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Original Article

Fetomaternal Outcomes among Pregnant Females Suffering from Malaria, A Study from Interior Sindh, Pakistan

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Abstract

Background: Malaria during pregnancy has the potential to harm the fetus and change fetal immunity, raising the risk of malaria infection at a younger age. Because malaria is common in Pakistan, it is critical to determine the fetomaternal consequences of malaria during pregnancy in order to develop strategies and treatment plans to attenuate negative malaria outcomes and lower overall baby and mother morbidity rates.
Objective: To determine fetomaternal outcomes among pregnant females presenting with malaria.
Study type, settings & duration: This cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Talluka Hospital, Kashmore from December 2019 to December 2020.
Methodology: All the pregnant females admitted in the labour room or antenatal ward diagnosed as having malaria were included in the study. Fetomaternal outcomes such as preterm labour, anaemia at delivery, hypocalcaemia, low birth weight, low Apgar score, prematurity and perinatal death were noted. Data was entered and analysed in SPSS version 23.
Results: The most common maternal and fetal outcome were post-delivery anaemia (40.9%) and low birth weight (23.2%) respectively. Fetomaternal outcomes were stratified with effect modifiers. Age showed significant association with preterm labor, anemia, low birth weight (LBW), prematurity and perinatal death ($p \leq 0.05$). Number of children showed significant association with preterm labor, anemia, LBW, prematurity and perinatal death ($p \leq 0.05$). Socio-economic status showed significant association with preterm labor and prematurity ($p \leq 0.05$). Education status and socioeconomic status of pregnant female showed statistically significant association with perinatal death ($p \leq 0.05$). Malarial prophylaxis showed statistically significant association with preterm labor, anemia and LBW ($p \leq 0.05$).
Conclusion: There is a strong association of old age of female during pregnancy with preterm labor, anemia, low birth weight (LBW), prematurity and perinatal death. Higher parity is a predisposing factor for preterm labor, anemia, LBW, prematurity and perinatal death. Low socio-economic status is associated with preterm labor and prematurity. Uneducated women and joint family system is a predisposing factor for perinatal death. Similarly, no malarial prophylaxis administration is a strong predisposing factor for preterm labor, anemia and LBW.
Key words: Fetal outcomes, maternal outcomes, malaria, pregnancy.

Introduction

Malaria is a parasitic infection caused by a protozoa of genus Plasmodium. It is a vector borne disease. According to World Health Organization report 2019, worldwide reported cases of malaria are between 206 to 258 million. Maximum number of cases (93%) were reported from Africa followed by South-East Asia (3.4%) and East Mediterranean Region (2.1%).[1]

Malaria is endemic in 30 countries worldwide.[1] Plasmodium falciparum accounts for 99.7% cases in African Region, 50% in South East Asia, 71% in East Mediterranean Region and 65% in Western Pacific Region. The other malarial species known as vivax accounts for 53% cases in

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Authors Contribution

PS & KA conceptualized the project. PS & NB did the data collection and literature search. Statistical analysis, drafting, revision & writing of manuscript were done by KA.

South-East Asia.[1] Epidemiologically Pakistan is classified as moderate malaria endemic country.[2] Of the total 217.1million country's population, about 98% (212.6 million) are at risk of developing Malaria and 54% are at high risk of getting infected from Malaria.[1] In Pakistan, malaria is mostly caused by Plasmodium vivax while, Plasmodium falciparum accounts for about 15% cases.[3] Globally, the most common cause of malaria is Plasmodium falciparum leading to potentially severe complications that inexplicably affect pregnant women.[4]

According to statistics, 11 million pregnant women were exposed to malaria infection in Africa in 2018 and gave birth to 16% low birth weight babies.[1] Worldwide, 50 million women during their pregnancy get infected with malaria known as malaria associated pregnancy (PAM) with mortality rate of almost ten thousand deaths annually.[5] Numerous studies have claimed that pregnant women living in malaria endemic areas are most vulnerable to malarial infection.[6-8] Unfortunately, pregnancy associated malarial infection is associated with increased mortality.[3] It is also associated with increased risk of cerebral malaria, congenital malaria, infant anaemia, low birth weight, premature labour, abortion, stillbirth, maternal anaemia and intrauterine growth retardation.[3,9] The higher susceptibility is explained due to temporary decline of cell mediated immunity that recovers soon after delivery.[10] It is also speculated that multiparous women are less likely at risk of getting infected with malaria than primagravida women because they develop natural immunity to Var2CSA variant of PfEMP1 present in plasmodium falciparum.[11]

