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Malaria Among Pregnant Women in Bossaso City, Somalia: Cross Sectional Study Design

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Abstract: Malaria is a protozoan-caused parasitic infection of the genus Plasmodium. Approximately 25 million pregnant women in sub-Saharan Africa live at risk of Malaria. This study aims to address the prevalence of Malaria and its associated factors among pregnant women in Bossaso, Somalia. A health institution-based cross-sectional study was conducted among 422 pregnant women in Bossaso General Hospital (BGH) using an interview-administered questionnaire and malaria diagnosis confirmation, which was done on microscope-based laboratory techniques. The collected data were analyzed. Bivariate and multivariate logistic regression models were employed to identify factors associated with Malaria. The overall prevalence of Malaria was found to be 20.9% [95%CI (15.9%, 25.9%)]. Of these, 64 (75.3%), 19 (22.4%), and 2 (2.4%) were caused by Plasmodium falciparum, Plasmodium vivax, and mixed infection, respectively. The factors like the presence of water pond sites around the house or vicinity [AOR= 6.5, 95% CI (1.6, 20.5)] and always using insecticide-treated bed nets (ITNs) [AOR=0.1, 95%CI (0.01, 0.88)] were found to be significantly associated with Malaria during pregnancy. The prevalence of Malaria among pregnant women in the study area was found to be high; Thus, this study emphasized the need to provide health education and consultation to pregnant women on the appropriate malaria preventive methods and continue strengthening other interventions.

Keywords: Malaria, Pregnant Women, Bossaso, Somalia

1. Introduction

Malaria is a serious disease that leads to severe adverse effects on mothers and the fetus during pregnancy. Plasmodium falciparum, Plasmodium vivax, Plasmodium Ovale, and Plasmodium malariae cause human malaria. It is naturally spread to humans through an infected female Anopheles mosquito bite. Among the four parasite species, plasmodium falciparum is the most prevalent malaria parasite in the World Health Organization (WHO) African Region, accounting for 99.7% of estimated malaria cases in 2017 [16].

Malaria disease is categorized as uncomplicated or with severe complications. Individuals infected with uncomplicated Malaria commonly experience a combination of flue like symptoms and other simple symptoms. If left untreated, these may proceed to complicated Malaria, which presents as organ failures, impairment of consciousness, and even death [8].

Approximately 228 million cases of Malaria occurred worldwide in 2018 compared to 231 million patients in 2017. The WHO African Region still bears the most significant burden of malaria morbidity in 33 moderate to high transmission countries in the WHO African Region. There were an estimated 33.2 million pregnancies, of which 35% (11.6 million) were exposed to malaria infection. By WHO subregion, East Africa had a high prevalence of exposure to Malaria during pregnancy by 2.4 million (24%) [19].

Malaria remains life-threatening and one of the most significant public health challenges worldwide, and it is amongst the top killers in sub-Saharan Africa. The WHO African Region continues to carry a disproportionately high share of the global malaria burden. In 2018 alone, the region was home to 93% of malaria cases and 94% of malaria deaths [19].

Since Malaria has significant public health problems, pregnant women are more likely to become infected with Malaria than non-pregnant women. Once infected, there is a tendency toward increased severity of the disease. In high-transmission settings, it is associated with maternal illness and low birth weight, while in low-transmission areas, Malaria usually presents as an acute illness with detectable peripheral parasitemia [5]. In addition, malaria susceptibility increases during pregnancy, making these women an important parasite reservoir in the community. Meanwhile, the biology and clinical presentations of Plasmodium falciparum in semi-immune women interfere with diagnosis during pregnancy, rendering targeted interventions ineffective for control. Furthermore, concerns for teratogenicity and embryotoxicity complicate the proposed application of any drugs, vaccines, or anti-vector measures among pregnant women [13].

In Somalia, although the prevalence of Malaria had dropped dramatically since 2009, when more than a quarter of Somalis (27.3%) were infected to fewer than two percent of the population in 2014, yet malaria endemicity remains in most parts of the central and Southern regions and some areas in the north with other areas being prone to epidemics [4].

