidity and mortality. This study seeks to examine the knowledge and risk factors associated with the spread of malaria infection among pregnant women in Bwari Area Council, Abuja. The study investigates pregnant women's awareness of malaria transmission, symptoms, preventive measures, and the influence of environmental and socio-economic determinants on infection risk. The study is anchored in the Health Belief Model and employed a cross-sectional survey design. Data were collected through a structured questionnaire administered to 272 pregnant women and analyzed using descriptive statistics and Pearson's correlation coefficient. Findings revealed that 64.7% of respondents identified mosquito bites as the primary mode of malaria transmission, knowledge of symptoms and preventive measures, including the use of insecticide-treated nets, was limited. Environmental and socio-economic factors, such as living near stagnant water and poor housing conditions, were identified as major risk factors, and adherence to preventive measures remained moderate. A moderate positive correlation ($r = 0.58$) between malaria knowledge and awareness of risk factors. The study concludes that gaps persist in understanding and applying malaria prevention strategies and recommends targeted health education, environmental interventions, and community outreach to improve the adoption of effective malaria control practices.
Keywords: Malaria, Pregnant Women, Knowledge, Risk Factors

1.1 Background to the Study

Malaria remains a major public health threat in tropical and subtropical regions, particularly during pregnancy, where it contributes substantially to adverse maternal and neonatal outcomes. In the World Health Organization African Region, malaria in pregnancy contributes to hundreds of thousands of low birth weight deliveries annually, largely due to infection with *Plasmodium falciparum* (World Health Organization, 2023; Chico, Chandramohan and Coleman, 2018). Infection during pregnancy can lead to severe complications including miscarriage, maternal anemia, placental malaria, fever, and increased risk of foetal infection (Rogerson et al., 2018). In endemic areas, most malaria infections during pregnancy are asymptomatic but remain strongly associated with maternal anemia and poor birth outcomes such as preterm delivery, low birth weight, and perinatal mortality (Desai et al., 2017; Gutman et al., 2017). The burden is particularly high among primigravidae, adolescents, and pregnant women living with human immunodeficiency virus, due to their reduced immunity (World Health Organization, 2022). Malaria contributes significantly to maternal mortality in endemic regions and is associated with congenital malaria, infant mortality, placental parasitaemia, prematurity, and

https://doi.org/10.5281/zenodo.19060703

intrauterine growth restriction leading to low birth weight (Chico et al., 2018). It is estimated that approximately 11.6 million pregnant women in sub Saharan Africa were exposed to malaria infection, with West Africa recording the highest prevalence (World Health Organization, 2023).

Malaria prevention during pregnancy is essential because it significantly reduces neonatal mortality and low birth weight. The World Health Organization recommends a combination of interventions including early diagnosis, prompt treatment, use of insecticide treated nets, and intermittent preventive treatment with sulfadoxinepyrimethamine (World Health Organization, 2022). Insecticide treated nets reduce human mosquito contact and have been shown to significantly lower malaria incidence, maternal anemia, and adverse pregnancy outcomes (Wilson et al., 2020). Intermittent preventive treatment in pregnancy has also been shown to reduce placental infection, maternal anemia, low birth weight, and neonatal mortality (Desai et al., 2017).