Pregnancy associated malaria is also responsible for neonatal mortality.[12] The mechanism is still to be researched. However, malaria during pregnancy could also affect foetus and alter foetal immunity that increases the risk of getting malarial infection in younger age.[13-15] Since, malaria is endemic in Pakistan[2] therefore, there is a dire need to ascertain fetomaternal outcomes of malaria during pregnancy to devise strategies and treatment plans to mitigate adverse outcomes of malaria and to reduce overall infant and maternal morbidity rate.

Methodology

This prospective study was conducted at the Department of Obstetrics and Gynaecology, Talluka Hospital, Kashmore, Pakistan from December 2019 to December 2020. A sample size of 181 was calculated using Open epi online sample size calculator by taking reference of birth anomaly as 21.4%, absolute precision as 6% and 95% confidence level.[16] All the pregnant females admitted in the labour room or antenatal ward with diagnosis of malaria were included in the study. Malaria was confirmed on the presence of Plasmodium species on slide and evaluated by Rapid Diagnostic test. Females with sickle cell disease or psychological problems were excluded from the study.

An informed consent was taken from all the eligible participants. Data of different variables i.e. socio demographic variables, obstetric history, malaria, laboratory findings i.e. serum calcium level and haemoglobin level and Apgar score along with fetal outcome and birth weight of neonate was recorded on predesigned questionnaire by the researchers. Enrolled pregnant females were followed till discharge from hospital after delivery. Hb level less than 11 gm/dl was considered as anemia.[17]

SPSS version 23 was used to analyse data. Mean and SD was computed for numeric variables whereas frequency and percentage was reported for qualitative variables. Chi-square was applied to assess the significance between fetomaternal outcomes and socio-demographic variables. *p*-value ≤0.05 was considered as statistically significant.

The Ethical approval was obtained from Institutional Ethical Review Committee of Talluka Hospital, Kashmore.

Results

Total 181 pregnant females fulfilling inclusion criteria and consenting to participate in study were included. Among them 147 pregnant female were suffering from Plasmodium falciparum (81.2%) and 34 had Plasmodium vivax/ ovale (18.8%). Mean age of the enrolled females was 30.25±4.41 years. Majority of the females had more than 1 child (72.37%) and belonged to low socio-economic group (65.2%).

Out of 181 females, 62.4% were uneducated, 50.3% were from rural area and 96.1% were unemployed. About 74% of the females were living in joint family and 40.3% of the females had malaria prophylaxis as treatment (Chloroquine/ intravenous (IV) Quinine with loading dose of 20mg/ kg/ IV Quinine without loading dose/ combination treatment with IV Clindamycin/ oral Artemether or oral halo-fantrine use) (Table-1).

The most frequent maternal outcome was post-delivery anemia (40.9%), followed by preterm labour (37%) and hypoglycaemia (16%) (Figure-1). The most common fetal outcome was low birth weight (23.2%) followed by prematurity (18.8%) (Figure-2).

Table 1: Baseline characteristics of study participants.

Variable	*Variables*	*n*	*%*
No. of children	0	12	6.6
	1	38	21.0
	2	61	33.7
	3	25	13.8
	>3	45	24.9
Socio-economic status	Low	118	65.2
	Middle	50	27.6
	High	13	7.2
Status of education	Uneducated	113	62.4
	Educated	68	37.6
Residence	Urban	90	49.7
	Rural	91	50.3
Occupation	Unemployed	174	96.1
	Employed	7	3.9
Living status	Joint family	134	74.0
	Nuclear family	47	26.0
Malaria prophylaxis	Yes	73	40.3
	No	108	59.7

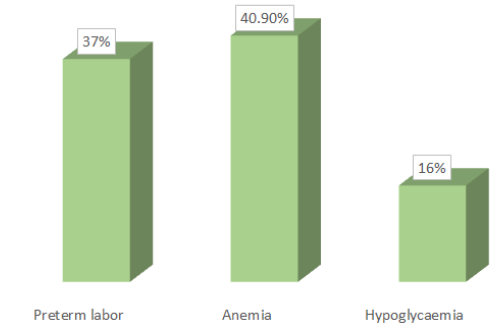

Figure 1: Frequency distribution of maternal outcomes among pregnant female suffering from malaria.

