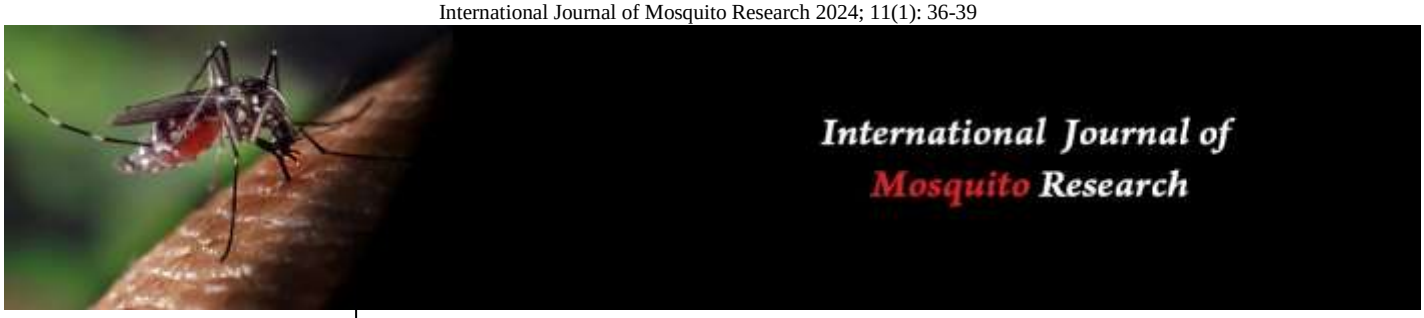

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An epidemiological study assessing maternal and fetal outcome of malaria in pregnancy: An observational study

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Abstract
Aim: The aim of the present study was to observe maternal and fetal outcome of malaria in pregnancy.
Materials and Methods: The present study of pregnant women with fever was conducted for the period of 1 year. Detailed history and clinical examination were done to ascertain the cause of fever. Haemoglobin, total and differential leucocyte count, rapid diagnostic tests (RDTs) for malaria, routine urine examinations were done. Microscopy of blood smears was done for species identification for all malaria positive pregnant women.
Results: During the research period, our hospital treated a cohort of 12,500 pregnant women, of whom 50 tested positive for malaria. The incidence of malaria in pregnant women throughout the research period was 0.40%. Out of the total malaria cases, 32 instances were seen in primigravidae (women who are pregnant for the first time) and 18 cases were observed in multi-gravidae (women who had been pregnant before), representing 64% and 36% of the cases respectively. Among the 50 cases, *P. falciparum*, *vivax*, and mixed malaria represent 24%, 58%, and 18% of the cases, respectively, with *P. vivax* being the most common pathogen. Among the 50 cases, 19 had maternal anaemia. Of them, 12 (24%) were primigravida and 7 (14%) were multi-gravida. Maternal thrombocytopenia was seen in 16 instances, with 11 (22%) occurring in primigravida women and 5 (10%) occurring in multigravida women. The occurrence of maternal anaemia due to various pathogens was responsible for 84.22% and 15.78% of cases, whereas maternal thrombocytopenia was attributed to 43.75% and 56.25% of cases caused by *P. vivax* and *falciparum*, respectively. The obstetric outcomes consist of 7 instances (14%) of spontaneous miscarriage, all occurring during the first trimester, 11 instances (22%) of preterm births, 15 instances (30%) of low-birth-weight newborns, and 1 instance (2%) of perinatal mortality.
Conclusion: Malaria has a negative impact on both pregnant women and the pregnancy outcome. It is recommended that all pregnant mothers with fever must undergo screening for malarial parasites and get appropriate medical treatment and supportive care to enhance the well-being of both mother and the foetus.