1.2 Statement of the Problem

Malaria during pregnancy continues to be a significant public health concern, especially in sub-Saharan Africa, where transmission rates are high and preventive interventions are not optimally utilized. According to the World Health Organization, Nigeria accounts for a significant proportion of global malaria cases and deaths, and pregnant women represent one of the most vulnerable groups due to reduced immunity during pregnancy (World Health Organization, 2023). Malaria infection during pregnancy contributes significantly to maternal anemia, placental malaria, miscarriage, stillbirth, premature delivery, and low birth weight, which are major causes of neonatal morbidity and mortality (Desai et al., 2017; Rogerson et al., 2018). According to world health organization (2020), among the pregnancies recorded in 2022 in 24 Nigerian States, 35% were expose to malaria. The highest frequency of exposure was recorded in Northern Nigeria at 40%, follow by South-West Nigeria at 39%, then 24% in south East and South-South Nigeria. In spite of the existence of effective measures to prevent malaria infection, such as the use of insecticide-treated bed nets and intermittent preventive treatment in pregnancy, malaria infection among pregnant women in Nigeria is very high. Findings based on the National Population Commission and ICF (2019) indicates that many pregnant women either initiate antenatal care late or do not adequately utilize malaria preventive services, thereby increasing their vulnerability to infection. This situation is often influenced by poor knowledge, misconceptions about malaria transmission, low educational status, and socioeconomic barriers, which limit the adoption of recommended prevention strategies (Yaya et al., 2018; Singh et al., 2020).Additionally, environmental and residential factors such as poor housing conditions, presence of stagnant water, inadequate sanitation, and overcrowding have been identified as major contributors to malaria transmission in endemic communities (Tusting et al., 2017). In addition, inadequate knowledge about malaria causes, symptoms, and prevention among pregnant women has been linked to low utilization of insecticide treated nets and poor compliance with preventive treatment guidelines (Ankrah et al., 2019). These gaps in knowledge and exposure to environmental risk factors increase theMalaria infection and its associated complications continue to pose significant health risks. In Bwari Area Council, Abuja, malaria remains a prevalent challenge among pregnant women attending antenatal clinics. Despite this, there is limited empirical evidence regarding the level of knowledge and the specific risk factors that contribute to malaria transmission among pregnant women in the area. This suggests that without a clear understanding of these factors, malaria prevention programs may fail to achieve optimal effectiveness. Accordingly, this study aims to examine the knowledge and risk factors associated with the spread of malaria infection among pregnant women in Bwari Area Council.

https://doi.org/10.5281/zenodo.19060703

2.0 Literature review

2.1 Malaria in Pregnancy

Each year, an estimated 25 to 30 million women become pregnant in malaria endemic areas of Africa, with millions more at risk in Asia, Oceania, and South America (World Health Organization, 2023; Rogerson et al., 2018). Malaria remains a major cause of severe maternal anemia in sub Saharan Africa and contributes significantly to maternal mortality, with approximately 10,000 maternal deaths annually attributed to malaria related complications (Desai et al., 2017; WHO, 2023). Furthermore, malaria infection during pregnancy contributes to between 75,000 and 200,000 cases of low birth weight each year as a result of preterm delivery and intrauterine growth restriction (Chico et al., 2018; Rogerson et al., 2018). Malaria also contributes indirectly to infant mortality, and it has been estimated that effective malaria control during pregnancy could prevent between 3 percent and 8 percent of infant deaths in endemic regions (WHO, 2022; Walker et al., 2014).

Malaria poses serious health risks to both the mother and the developing fetus. Pregnant women are more susceptible to malaria infection and are more likely to develop symptomatic disease compared to non-pregnant adults due to pregnancy related suppression of immunity (Rogerson et al., 2018; Desai et al., 2017). This increased susceptibility has been partly attributed to physiological and hormonal changes during pregnancy, which make pregnant women more attractive to malaria transmitting mosquitoes and reduce their ability to control parasite multiplication (Fried and Duffy, 2017). Studies have also shown that parasite densities tend to be higher in pregnant women than in non-pregnant adults, suggesting that pregnancy impairs the body's ability to suppress parasite replication (Rogerson et al., 2018). While some studies found no significant difference in infection complexity between pregnant and non-pregnant women, others reported increased parasite diversity particularly among younger pregnant women, indicating weaker acquired immunity (Mayor et al., 2015; Desai et al., 2017).

