Prevalence of Malaria Infection among Pregnant Women in Antenatal Care Units in Mogadishu, Somalia: Cross-Sectional Study Design

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Abstract:

Background: Malaria is a potential risk during pregnancy. Maternal anemia, low birth weight, stillbirths, abortions, and maternal death are possible outcomes. Because pregnancy lowers a woman's immunity, it increases her susceptibility to malaria, which is why pregnant women are more vulnerable to the disease. ***Objective***: This study aimed to assess the frequency, associated factors, and knowledge of pregnant women in Mogadishu to prevent the transmission from the mother to her fetus. ***Materials and Methods:*** Between November 2021 and July 2022, a descriptive cross-sectional study was carried out at Mogadishu, Somalia's antenatal care units. Pregnant women's sociodemographic information, related factors, and knowledge of malaria were gathered using a standardized questionnaire. The author-guided self-administered data collection technique was used, and SPSS version 21 and StataIC12 were utilized to analyze the data. ***Results***: A total of 300 pregnant women took part in the study. The mean age of participants was 25 years (the minimum value was 14 years and the maximum value was 40 years), and the highest age was 121 (43.6%), aged between 30 and 40, followed by 100 (31.5%), aged between 21 and 30, and 79 (24.9%), which implies the highest age is 31 to 40. The majority of pregnant women, 150 (48.4%), had the first trimester, 95 (30.6%), had the second trimester, and 55 (21.4%) had the third trimester. 211 pregnant women (70%) had good knowledge regarding malaria in pregnant women, while 89 of them (30%) had poor knowledge. ***Conclusions***: Pregnant women continue to face a serious public health risk from malaria, primarily as a result of illiteracy and noncompliance with ITN use. Raising knowledge of malaria prevention strategies and early prenatal care service attendance will contribute to a decrease in malaria and the resulting morbidities and fatalities.

Keywords: Prevalence, *P. falciparum,* Malaria, Pregnant women, awareness.

Introduction

Plasmodium vivax, P. ovale, P. malaria, and *P. falciparum* are the four species of the protozoan parasite genus Plasmodium that cause malaria in humans. About 80% of human morbidity and 90% of fatality are caused by *P. falciparum;* frequent symptoms include fever, headache, weakness, chills, rigors, high body temperature, bitter taste in the mouth, and appetite loss [1]. Pregnant women in malaria-endemic areas are most at risk of contracting the disease and developing a severe case that can be fatal. The social, cultural, and economic aspects that increase the susceptibility to control the disease in the majority of vulnerable and neglected groups should therefore be addressed by increasing the use of anti-malarial therapies that target pregnant women [2]. The increased body surface and certain odor secretions that occur during pregnancy may make women more susceptible to mosquito bites and contribute to the high prevalence of malaria during this time [2]. Almost 216 million new cases of malaria were reported worldwide in 2016, according to a report from the World Health Organization (WHO). The social, cultural, and economic aspects that increase the susceptibility to control the disease in the majority of vulnerable and neglected groups should therefore be addressed by increasing the use of anti-malarial therapies that target pregnant women. Over 25 million pregnant women were in danger of malaria, according to the estimated yearly study [2]. Pregnant women, particularly primigravidae, are known to be more sensitive to malaria and to have higher densities and prevalence of parasitemia than non-pregnant women in the same population in malaria transmission zones [3]. The magnitude of the increased risk changes with the pregnant woman's age, reflecting lifetime cumulative exposure to malaria, and with parity, due to pregnancy-specific immunity developed following exposure to malaria in prior pregnancies. Depending on the mother's immunity to the diseaseFrequent exposure to malaria results in the establishment of an effective anti-disease immunity, which inhibits the pro-inflammatory reactions that cause illness and prevents life-threatening parasite burdens in malaria-endemic locations [4]. In most situations, the acquired semi-immunity during pregnancy can keep the infection at an asymptomatic level [5]. Depending on how common the disease is in a particular area, it is expected that 1 to 50% of pregnant women may unwittingly carry malaria parasitemia, especially in the placenta [6, 7]. However, the mother and the fetus are still at serious risk due to the subclinical illness. The main effects of malaria infection during pregnancy are caused by parasites in the placenta that cause low birth weight (LBW), a significant indicator of baby and neonatal mortality, and maternal anemia, which can be fatal in extreme cases [8-10]. Adverse consequences of malaria infection during pregnancy include maternal anemia, intrauterine growth retardation [11], preterm delivery [12], stillbirth [13, 14], and low birth weight [6]. Low birth weight is linked to a much higher risk of neonatal mortality [7, 15]. Due to the lack of information on the risk factors associated with pregnancy-related malaria and the current state of large-scale malaria interventions, this study was required as a preliminary step towards

providing focused intervention for malaria during pregnancy while also utilizing high-quality malaria microscopy in reporting malaria in pregnancy given the varied reports in Mogadishu, Somalia.

MATERIALS AND METHODS

Study design

This is a hospital-based descriptive cross-sectional study.

