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The Prevalence of Microalbuminuria among Hypertensive Patients Attending University of Nigeria Teaching Hospital (UNTH) Enugu Clinics.

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Abstract: ***Objective****: To determine the prevalence of microalbuminuria among patients with essential hypertension and its relationship with age of the patient, prevailing blood pressure and duration of illness.* ***Methods****: One hundred patients with essential hypertension attending clinics of the University of Nigeria Teaching Hospital, Ituku-Ozalla, in Enugu State, Southeast Nigeria who gave their informed consent, participated in the study. Their random urine samples were analyzed. Samples that gave positive test result for overt proteinuria as well as those negative for both microalbuminuria and proteinuria were noted. Standard method was used to assay for microalbumin in the rest of the samples.* ***Results****: Out of the one hundred patients, 24 (24%). 54 (54%) and 22 (22%) had overt proteinuria, neither overt proteinuria nor microalbuminuria and microalbuminuria respectively. There was no significant difference among these three groups in their mean ages, Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) and Duration of illness. The rate of excretion of albumin did not correlate significantly with the blood pressure, age or duration of illness.* ***Conclusion****: A 22% prevalence rate of microalbuminuria recorded in this study is thought to be high since the patients were on drug treatment that was expected to reduce the figure. Frequent screening of patients of essential hypertension is indicated in order to prevent hypertensive nephropathy.*
Key words*: end-stage renal failure, hypertension, Microalbuminuria, proteinuria.*

I. Introduction

Blood pressure is the force exerted by the blood against any unit area of the vessel wall.[1] A constant blood pressure is important for the steady delivery of oxygen and nutrients to the tissues, especially the brain and the heart and for the effective removal of waste products by the lungs and kidneys.

Hypertension is a condition in which the blood pressure is chronically elevated above levels considered desirable or healthy for the person's age and size. Its pathogenic basis ranges from an excess of arterial vasoconstriction to a predominance of volume with intermediate forms in which relative excess of both components may overlap and jointly contribute to the development of hypertension.

Hypertension has been identified as the most common cardiovascular disease among Africans and its incidence is said to be on the increase due to rapid changes in lifestyle and environmental factors. [2] Hypertension does not always lead to complications in many patients and the associated sequalae could be seen in normotensives.[3] Appearance of complications in hypertension is affected by co-existence of other risk factors such as diabetes mellitus. However, long term elevation in blood pressure is associated with end stage organ damage, such as kidney, heart and brain damage. [4] Hypertension can be a cause or consequence of renal disease and it is one of the most important risk factors for the progressive loss of renal function in patients with intrinsic renal disease and in the elderly.[5]

It causes injury to arteriolar wall leading to increased permeability of the smaller vessels to proteins.[6] Increased blood pressure directly affects the glomeruli by extending preglomerular afferent vessels so that more blood is forced into the glomerulus leading to glomerular hypertension and glomerulosclerosis thus increasing the permeability of the glomeruli to albumin.

Microalbuminuria is a subtle increase in the urinary output of protein that can not be detected by the conventional assay methods.[7] Because of its size, albumin is the first plasma protein to be detected in increased amounts 30-300mg/dl in urine when there is injury to the kidneys.[8] It is proposed as an

atherosclerotic risk factor,[9] and it is associated with endothelial dysfunction, impaired regulation of renal haemodynamics and increased complications such as cardiac and retinal complications in essential hypertension.[8]

Microalbuminuria is a feature of sub-clinical nephropathy and is associated with changes in systemic vascular permeability in a variety of conditions hence its use as predictor of glomerular and cardiovascular damage.[8,10] Studies have shown that microalbuminuria is potentially reversible when patients are placed on correct antihypertensive therapy.[11] This necessitates the determination of its prevalence in a population of hypertensive patients attending the University of Nigeria Teaching Hospital, (UNTH), Ituku-Ozalla clinics.

II. Materials and Methods

One hundred registered hypertensive patients of the University of Nigeria Teaching Hospital, Ituku-Ozalla, in Enugu State of Southeast Nigeria, were randomly recruited for this study. They were on combined anti-hypertensive therapy with Aspirin, Nifidepine, Frusemide and Felodipine as the mainline drugs. These drugs are not known to affect protein excretion. Without drug treatment, their diastolic and systolic blood pressure readings were repeatedly above 90mmHg and 140mmHg respectively. The Ethical Committee of the hospital approved the study protocol and informed consent was obtained from all patients.

