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Proteinuria in Malaria Patients in Minna, Nigeria

EMMANUEL O. OGBADOYI AND FON CHARLES TEMBENG

Department of Biological Sciences, Federal University of Technology, Bosso Road, Minna, Niger State, Nigeria

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ABSTRACT

Persistent severe proteinuria in malaria is an indication of renal involvement, one of the secondary complications of malaria. The level of awareness of this fact in many malaria endemic countries is far from being satisfactory. In order to address this problem, we used the biuret method to estimate the urinary protein concentration of 100 malaria patients attending the Minna general hospital in Northern Nigeria. The student t-test was used in the analysis of the data obtained. The patients were grouped into males and females to see if sex had any effect on proteinuria in malaria. Results obtained showed urinary protein concentrations ranging from 2-46.5 mg/dl with a mean of 12.54± 8.52mg/dl in the malaria patients. These were significantly higher than those of the control population with corresponding values of 2-13.5 mg/dl and 5.03±2.37 mg/dl respectively. There was no significant difference in the degree of proteinuria between males and females. It is suggested that management of malaria patients in endemic areas should go beyond mere administration of anti-malaria drugs to include pathological test.

INTRODUCTION

Several parasitic diseases constitute a major public health problem in the tropics. Among these are leishmaniasis, trypanosomiasis, schistosomiasis and malaria. These and other infectious diseases are by some yet unclear mechanisms known to be associated with glomerulopathy (Velthuysen 1996). Reports of the association of nephrotic syndrome (characterized by proteinuria) with malaria in some endemic countries are available in the literature (Salomon et al. 1975;

Ehrich and Horstmann 1985; Rath et al. 1990; Scherberich 1990; Prakash et al. 1996; Sowunmi 1996). *Falciparum* malaria is recognized as an important factor in the etiology of acute renal failure in parts of India (Prakash et al. 1996). Rui et al. (1998a) observed strong correlation between the concentration of the proinflammatory cytokines, tumor necrosis factor-alpha and interleukin 1-alpha in kidney tubules and the severity of proteinuria in malaria. It is also known that strong correlation exists between intracellular adhesion molecule-1, the ligand leukocyte function antigen-1, complement receptor type 3 and proteinuria in malaria (Rui et al. 1998b).

Malaria is an infection of the blood by the hemoglobin-digesting protozoan parasite, *Plasmodia*, which is transmitted by anopheles mosquitoes. The physiological and ecological patterns of the disease differs, depending on the combination of *Plasmodia* and *Anopheles* of which there are several kinds. The most severe form of the disease is produced by *Plasmodium falciparum* and the *Anopheles gambiae* complex (WHO 1995). With 300-500 million clinical cases and 1-2 million deaths annually, including about 1 million children from Africa alone (WHO 1997), malaria represents the world's greatest public health problem in terms of number of people affected and the levels of morbidity and mortality. Malaria is believed to kill through cerebral malaria, anemia and renal failure (WHO 1995).

Like in many parts of Africa, malaria is endemic in Nigeria and until sustainable control measures are available, malaria remains a life threatening disease in most parts of sub-Saharan Africa. This is despite the fact that there are many antimalarial drugs in the market, some of which are cheap (e.g. chloroquine and fansidar). This can be explained largely by: the grossly inadequate health services which sadly enough is available only to a few, the intense nature of the transmission, and the problem of emerging drug resistant parasites. Under this scenario, it is pertinent to create or raise the level of awareness of all concerned, of the potential risk of complications such as renal dysfunction and consequent possible fatality that might result from untreated malaria or complications of acute malaria. This is intended to among other things, ensure thorough clinical examination and a more careful and better management of malaria patients should they report to health centers. It is for this reason that this study was undertaken in Minna, a small town in North Western Nigeria.

MATERIALS AND METHODS

Urine samples:

Test samples were collected in sterile sample bottles from 100 malaria patients (individuals who tested positive for the parasites and with apparent

clinical features of the disease) with no evidence of other forms of infection, attending the Minna general hospital and the Federal University of Technology, Minna University Clinic. The patients comprised of 39 males and 61 females. Control samples were similarly collected from 63 healthy (no evidence as far as we could tell, of any other form of infection or disease) staff and students of the Federal University of Technology, Minna. The control group comprised of 41 males and 22 females. All urine samples were analyzed on the day of collection.

Measurement of urinary protein:

Biuret reagent was obtained as a kit from Biotech Diagnostic, Suffolk, UK. Urinary protein concentration was determined using routine biuret method.

Data analysis:

The data obtained were analyzed using the student's *t*-test.

