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Studies of the Effects of Malaria Parasite on Haematological Profile of Pregnant Malarious Women

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Abstract: This study was designed to determine the effects of malaria parasite on packed cell volume (PCV), red blood cell count (RBC), haemoglobin estimation (HB), white blood Cell count (WBC) and platelets count of pregnant malarious women for possible effects on anaemia, leucopenia, immune deficiency and thrombocytopenia. Haematological parameters assessed were done using routine methods and results were expressed as mean±standard deviation of three observations, F-LSD was used to test the significance differences ($p < 0.05$) among treatment means. All analysis was performed using SPSS version 20. The result of this study showed that malaria parasite decreased the PCV, RBC and HB of pregnant malarious subjects when compared with pregnant non-malarious subjects, similarly it decreased that of non-pregnant malarious subjects when compare with non-pregnant non-malarious subjects but these decreases were statistically insignificant ($p < 0.05$). Similarly, malaria parasite decreased the WBC count and platelet count of pregnant and non-pregnant malarious subjects compared to the controls but these decreases were statistically insignificant ($p < 0.05$). This study has shown that malaria parasite decreased the haematological parameters (PCV, RBC, HB, WBC and Platelet) of pregnant and non-pregnant malarious subjects but these decreases were statistically insignificant and may not result to health disorders such as anaemia, leucopenia, immune deficiency and thrombocytopenia. The decreases in haematological parameters were statistically insignificant probably due to quality healthcare facilities available to the pregnant women, adequate management of malarious subject's blood profiles with dietary supplementation, adequate awareness on malaria prophylactic measures and other appropriate vector control measures. This is because it has been well established that malaria in pregnancy is associated with residence in rural areas, where health care facilities and malaria control programmes are very poor and less effective.

Key words: Malaria Parasite · Red Blood Cell Count · White Blood Cell Count · Platelet Count · Haemoglobin Estimation and Packed Cell Volume · Nigeria

INTRODUCTION

Malaria in pregnancy is a major public health challenge and a priority for the Roll Back Malaria partnership, because it is a health risk for the mother, her fetus and the neonate. The symptoms and complications of malaria in pregnancy vary according to transmission intensity and the level of acquired immunity, in areas of low transmission where levels of acquired immunity are low, women are susceptible to episodes of severe malaria which can result in stillbirths, spontaneous abortion or in the death of the mother, similarly in areas of

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high transmission where levels of acquired immunity tend to be high, women are susceptible to asymptomatic infection, which can result in maternal anaemia and placental parasitaemia, both of which can subsequently lead to low birth weight [1, 2]. Pregnant women with little or no previous immunity to malaria are two or three times more likely to develop severe disease as a result of malaria infection than non-pregnant adult living in the same area [2]. Every year there are approximately 515 million cases of malaria, the annual deaths due to malaria are between 1 and 3 million people and about 90% of malaria related deaths occur in Sub-Saharan Africa [3]. In Sub-Saharan Africa, maternal malaria is associated with up to 200,000 estimated infant deaths yearly [4] malaria-induced low birth weight is estimated to account for up to 360,000 infant deaths every year [5]. Overall, 11.4% of neonatal deaths and 5.7% of infant deaths in malaria endemic areas of Africa are estimated to be caused by malaria in Pregnancy [6]. Malaria in pregnancy is peculiar because of the sequestration of parasites in the placenta where infection is often extremely heavy. The World Health Organization (WHO) currently recommends a package of interventions for controlling malaria during pregnancy in areas with stable (High) transmission of *Plasmodium falciparum*, which includes the use of insecticide treated nets, intermittent preventive treatment and effective case management of malaria. WHO currently recommends at least two doses of sulphadoxine pyrimethamine (SP) for treatment, but growing resistance of malaria parasites to SP in many regions combined with the changing epidemiology of malaria, indicated that other prevention approaches must be explored which starts with more researches on different aspects of malaria in pregnancy. Considering the paucity of scientific investigations on the effects of malaria parasite on haematological profile of pregnant women, this present study was designed to determine the effects of malaria parasite on packed cell volume, red blood cell count, hemoglobin estimation, white blood cell count and platelet count.