Figure 2: Frequency distribution of fetal outcomes of pregnant female suffering from malaria.

Fetomaternal outcomes were stratified with effect modifiers. Age showed significant association with preterm labor, anemia, low birth weight (LBW), prematurity and perinatal death ($p \leq 0.05$). Number of children showed significant association with preterm labor, anemia, LBW, prematurity and perinatal death ($p \leq 0.05$) (Table-2).

Socio-economic status showed significant association with preterm labor and prematurity ($p \leq 0.05$). Education level of pregnant female and socioeconomic status showed statistically significant association with perinatal death ($p \leq 0.05$). Malarial prophylaxis showed statistically significant association with preterm labor, anemia and LBW ($p \leq 0.05$) (Table-3).

Table 2: Association of sociodemographic variables and maternal outcomes of pregnant females suffering from malaria.

	Preterm labor n (%)	*Anemia n (%)*	*Hypoglycemia n (%)*
Age groups			
<30 years	25(26.9)	24(25.8)	16(17.2)
≥30 years	42(47.7)	50(56.8)	13(14.8)
p-value	0.004	0.001	0.656
No of children			
<3	29(26.1)	28(25.2)	14(12.6)
≥3	38(54.3)	46(65.7)	15(21.4)
p-value	0.001	0.001	0.115
Socio-economic status			
Low	54(45.8)	55(46.6)	23(19.5)
Middle	10(20)	15(30)	5(10.0)
High	3(23.1)	4(30.4)	1(7.7)
p-value	0.004	0.1	0.215
Education status			
Uneducated	39(34.5)	43(38.1)	17(15)
Educated	28(41.2)	31(45.6)	12(17.6)
p-value	0.369	0.318	0.644
Residence			
Urban	35(38.9)	41(45.6)	17(18.9)
Rural	32(35.2)	33(36.3)	12(13.2)
p-value	0.604	0.204	0.296
Occupation			
Unemployed	62(35.6)	73(42)	29(16.7)
Employed	5(71.4)	1(14.3)	0
p-value	0.103	0.243	0.6
Living status			
Joint family	51(38.1)	55(41.0)	19(14.2)
Nuclear family	16(34.0)	19(40.4)	10(21.3)
p-value	0.624	0.999	0.254
Malaria prophylaxis			
Yes	39(53.4)	39(53.4)	15(20.5)
No	28(25.9)	35(32.4)	14(13.0)
p-value	0.001	0.006	0.172

Discussion

Post-delivery anemia was present among majority (40.9%) of the women. The majority of the females who participated in the study belonged to the rural region and women living in rural area are more susceptible to anemia. Similar finding was observed in another study that anemia is more frequently seen in pregnant women having malaria.[18] Voluminous number of studies have been conducted identifying prevalence of anaemia in malaria infected pregnant women. It was found that

Table 3: Association of sociodemographic variables with fetal outcomes of pregnant females suffering from malaria.