Study Area

The study was conducted at SOS Hospital, Mogadishu, Somalia. The SOS Martinet and Children Hospital is a teaching hospital in the Hiliwa district, medina, of Mogadishu, Somalia. The hospital facility that gives the patient is free. The SOS hospital has more departments, such as the emergency department, surgery, intensive care unit (ICU), obstetrics, and gynecology. The target population of this study is all pregnant women in the hospital SOS Mogadishu, Somalia.

Inclusion Criteria

All pregnant women attended a health facility in Hospital SOS Mogadishu between November 2021 and July 2022.

Exclusion Criteria

All pregnant women are under malaria treatment.

Sample size and sampling techniques

A total of 300 pregnant women took part in the study.

Data collection

The data collection will be conducted by a team of seven members from students at Jamhuriya University of Science & Technology who are earning their bachelor's degree in medical laboratory science in 2022. Before starting the interview, a brief introduction will be made to explain the nature and importance of the study to the respondents. The respondents will be assured of the confidentiality of the information they have given. The data collection will start on November 1st, 2021, and end on May 30th, 2022, through a guided questionnaire about socio-demographic data, associated factors, and knowledge of malaria in pregnant women.

Ethical Consideration

This study ethics was obtained and approved by the ethical review committee of Jamahiriya University Science and Technology (JUST) for these research activities to be carried out. Besides, permission is granted through the university to the hospital administrators. The research was conducted concerning the respondents' ethical values, confidentiality, and moral expectations.

Data analysis

When we collect our samples of diagnosis, after that the result we will analyze through a statistical package for social science (SPSS) statistical computer software will be used to tabulate the data.

Results

Table 1. Distribution of the Participants According to their Age Group.

Age group	*Frequency*	*Percent %*
14--20	21	32.3%
21-30	16	24.6%
31-40	11	16.9%
Total	**65**	**100.0**

Table 2. Distribution of the Participants According to education level.

Education level	*Frequency*	*Percent %*
Primary	63	19.9
Secondary	112	37.3
Bachelor	36	15.1
Non educated	89	27.7
Total	**300**	**100.0**

Table 3. Distribution of the Participants According to previous pregnancies.

No previous pregnancies	*Frequency*	*Percent %*
1st trimester	150	48.4
2nd trimester	95	30.6
3rd trimester	55	21.4
Total	**300**	**100.0**

Table 4. Distribution of the Participants According to abortion.

No abortion	*Frequency*	*Percent %*
1st times	30	9.4
2nd times	10	3.2
3rd times	5	1.4
4 non	255	86.0
Total	**300**	**100.0**

Table 5. Distribution of the Participants According to Haemoglobin Level.

Hemoglobin level	*Frequency*	*Percent %*
Low Hemoglobin	198	65.3
Normal hemoglobin	102	34.7
Total	**300**	**100.0**

Table 6. Distribution of the Participants According to Blood Groups.

Blood groups	*Frequency*	*Percent %*
A+	30	10.5
O+	237	77.5
B+	30	10.5
O-	3	1.0
Total	**300**	**100.0**

Table 7. Distribution of the Participants According to WBC levels.

WBC levels	*Frequency*	*Percent %*
High level	98	32.5
Low level	50	17.6
Normal WBC	152	49.9
Total	**300**	**100.0**

Table 8. Distribution of the Participants According to PCV level.

WBC levels	*Frequency*	*Percent %*
High level	28	9.5
Low level	198	64.7
Normal WBC	74	25.8
Total	**300**	**100.0**

Table 9. Distribution of the Participants According to Symptoms.

Symptoms	*Frequency*	*Percent %*
Fever	94	30.2
Chills	13	4.2
Abdominal pain	35	11.3
Headache	158	54.3
Total	**300**	**100.0**

Table 10. Binary logistic regression for Social-demographic characteristics.

Social-demographic characteristics	**No**	***Malaria result***		**95%CI for OR**	***P. value***
		Negative	*Positive*		
Age					
14-20	80(26.7)	79(26.7)	1(25.0)	**Ref. cat**	
21-30	99(33.0)	98(33.1)	1(25.0)	0.806(0.050-13.093)	0.880
31-40	121(40.3)	119(40.2)	2(50.0)	1.328(0.118-14890)	0.818
Education level					
Primary	61(20.3)	60(20.3)	1(25.0)	**Ref. cat**	
Secondary	112(37.3)	111(37.5)	1(25.0)	0.541(0.033-8.797)	0.666
Bachelor	37(12.3)	36(12.2)	1(25.0)	1.667(0.101-27.475)	0.721
Nan education	90(30.0)	89(30.1)	1(25.0)	0.674(0.041-10.988)	0.782
Number of pregnant					
1st trimester	148(49.3)	146(49.3)	2(50.0)	**Ref. cat**	
2nd trimester	96(32.0)	95(32.1)	1(25.0)	0.768(0.069-8.593)	0.831
3rd trimester	56(18.7)	55(18.6)	1(25.0)	1.327(0.118-14.932)	0.819
Number of abortion					
1st times	31(10.3)	30(10.1)	1(25.0)	**Ref. cat**	
2nd times	11(3.7)	10(3.4)	1(25.0)	3.00(0.171-52.527)	0.452
3rd times	6(2.0)	5(1.7)	1(25.0)	6.00(0.321112.258)	0.231
4 non	252(84.0)	252(84.8)	1(25.0)	0.120(0.007-1.961)	0.137
Hemoglobin					
Low Hb	198(66.0)	196(66.2)	2(50.0)	0.510(0.071-3.676)	0.504
Normal Hb	102(34.0)	100(33.8)	2(50.0)	**Ref. cat**	
WBC level					
High level	94(31.3)	93(31.4)	1(25.0)	**Ref. cat**	
Low level	51(17.0)	50(16.9)	1(25.0)	1.860(0.114-30.375)	0.663
Normal level	155(51.7)	153(51.7)	2(50.0)	1.216(0.109-13.593)	0.874
PCV level					
High level	29(9.7)	28(9.5)	1(25.0)	**Ref. cat**	
Low level	198(66.0)	197(66.6)	1(25.0)	0.142(0.009-2.337)	0.172
Normal level	73(24.3)	71(24.0)	2(50.0)	0.789(0.069-9.049)	0.849
Symptoms					
Fever	95(31.7)	94(31.8)	1(25.0)	**Ref. cat**	
Chills	14(4.7)	13(4.4)	1(25.0)	7.231(0.426122.754)	0.171
Abdominal pain	36(12.0)	35(11.8)	1(25.0)	2.686(0.164-44.115)	0.489
Headache	155(51.7)	154(52.0)	1(25.0)	0.610(0.038-9.875)	0.728