MATERIALS AND METHODS

Study Area: The study was conducted between May and June, 2015 in Living Word Mission Hospital, Aba, Abia State, Nigeria. The wet season is within the period of March to September, when breeding of *Anopheles* mosquitoes is at its peak and bites are prevalent. Oral consent was obtained from all the subjects recruited by random sampling for the study and they comprised of women (30 pregnant and 30 non-pregnant women) who attended clinics regularly at the hospital. The age range of the women used for the study was from 18 to 45 years. There are four experimental groups made up of 15 pregnant malarious subjects (PMS), 15 pregnant non-malarious subjects (PNMS), 15 non-pregnant malarious subjects (NPMS) and 15 non-pregnant non-malarious subjects (NPNMS). The haematological parameters (HB, PCV, RBC, WBC and platelet) evaluated were replicated thrice and mean and standard deviation of each group determined at the end of the experiment. Women excluded from the study were those on any form of malaria chemoprophylaxis as well as human immunodeficiency virus (HIV) positive patients and those with sickle cell disease.

Blood Collection and Malaria Parasite Test: The volar surface of the arm was cleaned with cotton wool moistened with methylated spirit, peripheral blood sample was collected with sterile hypodermic needle from each subject into a sterile container. Thin and thick blood smears were made on clean slides and labeled properly. The thin films were fixed with methanol and stained with 3% giemsa stain and then examined under the microscope. The malaria parasite density was estimated with the thick blood smear [7].

Evaluation of Haematological Parameters: Routine haematological methods involving the use of haematocytometer, microhaematocrit centrifuge and Sahlis method were used to determine RBC, PCV, HB, WBC and platelet estimation [8].

Data Analysis: Data collected were pooled and analysed for their central tendencies using descriptive statistics, values were given as mean± standard deviation of three observations. Analysis of variance and F-LSD were employed to test the significance difference ($p < 0.05$) among treatment means. All analysis was performed using SPSS for windows statistical software package version 20. The resulting outputs were presented in Tables.

RESULTS

The effects of malaria parasite on the PCV, RBC and HB of the subjects showed that the PCV of PMS (33.30±2.72) was lower than the PCV of PNMS (40.27±5.19) and the decrease was statistically insignificant ($p < 0.05$). Similarly, the PCV of NPMS (30.93±6.15) was lower than that of NPNMS (33.17±4.11) after the study, but the decrease was statistically insignificant ($p < 0.05$).

Table 1: The effects of malaria parasite on the PCV, RBC and HB of Pregnant malarious subjects

	Haematological Parameters		
Subjects	PCV (%)	RBC (106/µl)	HB (g/dl)
PMS	33.30±2.72a	4.10±0.29a	10.60±0.87a
PNMS	40.27±5.19b,a	4.20±0.76b,a	11.83±1.88b,a
NPMS	30.93±6.15c,a	4.29±0.35c,a,b	9.83±2.77c,a,b
NPNMS	33.17±4.11d,a,b,c	4.38±0.75d,a,b,c	10.20±1.25d,a,b,c

Values are expressed as Means±SD (n=3). Values labelled with the same superscripts are statistically insignificant at 5% significant level. Key: PMS = Pregnant Malarious Subjects, PNMS= Pregnant Non Malarious Subject, NPMS= Non Pregnant Malarious Subjects, NPNMS= Non Pregnant Non Malarious Subjects.

Table 2: The effects of malaria parasite on WBC and Platelet of pregnant malarious subjects

	Haematological Parameters	
Subjects	WBC (103/µL)	PLATELETS(103/µL)
PMS	9.23±1.80a	202.67±73.54a
PNMS	11.47±2.45b,a	206.33±51.33b,a
NPMS	4.70±1.56c	159.00±19.70c,a,b
NPNMS	7.23±1.72d,a,c	278.33±142.68d,a,b,c

Values are expressed as Means±SD (n=3). Values labelled with the same superscripts are statistically insignificant at 5% significant level. Key: PMS = Pregnant Malarious Subjects, PNMS= Pregnant Non Malarious Subject, NPMS= Non Pregnant Malarious Subjects, NPNMS= Non Pregnant Non Malarious Subjects.

