

# Male Erectile Dysfunction and Microalbuminuria in Adult Nigerians with Essential Hypertension

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## Abstract

**Background:** Microalbuminuria has been described as a marker of generalized vascular damage. **Aims:** The aim of the present study was to determine the prevalence of erectile dysfunction (ED) and microalbuminuria in adult male Nigerians with newly diagnosed hypertension. We also evaluated the relations between ED and microalbuminuria, electrocardiographic left ventricular hypertrophy, serum lipids, and cigarette smoking. **Materials and Methods:** A total of 81 male adult Nigerians with newly diagnosed hypertension were recruited into the study. There were also 75 age- and sex-matched healthy normotensive controls. ED was evaluated using a standardized questionnaire of the International Index of Erectile Function and microalbuminuria was determined using the Micra Test strips (Boehringer Mannheim GMBh, Mannheim, Germany). **Results:** Eighty-one hypertensive patients and 75 normotensive controls were studied. Mean age of the patients and the controls was  $53.8 \pm 5.6$  and  $51.2 \pm 7.1$  respectively. ED was found in 32.1% of the hypertensive patients and 16% of normotensive controls ( $P < 0.001$ ). The prevalence of microalbuminuria was significantly higher in patients with ED than in those without it (65.4% vs. 23.6%,  $P < 0.0001$ ). **Conclusion:** The study shows that ED and microalbuminuria are common in male adult Nigerians with hypertension. It also demonstrates that male ED is associated with an increased risk of cardiovascular disease.

**Keywords:** Erectile dysfunction, Hypertension, Left ventricular hypertrophy, Microalbuminuria

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## Introduction

Hypertension (HT) is a common cardiovascular disease globally and it causes significant morbidity and mortality. HT affects about one-fifth of adult Nigerians.<sup>[1-4]</sup> It is a risk factor for erectile dysfunction (ED) in men. Many studies have reported a higher prevalence of ED in hypertensive individuals compared with normotensive individuals.<sup>[5-7]</sup> ED is defined as the persistent inability to achieve and/or maintained penile erection sufficient for sexual intercourse.<sup>[6]</sup> Male ED is associated with markers for increased risk

of cardiovascular disease. Microalbuminuria (MA) is an important predictor of cardiovascular risk and complications in hypertensives.<sup>[8-10]</sup> MA has been described as a marker of generalized vascular damage. HT plays an important role in endothelial damage which may affect the nitric oxide production and/or release leading to ED.<sup>[11-13]</sup>

There are few Nigerian studies on male ED and HT. Our study focused on ED and MA in newly diagnosed adult male Nigerian hypertensives. The primary objective was to determine the prevalence of MA and ED in newly diagnosed hypertensive Nigerians. In addition, we also evaluated the relations between ED and MA and some other cardiovascular risk factors in essential HT.

## Materials and Methods

The study was conducted at the cardiology clinic of a tertiary referral hospital in Nigeria. The study population consisted of 81 newly diagnosed adult

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male Nigerian hypertensive patients. The study was done in newly diagnosed hypertensive patients who were yet to commence antihypertensive drugs. There were 75 age- and sex-matched healthy normotensive controls. The study protocol was approved by the Ethics and Research Committee of the study center. All the participants gave informed consent and the procedures followed were consistent with institutional guidelines. Individuals with diabetes mellitus, renal disease, endocrine disorder, heart failure, liver disease, prostatic enlargement, psychiatric illness, obesity, and proteinuria were excluded from the study.

All the participants underwent a detailed history and a thorough physical examination. History of alcohol ingestion and cigarette smoking was included. Blood pressure was measured using mercury column sphygmomanometer and cuff of appropriate size. A standardized protocol was followed, in which systolic blood pressure (SBP) and diastolic blood pressures (DBP) were measured on the left arm after the participants had been seated for at least 5 min. Three measurements were done at least 5 min apart and the mean value was used for the study. HT was defined as SBP  $\geq$  140 mmHg and/or DBP  $\geq$  90 mmHg, or use of antihypertensive drugs.<sup>[1]</sup> General as well as specific examination of the external genitals for local abnormalities and digital rectal examination for prostatic enlargement were conducted. Venous blood samples were collected and analyzed for fasting plasma glucose (FPG), serum total cholesterol (TC), and serum triglyceride (TG). Resting 12-lead electrocardiogram (ECG) of all the patients and controls were recorded using Schiller AT-1 machine at a sensitivity of 10 mm/mV and a paper speed of 25 mm/sec. ECG left ventricular hypertrophy (LVH) was diagnosed based on standard ECG criteria.<sup>[14-16]</sup>

