Original Article

# Malaria during pregnancy: An insights of complications

**Nayyar Latif[1], Uzma Zaman[1], Nasim Saba[2], Kiran Farooq[3]**
[1]District Gynecologist, Zanana Hospital M.T.I Dera Ismail Khan-29050-Pakistan
[2]Dean Gomal Medical College, Dera Ismail Khan-29050-Pakistan
[3]Trainee Medical Officer, Zanana Hospital M.T.I Dera Ismail Khan-29050-Pakistan
Email: nayyerlatif2015@gmail.com
**DOI:** 10.47750/pnr.2022.13.S06.459

## Abstract

Malaria is one of the leading causes of morbidity and mortality around the globe including Pakistan. Plasmodium vivax and Plasmodium falciparum are causing the majority of infections which are increasing and account for approximately 35-40% of cases. Several physiological and pathological changes occur due to adverse effects of malaria in pregnancy. The current study was conducted in District Headquarter Teaching Hospital, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan to govern the possessions and complications of malarial parasitaemia in pregnancy. Two thousand pregnant patients associated with malaria were included in this study. Regarding stage, and parity of pregnancy, malarial infections were found more common in primigravida and second gravida than in multigravida. Two commonest pathogens (Plasmodium vivax, and Plasmodium falciparum) were observed in pregnant patients. It was found that 84 (23.01%) of 365 women in their first pregnancy (P0) were parasitaemic. In 2nd, 3rd, and 4th pregnancies, almost 24.49, 28.94, 29.38, and 29.32% of women, respectively were parasitaemic. The maximum incidence of P. vivax was recorded in 3rd trimester followed by the 2nd, and 1st trimesters. Regarding pregnancy outcomes, 1.35% of patients developed puerperal pyrexia, 2.2 had an abortion, 5.50% neonatal death occurred, 6.90% patients had anemia, 1.25% patients have cerebral malaria, and a total of 6.6% complications were recorded in the current study. It is concluded that pregnant women are prone to malaria infections, causing spontaneous abortion, premature birth, reduce baby weight, and stillbirth, particularly in high-endemic areas.

**Keywords:** Malaria; Pregnancy; Plasmodium falciparum; Plasmodium vivax; Pakistan

## INTRODUCTION

Malaria is the most serious health issue in many regions of the globe, particularly in Pakistan. Malaria is estimated to affect more than 40% of the world's population, with more than one million people dying from this dangerous disease. Each year various control strategies are applied to manage this disease in the country but the disease still remains a major public health concern. It has been estimated that in 2018, total of 228 million cases of malaria occurred worldwide. Plasmodium vivax, P. falciparum, P. malariae, and P. ovale are the four parasitic malaria species that affect humans worldwide (Chaponda et al., 2015; Latif and Jamal, 2015; Grillet et al., 2021). Malaria adversely affects the pregnancy of women throughout the globe. The physiological changes of pregnancy and the different body changes like physical or pathological changes caused by malaria have a negative impact on each other's progression. Malarial infection causes adverse impacts on the mother's health during pregnancy and becomes risk to her fetus, and the newborn baby (Shulman et al., 1996; Ramsay, 2003; Van Eijk et al., 2015; Zheng and Cheng, 2017; Martínez-Pérez et al., 2018).

Women in areas with low P. falciparum transmission and low levels of acquired immunity are vulnerable to incidents of spartan malaria, which can affect stillbirths, spontaneous abortions, and even cause a mother's death. It has been documented that pregnant women die at a higher rate than non-pregnant women as a result of malarial infection (Khan et al., 2004; Nahlen, 2000; McGregor, 1983). Women infected with P. falciparum are further probable to progress hypoglycemia, parasitemia, acute pulmonary edema, premature labor, fetal distress, and spontaneous abortions (Luxemburger et al., 1997; Ullah et al., 2018; Ampofo et al., 2018).

Many contagious diseases such as systemic shock, cerebral malaria, tropical splenomegaly syndrome, and black water fever caused due to P. falciparum and P. malariae, while milder diseases are caused by P. vivax infection. The babies of malaria-infected women can't attain good weight in their mother as fetuses. Many studies have been conducted on malaria in many

regions of the world (Steketee et al., 1996; Matteelli et al., 1996; Djabanor et al., 2017; runner et al., 2019). The current trial was conducted in an endemic area (Dera Ismail Khan, KPK, Pakistan) for malaria to investigate the effects and complications of malaria during pregnancy.

## Material and method

This cross-sectional study was designed at Gomal Medical College, Dera Ismail Khan (D.I.Khan), and carried out in Gynecology and Obstetrics department of District Headquarters Teaching Hospital, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan from January 2020-January 2022. Irrigation and drainage facilities are the main issues in District D.I.Khan which is considered the main breeding site for mosquitoes (vector of malaria or plasmodia). This study included two thousand only (2000) pregnant women who was suspected to have malaria. Malaria was confirmed using the given procedure by Saba et al. (2008). We obtained procreative and own antiquities. The routine laboratory tests were determined. Less than 10 g/dl of hemoglobin was considered low and the neonate's birth weight was also determined. The low birth weight was defined as <2.5 kg.

