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Prevalence and risk factors of malaria among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital

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ABSTRACT

Malaria, according to the World Health Organisation (WHO), is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected female Anopheles mosquitoes. Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her foetus, and the newborn child. In Uganda, the overall burden of malaria is high, and its adverse outcomes for the infected mother and the unborn child are widespread. This study was designed to assess the prevalence of malaria in pregnancy and its associated factors among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital. A hospital-based cross-sectional study was conducted. The study was conducted in the antenatal clinic of Hoima Regional Referral Hospital, in the Hoima district of Western Uganda from from February 2022 to April 2022. A sample size of 204 was used. Data was coded and entered into IBM SPSS version 25. Data was then analyzed and the Chi-square test and logistic regression were done to find the associated factors of malaria in pregnancy at a 95% confidence interval. Results shows that the prevalence of malaria in pregnant women attending Hoima Regional Referral Hospital was 17.6%. This study showed that pregnant women remain particularly vulnerable to malaria and that the prevalence of malaria in pregnant women attending Hoima Regional Referral Hospital is high. Therefore, seminars and media education programmes should be started or put in place to educate women on the risk of malaria during pregnancy. Girl child education should be promoted by the government, as educated women are associated with a lower of malaria during pregnancy.

Keywords: Malaria, Anopheles mosquitoes, *Plasmodium falciparum*, Pregnant women

INTRODUCTION

Malaria, according to the World Health Organisation (WHO), is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected female Anopheles mosquitoes [1]. In 2016, there were an estimated 216 million cases of malaria in 91 countries, an increase of 5 million cases over 2015 [2]. The same report shows that the WHO African Region carries a disproportionately high share of the global malaria burden. For instance, in 2016, the region was home to 90% of malaria cases and 91% of malaria deaths [2]. Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her foetus, and the newborn child. Malaria-associated maternal illness and low birth weight are mostly the result of *Plasmodium falciparum* infection and occur predominantly in Africa [3]. Most cases of malaria in pregnancy in areas of stable malaria transmission are asymptomatic [4]. Depending on the endemicity of malaria in an area, it can be expected that 1–50% of pregnant women may carry malaria parasitemia, especially in the placenta, without noticing it [5]. This is attributed to immunity acquired during previous exposure that protects against clinical malaria [6-8]. Pregnant women are three times more likely to suffer from severe diseases as a result of malarial infection compared with their non-pregnant counterparts and have a mortality rate that approaches 50% [9]. The principal impact of malaria infection is due to the presence of parasites in the placenta, which causes maternal anaemia and low birth weight [10]. Beyond the post-partum period, the long-term consequences of malaria during pregnancy on the infant include poor development, behavioural problems, short stature, and neurological deficits [11]. Protection of pregnant women living in malaria-endemic countries has been of particular interest to many malaria control programmes because of this group's higher susceptibility and reduced immunity. WHO recommends the following package

of interventions for the prevention and treatment of malaria during pregnancy: use of long-lasting insecticidal nets (LLINs); in all areas with moderate to high malaria transmission in Africa, intermittent preventive treatment in pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP), as part of antenatal care services; and lastly, prompt diagnosis and effective treatment of malaria infections [12-14]. In Uganda, the overall burden of malaria is high, and its adverse outcomes for the infected mother and the unborn child are widespread. The Malaria Day Report 2018 shows that Uganda contributes 4% of the global malaria burden, and currently, the national malaria prevalence is 19% [15]. Although Uganda is regarded as being a malaria-endemic region, the transmission level varies considerably across the country [16].

In sub-Saharan Africa, over 30 million pregnancies occur annually in areas where malaria is endemic, and each year malaria in pregnancy is estimated to cause nearly one million low birth weight (LBW) deliveries and up to 100,000 infant deaths [3]. Given this high burden of disease, the World Health Organisation (WHO) recommends the implementation of malaria preventive measures in all African countries where *Plasmodium falciparum* remains endemic, including the use of long-lasting, insecticide-treated nets (LLINs) and intermittent preventive treatment during pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP) [17]. Despite these measures, rates of placental malaria and poor birth outcomes remain persistently high in many parts of Africa. In a recent study in Mulago Hospital, Kampala, Uganda, the prevalence of malaria in pregnancy was 12% in women who had received ≥two doses of IPTp-SP and 48% in women who had not received at least two doses of IPTp [18]. In addition, a surveillance report from the Ishaka Adventist Hospital in Bushenyi Ishaka municipality showed that among febrile women who reported to the hospital, 60.3% were found to have malaria [19]. To understand the burden of malaria in pregnancy at Hoima Regional Referral Hospital (HRRH), this study was designed to assess the prevalence of malaria in pregnancy and its associated factors among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital.

METHODOLOGY

Study design

A hospital-based cross-sectional study was conducted from February 2022 to April 2022.