RESULTS AND DISCUSSION

Two parameters were considered in the analysis of the data obtained. These were the health status of the study group (health and malaria patients) and sex (male and female). Results obtained showed that the mean urinary protein concentration of the malaria patients was significantly higher ($p<0.05$) than that of the control (healthy) subjects (Tables 1, 2 & 3). The urinary protein concentration of the malaria patients ranged from 2.0-46.5 mg/dl with a mean of 12.54 ± 8.52 mg/dl. The corresponding values for the control group were 2.0-13.5 mg/dl and 5.03 ± 2.37 mg/dl respectively. No significant difference ($p>0.05$) was observed in the urinary protein concentration of males and females, irrespective of whether they were malaria patients or healthy individuals (Tables 4 and 5).

Table 1. Urinary protein concentration in healthy individuals (HI) versus malaria patients (MP).

	Number of cases	Mean protein concentration (mg/dl)	SD	SE
HI	63	5.03	2.37	0.30
MP	100	12.54	8.52	0.85

Probability=0.000 at 95% confidence interval.

Table 2. Urinary protein concentration in healthy males (HM) versus male malaria patients (MMP).

	Number of cases	Mean protein concentration (mg/dl)	SD	SE
HM	41	4.89	2.96	0.31
MMP	39	13.77	8.11	1.30

Probability=0.000 at 95% confidence interval.

Table 3. Urinary protein concentration in healthy females (HF) versus female malaria patients (FMP).

	Number of cases	Mean protein concentration (mg/dl)	SD	SE
HF	22	5.30	3.01	0.64
FMP	61	11.75	8.75	1.1

Probability=0.000 at 95% confidence interval.

The urinary protein levels of the malaria patients as observed in this study are very disturbing when compared with the <15.0 mg/dl per day which is considered normal and considering the fact that urine samples analyzed in this study were collected once from the patients and not over a 24-hour period (we had extreme difficulty in getting the patients to provide their urine samples over 24-hour period). Moreover, the biuret method is relatively a less sensitive method. Although the mean urinary protein concentration of the malaria patients was 12.54 mg/dl, 30% of the patients had values well over the 15.0 mg/dl limit while 22% had values of 13-15 mg/dl (data not shown). We believe that the urine samples of the later when collected over a 24-hour period will also contain more than the acceptable limit of 15.0 mg/dl. It is therefore possible that about 52% of the patients had pathological cases of proteinuria. About 5% of the patients had what we considered severe proteinuria with urinary protein concentrations of 27.0 mg/dl, 36.5 mg/dl, 38.5 mg/dl, 46.5 mg/dl and 46.5 mg/dl. These may represent chronic cases in individuals who have not had adequate treatment over a prolonged period of infection and the observed effect might be a cumulative effect which could lead to renal dysfunction. Inadequate treatment of malaria over time is a common occurrence in many parts of rural Africa and even among the urban population. In the urban areas, the problem arises mainly from self-medication where unskilled personnel's in medicine stores scattered around the towns administer the self-prescribed drugs to the patients. In many instances too,

prescription and medication may be obtained from qualified medical personnel's but many a patient would fail to take the drugs as prescribed without supervision (which is almost always unavailable). In the rural areas, patients are usually left with no option but to use local herbs with all the attendant problems.

Table 4. Urinary protein concentration in healthy males (HM) versus healthy females (HF).

	Number of cases	Mean protein concentration (mg/dl)	SD	SE
HM	41	4.89	2.96	0.31
HF	22	5.30	3.01	0.64

Probability=0.57 at 95% confidence interval.

Table 5. Urinary protein concentration in male (MMP) versus female malaria patients (FMP).

	Number of cases	Mean protein concentration (mg/dl)	SD	SE
MMP	39	13.77	8.11	1.3
FMP	61	11.75	8.75	1.1

Probability=0.24 at 95% confidence interval.

The two highest urinary protein concentrations of 46.5 mg/dl were obtained from female patients and of the 100 malaria patients, 61 were females. Whether these have any gender implication is an open question.

It has been reported that nephritic syndrome and chronic renal failure occur on a larger scale in the tropics than in the temperate areas (Chug and Sakhuja 1990). This may not be unconnected with parasitic diseases prevalent in tropical areas and not so in the temperate areas. Although reports have it that renal disorder in Plasmodium falciparum infection is transient, cases of persistent glomerulonephritis are also known (Boonpaucknavig and Sitprija 1979). We therefore suggest that management of all clinical cases of malaria reported in hospitals and health center should go beyond the mere administration of antimalarial drugs to include a thorough pathological examination, bearing in mind that a good number of those that report in hospitals or health centers are very likely to be chronic patients. A simple estimation of urinary protein may help prevent renal failure and consequent death.

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