One out of every 20 women dies due to pregnancy-related causes (The maternal Mortality Ratio is 692 deaths of mothers for 100,000 live births). Maternal health services are low, with 44 and 38 percent of births in Somaliland and Puntland attended by skilled birth attendants [28]. Additionally, an estimated 11% of neonatal deaths are attributable to LBW due to Malaria in sub-Saharan Africa [26].

Moreover, no study has been conducted to address the prevalence and associated factors of Malaria among pregnant women in the region. Therefore, this study was designed to assess the prevalence of Malaria and the factors associated with its infection among pregnant women in the urban area of north-eastern Somalia.

2. Materials and Methods

2.1. Study Area, Design, and Period

The study was conducted in Bossaso city in the north-eastern Bari province, Somalia. It extends over an area of 28 km^2 and is populated by approximately 700,000 residents, its characterized by a hot temperature and a mean annual relative humidity of around 60% [19]. The study was carried out in Bossaso General Hospital, which provides health services to over one million people with six primary departments (Bossaso, G. H., 2019 unpublished raw data). Among these is the maternity department where this research was conducted.

Health institution-based cross-sectional study design was employed from June 7th to September 7th, 2020, where all pregnant women who visited the MCH department in BGH during the study period were illegible to be included; however, the pregnant women who visited the MCH in BGH and had a severe illness during the study period were excluded from this study.

2.2. Sample Size Determination and Sampling Procedure

The sample size was determined using a single proportion formula using a 95% confidence level, 5% margin of error, and a 50% prevalence of Malaria among pregnant women was considered since no previous studies clearly show the prevalence of Malaria among pregnant women has been done in the area. To compensate for the non-response rate, 10% of the determined sample size was added, which resulted in a total sample size of 422.

The required number of pregnant women was taken by systematic sampling technique, where participants were selected according to a random starting point with a fixed number. In contrast, the sampling intervals were based on every interval adjusted. The required sample was recruited from the pregnant women who were visiting and willing to give blood for microscopic blood film examination in BGH until the required sample size was achieved.

2.3. Data Collection Methods

The study subjects were interviewed using a pre-tested and structured interviewer-administered questionnaire, which was developed in both English and (af-Somali) languages and was pre-tested on 5% of the sample. The questionnaire contents included socio-demographic factors, maternal, environmental, and other factors, and laboratory results.

Malaria diagnosis was confirmed using microscopic blood films prepared from finger-prick blood sample results collected from selected pregnant women. Experienced laboratory technicians from BGH prepared thick and thin blood films labeled and air-dried horizontally in a slide tray. Thin films were fixed with methanol for about 30 seconds, and both thick and thin films were stained with 3% Giemsa for 20–30 minutes at the study health facilities by using the WHO 2015 standard malaria laboratory procedures guideline [15].

2.4. Data Management and Analysis

After collecting all the necessary data was coded on the principal investigators' coding sheet, and the collected data were entered and cleaned using Epi INFO version 7. After cleaning, the data was transported to the SPSS version 25 (Chicago, IL, USA) for analysis.

Both descriptive and inferential statistics were performed. In descriptive statistics, tables and graphs were used to depict frequencies, proportions, and summary statistics to describe the study population with relevant variables.

During analysis, both bivariate and multivariable logistic regression techniques were used to determine the extent of association between the different variables related to Malaria. Covariates with a p-value less than 0.25 in the bivariate logistic regression analysis were entered into the multivariable logistic regression analysis to control potential confounders and identify malaria-associated factors. A significant association of variables with the outcome was determined using adjusted odds ratios and a 95% confidence interval in multivariable analysis. Variables with a p-value of less than 0.05 were declared as statistically significant.

2.5. Data Quality Control

Attention was given to questionnaire designing, objective-based, logically sequenced, and free of scientific terms, and a non-leading structured questionnaire was prepared. Data collectors and supervisors were provided with two days of intensive training on the study's objective, the contents of the questionnaires, and how to maintain the confidentiality and privacy of the study subject.