Area of Study

The study was conducted in the antenatal clinic of Hoima Regional Referral Hospital, in the Hoima district of Western Uganda. It is the referral hospital for the districts of Kagadi, Kangwali, Masindi, and Kibali. According to the 2014 census data the hospital serves a population of 548,000 people the hospital has a bed capacity of 317 beds. Hoima RRH offers both General and Specialized Services and is a teaching and Referral Hospital.

Study population

The study included all women attending ANC in Hoima Regional Referral Hospital during the study period.

Inclusion criteria

Records of pregnant women with a gestational age of 14 weeks and above who attended ANC at Hoima RRH from February 2022 to April 2022.

Exclusion criteria

Pregnant women who did not test for malaria and those with incomplete documentation were excluded from the study.

Sample size determination

The sample size required for the study was calculated based on the formula by Kish [20] to estimate a single population proportion (Gwet [21]).

$$N = \frac{Z^2\, p(1-p)}{\delta^2}$$

Where,

N = estimated sample size

P = anticipated proportion of pregnant women with malaria. A similar study at Mulago Hospital found only a prevalence of 14%, so P was taken to be 0.14

Z = standard normal variation ant 95% confidence (1.96)

δ = margin of error (5%)

The calculated sample size was $\frac{1.96^2\, x\, 0.14(1-0.14)}{0.05^2}$ = **185 samples were considered.**

A 10% sample size was added to compensate for those who were missing the information in their files therefore final sample size became 204.

Sampling procedure and techniques

Simple random sampling was used to select the first number from the antenatal register, then every fifth woman was selected from the register until the required sample size was reached.

Data collection methods

Data was collected by reviewing records from the antenatal register, using a structured pretested checklist.

Data processing and analysis

The checklist was checked for completeness before leaving the study area. Data was coded and entered into IBM SPSS version 25. Data was then analyzed and the Chi-square test and logistic regression were done to find the associated factors of malaria in pregnancy at a 95% confidence interval. Variables with a P value of ≤ 0.05 were considered significantly associated with malaria in pregnancy. The odds ratio was used to determine the direction and strength of

the association. Results were presented in tables and charts.

Ethical Consideration

Ethical clearance was sought from the faculty of clinical medicine and dentistry in the form of an introduction letter. A copy of the introduction letter was taken to the hospital administrator to seek permission to collect the data.

RESULTS

Socio-demographic findings

Table 1: Shows socio-demographic findings

Variable	Frequency	Percent
Age of respondents		
18-25	87	42.6
26-35	90	44.1
35 and above	27	13.3
Level of education		
Primary	118	57.8
Secondary	66	32.4
Tertiary	17	8.3
Unspecified education level	4	1.5
Area of residence		
Rural	165	81.0
Urban	39	19.0
Occupation		
Peasant	143	70.1
Business	42	20.6
Civil servant	8	3.9
House wife	11	5.4

Table 1 shows that a greater number 90(44.1%) were aged 26-35 years, majority 143(90.5%) were married, many 118 (57.8%) were of primary level education, 128(81.0%) were from rural areas, and lastly, majority 143 (70.1%) were peasants.