2.1.2 Knowledge of Malaria

The degree of awareness and comprehension that people and communities have about the causes, symptoms, risk factors, transmission, and prevention of malaria is referred to as knowledge of the disease. Sufficient understanding of malaria reduces the risk of serious illness and transmission by empowering people to identify early symptoms, take preventative action, and seek treatment promptly (World Health Organization, 2023; Aung et al., 2020). This entails being aware that malaria is spread by the bite of an infected female Anopheles mosquito, identifying symptoms like fever, headache, chills, and weakness, and knowing how to prevent the disease by using insecticide-treated nets and maintaining a clean environment (Yaya et al., 2018).Designing successful malaria control and elimination programs that are sensitive to local needs, beliefs, and practices requires an understanding of community knowledge of the disease. Communities are more likely to follow treatment recommendations and take preventative action when they have accurate knowledge. On the other hand, inadequate understanding and misunderstandings could make it more difficult to apply malaria prevention measures effectively (Ricotta et al., 2019). As crucial elements of malaria control strategies, increasing community knowledge also helps to break down cultural barriers, dispel myths about the causes of malaria, and improve health-seeking behavior (WHO, 2022).

2.1.3 Risk Factors of Malaria Infection

The severity of malaria during pregnancy is greatly influenced by maternal, parasitic, and environmental factors. According to Rogerson et al. (2018) and the World Health Organization (2023), women in all pregnancy categories are still susceptible to malaria in areas with low transmission, while the burden of infection is highest among women in their first pregnancy in areas with high

https://doi.org/10.5281/zenodo.19060703

transmission. Primigravidae gradually acquire pregnancy-specific immunity in high transmission environments by producing antibodies against the Plasmodium falciparum-expressed VAR2CSA antigen, which offers some protection in subsequent pregnancies. However, in regions with low or unstable transmission, this protective immunity is less developed, making people more vulnerable to serious infections (Fried and Duffy, 2017; Desai et al., 2017). Compared to Plasmodium vivax, which also poses serious risks, especially for women with low immunity, Plasmodium falciparum is the most dangerous malaria species and is more frequently linked to serious maternal and fetal complications (Rogerson et al., 2018). The severity of malaria is also significantly influenced by maternal age and gravidity. Compared to older women who may have developed partial protection through repeated exposure, younger pregnant women, particularly adolescents, are more vulnerable to severe malaria because their immunity is still developing (Desai et al., 2017; Gonçalves et al., 2014). Compared to multigravidae, which enjoy the protection of pregnancy-specific immunity gained during prior pregnancies, primigravidae and secundigravidae are especially susceptible to severe malaria in sub-Saharan Africa. Another important factor affecting the outcome of malaria during pregnancy is the nutritional status of the mother. In pregnant women with malaria, malnutrition impairs the immune system and raises the risk of unfavorable birth outcomes like low birth weight, premature delivery, and poor fetal growth (Ceesay et al., 2016; Unger et al., 2019). Malnutrition and malaria often coexist, and their combined effects greatly increase the likelihood of delivering low birth weight infants compared to either condition alone, according to evidence from large-scale studies involving pregnant women in Africa and the Western Pacific (Unger et al., 2019). Additionally, recent research has linked poor pregnancy outcomes to nutritional deficiencies, specifically a decreased intake of vital amino acids like L arginine.

2.2 Empirical review

N. C. Iriemenam, A. O. Dosunmu, W. A. Oyibo, and A. F. FagbenroBeyioku (2011) examined knowledge, attitudes, and perceptions of malaria, as well as the prevalence of malaria parasitaemia, among pregnant women attending antenatal clinics in metropolitan Lagos, Nigeria. The study focused on assessing women's understanding of malaria, their preventive and treatment practices, and patterns of home management during pregnancy. A total of 350 consenting pregnant women were randomly selected during antenatal visits in Lagos. Data were collected using structured questionnaires administered at two points: during the early stage of antenatal registration and again approximately one to two months before delivery. Information obtained included socio demographic characteristics, parity, recognition of malaria symptoms, treatment seeking behaviour, preventive strategies, anti-vector measures, and laboratory indicators such as malaria parasitaemia and packed cell volume.The findings indicated that a large proportion of respondents correctly identified mosquito bites as the primary cause of malaria and recognized stagnant water as a breeding site. However, awareness of the benefits of insecticide treated bed nets was limited, with many participants citing cost as a barrier. The results further showed that targeted health education programmes for expectant mothers can enhance malaria prevention efforts. Laboratory analysis revealed that over one quarter of the participants tested positive for peripheral malaria infection, with the majority of cases attributed to Plasmodium falciparum and a smaller proportion to Plasmodium malariae. Packed cell volume levels ranged between 20 percent and 40 percent, with approximately one quarter of the women classified as anaemic.

