International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Malaria Burden and its Possible Risk Factors Among Pregnant Women Attending Antenatal Care at Iten County Referral Hospital, Elgeiyo-Marakwet County, Kenya

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Abstract: ***Background: Malaria in pregnancy is one of the leading causes of maternal and child morbidity and mortality worldwide, mainly in high endemic areas and has remained a serious public health concern with substantial risks for the pregnant woman, her fetus, and the newborn child. Its morbidity rate is higher in antenatal mothers and about 5% of the world's population is infected with malaria of which 1% are antenatal mothers (WHO, 2018). The diagnosis of malaria in a pregnant mother is often times difficult and this is due to its non-specific symptoms which resemble any other viral infection. The aim of this study was to determine the prevalence and possible risk factors for malaria in pregnant women attending antenatal clinic at Iten County Referral Hospital in Elgeiyo Marakwet County. Methods: A cross sectional facility based study was conducted from the month of Juneto August 2018 at Iten Referral Hospital. A total of 262 pregnant women were selected. A structured questionnaire was used to collect data on socio-demographic characteristics and possible risk factors. Pregnant women attending antenatal clinic (ANC) were included in the study after signing informed consent. For each participant, the social-demographic profile, malaria and obstetric histories were investigated through a questionnaire. Peripheral blood was collected and thick and thin blood smears were prepared to check Plasmodium falciparum parasitaemia. Hemoglobin concentration was measured. The associations between age, parity, gestational age, schooling, number of ANC visits, use of IPTp-SP, use of insecticide-treated nets (ITN) and anemia with the occurrence of P. falciparum malaria infection during pregnancy were analyzed through logistic regression. Results: During the period of study, 59 (22.5%) out of 262 pregnant women were infected with P. falciparum. The hemoglobin concentration mean was 10.5 ± 1.7/dL and was significantly lower in pregnant women with malaria infection (9.8 g/dL ±1.6) than in those who had no malaria infection (10.6 g/dL ±1.7) (P < 0.001). Multivariate analysis indicated that, education (AOR 1.9, 95% CI = [1.2-3.2]), parity [primigravidae (AOR 5.0, 95% CI = [2.5-9.8]) and secundigravidae (AOR 2.1, 95% CI = [1.2-3.8])], and anaemia (AOR 2.1, 95% CI = [1.3-3.5]) were significantly associated with P. falciparum malaria infection. The use of IPTp-SP was not associated with P. falciparum malaria infection. Conclusions: P. falciparum malaria infection is common in pregnant women attending antenatal clinic and anaemia is an important complication. The results show that the use of IPTp-SP does not reduce the risk of malaria incidence during pregnancy. Recommendations: This study recommends advocating for support community participation, collaboration and integration in malaria control programmes on antenatal mothers. Educating antenatal mothers on good housing and the importance of using conventional methods for control of malaria is important. More studies on factors contributing to prevalence of malaria of antenatal mothers should be done.***

Keywords: Malaria, Prevalence, antenatal, pregnant, Plasmodium *falciparum*

1. Background

Malaria during pregnancy is a serious public health problem in Sub-Saharan Africa. It is estimated that each year, approximately 25 million pregnant women in Sub-Saharan Africa are at risk of *Plasmodium falciparum* malaria infection during pregnancy (BMC, 2014). Malaria during pregnancy leads to serious adverse effects on the mother and the child. Indeed although malaria during pregnancy might be asymptomatic due to high level of acquired immunity in mothers residing in high transmission areas, it is still associated with maternal anaemia, abortion, prematurity and low birth weight (Brabin, 1983). Moreover, severe maternal anaemia increases the mother's risk of death and malaria related anaemia is estimated to cause as many as 10,000 maternal deaths each year in Africa (Strategic Framework for Malaria Prevention and Control in African Region, 2004). According to records in antenatal ward at Iten County Referral hospital, from the month of December 2017 to December 2018July to September out of 1887 mothers admitted with various diagnoses, 387 of them were diagnosed to have malaria in pregnancy (MOH records, 2018).