ED was evaluated using a standardized questionnaire of the International Index of Erectile Function (IIEF).<sup>[17-19,5]</sup> We used an "inform-then-probe" approach, whereby the participants were generously assured that their ED (if present) was not an uncommon condition. The questionnaire was administered by the researchers. The IIEF has been proved to be a reliable and widely used test to define sexual function.<sup>[17,20,21]</sup> The IIEF consists of 14 questions on several aspects of sexual function. ED is graded as severe (6-10 points), moderate (11-16 points), mild (17-25 points), and none (26-30 points).<sup>[17]</sup>

MA was determined using the Micra Test strips (Boehringer Mannheim, Mannheim, Germany). This dipstick has been found to be a fast, accurate, and relatively, the cheapest way to screen patients for the presence of MA.<sup>[22,23]</sup> There are four color blocks on the test strip corresponding to negative (or 0), 20, 50, and 100 mg/l of albumin. The test was done on three consecutive

first morning-voided urine samples collected at 3 weeks' intervals. MA was considered to be present when two of the three urine samples tested produce a reaction color corresponding to 20 mg/l or more. The mean value of the MA was also recorded for each participant.

### Statistical study

The data entry and analysis was done in SPSS software version 16.0. Data were reported as means and standard deviation (SD) and percentages. Statistical analyses were done using the Student's *t*-test and Chi-square to compare means and proportions respectively. *P* < 0.05 was considered as significant.

## Results

Eighty-one newly diagnosed hypertensive patients and 75 normotensive controls were studied. The mean age of the patients and the controls was  $53.8 \pm 5.6$  and  $51.2 \pm 7.1$  respectively. The other characteristics of the patients and the controls are described in Table 1. ED was found in 32.1% of hypertensive patients and 16% of normotensive controls and the difference was statistically significant (<0.001). Among the hypertensive patients, there was a significant difference between the mean age of those with ED and those without ED ( $54.2 \pm 8.5$  vs.  $49.2 \pm 6.8$ , *P* = 0.02). The prevalence of MA was significantly higher in patients with ED (65.4%) than in those without ED (23.6%) (*P* < 0.001). Hypertensive patients with ED were significantly more likely to have ECG LVH than their counterparts without ED (*P* < 0.001). The other characteristics and features of hypertensive patients with ED compared with hypertensive patients without ED are shown in Table 2. When hypertensive patients

**Table 1: Characteristics of hypertensive patients and the controls**

Characteristics	Patients (n=81)	Controls (n=75)	P value
Mean age (year)	53.8 $\pm$ 5.6	51.2 $\pm$ 7.1	0.56
Mean SBP (mmHg)	170.7 $\pm$ 8.6	121.2 $\pm$ 6.9	<0.001
Mean DBP (mmHg)	109.4 $\pm$ 7.7	82.9 $\pm$ 5.8	0.01
MA (%)	30 (37.0)	5 (6.7)	<0.001
ECG LVH (%)	22 (27.2)	3 (4.0)	<0.001
Mean TC (mmol/l)	4.47 $\pm$ 0.72	3.42 $\pm$ 0.38	0.001
Mean LDL-c (mmol/l)	3.25 $\pm$ 0.29	2.88 $\pm$ 0.32	0.03
Mean HDL-c (mmol/l)	1.18 $\pm$ 0.20	1.20 $\pm$ 0.17	0.24
Mean TG (mmol/l)	1.31 $\pm$ 0.17	1.26 $\pm$ 0.19	0.68
Alcohol consumption (yes) (%)	12 (14.8)	10 (13.3)	0.82
Cigarette smoking (yes) (%)	9 (11.1)	4 (5.3)	0.01
ED (%)	26 (32.1)	12 (16)	<0.001