2.3 Theoretical Framework

2.3.1 Health Belief Model

The Health Belief Model was developed in the 1950s by social psychologists, including Irwin Rosenstock, Godfrey Hochbaum, and Stephen Kegels, while working with the United States

https://doi.org/10.5281/zenodo.19060703

Public Health Service. It was originally created to explain why people did not participate in disease prevention programmes, such as tuberculosis screening, even when free medical services were available. Rosenstock expanded the model in 1966, and subsequent refinements in the 1970s and 1980s enhanced its ability to predict health related behaviours. The model assumes that individuals act rationally and will engage in preventive health actions if they believe these actions reduce their risk of illness.

Six key elements make up the Health Belief Model, which affects health-related behavior. How likely a person thinks they are to get sick is known as perceived susceptibility, and it affects their propensity to take preventative measures. The seriousness of the illness and its possible repercussions are related to perceived severity. Perceived barriers are potential roadblocks to adopting such behaviors, whereas perceived benefits are beliefs about the efficacy of preventive measures. Cues to action are external or internal triggers that lead to preventive actions, like medical advice or health education. Lastly, self-efficacy which was added later reflects a person's confidence in their capacity to successfully implement preventive measures.

Significance of Health Belief Model to the Study:

The model explains how knowledge of malaria and the risk factors for malaria infection the main variables in this study relate to each other. Pregnant women's knowledge affects their perception of their susceptibility to malaria infection, which is explained by perceived susceptibility. Pregnant women are more likely to take precautions like sleeping under insecticide-treated nets and going to prenatal clinics if they are aware that pregnancy lowers immunity and raises the risk of malaria.On the other hand, women with poor knowledge may underestimate their risk and fail to take preventive action, thereby increasing their chances of infection.

Perceived severity explains how knowledge of the consequences of malaria infection influences the behavior of pregnant women. When pregnant women are aware that malaria infection may lead to miscarriage, anemia, premature delivery, or death, they will be motivated to adopt preventive measures. However, if the severity of the consequences is not fully appreciated, the preventive measures may be ignored. Perceived benefits explain how the knowledge of the effectiveness of the preventive measures influences their adoption by pregnant women. When pregnant women are aware that the preventive measures, such as the use of bed nets and intermittent preventive treatment, are effective, they will be motivated to adopt the measures, which will reduce the chances of mosquito bites and, consequently, malaria infection.

Perceived barriers explain how various social, economic, and environmental risk factors may influence the behavior of pregnant women towards malaria infection. For example, poverty, lack of bed nets, poor living conditions, and lack of antenatal care may prevent pregnant women from adopting the preventive measures, regardless of their knowledge base. Cues to action explain how external influences such as health education, antenatal services, and media campaigns motivate pregnant women to adopt malaria prevention practices. Health workers play an important role in providing information and encouraging pregnant women to use preventive measures.Self-efficacy explains how pregnant women’s confidence in their ability to use preventive measures influences their behaviour. Women who believe they can properly use insecticide treated nets and attend antenatal clinics regularly are more likely to protect themselves against malaria infection.

Methodology

3.1 Research Design

This research used the cross sectional survey research design in exploring the knowledge and risk factors associated with the spread of malaria infection among pregnant women in BwariArea Council, Abuja. A cross sectional survey design is where data is collected from a particular population at a particular point in

https://doi.org/10.5281/zenodo.19060703

time, where the aim is to describe the conditions, establish relationships, and make inferences based on the findings.

3.2 The Study Area

The study involved women in Bwari LGA of F.C.T. Abuja between the ages of 21 and 49 who were either pregnant at the time of the study up to the second trimester or had been pregnant at least once in the two years prior to the study. They would have spent at least six months living in the study area.