Before the actual data collection began at BGH, pre-testing was conducted on 21 pregnant women visiting a local private health facility. The necessary correction was made to the questionnaires translated into the local languages. The questionnaire was thoroughly checked for errors, impossible values, and inconsistencies due to coding, entry, typing, and other errors. The investigators checked data collection tools daily for completeness, accuracy, clarity, and consistency.

Stained quality control slides were used to check the quality and performance of the Giemsa stain. Before the examination, the stained patient slides and stained quality control slides were checked for the quality of blood components from malaria-positive blood; then, if the quality control slides were satisfactory, the patient slides were cross-checked.

2.6. Ethical Consideration

An ethical clearance letter was obtained from Haramaya University, College of Health and Medical Sciences school of public health. The letter was communicated, and permission was obtained from the administrative organization of the hospital and the MCH sub-department. The participants were informed about the purpose of the study and the importance of their participation. Also, informed, voluntary, written, and signed consent was obtained from the participants. Only the volunteer individuals were involved, and study participants had the right to withdraw from the study at any time. Personal data was kept confidential.

3. Result

3.1. Socio-Demographic Characteristics

A total of 406 pregnant women participated in the study, with a response rate of 96.2%. The participant's age ranges from 18 to 45 years, with a mean age of 28.68 (SD ± 5.6). The majority of pregnant women belonged to the age group of 25-34 years 216 (53.2%). Nearly all the respondents were Muslim religious followers, 402 (99%). The majority ethnicity component of the participants was Somalis 331 (81.5%). The vast majority of respondents had a family size of fewer than eight individuals, 276 (68%). Close to half of the pregnant women were housewives, 195 (48%). Regarding the educational status of pregnant women, close to half of the pregnant women were educated until primary school 192 (47.3%). In comparison, 132 (32.5%) had no formal education. The majority of the participants' families earn a monthly income of < 100 USD 172 (42.4%) (Table 1).

Table 1. *Socio-demographic characteristics of pregnant women at BGH - Bossaso, Somalia 2020 (n=406).*

Variable	categories	frequency	percent (%)
Age	15 – 24	118	29.1
	25 - 34	216	53.2
	≥ 35	72	17.7
Residence	Urban	370	91.1
	Rural	36	8.9
Religion	Muslim	402	99.0
	Christian	4	1.0
Ethnicity	Somalis	331	81.5
	Somali Bantus	60	14.8
	Arab	3	.7
	Oromo	12	3.0
Family size	≤7	276	68.0
	≥ 8	130	32
Occupation	Government employed	3	.7
	Private organizational employee	16	3.9
	Merchant	82	20.2
	Daily laborer	65	16
	Farmer	8	2.0
	Pastoralist	37	9.1
	Housewife	195	48.0
Educational status	Had no formal education	132	32.5
	Primary school (1-8th)	192	47.3
	secondary school (9-12th) and above	82	20.2
Husband's educational status (n=351)	Had no formal education	3	0.9
	Primary school (1-8th)	116	33.0
	secondary school (9-12th) and above	114	32.5
Monthly income	0 - 99 USD	172	42.4
	100 - 199 USD	119	29.3
	200 - 299 USD	70	17.2
	≥ 300 USD	45	11.1

3.2. Maternal Characteristics

The largest part of the pregnant women was married 351 (86.5%), multigravidas 237 (67.2%), and slightly more than half of them were in the 3rd trimester of their gestational age 213 (52.5%). The foremost part of the participants, 158 (38.9%), had only one ANC visit during the current pregnancy, while 69 (17%) had no ANC visits before. Only a tiny portion of those who visited ANC clinics had health education during their ANC visits, 20 (7.7%). Of the pregnant women, 94 out of 337 (23.2%) had taken malaria drugs during ANC visits, and from these, 34 (36.2%) of them named SP (Fansidar) the medication that they had taken during their ANC visits.