Significance level where P value<0.05, OR= Odds ratio, CI= Confidence interval

Discussion

Many malaria-affected regions conduct research on malaria infection during pregnancy because the condition has detrimental consequences for both pregnant women and their fetuses. The present study found a similar problem among pregnant mothers attending health facilities at SOS Hospital. The prevalence among them was (0.0133%) in northeastern Nigeria, where pregnant women were found to have a frequency of 22.1% [16]. It was also Lagos, where antenatal clinic visits by pregnant women for the first time during their current pregnancy were reported to have a prevalence rate of 7.7% [17]. In Otukpo, Benue State, a total frequency of 42.3% was noted [18]. A similar study done in Zambia was 31.8% [19], and in Zimbabwe, the prevalence was found to be 14.7% [20]. Another study was done at antenatal clinics at Ed-Duweim Hospital, Sudan; the prevalence among them was high (38.1%) [21]. A lower detection level in peripheral blood is unlikely to account for the increased prevalence gap between pregnant women in areas with higher malaria transmission. Pregnant women with acute malaria consistently fare better at removing parasites following antimalarial treatment with chloroquine or sulfadoxine-pyrimethamine, according to prior research and meta-analyses [22, 23]. Pregnant women in high malaria endemicity areas typically have higher levels of acquired protective malarial immunity, which is likely why this finding occurs. As a result, primigravidae frequently do not have placental-type parasite antibodies at the start of pregnancy, but if they are exposed to malaria, they do develop these antibodies during pregnancy. Some people have recommended using these antibody responses as monitoring markers for malaria transmission [24]. The prevalence of malaria was not substantially correlated with the age of the mother, however, young mothers are more likely to contract malaria and have higher parasite densities. Other writers have documented similar results in Gabon and Eastern Sudan, where it was found that the prevalence of malaria decreased with age [25, 26]. As education levels increased, so did the prevalence of malaria and the density of parasites among pregnant women in the area. Prevalence rates were found to be lowest among tertiary educated women and greatest among uneducated women. But neither this study nor earlier research conducted in Lagos discovered a link between pregnant women's education and malaria infection [17]. This emphasizes the impact that education may have on the overall effectiveness of malaria control programs in the area. In the interest of reducing the burden of disease in the nation, particularly among the most susceptible population, government measures should be focused on enhancing citizens' educational statuses. Among pregnant women, there was a statistically negligible variation in the mean values of PCV, HB, and WBCS. This result conflicts with earlier research that found anemia to be among the most common pregnancy-related problems and that there was a strong positive link between anemia and parasitemia levels in pregnant subjects with Plasmodium falciparum parasitemia [27–29]. However, women with poor socioeconomic positions and those who attend prenatal clinics less frequently than others may be

at higher risk of contracting malaria [30–32]. There's a chance that women who skip prenatal visits will get the illness more often. This source of bias is most likely negligible in malaria-endemic Africa, where over 90% of women visit a prenatal clinic at least once [30]. Population-based surveys may be required in nations where this is not the case—that is if over 10% of women do not visit prenatal clinics—to determine whether the risk of malaria infection in these women differs from that of those who do.

Conclusion

Pregnant women continue to face a serious public health risk from malaria, mostly as a result of illiteracy and ITN non-compliance. Raising knowledge of malaria prevention strategies and early prenatal care service attendance will contribute to a decrease in malaria and the resulting morbidities and fatalities. The prevalence of malaria in pregnant women was low; however, many cases of malaria in the catchment area remained at home without seeking diagnosis and treatment in the hospital. Education, rural residence, knowledge about malaria, and the presence of breeding sites in the house were factors associated with malaria in pregnant women.

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Conflict of Interest

The author has declared that no competing interests exist.

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