## Results and discussion

Malaria is the second most commonly reported disease in the public health sector affecting approximately 4 million people every year in Pakistan. Several plasmodium species such as P. vivax, P. malariae, P. falciparum, P. ovale have been reported in the world which affects human health, especially among pregnant women (Briand et al., 2016). Among reported species, the first two species are widely dispersed and highly affect the human population in Pakistan (Ullah et al., 2018,2020; (Garcia et al., 2019; Dombrowski et al., 2018).

Table 1. Malaria parasitaemia by pregnancy stages

| | **Pregnancy stages** | | | **Puerperium** | **Total** |
|---|---|---|---|---|---|
| | **1st Trimester** | **2nd Trimester** | **3rd Trimester** | | |
| | **Cases Pf[a] Pv[b]** | **Cases Pf[a] Pv[b]** | **Cases Pf[a] Pv[b]** | **Cases Pf[a] Pv[b]** | **Cases Pf[a] Pv[b]** |
| **Parity** | | | | | |
| **$P_0$** | 68 10 6 | 87 11 16 | 132 11 14 | 78 6 10 | 365 38 46 |
| **$P_1$** | 93 7 5 | 105 15 19 | 143 9 17 | 55 11 14 | 396 42 55 |
| **$P_2$** | 99 9 12 | 110 19 21 | 133 10 14 | 76 15 21 | 418 53 68 |
| **$P_3$** | 103 7 10 | 121 17 20 | 144 17 22 | 54 19 12 | 422 60 64 |
| **$P_4$** | 58 5 14 | 103 13 15 | 149 21 19 | 89 16 14 | 399 55 62 |
| **Total** | 421 38 47 | 526 75 91 | 701 68 86 | 352 67 71 | 2000 248 295 |

a Cases with P. falciparum infection; b Cases with P. vivax infection

It was found that 84 (23.01%) of 365 women in their first pregnancy (P0) were parasitaemic. In 2nd, 3rd, and 4th pregnancies, almost 24.49, 28.94, 29.38, and 29.32% of women, respectively were parasitaemic. The highest prevalence of P. vivax malaria was recorded in the 3rd trimester followed by the perpeurium, 2nd, and 1st trimesters (Table 1).

Table 2. Malaria parasitaemia by parity groups

| Parity | Number of sampled | Number of positive (%) | Number of Negative (%) |
|---|---|---|---|
| Primiparae | 930 | 461 (23.05) | 467 (23.35) |
| Multiparae | 1070 | 383 (19.15) | 689 (34.45) |
| Total | 2000 | 844 (42.20) | 1156 (57.80) |

Out of examined women, 42.20% women were positive for malarial infection. Among 1070 samples of multiparae, 383 (19.15%) were found infected with malarial parasite while 689 (34.45%) were found negative. The maximum (23.05%) malarial infection was recorded in primiparae while the minimum (19.15%) in multiparae (Table 2). The highest intensity of malaria was recorded in primiparae (Table 3) and many previous researchers also reported similar findings (Mbanefo et al., 2009). It was also observed that the intensity of malaria depends on the parity and trimester of pregnancy. The haemoglobin profile of the patient is shown in figure 1 while outcomes of pregnancy recorded in the current study are shown in figure 2. Results reported by researchers around the globe (Saba et al., 2008; Tobon-Castano and Betancur, 2019) was almost same showing that primiparae are more prone to have malaria in malarial endemic regions compared to multiparae. Among complications of malaria, anemia is at top.

Table 3. Malaria intensity by parity groups of women.

| Intensity | Primiparae (%) | Multiparae (%) |
|---|---|---|
| 1-10/100hpf | 140 (30.36) | 125 (27.11) |
| 11-100/100hpf | 152 (32.97) | 143 (31.01) |
| 1-10/hpf | 93 (20.17) | 66 (14.31) |
| 11-100/hpf | 76 (16.48) | 49 (10.62) |