Slightly more than half of the pregnant women expressed that Malaria can be prevented by sleeping under insecticide-treated bed net 196 (48.3%). In comparison, 63 (15.5%) did not know that, and half of the participants suggested getting treatment within three days (Table 2).

Table 2. *Maternal characteristics of pregnant women at BGH - Bossaso, Somalia 2020 (n=406).*

Characteristics	Category	Frequency	percentage
Current marital status	Married	351	86.5
	Widowed	23	5.7
	Divorced	32	7.9
Gravidity	Primigravida	49	12.1
	Secundigravida	84	20.7
	Multigravida	237	67.2
Trimester	1st trimester	77	19
	2nd trimester	116	28.6
	3rd trimester	213	52.5
Number of ANC visits	Not visited before	69	17.0
	Once	158	38.9
	Twice	110	27.1
	Three times or more	69	17.0
Had health education during ANC visits (n=337)	Yes	26	7.7
	No	311	92.3
Taken malaria drugs during ANC visits (n=337)	Yes	94	23.2
	No	243	59.9
Types of malaria drugs taken (n=94)	SP (fansidar)	34	36.2
	Do not know	60	63.8
How is Malaria transmitted	Through mosquito bites	160	54.9
	By eating tainted food	79	19.5
	By drinking contaminated water	41	10.1
	Do not know	63	15.5
How is Malaria prevented	Washing fruit and vegetables before eating them	64	15.8
	Sleeping under an ITN	196	48.3
	Allowing inside the home to be sprayed with insecticides	146	36
If you think you are infected with Malaria, how soon should you get tested?	Within one week	65	16.1
	Within three days	200	50
	Within 24 hours	136	33.9

3.3. Environmental Characteristics

Nearly half of the participants, 194 (47.8%), live in cement-made houses. The other housing means include Emergency and transitional shelters 70 (17.2%) and Traditional Somali houses 43 (10.6%). Of the participants, 120 (29.6%) have water pond sites around their homes or vicinity. A significant proportion of the respondents, 252 (62.5%), stay outside overnight, while more than half of 257 (63.3%) usually sleep outside their houses.

The majority of the pregnant women's households had ITNS 256 (63.1%); from these, only 45 (17.6%) mentioned that they always used it, while 68 (26.6%) stated that they never used it. 98 (24.1%) use mosquito repellants from pregnant women, and 49 (12.1%) had at least one indoor residual spraying for the last 12 months (Table 3).

Table 3. *Environmental characteristics of pregnant women at BGH - Bossaso, Somalia 2020 (n=406).*

Characteristics	categories	frequency	percent (%)
Type of house	Mad and Thatch	6	1.5
	cement	194	47.8
	stone	93	22.9
	Emergency and transitional shelter	70	17.2
	Traditional Somali house	43	10.6

Characteristics	categories	frequency	percent (%)
Are there any water pond sites around your house or vicinity?	yes	120	29.6
	no	286	70.4
Do you stay outside overnight after (6:00 pm)?	yes	252	62.1
	no	154	37.9
Where do you usually sleep?	inside the house	149	36.7
	outside the house	257	63.3
Does your household have any Insecticide-treated bed nets that can be used while sleeping?	yes	256	63.1
	no	150	36.9
If yes, how often do you use it? (n=256)	Always	45	17.6
	Sometimes	143	55.9
	Never	68	26.6
If yes, do mothers and children given priority of using bed nets? (n=256)	yes	126	49.2
	no	130	50.8
Do you use mosquito repellants?	yes	98	24.1
	no	308	75.9
Do you use protective clothing at night (long close cover hands and legs)?	yes	129	31.8
	no	277	68.2
Was there indoor residual spraying in the last 12 months?	yes	49	12.1
	no	357	87.9
If yes, how often? (n=49)	once	43	87.6
	twice	6	12.2

3.4. Prevalence of Malaria Among Study Participants

The overall prevalence of Malaria among pregnant women in this study was 20.9% [95% CI (15.9%, 25.9%)], of whom 64 (75.3%), 19 (22.4%), and 2 (2.4%) had plasmodium falciparum, plasmodium vivax, and mixed infection respectively.