3.3 Population, Sample Size, and Sampling Technique

Pregnant women between the ages of 15 and 49 and female caregivers of children under five who have resided in the community for at least a year comprise the study population. Mothers and female guardians of children under five may be considered caregivers for the purposes of this study.According to records from the Primary Health Care Department and population projections from the National Population Commission, the estimated number of expectant mothers visiting antenatal care centres and female caregivers of children under five years old in Bwari Area Council is approximately (847) NPC, (2026)**.** Therefore, the total population for this study is 847 expectant mothers and women caring for children under five in Bwari Area Council, Abuja.

3.3.1 Sample Size

The sample size for this study was determined using the Taro Yamane formula (Yamane, 1967), which provides a simplified method for calculating sample size from a finite population.

The formula is expressed as:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = sample size

N = population size

e = level of significance (0.05)

1 = constant

For this study:

N = 847

e = 0.05

Substituting into the formula:

$$n = \frac{847}{1 + 847(0.05)^2}$$

$$n = \frac{847}{1 + 847(0.0025)^2}$$

$$n = \frac{847}{1 + 2.1175}$$

$$n = \frac{847}{3.1175}$$

$$n = 271.7$$

The calculated sample size is approximately **272**.

3.3.2Sampling Technique

The respondents were chosen using a multistage sampling technique. In Stage 1, a list of ten Bwari Area Council wards served as the sampling frame. Using a balloting procedure and simple random sampling, three wards were chosen. In the second stage, simple random sampling was used to choose five streets from each of the three chosen wards. In the third step, forty homes on each street were chosen using a systematic sampling technique and the determined sampling interval (K). In the fourth stage, one eligible woman was chosen at random from each home. In each of the three wards, equal numbers of respondents were interviewed.

3.4 Method of Data Collection

The main approach used to collect data in this study was a structured questionnaire. The questionnaire consisted of closed ended questions to ensure uniformity of responses and ease of analysis. The instrument was organized into two main sections. Section A addressed the socio-demographic characteristics of the respondents, including age, marital status, and educational level, occupation, and parity. Section B focused on issues related to the objectives of the study.

3.5 Method of Data Analysis

The data collected for this study were analyzed using a combination of descriptive and inferential statistical methods. The

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descriptive analysis statistical tools included frequency distribution and percentages, while the inferential statistical tool adopted was the Pearson Product Moment Correlation Coefficient.

Analysis of findings

4.1 Socio-demographic Profile of Respondents

Variable	Frequency (n)	Percentages (%)
Age		
15–19	67	24.6%
20–24	80	29.4%
25–29	48	17.6%
30–34	35	12.8%
35–39	28	10.2%
40–44	10	3.6%
45–49	4	1.4%
Marital status		
Single	74	27.2%
Married	155	56.9%
Divorced	24	8.8%
Widowed	19	6.9%
Level of education		
No-formal Education	81	29.7%
Primary	5	1.8%
Secondary	88	32.3%
Tertiary	98	36.0%
Occupational Status		
Farmer	56	20.5%
Business	118	43.3%
Civil-servant	92	33.8%
Number of children		
1-2	120	44.1%
3-4	84	30.8%
5- and above	68	25%

Source: Field Survey, 2026

The age distribution of respondents shows that the majority of participants were between 20and 24 years (29.4%)**,** followed by those aged 15–19 years (24.6%)**.** Respondents in the age groups 25–29 years and 30–34 years accounted for 17.6% and 12.8%, respectively, while only a small proportion of respondents were above 40 years (3.6% for 40–44 years and 1.4% for 45–49 years). This indicates that the study population largely consisted of young adults, which is consistent with the reproductive age profile of women most likely to attend antenatal clinics.

A majority of the respondents were married **(**56.9%)**,** followed by single women (27.2%)**.** Divorced and widowed respondents accounted for 8.8% and 6.9%, respectively. This suggests that most of the respondents were in marital unions, which may influence their exposure to malaria risk factors, health-seeking behaviour, and antenatal care attendance.

Regarding educational attainment, 36.0% of respondents had tertiary education, 32.3% had secondary education**,** 29.7% had no formal education**,** and only 1.8% had primaryeducation**.** The relatively high proportion of women with tertiary and secondary education may positively influence their knowledge of malaria and adoption of preventive measures.

