ASSESSMENT OF ELECTROLYTE AND RENAL IMPAIRMENT IN PREGNANT WOMEN WITH MALARIA PARASITEMIA IN ABIA STATE UNIVERSITY TEACHING HOSPITAL ABA

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ABSTRACT

Malaria morbidity and mortality has remained a major health burden in tropical Africa. Thus, malaria associated complication in pregnancy remains' a major health problem. This study is therefore aimed at evaluating the effect of malaria on electrolytes and the renal function of pregnant women receiving antenatal care in Abia State University Teaching Hospital Aba (ABSUTH). A case control study that enrolled a total of 100 pregnant women. Fifty with confirmed gestational malaria cases and 50 without malaria as control. Parameters assessed were serum electrolytes (sodium, potassium and magnesium), Renal (Urea, Creatinine). Serum was obtained from Blood sample collected from the test and control subjects which was used to determine the various parameters . These were analyzed using a chemistry automated Analyzer. Data generated were analyzed using Statistical Package for Social Sciences (SPSS Version 25), One-Way Analysis of Variance (ANOVA) and students t- test. Significance level for analysis was set at P-value 0.05 (P=<0.05). Plasma urea and creatinine were significantly increased among positive cases (pregnant women with malaria parasite) compared to the control (pregnant women without malaria parasite). However, there was no significant difference in the electrolytes analyzed in the two groups, apart from Potassium level which increased slightly among the malaria positive pregnant women. It is therefore important for expectant mothers to attend antenatal to help their health care givers monitor among other things malaria parasites as to prevent morbidity and mortality associated with Malaria.

*Key Words: Malaria, Gestational, Urea, Creatinine and Antenatal.

INTRODUCTION

Malaria is a life-threatening disease with those in the sub-Saharan tropics being vulnerable to the parasite. Malaria accounts for an estimated 2-3 million deaths annually and is also responsible for untold morbidity in approximately 300-500 million people annually. Malaria is caused by Plasmodium, which is transmitted by Anopheles Mosquitoes during blood meal. Four species of Plasmodium which can cause malaria in human include *Plasmodium falciparum, P. Vivax, P. malariae and P. ovale. However, Plasmodium falciparum* is responsible for most deaths and most of the severe complications, including cerebral malaria, anemia and renal failure (Mishra *et al.,* 2012).

In highly endemic areas, most cases of severe Malaria occur among children aged six months and five years with the highest mortality between one and three years of age. Another risk group in endemic areas are pregnant women who become susceptible to severe infection due to diminished cellular and humoral immunity during pregnancy. This is because pregnancy is usually accompanied by physiological and immunological changes (causes reduced immunity) that modify both resistance to infection and the pathogenesis of disease (Anorlu *et al.,* 2010).

Blood stage cycle of Plasmodium falciparum is responsible for most cases of malaria and for the most severe, often fatal forms of the disease. It has varied modes of presentation with occasional life-threatening complications such as cerebral Malaria, jaundice, renal failure, pulmonary oedema, Hypoglycemia, circulatory collapse, spontaneous bleeding, repeated generalized convulsion and acidosis can manifest (Prakash et al., (2016).

Mishra et al., (2012) in their study observed acute renal failure in falciparum malaria in patients and this was characterized by severe proteinuria, rise in blood urea, low urine specific gravity, low ratio of urinary to blood urea and hyperkalemia and metabolic acidosis. Prakash et al., (2016) further stressed the effect of Plasmodium falciparum malaria in causing acute renal failure. It is based on these findings that we decided to determine the level of electrolytes and renal impairment in positive malaria pregnant women in Abia State University Teaching Hospital Aba.

MATERIALS AND METHODS

This study was carried out at the Chemical Pathology Laboratory of Abia State University Teaching Hospital (ABSUTH).

Five 5mls of venue blood was taken from each patient for the blood film and the Biochemistry assay. The thick and thin films were analyzed for the number of parasites per 200 white blood cells. The level of parasitemia was read as low (<1000 parasite/microliter of blood), moderate (1000-9999 parasites/microliter of blood), and severe (>= 10,000 parasite/microliter of blood). Biochemical analysis was performed with the BT-3000 Analyzer. The reaction principles for the estimation of Urea and Creatinine were based on the Igboh et al (2013) method, Sodium, Potassium, and chloride levels were estimated using the ion selective electrolyte (ISE) analyzer (AU600 Beckman Coulter.)

Data was analyzed using Statistical Package for Social sciences (SPSS version 25). The difference between the groups were compared using one-way analysis of variance (ANOVA) and student "t"-test with a P value equal to or less than 0.05 (P=< 0.05) which was considered as being statistically significant. Results were expressed as Mean ± SD (Standard Deviation) which were calculated.

