

Feto-Maternal Outcome in Pregnancy with Malaria

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Abstract:

Background: Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant women, her fetus and newborn child. This study was undertaken to know the prevalence of malaria in pregnancy, demographic details of patients infected with malaria in pregnancy and to study the fetomaternal outcome in pregnancy with malaria.

Materials and Methods: This observational retrospective study was carried out from May 2017 to October 2019.

Results: Proportion of malaria in pregnancy was 0.20%. The proportion of *P.vivax* and *P.falciparum* was 0.19% and 0.01% respectively. The commonest pathogen found was *Plasmodium vivax* accounting for 91.9%. Majority of patients of pregnancy with malaria were in the age group of 20-24 years residing in the urban area. Majority of patients were illiterate and were multigravida. Majority 29(78.38%) patients came in third trimester. Missed abortion occurred in 1(2.70%) and Normal vaginal delivery was conducted in 26 (70.27%). Maternal anemia and thrombocytopenia accounted for 32(86.47%) and 29(78.38%) respectively. Live babies were 36(94.73%). Preterm babies were 14 (36.84%). NICU admission were 12 (31.57%). Majority of babies, 22 (57.89%) were of low birth weight (LBW) and had IUGR.

Conclusion: Malaria adversely affects both pregnant female as well as fetus. It is therefore advised all patients with fever in pregnancy must have screening for malarial parasite and treated adequately to improve the maternal and perinatal outcome. Multidisciplinary approach with help of physician, neonatologist and anesthetist can help in reducing fetomaternal morbidity and mortality. More public awareness programme and community participation also play important role in prevention of malaria.

Keywords: Fever, Malaria, Plasmodium, Pregnancy, Malaria in pregnancy.

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Introduction

Since ancient times, people have been aware of how malaria is spread by mosquitoes. India accounted for about 83% of all malaria deaths in the WHO South-East Asia Region.[1] Children under the age of five, pregnant women, and those with

impaired immune systems are particularly vulnerable to malaria infection and its severe effects.

The National Vector Borne Disease Control Programme (NVBDCP), is responsible for the prevention and management of vector-borne illnesses in India.[2] Pregnant women who are primi-gravida

are more vulnerable to the intensity and effects of malaria, especially during the second half of pregnancy.[3] *P. vivax* malaria is more prevalent in south and southeast Asia.[4] More severe maternal morbidity and death are seen in *P. falciparum* type infections than *P. Vivax*. With a mortality rate of 13% compared to 6.5% in non-pregnant women[5], the condition is more severe and lethal during pregnancy. Pregnancy-related malaria consequences include cerebral malaria, severe anemia, hypoglycemia, hemorrhage, maternal death, and fetal problems including preterm birth, Intra uterine growth restriction, low birth weight, and even perinatal mortality. It can affect the fetus in utero or during labour.[6]

The aim of this study was to determine proportion of malaria in pregnancy, to study demographic profile of patients and feto-maternal outcome of pregnancies with malaria.

Materials and Methods

This was a retrospective observational study carried out at tertiary care teaching hospital and we have collected the data from May 2017 to October 2019 from hospital records. Study population included were pregnant women diagnosed to have malaria by rapid diagnostic test or microscopy as an OPD/indoor patient during the study period. Data was recorded as per proforma that included, demographic profile of patients, detailed history, clinical examination findings, investigations, gestational age at the time of delivery, progress of labour, mode of delivery and feto-maternal outcome. Data was analyzed by appropriate statistic tool.

Inclusion Criteria: All pregnant patients who presented with malaria infection, irrespective of gestational age, who were managed at our hospital.

Exclusion Criteria: All pregnant patients who presented with malaria infection in antenatal period, but who's follow up was lost.

