PLASMA PROTEINS AND PROTEINURIA IN GESTATIONAL MALARIA

Asaolu Modupe Fisayo

Department of Biochemistry, University of Ado-Ekiti, Nigeria.

ABSTRACT

The plasma concentrations of total protein, albumin, immunoglobulins IgG, IgA and IgM and urinary protein were assayed in 250 pregnant Nigerian women with malaria and compared with 250 healthy pregnant women which served as controls. The mean values of plasma total proteins, albumin, IgG and IgA were significantly lowered ($P < 0.05$) while a slight increase in IgM was observed in the malaria patients. Urinary proteins value of 23.10 ± 0.50 mg/dl was obtained for the pregnant women with malaria, this was significantly higher ($P < 0.05$) than that of the controls with the corresponding value of 15.32 ± 0.09 mg/dl. This study has therefore demonstrated elevations of the urinary and decrease in plasma proteins in gestational malaria. These findings suggest that the protein profile should be considered in the diagnosis and treatment of malaria.

KEY WORDS

Malaria, Proteins, Immunoglobulins, Pregnancy

INTRODUCTION

Malaria is a disease caused by the presence of a unicellular parasite belonging to the genus plasmodium in the red blood corpuscles or in the liver cells. Four different species of human malaria parasite are known namely *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae* and *Plasmodium ovale*. They are known to cause different types of malaria ranging, from benign to tertian malaria (1). Of the four species, *P.falciparum* is the most widely spread and can lead to death through cerebral involvement in the form of cerebral malaria which kills about 2 million people each year worldwide (2). The severity of it is accentuated by the increasing resistance of *P falciparum* to commonly used drugs.

The severity of gestational malaria depends on the initial immunity of the pregnant woman. The impact of malaria on pregnancy and conversely, the impact of pregnancy on malaria are two factors which must be put into consideration during gestational malaria. Malaria is more pronounced on the second trimester of pregnancy and the risk is greater in nulliparous than in multiparous since, women protected from first

prophylaxis are subsequently protected. So also, the degree of parasitaemia falls with the advancing age of the expectant mother (3).

Gestational malaria has effects on both the mother and the foetus. The maternal effects are repeated febrile illness, anaemia, premature labour and maternal mortality. The foetal effects include late abortions, intrauterine growth retardation, low birth weight and perinatal mortality among others.

Proteins has multiple functions which include immune defense and relationship of protein to diseases can be well explained by antigen and antibodies since both are examples of proteins and as well related to immune defense (4). The present study was partly motivated by these functions and the need to investigate the management of malaria in pregnancy beyond the mere administration of antimalarials.

MATERIALS AND METHODS

Two hundred and fifty randomly selected pregnant women with malaria admitted at the University College Hospital (UCH) Ibadan, Nigeria were included in present study. One hundred and twenty (120) healthy pregnant women with similar parity and age were also studied at comparable gestational ages and treated as controls. The control group was not hospitalized, non of the patients or controls had sickle cell haemoglobin and no patient had any history of preexisting

Address for Correspondence :

Dr. M.F. Asaolu

Department of Biochemistry,
University of Ado-Ekiti, Nigeria.
E-mail: mfasaolu@yahoo.com

medical complications apart from malaria.

Blood samples were drawn in lithium heparinised bottle and centrifuged at 1000 revolution per minute for 10minutes. The plasma was then stored at -70°C prior analysis.

Determination of total protein was carried out using Biuret method while albumin was assayed using Bromocresol dye binding method (5). Immunochemical methods (6) were used for the estimation of immunoglobulins. Total urinary protein concentration was estimated by turbidimetric method (7).

RESULTS

As analysed by two-way analysis of variance, plasma total proteins, albumin and immunoglobulins (IgG, IgA and IgM) were lower in women with malaria ($F = 9.6$, $P < 0.05$). Mean plasma total protein, albumin and immunoglobulins decreases with gestational age in both malaria and normal pregnancies. Mean urinary protein was significantly higher in women with malaria.

DISCUSSION

The results obtained from the present study have shown that gestational malaria which is due to the presence of parasite in the blood has an effect on all the parameters studied.