Keywords: Fever, Malaria, *Plasmodium*, Pregnancy

Introduction
Malaria, a parasitic infection transmitted by mosquitoes and recorded since ancient times, is among the most destructive infectious diseases. After TB, it is the second leading cause of mortality associated to infectious diseases worldwide. Annually, it is estimated that this condition affects a range of 350 to 500 million individuals and results in 1 to 3 million deaths [1, 2]. Regrettably, individuals in the early stages of life and expectant mothers continue to be at risk, particularly in regions where the spread of the disease is ongoing. The *Plasmodium* spp. parasite is the cause of this condition, which can lead to significant illness and death. Malaria during pregnancy can cause severe harm to the mother's health, such as significant maternal anaemia, low blood sugar, acute lung injury, and even death [3, 5]. Adverse pregnancy outcomes linked to *Plasmodium falciparum* and *Plasmodium vivax* include miscarriage, stillbirth, preterm birth and foetal growth restriction [3]. Prenatal exposure has been linked to elevated risks of malaria, stunted development and neurological complications throughout infancy [4]. Pregnant women, even those who already have immunity, face risks to themselves and their

unborn babies when exposed to malaria. Infection raises the chances of the mother dying, experiencing severe anaemia, and the foetus or newborn dying [6, 7]. Despite acquiring immunity against malaria during childhood, first-time pregnant mothers, also known as primigravidas, remain susceptible to the disease due to a combination of factors related to both the host and the parasite [4, 5]. Malaria during pregnancy, known as Malaria in pregnancy (MiP), leads to infection in the placenta, referred to as placental malaria (PM), which increases the risk of placental damage and dysfunction.

Placental insufficiency is the term used to describe inadequate functioning of the placenta, which is frequently observed in pregnancies with placenta previa. Additionally, it is postulated that it serves as a primary factor contributing to low birthweight (LBW). A baby with LBW is described as a live born who is < 37 gestational weeks) or small for gestational age (SGA) (birthweight < 10th percentile for its gestational age) [8, 10]. Low birth weight at birth is a significant predictor of mortality in newborns. MiP is expected to cause roughly 900,000 LBW births yearly, with an estimated 100,000 MiP-related newborn deaths [3, 11]. While pregnant women and children under age 5 are particularly exposed to severe malaria complications, poor pregnancy outcomes are typically ignored as malaria-related occurrences, and usually not included in yearly malaria burden studies such as malaria-related infant death estimates [12]. Twenty-five million pregnant women are now at risk for malaria, and, according to the World Health Organization (WHO), malaria responsible for around 10,000 maternal and 200,000 newborn deaths every year [13]. Malaria in pregnancy affects the well-being of the mother and her growing baby.

Hence this research was undertaken to examine maternal and fetal outcome of malaria in pregnancy.

Materials and Methods

The present study was conducted on pregnant women with fever during the months of January 2023 to December 2023 (1 Year) period. Detailed history and clinical examination were done to ascertain the cause of fever. Haemoglobin, total and differential leucocyte count, rapid diagnostic tests (RDTs) for malaria, routine urine examinations were done. Microscopy of blood smears was done for species identification for all malaria positive pregnant women.

Inclusion criteria

Pregnant women diagnosed to have malaria by rapid diagnostic test or microscopy were included in this study. Microscopy of blood smears was done for species identification.

Exclusion criteria

Patients with Chronic anaemia, ITP, liver disorders, chronic hypertension, Chronic diseases like renal disease, etc.

Methodology

Maternal demographic Profile, maternal and fetal complications were evaluated during the study period.

A total of 50 patients were found to be smear positive for *Plasmodium*. The patients were treated with tablet chloroquine, quinine or artemisinin combination treatment depending on species identification, trimester and severity of malaria. Maternal demographic details, maternal and fetal complications were noted during the study period. Maternal complication include anemia, thrombocytopenia, jaundice, shock etc., and fetal complications like miscarriage, low birth weight, Intra- uterine death etc. Data was obtained from outpatient records, case sheets and labor records of the hospital, analyzed by calculation of percentages.

Results

Table 1: Prevalence of malaria

Total no of patients	No of positive for malaria	%
12500	50	0.40

A total of 12500 pregnant women attended our hospital during study period out of which 50 were positive for malaria. Prevalence of malaria in pregnancy during the study period was 0.40%.