SBP: Systolic blood pressure; DBP: Diastolic blood pressure, MA: Microalbuminuria; ECG LVH: Electrocardiography left ventricular hypertrophy; TC: Total cholesterol; LDL-c: Low density lipoprotein cholesterol; HDL-c: High density lipoprotein cholesterol; TG: Triglycerides; ED: Erectile dysfunction

with ED are divided into two subsets based on the presence or otherwise of MA, and then compared, the results obtained are shown in Table 3: The means of SBP ( $P = 0.04$ ), DBP ( $P = 0.02$ ), ECG LVH ( $P < 0.001$ ), serum TC ( $P = 0.1$ ), serum LDL-c ( $P = 0.001$ ) were significantly higher in those with MA than their counterparts without MA. Multiple regression analysis showed that ED was independently associated with MA, ECG LVH, age, DBP, and cigarette smoking.

### Discussion

Our study demonstrated a higher prevalence of ED in hypertensive patients than in normotensive individuals (32.1% vs. 16.0%). This finding is consistent with reports from previous studies in Nigeria.<sup>[5,24]</sup> However, the prevalence of ED is lower than findings in some Caucasian studies.<sup>[6,7,21]</sup> For instance, Aranda *et al.*<sup>[6]</sup> reported a prevalence of ED among hypertensive patients of 46% in Spain where patients with diabetes mellitus were included in the study. In this study, diabetes mellitus was an exclusion criterion and only newly diagnosed hypertensive patients were used. Thus, the difference in prevalence may be due to study methodology including the selection of patients.

Hypertensive patients with ED have significantly higher cardiovascular risk factors when compared to their counterparts without ED and to the normotensive controls. This is consistent with findings in previous studies.<sup>[5,21]</sup> These cardiovascular factors have been implicated in the pathogenesis of ED in HBP.<sup>[25,26]</sup> MA was found in 37% of the hypertensive patients as

against 6.7% in the controls. This finding is higher than that of Akinsola *et al.* who reported 17.4% prevalence of MA in HT. The difference may be attributed to patient selection as we recruited hypertensive patients who had never been treated previously for the study. Treatment of HBP with antihypertensive medications, particularly angiotensin-converting-enzyme (ACE) inhibitors, has been found to improve MA.<sup>[27]</sup> In our study, MA, a cardiovascular risk factor and marker of endothelial damage, is also significantly more common in hypertensives with ED than in hypertensives without ED. That is, patients with ED are more likely to have endothelial damage and dysfunction than their counterparts without ED. The study also revealed that ED may also be related to cardiac damage as significantly more hypertensive patients with ED have ECG LVH.

ED is often a sentinel manifestation of damage to the vascular endothelium.<sup>[28-30]</sup> The main link between ED and cardiovascular disease is the vascular endothelium, which has a fundamental role in the regulation of circulation. The formation of nitric oxide is a fundamental link between the endothelium and ED.<sup>[25]</sup> Nitric oxide is produced in the endothelial cells by nitric oxide synthase. Its release stimulates the relaxation of smooth muscle cells of the corpus cavernosum. Thus, once the ability to generate nitric oxide has been compromised, ED may ensue.<sup>[25]</sup> The study shows that MA and ED might represent different variables with a common pathological process such as vascular damage. This hypothesis is consistent with the finding of Pedrinelli *et al.*<sup>[31]</sup> who reported that MA was strongly associated with C-reactive protein (CRP) which is an evidence of subclinical inflammation. CRP is also a cardiovascular risk factor and predicts cardiovascular prognosis independent of conventional risk factors.<sup>[32]</sup>

**Table 2: Characteristics of hypertensive patients with and without erectile dysfunction**

Characteristics	Patients with ED (n=26)	Patients without ED (n=55)	P value
Mean age (year)	54.2±8.5	49.2±6.8	0.02
Mean SBP (mmHg)	178.4±12.8	174.6±9.7	0.07
Mean DBP (mmHg)	104.8±7.1	99.2±8.3	0.04
MA (%)	17 (65.4)	13 (23.6)	<0.001
ECG LVH (%)	12 (46.2)	10 (18.2)	<0.001
Mean TC (mmol/l)	4.46±0.58	4.28±0.64	0.21
Mean LDL-c (mmol/l)	3.48±0.49	2.80±0.52	0.01
Mean HDL-c (mmol/l)	1.26±0.18	1.27±0.21	0.82
Mean TG (mmol/l)	1.29±0.19	1.30±0.22	0.74
Alcohol consumption (yes) (%)	4 (15.4)	8 (14.5)	0.78
Cigarette smoking (yes) (%)	5 (19.2)	4 (7.3)	0.001