Moreover, the RBC of PMS (4.10±0.29) was lower than that of PNMS (4.20±0.76) and the decrease was statistically insignificant ($p < 0.05$). Similarly, the RBC of NPMS (4.29±0.35) was lower than that of NPNMS (4.38±0.75) after the duration of the study and the decrease was statistically insignificant ($p < 0.05$). Furthermore, the HB of PMS (10.60±0.87) was lower than that of PNMS (11.83±1.88) and the decrease was statistically insignificant ($p < 0.05$). Similarly, the HB of NPMS (9.83±2.77) was lower than that of NPNMS (10.20±1.25) after the study and the decrease was statistically insignificant ($p < 0.05$) Table 1.

The effects of malaria parasite on WBC and Platelets counts of subjects showed that the WBC of PMS (9.23±1.80) was lower than that of PNMS (11.47±2.45) and the decrease was statistically insignificant ($p < 0.05$). Similarly, the WBC of NPMS (4.70±1.56) was lower than that of NPNMS (7.23±1.72) after the study and the decrease was statistically insignificant ($p < 0.05$). Moreover, the platelets count of PMS (202.67±73.54) was lower than that of PNMS (206.33±51.33) and the decrease was statistically insignificant ($p < 0.05$). Similarly, the platelets of NPMS (159.00±19.70) was lower than that of NPNMS (278.33±142.68) after the duration of the study and the decrease was statistically insignificant ($p < 0.05$) Table 2.

DISCUSSION

Malaria in pregnancy constitutes serious health challenge in malaria endemic areas of Africa because it causes low birth weight, maternal, infant and neonatal mortality. Pregnant women are most vulnerable to malaria because pregnancy reduces a women's immunity, making her more susceptible to malaria [9]. Blood is a good indicator to determine the physiological status of man and the assessment of haematological parameters can be used to determine the extent of deleterious effects of foreign materials including malaria parasite [10]. The present study showed that malaria parasite decreased packed cell volume, red blood cell count and haemoglobin estimation but these decreases were statistically insignificant and less likely to lead to anaemia and this is supportive of previous works by Erhabor *et al.* [11], Anigo *et al.* [12] and Osonugo *et al.* [13]. Furthermore, malaria parasite decreased WBC and platelet count in pregnant malarious subjects but these decreases were statistically insignificant and may not lead to immune deficiency and thrombocytopenia, in disagreement with the study of Osonugo *et al.* [13] which reported that WBC is elevated during pregnancy and in agreement with Senthilkumaar and Sarojini [14]. The decreases in haematological parameters recorded in this study were statistically insignificant which may be due to quality healthcare facilities available to pregnant women at Living Word Mission Hospital Aba, adequate management of malarious subject's blood profiles with dietary supplementation, adequate awareness on malaria prophylactic measures especially by the use of insecticide treated bed nets, repellants and other appropriate vector control measures. This is more so as it has been well established that malaria in pregnant women are associated with residence in rural areas, where healthcare facilities and malaria control programmes are very poor and less effective [15].

CONCLUSION

This study showed that malaria parasite decreased the haematological parameters (PCV, RBC, HB, WBC and platelet count) of pregnant and non-pregnant women but these decreases were statistically insignificant and may not lead to health disorders such as anaemia, leucopenia,

immune deficiency and thrombocytopenia. The decreases in haematological parameters were statistically insignificant may be due to quality healthcare facilities available to the pregnant women at Living Word Mission Hospital Aba as it has been well established that malaria in pregnancy is associated with residence in rural areas, where health care facilities and malaria control programmes are very poor and less effective. Further study should be done taking into account the gravidity and the level of parasitaemia of the subjects to help pinpoint the findings of this study.

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