	Low birth weight N (%)	*Prematurity N (%)*	*Low Apgar score N (%)*	*Perinatal death N (%)*
Age groups				
<30 years	13(14.0)	4(4.3)	19(20.4)	0
≥30 years	29(33.0)	30(34.1)	9(10.2)	10(11.4)
p-value	0.003	0.001	0.058	0.001
No of children				
<3	15(13.5)	8(7.2)	20(18)	0
≥3	27(38.6)	26(37.1)	8(11.4)	10(14.3)
p-value	0.001	0.001	0.233	0.001
Socio-economic status				
Low	30(25.4)	29(24.6)	16(13.6)	9(7.6)
Middle	7(14.0)	4(8)	9(18.0)	1(2.0)
High	5(38.5)	1(7.7)	3(23.1)	0
p-value	0.111	0.012	0.563	0.229
Education status				
Uneducated	24(21.2)	20(17.7)	16(14.2)	1(0.9)
Educated	18(26.5)	14(20.6)	12(17.6)	9(13.2)
p-value	0.419	0.63	0.53	0.001
Residence				
Urban	22(24.4)	17(18.9)	16(17.8)	6(6.7)
Rural	20(22.0)	17(18.7)	12(13.2)	4(4.4)
p-value	0.694	0.971	0.393	0.504
Occupation				
Unemployed	39(22.4)	34(19.5)	27(15.5)	10(5.7)
Employed	3(42.9)	0	1(14.3)	0
p-value	0.356	0.35	0.999	0.999
Living status				
Joint family	33(24.6)	21(15.7)	20(14.9)	2(1.5)
Nuclear family	9(19.1)	13(27.7)	8(17.0)	8(17.0)
p-value	0.444	0.07	0.732	0.001
Malaria prophylaxis				
Yes	24(32.9)	16(21.9)	12(16.4)	6(8.2)
No	18(16.7)	18(16.7)	16(14.8)	4(3.7)
p-value	0.011	0.375	0.767	0.192

anemia was almost 2 times highly associated with malaria infected pregnant women.19,20 In a Pakistani study, it has been observed that mean haemoglobin in pregnant females with malaria was significantly lower than controls (9.4 vs 12.2 gm/dl).[21] Similarly, Lufele E et al. examined more than thousand malaria infected pregnant women and found out that among women living in rural area, low birth babies and preterm delivery were more likely to be associated with malaria infected pregnant women.[22] Bhatti et al. also indicated that seven babies were delivered with preterm labour and all were of less than 2.5 kg in weight.[21]

Evidence suggests that there is strong association between intrauterine growth restriction and prematurity in malaria infected pregnant women. Umbers AJ et al. revealed that malaria in endemic areas is a major cause of intrauterine growth restriction in 70% of the foetuses affecting oxygen and nutrients.[23] In the present study 18.8% babies were born premature whereas another study showed slightly higher results in terms of prematurity.[5] Biswas J et al. found that almost 35% pregnant females infected with malaria presented with fever and suffered complications. There was no significant association found between age, parity duration of gestation and maternal complications.[24] The present study revealed that age plays a vital role among different feto-maternal outcomes. Almost of 27% of women who experienced preterm labour were of age less than 30 years which showed that younger women were less likely to suffer from preterm labour. Further 14% of these women delivered low birth weight babies and only 4.3% of them had premature deliveries. Similarly, one fourth young pregnant women had anemia. The study also suggest that older age is at high risk of developing anemia.[25] Unfortunately, perinatal death was mostly associated with older women similar to Walker KF et al study[26] This clearly explains that physiological aging is associated with more adverse outcomes.

Furthermore, the current study showed that increase parity was significantly associated with preterm labor, anemia, LBW, prematurity and perinatal death. However, a study showed

contradictory results between increased parity and anemia.[27] The other factors in the present study showed that socio-economic status had significant association with preterm labor and prematurity which suggests that low income families are not able to attend follow ups and routine ultrasounds and hence suffered adverse outcomes. Moreover, education status and family status was significantly associated with perinatal death. The results suggest that lack of awareness regarding pregnancy complications among uneducated females is major cause of perinatal death. Similarly, women that were given malarial prophylaxis had fewer risks and experienced less severe outcomes.

Hence, it is an important study because malaria is recognized as an important risk factor not only for adverse obstetric outcomes including miscarriage, maternal anemia but also poor fetal outcomes such as preterm delivery and intrauterine growth restrictions. This study would help the national malaria control program to develop strategies and policies for prevention and control of malaria in pregnant women.

The results showed wide range of fetomaternal outcomes in malaria infected pregnant women. The most frequent maternal outcome was post-delivery anemia. The most common fetal outcome was low birth weight. Older age is strongly associated with preterm labor, anemia, low birth weight (LBW), prematurity and perinatal death. Higher parity is a predisposing factor for preterm labor, anemia, LBW, prematurity and perinatal death. Low socio-economic status is associated with preterm labor and prematurity. Uneducated women and joint family system is a predisposing factor for perinatal death. Similarly, lack of administration of antimalarial prophylaxis is a strong predisposing factor for preterm labor, anemia and LBW.

Conflict of interest: None declared.

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