RESULTS AND DISCUSSION

Table 1: Demographic and Biochemical Characteristics of study participants

PARAMETERS	MALARIA POSITIVE %	MALARIA NEGATIVE %	TOTAL	P-VALUE
UREA (mg/dl)	20.92±11.9	14.1±4.4	17.51±9.58	*0.0003
CREATININE (mmol/l)	0.92±0.3	0.7±0.1	0.82±0.26	0.0001
SODIUM (mmol/l)	149±11.7	148.50±11.29	0.92±0.20	0.6405
POTASSIUM (mmol/dl)	11.13±0.69	4.1±0.8	4.2±0.6	0.8759
CHLORIDE (mmol/dl)	104.5±3.5	104.5±3.2	104±0.8	0.9438
MAGNESIUM (mmol/dl)	0.48±0.29	0.50±0.308	0.50±0.29	0.0005

Table 2: Biochemical Characteristics of study participants

PARAMETERS	NO MALARIA	LOW <1000	MODERATE 1000-9999	HIGH >= 10,000	P. VALUE

UREA (mg/dl)	14.1±4.4	15.3±2.7	16.32±5.4	38.25±14.6	0.210
CREATININE (mg/dl)	0.71±0.1	0.73±0.1	0.80±0.2	1.42±0.2	0.321
CHLORIDE (mmol/dl)	104.5±3.8	104.3±3.2	104.8±3.6	104.1±2.1	0.542
SODIUM (mEq/La)	148±11.0	147±10.2	150.1±10.9	148.3±13.2	0.231
POTASSIUM (mmol/l)	4.14±0.5	4.12±0.7	4.2±0.8	3.9±1.0	0.332
MAGNESIUM (mg/dl)	3.15±0.7	2.1±0.1	1.5±0.5	2.2±1.1	0.111

The study showed that Plasma urea and creatinine were significantly increased among positive cases of malaria positive pregnant women compared to the controls. However, there was no significant difference in the electrolytes analyzed in the two groups, apart from Potassium level which increased slightly among the malaria positive pregnant women

This is not surprising considering that when red cells lyse among things liberated is potassium.

Elevated Urea and creatinine levels in malarious subjects suggests possible renal function derailment, and this is further supported by the strong correlation of these parameters to the increasing degree of malaria parasitemia. Meanwhile, the association of Plasmodium falciparum infection with clinically significant renal and renal related Biochemical derailment has previously been established, these disorders are thought to be mediated by a complex interaction of mechanical, immunologic, cytokine, humeral, and acute phase response and nonspecific factors and hemodynamic factor which usually occur in normal pregnancy (Anorlu *et al.,* 2010).

Again ,the fall in plasma Urea and creatinine concentration could be attributed to several factors, including dilutional effect of an expanding plasma volume, increased production (positive nitrogen balance) and increased renal excretion because of a Pregnancy-induced increase in the glomerular filtration rate (Abdul-Manam *et al.,* 2006). Despite all these considerations, Serum urea levels do not reflect the performance of the kidneys like creatinine. This is because urea production is also affected by dehydration, good protein intake and tissue catabolism. Thus, an increase in serum urea concentration with a concomitant inverse in serum creatinine concentration in the infected subjects as shown in the study reflect the functioning of kidneys has been compromised.

The result in this study conforms to the report of Mishra *et al.*, (2012) who reported that over 90% of the global malaria burden occurs in the southern parts of Africa. Although, *Plasmodium falciparum* has been reported as the predominant specie isolated among pregnant women in the tropics but the presentation of asymptomatic malaria parasitemia is different from that of severe to chronic malaria parasitemia during pregnancy.

The high parasite density reported may be due to immune suppression among those individuals in their second and third trimesters attributed to the effect of *Plasmodium falciparum* infection, and this is more prominent among malaria infected pregnant women in their third trimester. In contrast to other studies (Ofori *et al.,* 2009), the study showed no association with age, parity, gravidity among those with Malaria and the control group. However, a similar study conducted by Elbadawi *et al.,* (*2013*), also revealed the same trend as observed in this study. Other studies such as Ekeanyanwu, *et al.,* (*2010*), reported elevated levels of Urea and creatinine alongside increasing level of parasitemia.

This study revealed an association between Malaria and the level of urea and creatinine in pregnancy. This study reinforces the need for a more careful medical follow up during pregnancy, including malaria diagnosis as part of antenatal care for all pregnant women residing in endemic areas to decrease the risk of complications and to avoid multiple malaria episodes associated with greater malaria severity.

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