Results

Table 1: Proportion of Pregnancy with of Malaria

Total Obstetric Admissions	Pregnancy with Malaria No. (%)	<i>P.vivax</i> No. (%)	<i>P.falciparum</i> No. (%)
17656	37 (0.20%)	34 (0.19%)	3 (0.01%)

As shown in Table 1, out of 17656 Obstetric admissions, there were 37 pregnant patients having malaria. Hence, proportion of malaria in pregnancy was 0.20% and that of due to *P.vivax* and *P.falciparum* was 0.19% and 0.01% respectively. The ratio of *P.vivax* and *P.falciparum* was 0.91 and 0.08 respectively.

Table 2: Demographic Details of Pregnancy with Malaria (n=37)

Demographic Details		<i>P. vivax</i> (%)	<i>P. falciparum</i>	Total
Age (years)	<=19	2 (5.40%)	1 (2.70%)	3 (8.10%)
	20-24	15 (40.54%)	2 (5.40%)	17 (45.94%)
	25-29	10 (27.02%)	0 (0%)	10 (27.02%)
	30-34	6 (16.21%)	0 (0%)	6 (16.21%)
	>=35	1 (2.70%)	0 (0%)	1 (2.70%)
	Total No. (%)	34 (91.89%)	3 (8.10%)	37 (100%)
Type of Admission	Registered No. (%)	20(54.05%)	3(8.10%)	23(62.16%)
	Unregistered No. (%)	14(37.84%)	0 (0%)	14(37.84%)
	Total No. (%)	34(91.89%)	3(8.10%)	37 (100%)
Residence	Urban	29(78.37%)	3(8.11%)	32(86.48%)
	No. (%)			
	Rural	5(13.51%)	0 (0%)	5(13.51%)
	No. (%)			
	Total No. (%)	34(91.89%)	3(8.11%)	37 (100%)
Education Level	Illiterate No. (%)	13(35.13%)	1(2.70%)	14(37.84%)
	Primary No. (%)	11(29.73%)	0 (0%)	11(29.73%)
	Secondary No. (%)	8(21.62%)	1(2.70%)	9(24.32%)
	Higher	2(5.40%)	1(2.70%)	3(8.10%)
	secondary No. (%)			
	Total No. (%)	34 (91.89%)	3 (8.10%)	37 (100%)
Gravida	Primigravida No. (%)	9(24.32%)	3(8.10%)	12(32.43%)
	Second	7(18.91%)	0 (0%)	7(18.91%)
	gravida No. (%)			
	Multigravida No. (%)	18(48.64%)	0 (0%)	18(48.64%)
	Total No. (%)	34(91.89%)	3(8.10%)	37 (100%)

As shown in Table 2, out of 37 patients of pregnancy with malaria, majority of patients, 17(45.94%) were in the age group of 20 to 24 years and 15(40.54%) and 2(5.40%) patients were infected with *P. vivax* and *P. falciparum*

rum infection respectively. Majority of patients, 23 (62.16%) were registered patients with P.vivax and P.falciparum infection in 20(54.05%) and 3(8.10%) respectively. Majority of patients, 32(86.48%) patients were residing at the urban area having P.vivax and P. falciparum, infection in 29 (78.37%) and 3 (8.11%) respectively. Majority of patients were illiterate 14(37.84%) having P. vivax and P.falciparum infection in 13(35.13%) and 1(2.70%) respectively. Majority of patients of pregnancy with malaria were multigravida and all were infected with P. vivax.

Table 3: Trimester wise Distribution and Type of Malaria (n=37)

Type	1 st Trimester No. (%)	2 nd Trimester No. (%)	3 rd Trimester No. (%)	Total No. (%)
P.vivax	3(8.11%)	5(13.51%)	26 (70.27%)	34(91.89%)
P.falciparum	0(0%)	0(0%)	3(8.11%)	3(8.11%)
Total	3(8.11%)	5(13.51%)	29 (78.38%)	37 (100%)

As shown in Table 3, majority 29(78.38%) patients were diagnosed in third trimester and 26(70.27%) patients were infected with P. vivax and 3(8.11%) patients were infected with P. falciparum during third trimester. In first and second trimester, 3(8.11%) and 5(13.51%) patients were infected respectively with P. vivax only.