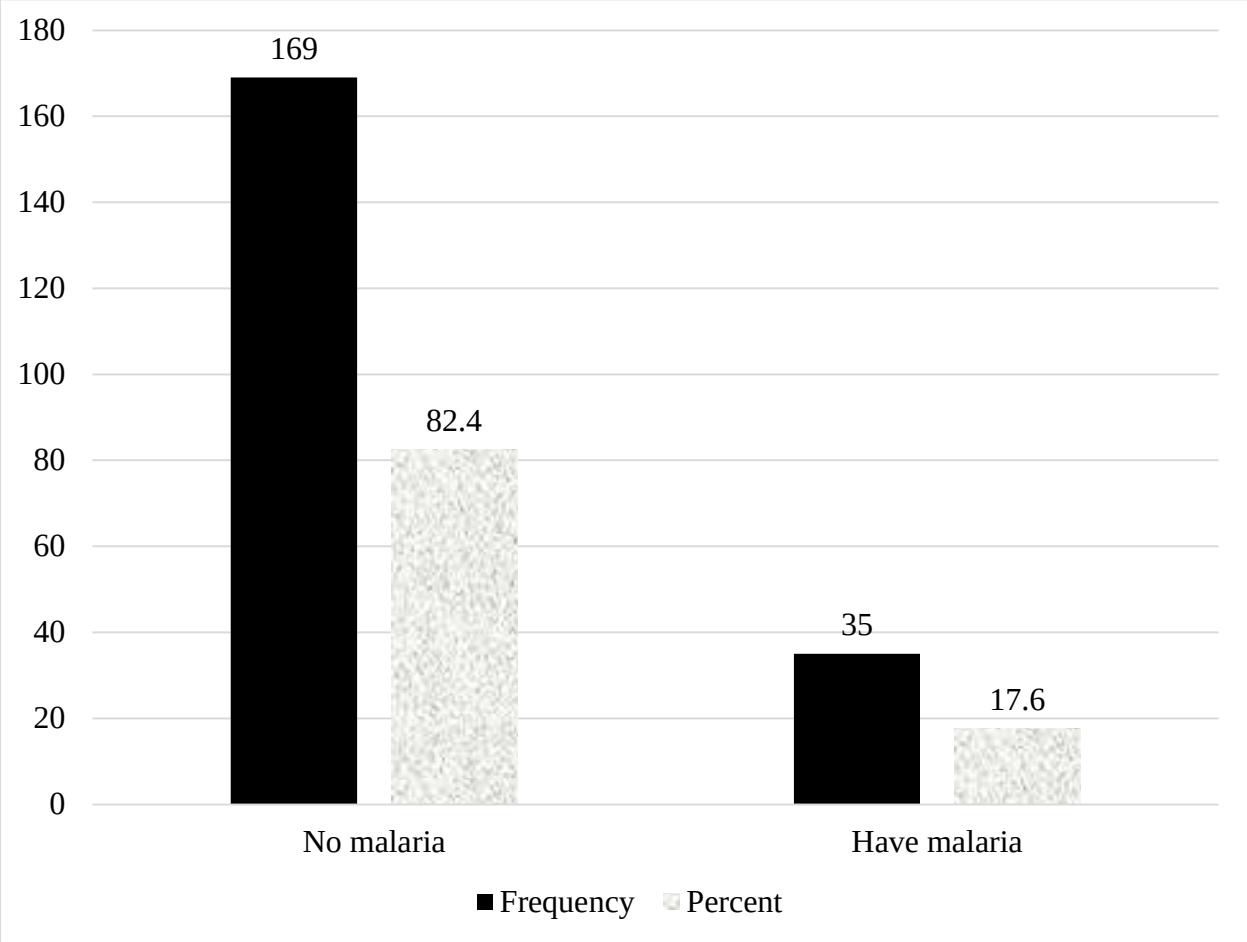

Figure 1: A graph showing the prevalence of malaria in pregnant women attending Hoima Regional Referral Hospital.

Figure 1 shows that the prevalence of malaria in pregnant women attending Hoima Regional Referral Hospital was 17.6%. Socio-demographic factors associated with malaria among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital. Bivariate analysis of socio-demographic factors associated with malaria among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital.

Table 2: indicates the bivariate analysis of socio-demographic factors associated with malaria among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital

Variables in the Equation		B	S.E.	Sig. (P-value)	Exp(B) (Odd Ratio)
Step 1[a]	Age of respondents	-18.950	3661.109	0.996	0.000
	Level of education	1.761	0.864	0.042	5.816
	Area of residence	2.162	1.314	0.100	8.686
	Occupation	-.759	0.678	0.263	0.468

Table 2 indicates that only the level of education and area of residence significantly had a p-value of less than 2 and thus proceeded to the multivariate stage. Multivariate analysis of socio-demographics associated with malaria among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital.

Table 3: shows a multivariate analysis of socio-demographics associated with malaria among pregnant women presenting at the antenatal clinic in Hoima Regional Referral Hospital

Have malaria in pregnancy		B	Std. Error	Sig. (P-value)	Exp(B) (Odd Ratio)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Yes	Primary	1.975	1.053	**0.031**	**7.206**	**0.916**	**56.713**
	Secondary	0.779	0.935	0.405	2.179	0.349	13.619
	Tertiary	0[b]	.	.	1.000	.	.
	Rural	0.506	.875	0.563	1.659	0.299	9.218
	Urban	0[b]	.	.	.	.	.

Table 3 indicates a significant relationship between primary and tertiary (P-value < 0.05) that is those of primary level were 7 times more likely to have malaria in pregnancy compared to those of tertiary level. Obstetric factors associated with malaria among pregnant women attending ANC at Hoima Regional Referral Hospital.

Table 4: Shows the bivariate of Obstetric factors associated with malaria among pregnant women attending ANC at Hoima Regional Referral Hospital

Variables in the Equation		B	S.E.	Sig. (P-value)	Exp(B) (Odd Ratio)
Step 1[a]	Do you get family support during pregnant	-8.664	14020.857	1.000	0.000
	How often do you visit ANC	.487	.759	0.521	1.627
	Have you ever used IPT	-17.342	62498.155	1.000	0.000
	if yes are you willing to go or get an IPT dosage	-16.368	25982.144	0.999	0.000
	Do you know the recommended drug for IPT	24.728	53430.439	1.000	54875914710.130
	Do you know SP [Sulphadoxine pyrimethamine]	-16.937	19174.997	0.999	0.000

Table 4 indicates that none of the individual-related factors was significantly related to malaria in pregnancy at the stage of analysis. In addition, since all the P-values were not < 0.2 the multivariate was not performed thus this stage concluded the individual-related factors were not significant.