Factors Associated with Malaria Among Pregnant Women.

To determine the association between Malaria and explanatory variables, bivariate and multivariable analyses were performed using binary logistic regression. As shown in (Table 4), there are 12 factors associated with Malaria in the bivariate analysis at a p-value of <0.25, and these include age, gravidity, number of ANC visits, health education during ANC visits, how Malaria is transmitted, presence of water pond sites around the house or vicinity, staying outside overnight after (6:00 pm), usually sleeping outside or inside the house, how often ITNS being used, utilization of mosquito repellants, usage of protective clothing at night (long close cover hands and legs), presence of indoor residual sprayed this year.

Then all of these factors listed above were further analyzed and entered into the final model for adjusting confounding factors. After adjusting in multivariable logistic regression, only two factors remained significantly associated with Malaria.

Pregnant women who had water pond sites around their house or vicinity had 6.5 times increased odds of malaria infection compared to their counterparts [AOR= 6.5, 95% CI (1.6, 20.5)]. The odds of malaria infection among pregnant women were decreased by 90% for those who always used ITNs compared to those who used it less frequently [AOR=0.1, 95%CI (0.01, 0.88)] (Table 4).

Table 4. *Factors associated with Malaria among pregnant women at BGH - Bossaso, Somalia 2020 (n=406).*

Covariant	Category	Malaria status		COR (95%CL)	AOR (95%CL)
		Positive N (%)	Negative N (%)		
Age	15 – 24	19 (16.1 %)	99 (83.9%)	1.04 (0.47, 2.3)	2.25 (0.14, 35.38)
	25 – 34	54 (25%)	162 (75%)	0.6 (0.3, 1.2)	2.67 (0.5, 14.32)
	≥ 35	12 (16.7%)	60 (83.3%)	1	1
Gravidity	Primigravida	21 (42.9%)	28 (57.1%)	0.31 (0.16, 0.58)	2.23 (0.14, 35.5)
	Secundigravida	13 (15.5%)	71 (84.5%)	1.26 (0.65, 2.44)	0.7 (0.1, 5.05)
	multigravida	51 (18.7%)	222 (81.3%)	1	1
Number of ANC visits	Never visited	33 (47.8%)	36 (52.2%)	0.2 (0.88, 0.43)	2.43 (0.42, 14.12)
	Once	30 (19%)	128 (81%)	0.8 (0.38, 1.73)	0.37 (0.08, 1.7)
	Twice	11 (10.0%)	99 (90.0%)	1.9 (0.76, 4.74)	0.19 (0.04, 1.01)
	Three times or more	11 (15.9%)	58 (84.1%)	1	1
Had health education during ANC visits (n=337)	Yes	6 (23.1%)	20 (76.9%)	0.56 (0.2, 1.48)	5.9 (0.7, 46.3)
	No	45 (14.5)	266 (85.5%)	1	1
How is Malaria transmitted	Through mosquito bites	50 (22.4)	173 (77.6%)	0.58 (0.27, 1.25)	5.6 (0.94, 33.7)
	By eating tainted food	18 (22.8%)	61 (77.2%)	0.57 (0.23, 1.36)	3.8 (0.55, 26.9)
	By drinking contaminated water	8 (19.5%)	33 (80.5)	0.69 (0.24, 1.96)	3.9 (0.43, 36.0)
	Do not know	9 (14.3%)	54 (85.7)	1	1
Presence of water pond sites around your house or vicinity	yes	42 (35%)	78 (65%)	3.04 (0.2, 0.54)	6.5 (1.6, 20.53) *
	no	43 (15%)	243 (85%)	1	1
staying outside overnight after (6:00 pm)	yes	63 (25%)	189 (75%)	0.5 (0.29, 0.85)	1.8 (0.6, 5.35)
	no	22 (14.3%)	132 (85.7%)	1	1
Usually sleep	Inside the house	25 (16.8%)	124 (83.2%)	1	1
	Outside the house	60 (23.3%)	197 (76.7%)	0.66 (0.39, 1.11)	1.1 (0.33, 3.04)