Malaria is parasitic infection which is most common caused by an organism known as the *plasmodium falciparum.* The parasites causing malaria are carried by the female anopheles' mosquitoes and once it infects an antenatal mother, malaria causes parasitation of the placental site, these causes effects including neonatal death, pre-term delivery, abortion, still births, intra-uterine growth retardation and acute renal failure among others (USAID, 2000).

To face this flail, the World Health Organization (WHO) adopted the intermittent preventive treatment with sulfadoxine-pyrimethamine during pregnancy (IPTp-SP). This policy has been adopted by the Kenyan Ministry of Health. Several epidemiological studies have been conducted in pregnancy before and after the implementation of IPTp-SP in Kenya. The prevalence of maternal peripheral *P. falciparum* infection assessed by microscopy was 23% in urban areaand varied from 19.4% to 50.8% in rural area (BMC, 2014). Factors influencing malaria prevalence in pregnant women include maternal age, parity, use of prophylaxis, nutrition, host and parasite genetics and level of anti-parasitic immunity with conflicting data concerning maternal age and parity depending on urban or rural setting.

This study aimed to assess the prevalence of malaria infection and possible associated risk factors in pregnant women attending antenatal clinic at Iten County Referral Hospital.

2. Problem Statement

Malaria is the second most common cause of infectious disease-related death in the world after tuberculosis. It is estimated to affect between 350 to 500M people annually and accounts for 1 to 3 deaths of pregnant mothers per year (WHO 2017).

Sub-saharan Africa has the largest burden of malaria disease.25M pregnant women are currently at risk for malaria. Malaria accounts for over 10000 maternal and 200000 thousand neonatal death in Africa per year (WHO 2017).

Malaria infection during pregnancy is a significant public health problem with a substantial risk for the pregnant women her fetus and the new born child. Malaria associated maternal illness and low birth weight is mostly the result of plasmodium falciparum infection and occurs predominantly in Kenya (MOH, 2017).

Following the antenatal records in Iten County referral hospital, prevalence of malaria among the antenatal mothers has increased from 26.7 to 38.5%and therefore there is need to identify the factors leading to this prevalence.

Malaria in pregnancy can cause sudden dramatic complications. Therefore, it is very much essential to look for any complications by regular monitoring of patients. Malaria poses substantial risk to the mother, her fetus, and the neonate; the infection contributes to as much as 15% of maternal anemia,14% of low birth weight infants,30% of preventable low birth weight,70% of intrauterine growth retardation,365 of premature deliveries and 8% of infant mortality.

Justification

Understanding the epidemiology of malaria during pregnancy facilitates decision on control strategies. Findings from the study will guide in informing policy on preventive measures of malaria among pregnant women. It is expected that the findings of this research would help to fill the existing gaps on management of Malaria among antenatal mothers. No particular study has been done so far, regarding factors associated with high prevalence of malaria in pregnant mothers in Elgeiyo-Marakwet Region.

Broad Objective

To determine the possible risk factors associated with prevalence of malaria among antenatal mothers in Iten County Referral Hospital.

Methods

A cross sectional facility based study was conducted from the month of June to August 2018 at Iten County Referral Hospital. A total of 262 pregnant women were selected. A structured questionnaire was used to collect data on socio-demographic characteristics and possible risk factors. Pregnant women attending antenatal clinic (ANC) were included in the study after signing informed consent. For each participant, the social-demographic profile, malaria and obstetric histories were investigated through a questionnaire. Peripheral blood was collected and thick and thin blood smears were prepared to check *Plasmodium falciparum* parasitaemia. Hemoglobin concentration was measured. The associations between age, parity, gestational age, schooling, number of ANC visits, use of IPTp-SP, use of insecticide-treated nets (ITN) and anemia with the occurrence of *P. falciparum* malaria infection during pregnancy were analyzed through logistic regression.