Table 4: Outcome of Pregnancy and Type of Malaria (n= 37)

Type of malaria	Missed Abortion No. (5)	Vaginal Delivery No. (%)	LSCS No. (5)	Total No. (%)
P. vivax	1(2.70%)	23(62.16%)	10(27.03%)	34(91.89%)
P.falciparum	0(0%)	3(8.10%)	0(0%)	3(8.10%)
Total	1(2.70%)	26(70.27%)	10(27.03%)	37 (100%)

As shown in Table 4, 1(2.70%) patient having P.vivax infection had missed abortion. Vaginal deliveries were conducted in 26(70.27%) patients having P. vivax and P. falciparum infection in 23(62.16%) and 3(8.10%) respectively. LSCS was performed in 10(27.03%) patients and all had P.vivax infection.

Table 5: Maternal Complications in Pregnancy with Malaria (n=37)*

Maternal Complications		P.vivax No. (%)	P.falciparum No. (%)	Total No. (%)
Anemia	No Anemia	05 (13.51%)	0 (0%)	05 (13.51%)
	Mild	07 (18.91%)	01 (2.70%)	08 (21.61%)
	Moderate	21 (56.75%)	02 (5.40%)	23 (62.15%)
	Severe	01 (2.70%)	0 (0%)	01 (2.70%)
Thrombocytopenia	Normal >1,50,000/ μ L	07 (18.91%)	01 (2.70%)	08 (21.61%)
	Grade 1: 75000-1,50,000/ μ L	13 (35.13%)	01 (2.70%)	14 (37.83%)
	Grade 2: 50,000-75,000/ μ L	06 (16.21%)	01 (2.70%)	07 (18.91%)
	Grade 3: 25,000-50,000/ μ L	07 (18.91%)	0 (0%)	07 (18.91%)
	Grade 4: <25,000/ μ L	01 (2.70%)	0 (0%)	01 (2.70%)
Gestational Hypertension		02 (5.40%)	0 (0%)	02 (5.40%)
Jaundice		01 (2.70%)	0 (0%)	01 (2.70%)
Episiotomy Wound Gap		01 (2.70%)	0 (0%)	01 (2.70%)
Pleural Effusion		01 (2.70%)	0 (0%)	01 (2.70%)

*More than one complication in some patients

As shown in Table 5, maternal anemia was present in 32(86.47%), with mild, moderate and severe anemia in 08(21.61%), 23 (62.15%) and 01(2.70%) respectively. Thrombocytopenia was present in 29 (78.38%), with thrombocytopenia of grade 1, grade 2, grade 3, grade 4 in 14(37.83%), 7 (18.91%), 7 (18.91%) and 1 (2.7%) respectively.

As per our data according to gravidity, maternal anemia was present in 11(29.72%), 6(16.21%) and 15(40.54%) of primigravida, second gravida and multigravida respectively. Thrombocytopenia as present in 10(27.01%), 7(18.91%) and 12(32.43%) of primigravida, second gravida and multigravida respectively. Hence, majority of patients who were multigravida had anemia and thrombocytopenia. Gestational hypertension was present in 2 (5.40%). Jaundice, episiotomy wound gap and plural effusion were present in 1(2.70%) each.

Table 6: Fetal Outcome in Pregnancy with Malaria (n=38*)

Type of Malaria	Live Baby n= 36 (94.73%)					IUD No. (%)	Total No. (%)	NICU Admission No. (%)
	Preterm n=14 (36.84%)				Term No. (%)			
	Ex-treme Preterm (<28 weeks) No. (%)	Very Preterm (28-32 weeks) No. (%)	Moder-ate Pre-term (32-36 weeks) No. (%)	Late Preterm (36-37 weeks) No. (%)				
P.vivax	1 (2.63%)	2(5.26%)	7 (18.42%)	3 (7.89%)	20 (52.63%)	2 (5.26%)	35 (92.10%)	12 (31.57%)
P.falciparum	0(0%)	0(0%)	1(2.63%)	0(0%)	2(5.26%)	0(0%)	3(7.89%)	0 (0%)
Total	1 (2.63%)	2 (5.26%)	8 (21.05%)	3 (7.89%)	22 (57.89%)	2 (5.26%)	38 (100%)	12 (31.57%)