Covariant	Category	Malaria status		COR (95%CL)	AOR (95%CL)
		Positive N (%)	Negative N (%)		
How often ITNS being used (n=256)	Always	6 (13.3%)	39 (86.7%)	1.38 (0.53, 3.6)	0.1 (0.01, 0.88) *
	Sometimes	19 (27.9%)	49 (72.1)	0.55 (0.28, 1.08)	0.9 (0.2, 4.2)
	Never	25 (17.5%)	118 (82.5%)	1	1
Utilization of mosquito repellants	yes	12 (12.2%)	86 (87.8%)	1	1
	no	73 (23.7%)	235 (76.3%)	0.45 (0.23, 0.87)	2.6 (0.8, 8.42)
Usage of protective clothing at night (long close cover hands and legs)	yes	20 (15.5%)	199 (84.5%)	1	1
	no	65 (23.5%)	212 (76.9%)	0.6 (0.35, 1.04)	1.4 (0.4, 4.7)
Presence of IRS this year	yes	7 (14.3%)	42 (85.7%)	1.68 (0.73, 3.88)	0.2 (0.02, 1.7)
	no	78 (21.8)	279 (78.2%)	1	1

4. Discussion

This study assessed the prevalence of malaria infection and associated factors among pregnant women in Bossaso city, Somalia. This study resulted in a prevalence of 20.9%. In addition to these various potential factors assessed in this study, the factors like the presence of water bond sites around the house and always using ITNs were associated with Malaria among pregnant women. However, different studies reported different factors influencing the malaria infection rate among pregnant women.

The prevalence in this study (20.9%) was much closer to a prevalence of a study done in Benin (20.8%) [13]. However, this finding is more outstanding from the studies conducted in western Ethiopia (10.2%) [6], Salavan province, Laos (5.9 %) (Briand et al., 2016), Burkina Faso (18.1%) (Cisse et al., 2014) Nigeria (3.1%) [20] & in Nigeria as well 7.7% [1]. This discrepancy might be attributed to the difference in geographical location among the study areas. For instance, our study was conducted in a malaria-endemic area with a high transmission rate. Therefore, individuals living in malaria-endemic areas have a greater chance of developing asymptomatic Malaria. In contrast, those living in low transmission areas have a low probability of infection, leading to a low prevalence of the diseases in such areas. Another reason for the difference could be methodology, including sampling techniques among these studies.

When this figure is compared with the results from Nigeria (41.6%) [21], and Zambia 31.8 % [22], the findings were found to be lower. The difference in the prevalence might be due to the study period, study design, and economic differences between the study areas and better implementation of improved malaria interventions, including increased coverage in the distribution of ITNS and IRS in our study area. Based on personal communication with the regional health office, this difference might be due to the better availability of ITNs in Bossaso, good health awareness of the community, and expanded health service coverage and utilization in Bossaso.

In this study, Plasmodium falciparum and vivax species caused the majority of the cases, 75.3% and 22.4%, respectively, while the remaining were caused by mixed infection (2.4%). This result is in line with the 2016 screening survey conducted in the Bossaso regional hospital, which showed 73.7 %, and 25.4% of malaria infections were caused by Plasmodium falciparum and vivax correspondingly [8]. However, our result was lower than the WHO Somalia prevalence reports of the species, which was >95% of malaria species in the country was due to plasmodium falciparum [17]. On the other hand, the proportion of malaria cases caused by Plasmodium falciparum in our study was lower than the WHO malaria 2018 report, which revealed over 99% of malaria cases in the African region were due to Plasmodium falciparum [18]. The possible reason for these variations might be due to marked seasonal, inter-annual, and spatial variability. It may also be due to significant differences in climate (temperature, rainfall, and relative humidity), human settlement, and population movement patterns.