Data collection

All pregnant women presenting for their routine antenatal clinic visits were included in the study after explaining to them the purpose of the study and signing informed consent. Each participant was evaluated only once. Data were obtained through a questionnaire and included the following information: social-demographic profile, malaria history, obstetric history including parity, gestational age. Gestational age was calculated from the first day of bleeding of the last menstrual period.

Laboratory methods

Blood samples were taken by finger prick for checking both malaria parasite and hemoglobin concentration. Blood smear and thick drop assays were stained with 10% Giemsa dye. Smears were fixed with May Grunvald for three minutes before staining with Giemsa for 20 minutes. Parasite density was determined by counting asexual forms of the parasite per 200 leukocytes assuming 8,000 leukocytes/µL of blood. A slide was considered negative if no parasite was found after counting 500 leukocytes. All the slides were double-checked blindly and for discrepant results a third consensus reading was performed.

Hemoglobin concentration was determined by the hematic acid method using a hemoglobinometer (HemoCue AB, Angelhom, Sweden) and were classified as anemia (<11 g/dL), severe anemia (<8 g/dL) and normal (≥11 g/dL) [Valea, 2010].

Sample size

The sample size calculation was based on an assumed prevalence of malaria in pregnant women attending antenatal clinic and benefiting from IPT-SP of 13.8%, a precision of 5% and for a significant result at the 5% level. A sample of 83 pregnant women was needed. Then we sampled 83 pregnant women in each trimester of pregnancy resulting a total size of 262 pregnant women.

Statistical analysis of data

Data were double entered in EpiData 3.1 software and analyzed by using Stata 12 software.

The prevalence of *P. falciparum* malaria infection has been estimated with a 95% confidence interval (CI). Univariate analyses were performed by using the Pearson Chi-square or Fisher's exact tests to compare proportions for categorical variables. Comparison between continuous variables with normal distributions including age and hemoglobin concentration was done by the Student's t-test or the Anova test. The Wilcoxon rank sum test and the Kruskall-Wallis test were used to compare continuous variables with non-normal distributions (parasite density and number of ANC visits).

Simple and multiple logistic regression models were also used as described below. The variable malaria (including with and without *P. falciparum* malaria infection categories) was considered as the dependent variable. The independent variables included age, schooling, gestational age, parity, use of IPTp-SP and insecticide-treated net (ITN) during pregnancy, number of ANC visits and anaemia. Variables were categorized as follows: age (<20 years old, ≥20 years old); parity as primigravidae, secundigravidae, multigravidae (≥3); gestational age [first trimester (<14 weeks), second trimester (14-27 weeks) and third trimester (≥28 weeks)], number of ANC visits (0-1, 2 and ≥3). To investigate the association between the several independent variables and malaria, we began by performing simple logistic regressions with each independent variable. Next, we applied multiple regression models to control possible confusion. Variables exhibiting statistically significant associations ($p < 0.05$) or with important epidemiological meanings were included. These co-variables were kept in models, independent of their significance, in univariate analysis due to their possible relevance in the final results; thus, we could analyze their possible influence when considered together with the other variables.

Ethical considerations

After the research proposal was cleared, the following was ensured:

Clearance by the Ethics Committee: Before commencing the study, the research proposal was presented to the Institutional
Research and Ethics Committee (IREC) based in Moi University and Moi Teaching and Referral Hospital for approval.

Permission to carry out the Study: After the approval by IREC, permission was sought from the Iten County Hospital Administration to allow the researcher proceed with the study in their institution.

Respect for Autonomy: The identified participants who met the eligibility criteria were given a full explanation about the purpose of the study. Upon the agreement to participate, they were given a consent form to sign that gave details of the nature of the study. A written informed consent was obtained from all pregnant prior to their enrolment in the study. For illiterate pregnant women, the informed consent discussion process was witnessed by an impartial individual. In those cases, the informed consent form had been signed with a thumbprint. They were free to withdraw from the study at will.