Table 2: Parity and Types of parasite causing malaria

Parity	No. of patients	%
Primigravida	32	64
Multigravida	18	36
Type of malaria		
P. falciparum	12	24
P. vivax	29	58
Mixed infection	9	18

Among the malaria cases, 32 cases were primigravidae and 18 were multi-gravidae, accounting for 64% and 36% respectively. Out of 50 cases, *P. falciparum*, *vivax*, and mixed malaria accounts for 24%, 58% and 18% cases respectively showing the predominant pathogen as *P. vivax*.

Table 3: Maternal anaemia with parity and Maternal thrombocytopenia in relation to parity

Maternal anemia	Primigravida N (%)	Multigravida N (%)
Present	12 (24)	7 (14)
Absent	20 (40)	11 (22)
Maternal thrombocytopenia		
Present	11 (22)	5 (10)
Absent	21 (42)	13 (26)

Out of 50 cases, maternal anemia was present in 19 cases of which 12 (24%) were primigravida and 7 (14%) were multi-gravida. Maternal thrombocytopenia was seen in 16 cases of which 11 (22%) were primigravida and 5 (10%) were multigravida.

Table 4: Maternal complications caused by different malarial pathogens

Type of maternal complication	*P. vivax* N (%)	*P. falciparum* N (%)
Maternal anemia (19)	16 (84.22%)	3 (15.78%)
Maternal thrombocytopenia (16)	7 (43.75%)	9 (56.25%)

Table 5: Foetal complications among affected pregnant women in relation to parity

Type of fetal complication	Primigravida N (%)	Multigravida N (%)
Spontaneous miscarriage	4 (8)	3 (6)
Preterm delivery	5 (10)	6 (12)
Low birth weight	9 (18)	6 (12)
Perinatal death	1 (2)	0

Complications caused by different pathogens accounted for maternal anemia were 84.22% and 15.78%, maternal thrombocytopenia were 43.75% and 56.25% of *P. vivax* and *falciparum* respectively. Obstetric outcomes include, 7 cases (14%) of spontaneous miscarriage, all belonging to first trimester, 11 cases (22%) of preterm deliveries, 15 (30%) cases of low-birth-weight babies and 1 case (2%) of perinatal death.

Discussion

Malaria, a parasitic infection transmitted by mosquitoes, is one of the most destructive infectious diseases and has been documented as one of the oldest. Global statistics from 2017 indicate that a staggering 219 million individuals were impacted, resulting in a significant 435,000 fatalities [14]. Sub-Saharan Africa bears the greatest disease burden, representing 89% of global malaria cases [15, 16]. Although individuals who were exposed to malaria during childhood develop immunity against the disease, first-time pregnant mothers, also known as primigravidas, are still vulnerable to malaria due to a combination of factors related to the host and the parasite [17]. Malaria during pregnancy leads to the infection of the placenta, known as placental malaria (PM), which increases the risk of placental damage and dysfunction. Placental insufficiency is characterised by inadequate placental function and is frequently seen in pregnant women with placenta previa. Additionally, it is postulated that it is a primary factor contributing to low birthweight (LBW). A baby with low birth weight (LBW) is defined as a live born infant weighing less than 2,500 grams, regardless of their gestational age [5].

Our hospital had a total of 12,500 pregnant women throughout the research period, and among them, 50 tested positive for malaria. The incidence of malaria in pregnant women throughout the research period was 0.40%. Out of the total malaria cases, 32 cases were observed in primigravidae (women pregnant for the first time) and 18 cases were observed in multi-gravidae (women who have been pregnant before), accounting for 64% and 36% respectively. Malaria is more frequently observed in women experiencing their first pregnancy (primigravida) compared to those who have had multiple pregnancies (multigravida) [18]. women in endemic areas are somewhat protected from placental malaria and this may be the result of maternal antibodies preventing cytoadhesion of the parasite to the placenta. Nineteen Desai M *et al*. also observed a similar finding in their studies [11].

