

# Prevalence of microalbuminuria in newly diagnosed hypertensives in a tertiary hospital setting, using a semi-quantitative screening tool

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## Abstract

Microalbuminuria, a subtle increase in the urinary excretion of albumin that cannot be detected by the conventional urinalysis method, is an early marker of cardiovascular complications and increased cardiovascular risk in hypertension. The prevalence of microalbuminuria (MAU) is prone to modification by factors such as age, race, and severity of the disease process and presence of co-morbid factors. In view of this, a range of rates abound from various studies. In addition the methodologies of evaluation of MAU also contribute to the observed differences in prevalence reported in literature. Due to the challenges of 24-hour urine estimation, albumin excretion rate (AER) methods using spot urine has gained wide clinical acceptance. In our environment however, AER methods are not in widespread routine use and patients are still assessed by conventional dipsticks for urinalysis with the consequence outcome of not identifying patients with MAU. In this study, we evaluated sixty-four newly diagnosed hypertensives for MAU using a semi-quantitative urine test strip based on the immunoassay principle (ChemstripMicral™-Roche). The prevalence of MAU was 47% in our study and these subjects had all been evaluated with the conventional urine dipsticks. Of our study subjects, only a third was on reno-protective medications such as angiotensin-converting enzyme inhibitors. These findings indicate the need for the introduction of screening for MAU using these types of strips in lieu of the current conventional urinalysis in the assessment of hypertensives. This can be used for stratification of the patients to allow for subsequent AER evaluation in those detected as having MAU by this screening tool. This is important as it will guide treatment choices for the patients, especially given the challenges of cost in our resource-poor environment.

**Keywords:** Hypertension, Albuminuria, Albumin excretion rate, Dipstick, Cardiovascular disease

## INTRODUCTION

Proteinuria, majorly in the form of albuminuria has been associated with adverse clinical outcomes. Overt albuminuria, macroalbuminuria, or proteinuria is defined as a urinary albumin excretion of  $\geq 300$  mg/24 h and this usually, can be detected by routine urinalysis using the conventional dipsticks. Microalbuminuria (MAU), defined as persistent elevation in levels of albumin ranging from  $>30$  to  $<300$  mg in a 24-h urine collection cannot be detected by the usual urinalysis strips as these levels fall

below the detection limit of these strips. MAU is a marker of endothelial dysfunction and widely accepted as a predictor of renal decline in patients with hypertension, risk of cardiovascular mortality, cerebrovascular disease and peripheral artery disease. (Chugh and Bakris, 2007; Weir, 2007). Studies have also shown that the presence of microalbuminuria predicts all-cause mortality in the general population in addition to those with concomitant hypertension where the relative risk is much higher.

(Jager et al., 1999; Romundstad et al., 2003). Epidemiological studies are fraught with various figures

by evaluating the renal function assessment at the time of initial presentation at the clinic, as documented in the Nwegbu et al. 011

on the prevalence of albuminuria in essential hypertension. Factors believed to give rise to differences in documented rates include different methodologies of assessment for albuminuria, different patient profiles, duration of hypertension and therapeutic modules. (Basi et al., 2008) In Nigeria, documented prevalence rates range from 22% (Ogbu et al., 2013) to 41%. (Odili, 2008)

The evaluation of microalbuminuria is best done by a 24-hour urine collection due to diurnal variations in albumin excretion principally due to variations in urine concentration caused by hydration levels. (American Diabetes Association: Standards of medical care in diabetes. 2005). However just like other assessment procedures requiring 24-hour urine collection, it is prone to errors arising from adequacy of urine collection. (Ogbu et al., 2013).

In a measure to handle these challenges, the concept of urinary albumin excretion rate (AER) was introduced and is evaluated via concurrent urinary creatinine measurement, using spot collection, in the form of urinary albumin-to-creatinine ratio (ACR). (K/DOQI clinical practice guidelines for chronic kidney disease, 2002). Whereas precise methods to quantify urinary albumin excretion rates (AERs) are desirable and recommended in studies of MAU, urinary dipsticks are acceptable for quick screening, oftentimes as a prelude to the former. (Ogbu et al., 2013). It is important to note that in our environment, evaluation of patients for microalbuminuria using AER methods like ACR are not routinely done and therefore makes it more imperative that a simple method of screening these patients which require little or no expertise be employed. Those detected as having MAU, by this simple urinalysis screening process, can subsequently, be evaluated further by more precise AER procedures.

In this study we evaluated newly diagnosed patients categorized as having essential hypertension, for MAU using the MicralStrip™ which is a semi-quantitative urinary dipstick for microalbuminuria detection.