Confidentiality: Computerized data were password protected. Confidentiality of the participants was assured by ensuring that their names did not appear in the final drafts of the study and that all the questionnaires for the interviews were locked up and keys kept safe.

All women with anaemia or positive for malaria have been treated orally with folic acid plus ferrous and quinine 300 mg (24 mg/day until 7 days), respectively.

3. Results

Demographic characteristics of pregnant women attending antenatal clinic

The baseline characteristics of the 262 pregnant women involved in the study indicated that the pregnant women were young (23.4 years ±6.7) and most (67%) of them had no formal education (61.1%), and were multigravida (52.7%). Moreover 50.9% and 36.7% of pregnant women benefited from ITN and at least two doses of IPTp-SP, respectively. The proportion of pregnant women receiving the recommended 2 or 3 doses of IPTp-SP was higher during the 3rd trimester ($p < 0.001$). Of the 262 participating women, 60.9% reported attending ANC at least once during their pregnancy. The number of ANC visits varied from 0 to 2 with a median of 2 visits. Among ANC attendees, majority (46.7%) made their first visit during the second trimester. Only 2.8% of the ANC attendees had complete attendance (considered to be at least four ANC visits during pregnancy). The prevalence of *P. falciparum* parasitaemia was 15.1% (95% CI = [15.1-21.2]) and the geometric mean of the parasite density (GMPD) was 2254 parasites/µL (95% CI = [1755-2894]). The geometric mean of the density of *P. falciparum* parasitaemia was significantly lower in pregnant women who had used IPTp-SP ($P < 0.001$). The haemoglobin concentration mean was significantly lower in pregnant women with malaria infection (9.8 g/dL ±1.6) than in those who had no malaria infection (10.6 g/dL ±1.7) ($P < 0.001$).

IPTp-SP uptake at ANC clinic

The proportion of women receiving the recommended 2 or 3 doses of IPTp-SP increased ($p < 0.001$) with the number of ANC visits attended as indicated in Table 1 below.

Table 1: Distribution of IPTp-SP doses according to the number of ANC visits

Characteristics	Number of ANC visits			P
	0-1	2	≥ 3	
IPTp-SP doses				
0	198 (75.5)	1 (0.9)	0 (0.0)	<0.001[f]
1	50 (19.1)	53 (49.1)	12 (20.3)	
≥ 2	7 (2.67)	54 (50.0)	47 (79.7)	

[f]Determined by Chi-square (Fischer exact) Test.

Factors associated with malaria among pregnant women attending antenatal clinic

Multivariate analysis indicated that, lower level of education (AOR 1.9, 95% CI = [1.2-3.2]), parity [primigravidae (AOR 5.0, 95% CI = [2.5-9.8]) and multigravidae (AOR 2.1, 95% CI = [1.2-3.8])], and anaemia (AOR 2.1, 95% CI = [1.3-3.5]) were significantly associated with *P. falciparum* malaria infection. The use of IPTp-SP was not associated with *P. falciparum* malaria infection.