Measurements of their demographic and anthropometric parameters were taken and their blood pressure readings as measured on the day of sample collection were recorded.

Samples were tested for overt proteinuria using albustix dipstick method. Samples that tested positive at this stage and those that tested negative for both overt proteinuria and microalbuminuria were noted. The rest were analyzed within 48 hours of sample collection for microalbumin using the method of Pasce and Strande.[12] Samples were stored at 4-8^{0}C until analyzed.

For statistical analyses, the patients were grouped into four; those that showed overt proteinuria, those with microalbuminuria, those negative for both proteinuria and microalbuminuria and lastly all the subjects together. Analysis of variance (ANOVA) statistics was used to compare the mean values of the groups and Pearsons correlation analyses were used to determine the relationship between the protein values, age, blood pressure and duration of illness.

III. Results

One hundred patients were studied. Out of this number, 24, (24%) had proteinuria, 54 (54%) had neither proteinuria nor microalbuminuria and 22 (22%) had microalbuminuria. The mean blood pressure, age and duration of illness differed between the three groups of patients, (those with proteinuria, those with neither proteinuria nor microalbuminuria and those with microalbuminuria), but the differences were not statistically significant, ($p>0.05$), (Table 1). Their mean systolic blood pressure was higher than 140mmHg and most of them had been ill for less than 9 years, (Tables 1, 2). More of the patients, especially among those with proteinuria, (75%), had raised systolic blood pressure, >140mmHg, (Tables 1, 2). Similarly, more of the patients, especially among those with neither proteinuria nor microalbuminuria, (74.5%), had their diastolic blood pressure lower than 90mmHg, (Tables 1, 2). Most of the patients were aged above 54 years, (68%) and may have been sick for less than 5 years, especially among patients with microalbuminuria, (68.2%), (Tables 1, 2).

The mean microalbumin value obtained for the group with microalbuminuria was 25.22 ± 3.79mg/dl with a range of 13.8 – 30 mg/dl. As at the time of sample collection equal numbers of patients in this group had their systolic blood pressure less than or higher than 140mmHg, while a greater percentage had their diastolic blood pressure lower than 90mmHg, 54.5%, (Table 2). As stated above, most of them had been ill for les than 5 years. Microalbumin concentration did not correlate significantly with the blood pressure, age or duration of illness, ($p>0.05$).

IV. Discussions.

The prevalence of microalbuminuria among patients of essential hypertension seen in the University of Nigeria Teaching Hospital was 22%. A similar figure, 23%, was reported by Agewell *et al* [13] among hypertensive patients under treatment. Also Hitha *et al*, [14] reported a prevalence of 26.67% among patients with essential hypertension. Some workers have reported higher values than these. Jalal *et al*,[15] Sharan *et al*,[16] and Poudel *et al* [17] reported prevalence rates of 37.5%, 63%, and 51.88% respectively. Odili,[18] reported a prevalence rate of 41%; males 32.7% and females 48.2%, in Port Harcourt Nigeria. In a study done on adolescent and young offsprings of hypertensive Nigerian adults, Ibadin *et al*,[19] reported a prevalence of 19%. Some of these workers, however, studied patients who were not on antihypertensive therapy or used 24 hour urine collection and for analysis used test strip.[18] These could yield higher values than the random urine sample collected from patients under treatment used in the present study.

Some other workers have also reported lower figures than 22%. Pontremoli *et al*, [20] Bacanu et al, [21]and Palatini *et al* [22] reported 6.7%, 15%, and 6.1% respectively. They were able to exclude patients with urinary tract infection by urine culture; a condition that is known to influence urinary albumin excretion. Reported figures for the prevalence of microalbuminuria among patients of essential hypertension may, therefore, differ with the design of the experiment and the presence of complicating factors such as urinary tract infection. An additional factor to consider is racial/ethnic differences. There have been reports that blacks have greater odds compared with whites in the prevalence and incidence of microalbuminuria.[23,24] The studies were, however, done on diabetics but reasons adduced for the differences include socioeconomic disparities, [25] disparities in access to health care,[26,27] uncontrolled hypertension,[25] and possible biologic or genetic differences.[28] These could apply equally to hypertensive patients. A prevalence of 22% recorded in this study is thought to be high considering the fact that the patients were on drug treatment at the time of sample collection.