SBP: Systolic blood pressure; DBP: Diastolic blood pressure; MA: Microalbuminuria; ECG LVH: Electrocardiography left ventricular hypertrophy; TC: Total cholesterol; LDL-c: Low density lipoprotein cholesterol; HDL-c: High density lipoprotein cholesterol; TG: Triglycerides; ED: Erectile dysfunction

**Table 3: Characteristics of hypertensive patients with erectile dysfunction with and without microalbuminuria**

Characteristics	ED with MA (n=17) (%)	ED without MA (n=9) (%)	P value
Mean age (year)	52.9±7.2	48.3±8.4	0.34
Mean SBP (mmHg)	174.9±9.5	165.0±7.9	0.04
Mean DBP (mmHg)	107.4±6.8	98.4±8.1	0.02
ECG LVH	9 (52.9)	3 (33.3)	<0.001
Mean TC (mmol/l)	4.86±0.64	4.42±0.48	0.01
Mean LDL-c (mmol/l)	3.99±0.49	3.42±0.43	0.001
Mean HDL-c (mmol/l)	1.22±0.20	1.31±0.18	0.07
Mean TG (mmol/l)	1.32±0.35	1.35±0.40	0.65
Alcohol consumption (yes)	1 (5.9)	3 (3.3)	0.08
Cigarette smoking (yes)	4 (2.4)	1 (1.1)	0.01

SBP: Systolic blood pressure; DBP: Diastolic blood pressure; MA: Microalbuminuria; ECG LVH: Electrocardiography left ventricular hypertrophy; TC: Total cholesterol; LDL-c: Low density lipoprotein cholesterol; HDL-c: High density lipoprotein cholesterol; TG: Triglycerides; ED: Erectile dysfunction



Thus, vascular damage with possible atherosclerosis and the resultant inadequate blood flow to the erectile tissue might cause ED.

There are conflicting reports on the role of cigarette smoking in the etio-pathogenesis of ED. Moreira *et al.*<sup>[33]</sup> showed a 2.5-fold increased risk of ED among smokers in contrast to the study by Doumas *et al.*<sup>[21]</sup> and the Massachusetts Male Aging Study<sup>[34]</sup> where smoking was found not to be associated with ED. This notwithstanding, long-term cigarette smoking is a major risk factor for vasculogenic ED because of its effects on the vascular endothelium.<sup>[34]</sup> Cigarette smoking decreases the nitric oxide synthase activity in the penis. It also causes nicotine-induced vasoconstriction of the cavernous smooth muscle.<sup>[34]</sup> In our study, patients with ED were significantly more likely to be cigarette smokers than those without ED. This is consistent with the report of a Nigerian study by Opadijo.<sup>[5]</sup> The effect of alcohol on penile erection depends on the volume and the duration of consumption. Although small quantities of alcohol may improve erection and enhance libido, large amounts result in central sedation, depression of libido, and ED.<sup>[35]</sup> Polyneuropathy from chronic alcoholic intake may also cause or worsen ED.<sup>[35,36]</sup> In our study, we found no association between alcohol ingestion and ED. However, one of the limitations of the study is that the alcohol ingestion was not quantified.

## Conclusion

The study reveals that both ED and MA are common in adult male Nigerians with HT. It also points out that male ED in hypertensive patients is associated with MA and the subsets with either or both have increased risk of cardiovascular disease. Cigarette smoking, a major risk factor for atherosclerosis and cardiovascular disease, is also associated with ED. With a somewhat common pathological process of vascular damage between ED and MA, it could be expected that antihypertensive drugs, particularly ACE-inhibitors and angiotensin-receptor blockers, that improve MA might have some impact on ED. This hypothesis is yet to be proven and may become a focus of research in the future.

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