Table 2: Risk factors associated with malaria among pregnant women attending ANC

Potential factors	Malaria	Crude OR [95% IC]	Adjusted OR [95% IC]	P
Age				
≥ 20 years	17.0 (80/187)	1	1	-
< 20 years	23.1 (25/75)	1.5 [0.9-2.4]*	1.6 [0.8-3.2]	0.2
Education				
Formal schooling	19.8 (70/200)	1	1	-
No formal schooling	15.6 (35/62)	1.3 [0.9-2.1]*	1.9 [1.2-3.2]	0.01
Gestational age				
3rd trimester	11.4 (22/83)	1	1	-
2nd trimester	19.7 (37/83)	1.8 [1.04-3.3]	0.7 [0.3-1.5]	0.4
1st trimester	23.8 (46/83)	2.4 [1.4-4.23]	0.8 [0.3-1.9]	0.6
Parity				
Multigravidae	11.2 (29/90)	1	1	1
Secundigravidae	18.0 (27/80)	1.7 [0.9-3.1]	2.1 [1.2-3.8]	0.02
Primigravidae	28.8 (49/92)	3.2 [1.9-5.3]	5.0 [2.5-9.8]	<0.001
ANC visits				
0-1	22.3 (92/240)	1	1	1
2	4.6 (5/108)	0.2 [0.1-0.4]	0.3 [0.1-1.0]	0.05
≥ 3	13.6 (8/59)	0.5 [0.2-1.2]	1.3 [0.3-5.2]	0.7
IPTp-SP dose				
0	23.4 (83/240)	1	1	-
1	11.3 (14/124)	0.4 [0.2-0.8]	0.5 [0.2-1.2]	0.1
≥ 2	7.8 (8/103)	0.3 [0.1-0.6]	0.3 [0.1-1.5]	0.1
ITN				
No	20.9 (64/188)	1	1	1
Yes	14.8 (40/208)	0.7 [0.4-1.0]	0.8 [0.5-1.5]	0.4
Anaemia				
No	12.5 (29/187)	1	1	1
Yes	21.7 (76/200)	2.0 [1.2-3.1]	2.1 [1.3-3.5]	0.003

*P value =0.2

4. Conclusion

Findings suggest that malaria is common in pregnant women attending antenatal clinic in Iten County Referral Hospital and that anemia is an important complication associated with P. falciparum infection. Lack of formal education and parity even adjusted for age are main risk factors for malaria. The use of IPTp-SP was not associated with P. falciparum malaria infection.

5. Recommendation

1. There is need to strengthen community participation, collaboration and integration in malaria control programmes on pregnant mothers.
2. It would be imperative to continuously educate the antenatal mothers on good housing and the importance of using conventional methods for control of malaria.

References

[1] A Strategic Framework for Malaria Prevention and Control during Pregnancy in the African Region. World Health Organization Regional Office for Africa, AFR/MAL/04/01. 2004.
[2] Benet, R. (2012). Myles Textbook for Midwives 13th edition. Publishers Limited. Pg 305
[3] Berkow M.P (2009). The merck manual of medical information home edition. Mark research laboratories page 898-899.
[4] Brabin BJ: An analysis of malaria in pregnancy in Africa. Bull World Health Organ. 1983, 61: 1005-1016.
[5] MOH (2014). National guidelines for diagnosis treatment and prevention of malaria for health workers January edition. The legal press of Kenya press limited, Nairobi pg 12-48
[6] MOH (2010). Simplified antenatal guidelines on malaria control for community resource person September, edition.
[7] MOH (2013). Division of reproductive health, national guidelines for quality obstetric and perinatal care. Kenya College of communication technology Mbagathi.
[8] Norberg E (2013). Communicable disease, 3rd edition African medical research foundation, Nairobi.
[9] Stephe, R. B (2017). Jooheys medicine 14th edition Churchill Livingstone, imprint of Horcourt publishers limited pg 64-65
[10] USAID and Sara (2008). Lives at risk malaria and pregnancy, TerKnill publishers pages 1-6.
[11] Valea I, Tinto H, Drabo MK, Huybregts L, Henry M, Roberfroid D, Guiguemde RT, Kolsteren P, Alessandro UD: Intermittent preventive treatment of malaria with sulphadoxine-pyrimethamine during pregnancy in Burkina Faso: effect of adding a third dose to the standard two-dose regimen on low birth weight, anaemia and pregnancy outcomes. Malar J. 2010, 9 (1): 324-
[12] White N.J (2003). Tropical diseases 14th Edition book power Elst Imprint, pages 1205-1278.
[13] World Health Organization (2012). Guidelines for the Treatment of Malaria. 2nd edition.