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Most respondents were engaged in business (43.3%), followed by civil service (33.8%), and farming (20.5%). This indicates that the respondents come from varied socio-economic backgrounds, which may impact access to malaria prevention tools such as insecticide-treated nets or regular antenatal care.

In terms of parity, 44.1% of respondents had 1–2 children, 30.8% had 3–4 children, and 25.0% had 5 or more children. This suggests that a significant proportion of the respondents were either first-time mothers or had a small number of children, which may place primigravidae and secundigravidae at higher risk of malaria infection, consistent with existing literature.

Analysis of the Objectives

Section B: The level of knowledge of pregnant women on malaria

Table 4.2 Respondents' Knowledge of Malaria

Knowledge of Malaria	Frequency	Percentages
Malaria is caused by a virus	31	11.3%
Malaria is transmitted through mosquito bites	176	64.7%
Common symptoms include fever, chills	51	18.7%
Insecticide-treated nets can prevent malaria	10	3.6%
Malaria cannot affect pregnant women	4	1.5%
Total	**272**	**100.0%**

Source: Field Survey, 2026

Table 4.2 reveals that the majority of respondents (64.7%) correctly identified mosquito bites as the mode of malaria transmission, indicating a relatively good awareness of the cause of infection. However, only 18.7% recognized fever and chills as common symptoms, suggesting limited knowledge of clinical manifestations. While, (3.6%) acknowledged that insecticide treated nets can prevent malaria, reflecting poor awareness of preventive strategies. Furthermore, 11.3% incorrectly believed that malaria is caused by a virus, while 1.5% believed that malaria cannot affect pregnant women, indicating the presence of misconceptions.

Section C: TheEnvironmental and socio-economic risk factors associated with malaria infection.

Table 4.3 Respondents' Opinion on risk Factors Associated with Malaria

Risk Factors	Frequency	Percentages
Living near stagnant water	118	43.3%
Poor housing with open windows	98	36.0%
Low household income	41	15.0%
Poor sanitation and drainage	10	3.6%
Not owning an insecticide treated net	5	1.8%
Total	**272**	**100.0%**

Source: Field Survey, 2026

Table 4.3 shows that 43.3% of respondents identified living near stagnant water as a major risk factor for malaria infection, while 36.0% mentioned poor housing with open windows. These findings indicate a reasonable awareness of environmental determinants of

https://doi.org/10.5281/zenodo.19060703

malaria transmission. Fewer respondents associated malaria with low household income (15.0%), poor sanitation and drainage (3.6%), and not owning an insecticide treated net (1.8%).

Section D: The Level of Utilization of Malaria Preventive Measures

4.4 Respondent Opinion on Level of Utilization of Malaria Preventive Measure

Preventive Measure	Frequency	Percentages
Sleeping under an insecticide treated net	76	27.9%
Taking intermittent preventive treatment (IPTp)	81	29.7%
Wearing protective clothes to avoid mosquito bites	68	25%
Using insect repellents	41	15.0%
None of the above	6	2.2%
Total	**272**	**100.0%**

Source: Field Survey, 2026

Table 4.4 indicates that 29.7% of respondents reported taking intermittent preventive treatment during pregnancy, while 27.9% reported sleeping under an insecticide treated net. Additionally, 25.0% reported wearing protective clothing, and 15.0% used insect repellents. Only 2.2% indicated that they did not utilize any preventive measure.

Section E: The Relationship between Knowledge of Malaria and the Risk of Malaria Infection among Pregnant Women

Table 4.5 Test of Hypotheses

Our Pearson correlation coefficient is:

X	Y	XY	X^2	Y^2
31	118	3658	961	13924
176	98	17248	30976	9604
51	41	2091	2601	1681
10	10	100	100	100
4	5	20	16	25
∑=272	∑=272	∑=23117	∑=34654	∑=25334