The decrease in plasma concentration of IgG and IgA in patients with gestational malaria shows that immune system may be probably affected by gestational malaria (Figs. 1

Figure 1 : Mean plasma IgG levels in 250 pregnancies complicated by malaria (hatched bars) and in 120 normal pregnancies (white bars),

and 2). However, there was a slight increase in IgM levels in malaria patients when compared with the controls (Tables 1) and this increase in the plasma level of IgM may be attributed to humoral immunity. Immunoglobulins have been shown to have a protective role in blocking the penetration of merozoites in red blood cells as they are directed against parasite surface antigens (8). Immunology can therefore play a significant role

Table 1: Mean values of plasma total protein and immunoglobulins in women with Gestational malaria and Normal pregnant women:

Parameters	Gestational Age				
	21-24	25-28	29-32	33-36	37-40
Gestational malaria					
Total Protein (g/dl)	37±2.11	32±4.11	22±0.11	10±2.11	5±0.23
Albumin (g/dl)	28±1.31	24±2.32	18±0.50	16±4.12	8±0.59
IgG (mg/dl)	460±10.10	350±20.14	280±10.14	180±10.22	140±10.12
IgA (mg/dl)	110±12.33	80±5.21	60±14.21	40±3.10	18±0.33
IgM (mg/dl)	320±11.14	280±10.16	200±10.31	220±10.18	210±10.50
Normal pregnant women					
Total Protein (g/dl)	42±3.11	36±3.14	28±4.10	15±4.11	12±5.11
Albumin (g/dl)	30±1.14	26±2.10	22±2.33	18±2.80	14±2.33
IgG (mg/dl)	550±20.21	390±22.15	320±12.50	220±12.41	150±6.11
IgA (mg/dl)	122±10.35	98±10.56	78±15.34	42±4.31	32±5.10
IgM (mg/dl)	280±9.14	250±12.11	230±9.40	180±12.01	120±9.31

Table 2: Urinary Proteins (g/dl) in women with gestational malaria and in normal pregnant women.

Gestational malaria	Normal pregnancy
23.10 ± 0.50	15.32 ± 0.09

Figure 2 : Mean plasma IgA levels in 250 pregnancies complicated by malaria (hatched bars) and in 120 normal pregnancies (white bars),

in the treatment and management of gestational malaria.

The decrease in plasma total protein concentrations (Table 1) found in pregnant women with malaria may be due to the reduction in protein synthesis as a result of the destruction of the cells that are responsible for the synthesis of proteins in the body of these pregnant women by malaria parasites. This finding agree with earlier report that diseases such as chronic infections and autoimmune diseases may lead to reduced protein synthesis (9). Proteins are known to be very important in immune response as they are antibodies.

There was also a marked increased proteinuria in pregnant women with malaria when compared with the values obtained for the controls. Urinary protein value of 23.10 ± 0.50 g/dl was

obtained in gestational malaria. This was significantly higher ($P < 0.05$) that that of the control with the corresponding value of 15.32 ± 0.09 g/dl (Table 2). This increased proteinuria, may account for the reduction in plasma concentrations of proteins in pregnant women with malaria as was obtained in this study. It could therefore be concluded that the estimation of plasma proteins should also be used as diagnostic indices as well as curative in gestational malaria.

REFERENCES

1. Wright JW. Community malaria. *Brit Med Jour* 2004; 4: 49-54.
2. Anderson JR. Parasitic invasion of red cells: In *Mur's Textbook of Pathology*. Edward Arnold Publishers Ltd, 11th ed. 1981; Pg 528-32.
3. World Health Organization. World malaria situation in 1994. *Wkly Epidemiol. Rec* 1997; 72: 269-76.
4. Baron DN, Whicher JT, Lee KE. Plasma protein metabolism. In: *A New Short Textbook of Chemical Pathology*. ELBS, London. 5th Edn. 1989; 91-104.
5. Peters T, Biamonte GT, Dumas BT. Protein (total protein) in serum, urine and cerebrospinal fluid; albumin in serum. In: *Selected Methods of Clinical Chemistry*. WR Faulkner, D Meites, Eds. Washington, D.C., American Association for Clin Chem 1982; 9: 125-32.
6. Whicher JT, Warren C, Chamber RE. Immunochemical assays for immunoglobulins. *Ann Clin Biochem* 1984; 21: 79-91.
7. Shahangian S, Brown PI, Ash, KO. Turbidimetric measurement of total urinary proteins: A revised method. *Am J Clin Pathol* 1984; 81: 651-4.
8. Reeve PA. Malaria treatment in Vanuatu. *New National treatment guideline. Ann Clin Biochem* 1994; 37 (3): 181-8.
9. Bygbjerg LC, Flashes H. Effects of chloroquine on human lymphocyte proliferation. *Tran Soc Tro Med Hyg* 2001; 80: 231-5.