Malaria is diagnosed by using different techniques like Conventional microscopic diagnosis by staining thin and thick peripheral blood smears, RDTs, serological test and molecular diagnostic methods, such as polymerase chain reaction [20]. Some advantages and shortcomings of these methods have also been described, related to sensitivity, specificity, precision, accuracy, time consumed, labour intensiveness, cost-effectiveness, the need for skilled microscopists. Since the WHO recognized the urgent need for new, simple, quick, accurate, and cost-effective diagnostic tests for determining the presence of malaria parasites, to overcome the deficiencies of light microscopy, numerous new malaria-diagnostic techniques have been developed like RDTs. This, in turn, has led to an increase in the use of RDTs for malaria, which are fast and easy to perform, and do not require electricity or specific equipment [21]. Out of 50 cases, *P. falciparum*, *vivax*, and mixed malaria accounts for 24%, 58% and 18% cases respectively showing the predominant pathogen as *P. vivax*. Out of 50 cases, maternal anemia was present in 19 cases of which 12 (24%) were primigravida and 7 (14%) were multi-gravida. Maternal thrombocytopenia was seen in 16 cases of which 11 (22%) were primigravida and 5 (10%) were multigravida.

Complications caused by different pathogens accounted for maternal anemia were 84.22% and 15.78%, maternal thrombocytopenia were 43.75% and 56.25% of *P. vivax* and *falciparum* respectively. Obstetric outcomes include, 7 cases (14%) of spontaneous miscarriage, all belonging to first trimester, 11 cases (22%) of preterm deliveries, 15 (30%) cases of low-birth-weight babies and 1 case (2%) of perinatal death. In a study by Shulman CE *et al*, the prevalence of anemia among pregnant women with malaria was 38% whereas in present study it was 36% [22]. The cause of anemia particularly in pregnant lady is because of hemolysis of parasitized blood and increased demand of blood during pregnancy. Anemia increases prenatal morbidity and death and increased risk of postpartum hemorrhage. Thrombocytopenia in malaria presumably occurs by peripheral destruction, sequestration or excessive evacuation of the platelets by the spleen, as well as platelet consumption by the process of disseminated intravascular coagulation. Platelets have been shown to increase clumping of *P. falciparum*-infected erythrocytes, and this process could lead to pseudo thrombocytopenia. 30% incidences reveal maternal thrombocytopenia in malaria cases when as it had varied from 50-56% in previous research [23].

Conclusion

Malaria has a negative impact on both pregnant women and their pregnancy outcome. Malaria increases the occurrence of anaemia, thrombocytopenia, renal failure, hepatic failure, multi organ dysfunction in pregnant women, and also heightens the likelihood of spontaneous abortion, intra-uterine growth retardation, preterm delivery, and perinatal mortality. Therefore, it is recommended that all pregnant patients with fever undergo screening for malarial parasites and get appropriate medical treatment, attentive monitoring, and supportive care in order to enhance the outcomes for both the mother and the foetus.

Conflict of interest: None to be declared

References

1. Schantz-Dunn J, Nour NM. Malaria and pregnancy: A global health perspective. Reviews in obstetrics and gynecology. 2009;2(3):186.
2. Malaria. The Global Fund Web site.