*Including two twin deliveries

As shown in Table 6, live babies were 36(94.73%), that included two set of twins. Preterm and term babies were 14 (36.84%) and 22 (57.89%) respectively. NICU admission were 12 (31.57%). Extreme preterm, very preterm, moderate preterm and late preterm were 1(2.63%), 2(5.26%), 8(21.05%) and 3(7.89%) respectively.

Table 7: Birth weight (n=38)

Type of Malaria	<1000 Grams No. (%)	1000-1499	1500-1999 Grams No. (%)	2000- 2499 Grams No. (%)	2500-2999 Grams No. (%)	3000- 3499 Grams No. (%)	>3500 Grams No. (%)
P.vivax	1(2.63%)	2(5.26%)	7(18.42%)	10(26.31%)	10(26.31%)	4(10.52%)	1(2.63%)
P.falciparum	0 (0%)	0 (0%)	0 (0%)	02(5.26%)	01(2.63%)	0 (0%)	0 (0%)
Total	1(2.63%)	2(5.26%)	7(18.42%)	12(31.57%)	11(28.94%)	4(10.52%)	1(2.63%)

As shown in Table 7, majority of babies, 22 (57.89%) were weighing 2500 grams or less, whereas 16(42.11%) were weighing more than 2500 grams. Hence, majority of babies were of low birth weight (LBW) and had IUGR and average birth weight was 2298 grams in our study.

Discussion

In present study, proportion of malaria with pregnancy was 0.20% and that of due to P. vivax and P. falciparum was 0.19 % and 0.01 % respectively. The ratio of P.vivax and P.falciparum was 0.91 and 0.08 respectively. Palm G et al.[7] have reported ratio of P.vivax and P.falciparum as 0.63 and 0.22 respectively. The majority of vivax malaria occurs in south and southeast Asia[4]. Palem G et al.[7], Espinoza et al.[8] and Gidiri MF et al.[5] had reported the proportion of pregnancies affected by malaria as 0.32%, 0.21%, and 0.12% respectively.

In present study, majority of patients of pregnancy with malaria were in the age group of 20-24 years with interquartile range (IQR) was 22 to 26 years. The mean age of patient of pregnancy with malaria was 24.62 years and median age of patients of pregnancy with malaria was 24 years. In two studies reported by De Beudrap et al.[9-10] median age of patients of pregnancy with malaria was 22 (IQR 19 to 25) years and 24 (IQR 21 to 27) years.

In present study, registered patients were 23(62.16%), and out of all patients, 20(54.05%)

patients had P.vivax infection and 3(8.10%) patients were infected with P. falciparum. There were 14(37.84%) unregistered patients and all were infected with P. vivax. Gidiri MF et al.[5] had reported registered and unregistered patients as 63% and 37% respectively. In present study, 32(86.48%) patients were residing in the urban area. Majority of patients were from an urban area as ours is a tertiary care hospital located in the urban area, and the majority of patients were residing within city limit. De Beudrap et al.[9-10] and Espinoza et al.[8] had reported 60%, 63% and 55% of patients of pregnancy with malarial infection were residing at urban area.