DISCUSSION

Prevalence of malaria in pregnant women

In this study, the prevalence of malaria in pregnant women attending Hoima Regional Referral Hospital was 17.6%. The study's prevalence is also consistent with a study among 685 urban and peri-urban women attending their first antenatal clinic (ANC) at Nyanza Provincial General Hospital in Kisumu (western Kenya) also found that the prevalence of malaria parasitaemia was 18.0% [22] and 18.1% in a cross-sectional study conducted in Bobo-Dioulasso, Burkina Faso, from September to December 2010 [23]. The reason for the consistent finding could be geographical location, as these studies were done in Africa, where most countries are developing and presenting almost similar lifestyles. Lastly, the study found that the found that the prevalence of malaria in pregnant women was higher than 10.2% in a community-based cross-sectional study conducted on a total of 498 pregnant women from July to August 2018 in Sherkole district, West Ethiopia [24]. It was also higher than studies conducted in Felege Hiwot referral hospital and Addis Zemen Health Centre, Ethiopia (2.83%) [25], coastal Ghana (5%) [26], and India (5.4%) [27]. A cross-sectional study done by Namusoke et al. [28] at Mulago Hospital in Kampala, Uganda, found that the malaria prevalence in pregnant women was low at 15.5%. Another cross-sectional study by Tour et al. [29] also showed that the prevalence of malaria in pregnant women in Guinea was 15.8% and 14.8% for peripheral and placental malaria, respectively. This difference might be attributed to the difference in geographical location among the study areas and the better implementation of improved malaria interventions, including increased coverage in the distribution of long-lasting insecticide-treated nets (LLINs) and indoor residual spraying. Therefore, the prevalence of malaria in pregnant women varies from place to place and remains significantly high across different populations.

Socio-demographic factors associated with malaria in pregnant women

This study found a significant relationship between primary and tertiary (P-value < 0.05), that is, those at the primary level were 7 times more likely to have malaria in pregnancy compared to those at the tertiary level. This finding is consistent with the results of a study done by Amos et al. [30] in Sierra Leone, which found that women with higher education had lower odds of malaria in pregnancy. In addition, women who had never been to school were almost twice as likely as those of secondary or higher education who had never been to school to have malaria in pregnancy, and being unmarried was associated with a 60% decline in malaria in pregnancy [31]. This could be because Onyinyechi et al. [33] suggest that education may offer a protective effect against malaria through increased knowledge of the disease and the use of preventive interventions such as LLINs. Studies elsewhere have shown women's education status to be associated with the risk of malaria among children.

Obstetric factors associated with malaria among pregnant women

This study showed that none of the individual-related factors was significantly related to malaria in pregnancy. This finding, however, contradicts many other studies that have shown that various individual-related factors have been revealed to have a significant relationship with malaria in pregnancy, for example, women who initiated antenatal care in at least 6 weeks of pregnancy or who attended four antenatal visits or more were less likely to have malaria in pregnancy [33], women who have not informed not malaria in pregnancy were 2 times more likely to have malaria in pregnancy compared to those who were informed and women who never used intermittent preventive treatment for malaria in pregnancy were found to be 2 times more likely to have malaria in pregnancy compared to those who did not use [34]. A study done in Tanzania showed knowledge of the adverse effects of placental malaria was significantly associated with malaria in pregnancy [35]. Other studies showing individual-related factors significantly related to malaria in pregnancy include a study by Okoyo et al. [36] in Kenya, which found a visit to rural areas and the second trimester of pregnancy were significant risk factors for malaria in pregnancy. Another study done in Kenya found that women initiating antenatal attendance in the sixth month of pregnancy had about 10.5 times the odds of having malaria in pregnancy as those starting antenatal visits in the second month. Again, women who mentioned the community (friends and family) as the main source of information were about 12.7 times as likely to have malaria in pregnancy as those who relied on health facilities. Women who did not receive support from their partners towards antenatal visits had about 8.2 times the odds of having malaria in pregnancy as those who received partner support [37].

CONCLUSION

This study showed that pregnant women remain particularly vulnerable to malaria and that the prevalence of malaria in pregnant women attending Hoima Regional Referral Hospital is high. The odds of malaria in pregnancy are increased by the education level of women.

Recommendations

Seminars and media education programmes should be started or put in place to educate women on the risk of malaria during pregnancy. Girl child education should be promoted by the government, as educated women are associated with a lower of malaria during pregnancy. Researchers, academicians, and organisations should carry out more studies addressing the gaps left by this study. For example, individual-related factors contradicted many other studies, leaving them inconclusive.

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