In this study, the patients with microalbuminuria did not show any outstanding characteristics, except perhaps in the duration of illness, that could be used in differentiating them from the general population of hypertensive patients. Prevailing blood pressure and even duration of illness did not count as determining factors in the occurrence of microalbuminuria as shown by the correlation analyses. However, microalbuminuria was more prevalent early in the course of the illness (1 – 4 years) than later (≥ 5years) and more of the subjects with microalbuminuria had their DBP >90mmHg and equal number of them had SBP less and higher than 140mmHg (Table 2). The condition could, therefore, exist in hypertensive patients even while they were under therapeutic blood pressure control.

Clinical proteinuria was associated with higher SBP and lower DBP than microalbuminuria (Table 1). Subjects with neither proteinuria nor microalbuminuria had lowest blood pressure readings suggesting the benefit of blood pressure control in the prevention of renal complications of hypertension, (Table 1).

Therefore, in the absence of any other clinical criterion for the diagnosis of this condition in essential hypertension, regular laboratory screening for microalbuminuria could be used to detect incipient microalbuminuria and prevent nephropathy in essential hypertension.

V. Conclusion.

Prevalence rate of microalbuminuria recorded in this study is thought to be high and indicates predisposition to severe renal damage. Since microalbuminuria is the first indicator of renal involvement in essential hypertension,[28] and the condition can be reversed by appropriate drug treatment,[27] it is recommended that regular laboratory screening of patients should be introduced into the care of this group of patients in Nigeria in order to detect and reverse early glomerular damage.

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TABLE 1: Mean (±SD) of parameters of subjects used for the study.

	SBP. (mmHg).	**DBP. (mmHg).**	**Age. (years).**	**Duration of illness. (years).**	**Microalb. (mg/dl).**
All Subjects. (n = 100).	144.4±28.50 (100 - 255)	85.22±14.71 (60 – 140)	58.09±10.85 (35 - 78)	6.48±6.47 (1 - 28)	25.22±3.79 (13.8 - 30)
Neg. for Proteinuria and Microalb. (n = 54)	140.1± 28.0 (100 – 213)	82.64±3.88 (60 – 120)	56.69±10.81 (35 – 86)	5.67±5.62 (1 – 27)	
Pos. Proteinuria. (n = 24)	156.1±30.14 (112 – 255)	87.70±16.54 (67 – 140)	59.96±10.98 (27 – 77)	9.21±7.90 (1 – 25)	
Pos. Microalbuminuria. (n = 22)	147.4±35.44 (100 – 202)	90.77±18.06 (60 – 119)	59.23±10.68 (39 – 78)	5.27±6.2 (1 – 28)	25.22±3.79 (13.8 - 30)
ANOVA.	NS	NS	NS	NS	

Table 2: Showing percentage of subjects with particular clinical characteristic (number of subjects in bracket)

Parameters	**All subjects (100)**	**Male subjects (54)**	**Female subjects (46)**	**Subject with microalbuminuria (22)**
SBP(mmHg)				
< 140	46 (46)	48.9 (26)	25 (11)	50 (11)
> 140	54 (54)	51.1 (28)	75 (35)	50 (11)
DBP (mmHg)				
< 90	67 (67)	74.5 (40)	54.2 (25)	54.5 (12)
> 90	33 (33)	25.5 (14)	45.8 (21)	45.5 (10)
Age (years)				
35 - 44	10 (10)	11.1 (6)	4.1 (2)	9.0 (2)
45 - 54	22 (22)	24.1 (13)	20.9 (10)	18.2 (4)
55 - 64	38 (38)	38.9 (21)	41.7 (19)	36.4 (8)
≥ 65	30 (30)	25.9 (14)	33 (15)	36.4 (8)
Duration(years)				
1 – 4	53 (53)	55.6 (30)	37.0 (17)	68.2 (15)
5 – 10	22 (22)	24.1 (13)	29.2 (13)	13.6 (3)
>10	25 (25)	20.3 (11)	33.3 (16)	18.2 (4)