In present study, 14(37.84%), 11(29.73%), 9(24.32%) and 3(8.10%) of pregnant patients, who were illiterate, had primary education, secondary education and higher secondary education respectively. Gidiri MF et al.[5] had reported 1%, 23%, 74% and 2% of pregnant patients infected with malaria who were illiterate, had primary, secondary, and tertiary level of education. De Beudrap et al. in their two studies[9-10] reported higher prevalence of 59% and 45% of malaria infection in pa-

tients having primary level of education. They reported that low education level independently associated with malaria during pregnancy.[9]

In present study, the majority of patients, primigravida, second gravida and multigravida were 12(32.43%), 7(18.91%) and 18(48.64%) respectively. Hence, majority of patients having pregnancy with malaria were multigravida. Gidiri MF et al.[5] had reported 30% primigravida, 25% second gravida and 45% multigravida patients of pregnancy with malaria. De Beaudrap et al.[9,10] in their two studies reported malaria in pregnancy in 55% and 63% of multigravida patients. Palem G et al[7] had reported 56% of primigravida and 44% of multigravida patient. KC Nayak et al[11] had reported primigravida, second gravida and multi gravida had shown 40%, 32% and 28% patients infected with malaria respectively. The number of patients of pregnancy with malaria decreases with increasing gravidity. Multigravida women in endemic areas are somewhat protected from placental malaria and this may be the result of maternal antibodies preventing cyto-adhesion of the parasite to the placenta.[12]

In present study, 3(8.11%), 5(13.51%) and 29(78.27%) patients were diagnosed in first, second and third trimester respectively. Palem G et al[7] had reported 7%, 22%, and 71% of pregnant patients diagnosed with malaria during first, second and third trimester respectively. Gidiri MF et al.[5] had reported 6.79%, 23.30% and 69.90% of pregnant patients diagnosed with malaria during first, second and third trimester respectively. Hence, majority of patients were infected with malaria in third trimester. There is an increased risk of infant malaria was observed when maternal malaria occurred within the last 12 weeks before delivery.[10]

In present study, dilatation and evacuation (D &E) was performed for missed abortion in 1(2.7%) patient having *P. vivax* infection. Palem G et al.[7] had shown spontaneous miscarriage in 17% patients, out of these, 28% and 72 % of total miscarriage were accounted by *P.vivax* and *P.falciparum* respectively. Vaginal deliveries were conducted in 26(70.27%) patients who had *P.vivax* infection, 23(62.16%) and *P.falciparum*, 3(8.10%) LSCS was performed in 10(27.03%) patients and all had *P. vivax* infection. Indications of LSCS were oligohydramnios and previous caesarean section with scar tenderness, in 3(8.11%) patients each and indications of LSCS were twin pregnancy with oligohydramnios, meconium stain liquor, fetal distress, previous two caesarean section with scar tenderness, in 1(2.7%) patients each respectively.

In present study, maternal anemia was present in 32(86.47%), with mild, moderate and severe anemia in 08(21.61%), 23 (62.15%) and 01(2.70%) respectively and primigravida, second gravida and multigravida were 11(29.72%), 6(16.21%) and

15(40.54%) respectively. Palem G et al.[7] had reported the prevalence of 34.14% of maternal anemia with malaria. Out of these, 19.5% patients were primigravida and 14.6% were multigravida. The mean hemoglobin level of all patients in our study was 9.2 gm/dl. Mean hemoglobin level in patients with infection of *P. vivax* and *P. falciparum* was 9.2 gm/dl and 8.6 gm/dl respectively. Shulman CE et al.[13] had reported mean hemoglobin level as 9.05 gm/dl and 6.42gm/dl in *P. vivax* and *P. falciparum* infection respectively. Gidiri MF et al.[5] had shown 47.2% of patients had hemoglobin level below 10 gm/dl and 16.6% patients had hemoglobin level below 7 gm/dl.