Source: Field Work, 2025

$N\sum XY=23117\ \sum X=34654,\ \sum y=25334$

$$Pr = \frac{5(23117) - (272\times272)}{\sqrt{[5(34654-(272)^2] - [5(25334-(272)^2]}}$$

$$\frac{115585-73984}{R=\sqrt{[173270-73984]\ \ [126670-73984]}}$$

$$= \frac{41,601}{\sqrt{(99286)\ (52686)}}$$

$$= \frac{41,601}{\sqrt{5,230,982,196}} = \frac{41,601}{72325.529}$$

Pr = 0.58

https://doi.org/10.5281/zenodo.19060703

Decision:
The computed Pearson correlation coefficient (r) is 0.58**.** This value indicates a moderate positive relationship between knowledge of malaria and identified malaria risk factors. A correlation coefficient of 0.58 indicates that awareness or identification of malaria risk factors rises in proportion to knowledge level.

4.2 Discussion of Findings
The findings revealed that a majority of respondents identified mosquito bites as the primary mode of malaria transmission, indicating a generally satisfactory level of awareness regarding the disease's cause. However, a notable minority held misconceptions, including the belief that malaria is caused by a virus. This findings corroborate the findings of Aderaw and Gedefaw (2013), who reported high awareness of mosquito transmission among pregnant women in Ethiopia but identified significant gaps in knowledge of prevention and clinical manifestations. Similarly, Okeke and Uzochukwu (2009) observed that while community members in southeastern Nigeria demonstrated familiarity with malaria transmission, misconceptions regarding causation and prevention persisted.
Finding on environmental and socio economic determinants, show that many respondents identified living near stagnant water and poor housing conditions as key risk factors. This reflects an appreciable understanding of environmental contributors to malaria transmission. This findings is consistent with ecological evidence presented by Lindsay et al. (2003), who demonstrated a strong association between housing structure and malaria transmission in sub Saharan Africa. Likewise, Tusting et al. (2015) found that improved housing significantly reduces malaria risk, underscoring the importance of environmental determinants.
Findings on the utilization of malaria preventive measures indicated a moderate level of adoption. Practices such as intermittent preventive treatment during pregnancy and sleeping under insecticide treated nets were commonly reported by a proportion of respondents, while some relied on protective clothing or repellents. This findings is comparable to the findings of Hill et al. (2013), who reported inconsistent utilization of recommended malaria preventive strategies among pregnant women in sub Saharan Africa. Similarly, Eisele et al. (2012) documented that although ownership of insecticide treated nets had improved across many African countries, actual utilization among pregnant women remained below optimal levels.
Finding on the relationship between the Knowledge of Malaria and risk factors, the Pearson correlation coefficient of 0.58 demonstrated a moderate positive relationship between knowledge of malaria and awareness of malaria risk factors. This finding is supported by the work of Iriemenam et al. (2011), who reported that increased malaria knowledge among pregnant women in Nigeria was associated with improved perception of susceptibility and greater engagement in preventive behaviour.

5.1 Conclusion
In conclusion, this study demonstrates that although pregnant women in Bwari Area Council possess a basic understanding of malaria transmission, significant gaps remain in their knowledge of symptoms, preventive strategies, and socio-economic risk factors. Environmental factors, such as stagnant water and poor housing conditions, were more readily recognized than structural or economic determinants. The adoption of preventive measures, including insecticide-treated bed nets and intermittent preventive therapy, was only moderate. The observed moderate positive correlation between knowledge and awareness of risk factors highlights the critical role of education in shaping risk perception, while also indicating that knowledge alone is insufficient to ensure optimal engagement with preventive practices.

5.2 Recommendations
Based on the results of this research, the following recommendations are put forward:

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i. Public health authorities and antenatal care providers should implement targeted and context-specific malariahealth education initiatives for expectant mothers.
ii. Expectant mothers should be encourage to sleep under insecticide-treated nets and following intermittent preventive treatment protocols during pregnancy is a proven malaria preventive strategies that should be more widely adopted and consistently used.
iii. Local Government and community leaders should prioritize interventions to reduce environmental malaria risks, such as draining stagnant water, improving housing conditions, and enhancing sanitation and drainage systems.
iv. Community-based approaches, including outreach programs, workshops, and interactive campaigns, should be employed to enhance knowledge and perception of malaria risks.

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