3. World Health Organization. World Malaria Report 2019. Geneva: World Health Organization; c2019.
4. Salanti A, Staalsoe T, Lavstsen T, Jensen AT, Sowa MK, Arnot DE, *et al*. Selective upregulation of a single distinctly structured var gene in chondroitin sulphate A-adhering *Plasmodium falciparum* involved in pregnancy-associated malaria. Molecular microbiology. 2003 Jul;49(1):179-91.
5. Veenstra van Nieuwenhoven AL, Heineman MJ, Faas MM. The immunology of successful pregnancy. Human reproduction update. 2003 Jul 1;9(4):347-57.
6. Fried M, Duffy PE. Malaria during pregnancy. Cold Spring Harbor perspectives in medicine. 2017 Jun 1;7(6):a025551.
7. Xiong X, Buekens P, Alexander S, Demianczuk N, Wollast E. Anemia during pregnancy and birth outcome: a meta-analysis. American journal of perinatology. 2000;17(03):137-46.
8. Sykes L, MacIntyre DA, Yap XJ, Teoh TG, Bennett PR. The Th1: th2 dichotomy of pregnancy and preterm labour. Mediators of inflammation. 2012 Oct, 2012.
9. McDonald CR, Weckman AM, Conroy AL, Olwoch P, Natureeba P, Kamya MR, *et al*. Systemic inflammation is associated with malaria and preterm birth in women living with HIV on antiretrovirals and co-trimoxazole. Scientific reports. 2019 May 1;9(1):6758.
10. Nkwabong E, Mayane DN, Meka E, Essiben F. Malaria in the third trimester and maternal-perinatal outcome. International Journal of Gynecology & Obstetrics. 2020 Oct;151(1):103-8.
11. Desai M, Ter Kuile FO, Nosten F, McGready R, Asamoa K, Brabin B, *et al*. Epidemiology and burden of malaria in pregnancy. The Lancet infectious diseases. 2007 Feb 1;7(2):93-104.
12. Taylor SM, Ter Kuile FO. Stillbirths: the hidden burden of malaria in pregnancy. The Lancet Global Health. 2017 Nov 1;5(11):e1052-3.
13. Global Malaria Programme: pregnant women and infants. World Health Organization.
14. Sitalakshmi S, Srikrishna A, Devi S, Damodar P, Mathew T, Varghese J, *et al*. Changing trends in malaria-a decade's experience at a referral hospital. Indian journal of pathology & microbiology. 2003 Jul 1;46(3):399-401.
15. Newman RD, Hailemariam A, Jimma D, Degifie A, Kebede D, Rietveld AE, *et al*. Burden of malaria during pregnancy in areas of stable and unstable transmission in Ethiopia during a nonepidemic year. The Journal of infectious diseases. 2003 Jun 1;187(11):1765-72.
16. Tusting LS, Thwing J, Sinclair D, Fillinger U, Gimnig J, Bonner KE, *et al*. Mosquito larval source management for controlling malaria. Cochrane database of systematic reviews. 2013, 8.
17. World Health Organization. World Malaria Report 2019. Geneva: World Health Organization; c2019.
18. Singh N. Epidemiology of *falciparum* and *vivax* malaria in pregnancy in India. Ina Symposium on Malaria in Pregnancy in Kisumu, Kenya, organized by the Centers for Disease Control and Prevention (CDC), Atlanta, and the Kenyan Medical Research Institute (KEMRI), Kenya; c1997 Nov. p. 11-13.
19. Beeson JG, Rogerson SJ, Elliott SR, Duffy MF. Targets of protective antibodies to malaria during pregnancy. Journal of Infectious Diseases. 2005 Nov 1;192(9):1647-50.
20. Endeshaw T, Gebre T, Ngondi J, Graves PM, Shargie EB, Ejigsemahu Y, *et al*. Evaluation of light microscopy and rapid diagnostic test for the detection of malaria under operational field conditions: a household survey in Ethiopia. Malaria journal. 2008 Dec;7:1-7.
21. World Health Organization. A Rapid dipstick antigen capture assay for the diagnosis of *falciparum* malaria: based on the report of a joint SEARO/TDR/CTD Informal Consultation on Recent Advances in Diagnostic Techniques and Vaccines for Malaria, Institute of Immunology, New Delhi, India; c1995 Mar. p. 27-28.
22. Shulman CE, Dorman EK, Bulmer JN. Malaria as a cause of severe anaemia in pregnancy. The Lancet. 2002 Aug 10;360(9331):494.
23. Newton PN, Essien E, White NJ. Platelets and blood coagulation in human malaria. In Malaria: A Hematological Perspective; c2004. p. 249-276.