In present study, thrombocytopenia was present in 29 (78.37%), with thrombocytopenia of grade 1, grade 2, grade 3, grade 4 in 14(37.83%), 7 (18.91%), 7 (18.91%) and 1 (2.7%) respectively and primigravida, second gravida and multigravida were 10(27.01%), 7(18.91%) and 12(32.43%) respectively. Palem G et al.[7] had reported 26.8% patients who had thrombocytopenia and out of these 19.5% and 7.3% were infected with primi and multigravida respectively. In our study 56.25% patients had shown thrombocytopenia of less than 1,00,000/ μ L platelets, similar to study by KC Nayak et al.¹¹ which had shown 56% patients of thrombocytopenia of less than 1,00,000/ μ L platelets in *P. vivax* infection. Gidiri MF et al.[5] had reported 30% patients who had thrombocytopenia of less than 1,00,000/ μ L platelets. Blood transfusion was required in 10 (27.02%) and 5(13.51%) patients required transfusion of platelets. Out of 10 patients who required blood transfusion, 8(80%) had *P. vivax* and 2(20%) had *P. falciparum* infection. Out of 5 patients who required platelet transfusion, all were infected with *P. vivax* on admission and one was NS₁IgM positive along with *P.vivax* infection. In present study, jaundice was present in 1(2.70%) patient. Espinoza et al.[8] reported 8.8% of patients had jaundice. Gidiri MF et al.[5] reported 1.94% and 5.82% of patients had cerebral malaria and severe anemia as maternal complication due to malarial infection respectively.

In present study, out of 38 delivered babies, live babies were 36(94.73%) and preterm and term live babies were 14(36.84%) and 22(57.89%) respectively. Extreme preterm, very preterm, moderate preterm and late preterm were 1(2.62%), 2(5.26%), 8(21.05%) and 3(7.89%) respectively. NICU admissions were required in 12(31.57%) babies and 1(2.63%) baby expired on 3rd day of NICU admission due to respiratory distress syndrome (RDS). Espinoza et al.[8] had reported 50%, 25% and 8.8% of delivered babies were full term, preterm and IUD respectively. Palem G et al.[7] had reported 21.8% preterm babies, out of these 66% and 34% were due to *P. vivax* and *P. falciparum* respectively. Gidiri MF et al.[5] had reported 23.33% normal

term baby, 9.70% baby with preterm delivery, 5.82% babies were stillbirths.

In present study, 1(2.63%) baby was weighing less than 1000 grams, 2(5.26%) were weighing between 1000-1499 grams, 7(18.42%) were weighing 1500-1999 grams, 12(31.57%) were weighing 2000-2499 grams, 11(28.94%) were weighing 2500-2999grams, 4(10.52%) were weighing 3000-3499 grams and 1(2.43%) Baby was weighing more than 3500 grams. Majority of babies, 22 (57.89%) were weighing 2500 grams or less, whereas 16(42.11%) were weighing more than 2500 grams. Hence, majority of babies were of low birth weight (LBW) and had IUGR. Gidiri MF et al.[5] had reported, 5% of babies weighing between 1000-1499 grams, 10% of babies weighing 1500- 1999 grams, 15% of babies weighing 2000-2499 grams, 26% weighing 2500-2999 grams, 31% of babies weighing 3000-3499 grams and 13% of babies weighing more than 3500 grams. Gidiri M F et al.[5] and De Beaudrap et al[9] had reported mean fetal weight of 2739 grams and 3095 grams respectively. Palem G et al.[7] had shown 21.9% LBW babies delivered with patient with malaria.

Conclusion

In our study, proportion of malaria in pregnancy was 0.20% and that of due to P.vivax was 0.19%. Malaria in pregnancy was found more in young, illiterate, multigravida residing in urban areas. Malaria adversely affects both pregnant female as well as fetus. It increases the incidence of anemia, thrombocytopenia and also increases the risk of abortion, preterm delivery, low birth weight, IUGR, and perinatal death. Early diagnosis, prompt treatment and prevention of malaria should be done as per National guidelines. To avoid fetomaternal morbidity and mortality in pregnancy with malaria, all patients with fever in pregnancy must have screening for malarial parasite and if found positive, should be treated adequately in consultation with physician, close monitoring and supportive care to prevent complications. Multidisciplinary approach with help of physician, neonatologist and anaesthetist can help in reducing fetomaternal morbidity and mortality. More public awareness programme and community participation also play important role in prevention of malaria in addition to awareness for contraception and education of girl child.

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