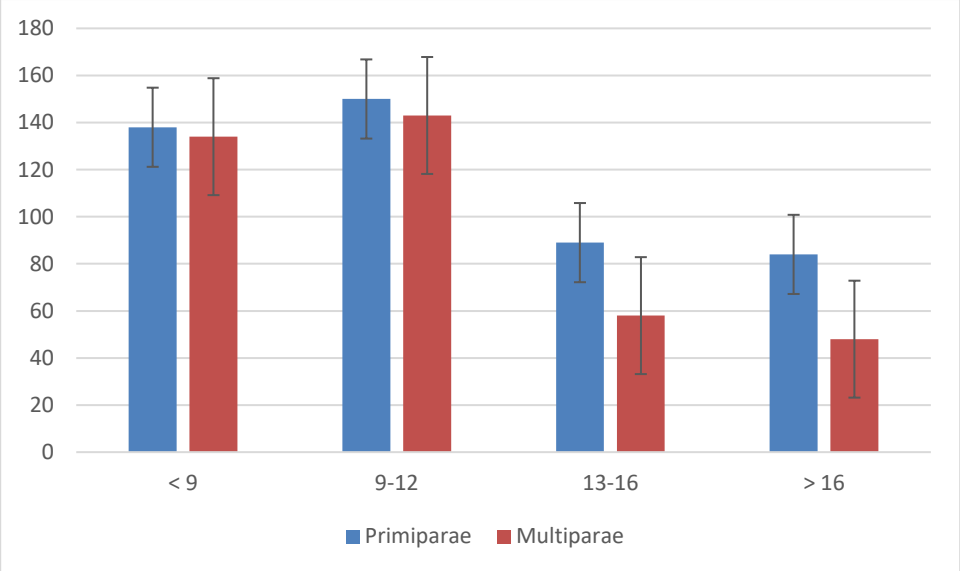


Figure 1. Hemoglobin Profile of women

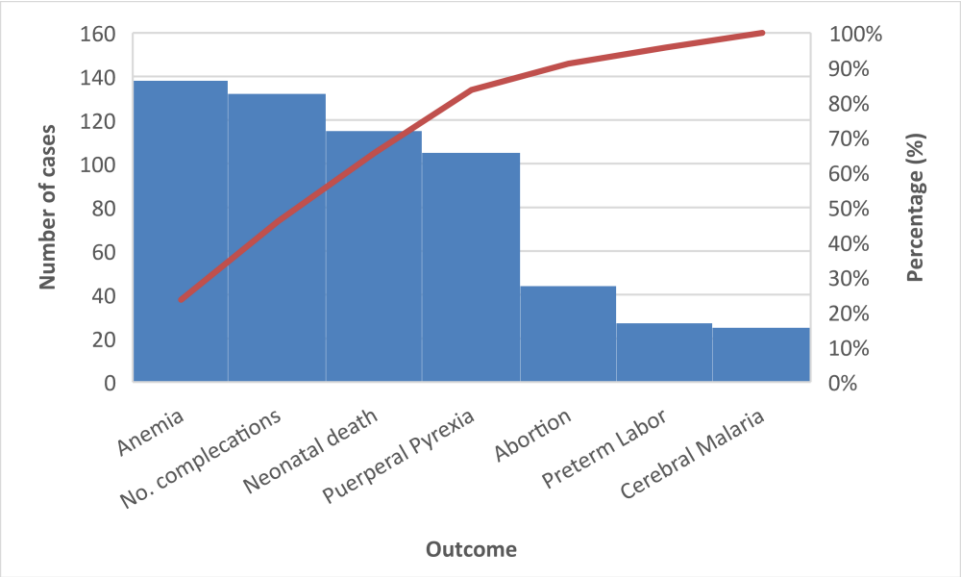


Figure 2. Outcomes of pregnancy recorded in the study.

Table 4. Complication rates in parity groups of women.

| Factors | Parity | | *P*-value |
|---|---|---|---|
| | Primiparae n (%) | Multiparae n (%) | |
| **Platelets (per mm$^3$)** | | | |
| < 50000 | 183 (39.69) | 130 (33.94) | 0.777 |
| ≥ 50000 | 278 (60.30) | 253 (66.05) | |
| **Baby weight (in kg)** | | | |
| < 2.5 | 129 (27.98) | 118 (30.80) | 0.874 |
| ≥ 2.5 | 332 (72.01) | 265 (69.19) | |
| **Abortion** | | | |
| Yes | 25 (5.42) | 19 (4.96) | 0.578 |
| No | 436 (94.57) | 364 (95.03) | |

The number of platelets was ≥ 50000 in 60.30% of women with primiparae while 66.05% with multiparae. A total of 44 (10.38%) women had an abortion, among 44 women, twenty-five and nineteen were primiparae and multiparae, respectively (Table 4). Bhatti et al. (2007) and Yakoob et al. (2005) reported similar findings about the risk factors of malaria. They reported 150,000 platelets in 78.6% of patients, with 67.4% being multigravida and 32.6% being primigravid. Pregnancy and functional fluctuations have been revealed to be a hazardous issue for malaria resulting decrease in birth weight. Prevalence and parasite densities are decreasing as the number of pregnancies increases, and the effect of infection (LBW) is decreasing (De Beaudrap et al., 2013). The findings of this study confirmed primiparae's high vulnerability to malaria infested areas. This would be due to the new product's progress. During the first pregnancy, the uteroplacental vasculature is immunologically naive. It is consistent with findings from similar studies conducted in different countries by scientists (Djabanor et al., 2017; Musumeci et al., 2015; Maestre and Carmona-Fonseca, 2014).

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