Our study also assessed socio-demographic, obstetric, environmental, and ITN ownership and utilization factors. As a result, the presence of water pond sites around the house or vicinity and how often ITNs were used were significantly associated with Malaria.

In this study, always using malaria preventive ITNS was significantly associated with decreased odds of developing malaria infection during pregnancy [AOR=0.1, 95%CI (0.01, 0.88)]. A similar association was found in a study conducted in Lagos, Nigeria [1]. The possible explanation could be due to UNICEF's recent provision of ITNS and community awareness campaigns by the MOH. The use of ITNs reduces malaria transmission, and it is one of the proven, cost-effective components of malaria prevention through the vector control approach.

In the present study, having water pond sites around the house or vicinity was significantly associated with the occurrence of Malaria in pregnant women [AOR= 6.5, 95% CI (1.6, 20.5)]. This finding is in line with a study conducted in Uganda [23] and other studies done in east India, which described it as a potential source of transmission [24]. The presence of stagnant water could explain which is an environmental risk factor that increases the breeding of mosquitoes near homes. The relatively inexpensive measures of removing pools of water have been shown to reduce mosquito abundance and malaria incidence significantly. Such interventions can be used with core malaria prevention methods, such as utilizing ITNs as a strategy to minimize the occurrence of the disease.

Overall, a timely intervention strategy is mandatory and should focus on the WHO-recommended three-pronged approach for Malaria in pregnancy, which includes ITNS, IPT, and case management. In this study, although most of the pregnant women had ITNs, only a few were regularly using it,

so the healthcare providers in the region and stakeholders should create health awareness campaigns on the importance of using ITNs, specifically targeting pregnant women during routine care visits. In addition, a small portion of pregnant women had Sulfadoxine-pyrimethamine during ANC visits. This is also another area that the health care providers should work on since the administration of SP to pregnant women has already demonstrated significant reductions in the morbidity and mortality of Malaria in pregnancy.

5. Limitation of the Study

The time of data collection may affect the prevalence due to seasonal variations of malaria transmission. The study did not include a qualitative method, particularly observation of housing conditions. The low prevalence of some of the associated factors created a wide confidence interval reducing the precision of the findings.

This study was conducted in the COVID-19 era, when health systems have become overwhelmed with efforts to stop coronavirus transmission, and hospitals have struggled to cope with increasing numbers of COVID-19 cases. This led to comprehensive concerns about the potential consequences of the pandemic, including disruptions of essential health services, including malaria services.

6. Conclusion and Recommendations

The study found that the overall prevalence of Malaria among pregnant women in the study area was found to be high. The high proportion of these malaria species in our study clearly implies that there is a need for aggressive prevention and control of the disease, especially among pregnant women. Because Plasmodium falciparum causes the most severe form of the disease, it can cause devastating complications for the mother and the fetus. Factors significantly associated with Malaria were only two factors; the presence of water pond sites and how often ITNs were being used.

The study recommends that district health offices provide broad-scale health education and awareness-building projects to the pregnant women communities regarding cleaning their surroundings and removing stagnant water pools to prevent mosquito abundance and decrease malaria incidence.

The health care providers should deliver health education sessions to pregnant women during routine care visits and teach them different malaria prevention methods, especially the importance of ITNs.

The study encourages MOH and other stakeholders to do further studies on the specific types and other causes of Malaria. Using more advanced equipment could motivate more focused clinical management of selected pregnant women and result in essential improvements in their overall health and survival.

Conflict of Interest

The authors declared no competing of interest.

Authors' Contributions

AJ has contributed substantially from the idea's inception, proposal development, data collection, analysis, interpretation, final write-up, and manuscript drafting. TA and AA designed the work, edited the proposal, revised it, and facilitated publication. After reading and approving the submitted paper in its final form, the authors agreed to be responsible for all aspects of the work.

Data Availability

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Funding Statement

Haramaya university's postgraduate directorate funded this study. The funding body had no role in designing the study, data collection, analysis, interpretation, and manuscript writing.

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