## MATERIAL AND METHODS

The study was conducted on patients aged 25-65 years attending the cardiology clinic of the Internal Medicine Department of University of Abuja Teaching Hospital (UATH) between January 2012 and September 2012.

Inclusion criteria were diagnosis of hypertension not exceeding the preceding six (6) months and clinical classification of diagnosis as essential hypertension. Exclusion criteria included first time diagnosis of hypertension later than 6 months, clinical diagnosis of secondary hypertension, co-morbid conditions such as diabetes mellitus and an estimated glomerular filtration rate (eGFR) less than 60mls/min. The eGFR was gotten

patient's case folder and was derived using the Modification of Diet in Renal Disease (MDRD) equation.

Consecutive sampling on clinic days was applied until the sample size was achieved. Ethical clearance was obtained from the hospital's Health Research Ethics Committee.

Informed consent was gotten from the study subjects before commencement of the study procedures. A short semi-structured questionnaire was administered to the subjects in order to garner socio demographic data, note ongoing treatment modalities outside of those on the case folder and additionally identify any subjects who might have been under treatment elsewhere prior to presenting at UATH.

Blood pressure readings comprising the initial recording at the first clinic presentation and the average of the blood pressure readings in the last three months were retrieved from the subject's medical records.

Weight and height were measured and the body mass index (BMI) calculated. Each study subject provided a morning mid-stream urine specimen for analysis for MAU using a semi-quantitative urine test strip based on antibody-colloidal gold conjugate immunoassay principle (Chemstrip Micral™-Roche). Four categories of results are available from the strip; 0(neg), 20, 50 and 100mg/L.

## RESULTS

A total of seventy subjects were initially assessed but six of them had eGFR of less than 60mls/min and were excluded from the recruitment process.

Of the sixty-four subjects recruited, there were 36 males and 28 females. Forty-two percent of the subjects were in the 50-59 years age bracket (table 1)

The mean BMI of the study subjects was 26.3kg/m<sup>2</sup> and the greatest frequency of distribution was noted in the overweight (25-29.9kg/m<sup>2</sup>) category. The mean BMI was higher amongst the females (27.1kg/m<sup>2</sup>) compared to the males (25.5kg/m<sup>2</sup>). The prevalence of obesity as defined by BMI was about 20% while a third of the subjects had normal BMI (Table 2).

The mean (±SD) systolic and diastolic blood pressures were 152.8 ± 11.2 and 94.8 ± 6.36 respectively. MAU was observed in 47.3% of the subjects and about two-thirds of these affected subjects were in the 20mg/L range, while the remainder were in the 50mg/L range of MAU. None of the subjects with MAU was detected in the 100mg/L range. Amongst the subjects detected with MAU, 60% of them were in the 50-59 years age range.

Of all the study subjects, 87.5% were currently on anti-hypertensive medications but only a third of them were on angiotensin-converting enzyme (ACE) inhibitors. Most of those who were not on ACE inhibitors despite it being part of their combination therapy, alluded to cost as the

reason. The subjects who were not on any antihypertensive therapy at the time of the study, gave 012 Int. Res. J. Basic Clin. Stud.

**Table 1:** Microalbuminuria vs age distribution of subjects

| Age (years) | Frequency | Percentage (%) |
|-------------|-----------|----------------|
| 20-29       | 3         | 4.7            |
| 30-39       | 7         | 10.9           |
| 40-49       | 16        | 25             |
| 50-59       | 27        | 42.2           |
| ≥ 60        | 11        | 17.2           |

**Table 2:** Prevalence of Obesity by BMI

| BMI Category | Frequency (N) | Percentage (%) |
|--------------|---------------|----------------|
| 18-24.9      | 22            | 34.4           |
| 25-29.9      | 29            | 45.3           |
| ≥ 30         | 13            | 20.3           |

varied reasons; four subjects adduced to financial constraints, three stated that they (on their own) were trying dietary management prior to commencing the prescribed drugs while one candidate stated that he skips his medications sometimes following “good” readings gotten from his home blood pressure monitoring devices.

There was no statistically significant relationship between the BMI and MAU categories ( $p= 0.625$ ) and likewise non was noted between eGFR and MAU.

## DISCUSSION

Findings from our study showed a high prevalence (47%) of MAU in these newly diagnosed hypertensives. This prevalent rate is higher than other reports such as 22% (Ogbu et al., 2013), 23% (Agewall et al., 1993), 26.6% (Hitha et al., 2008) but much closer to the findings of the study by Odili and Poudel who reported 41% (Odili, 2008) and 52% (Poudel et al., 2012) respectively. It also needs to be stated also, that levels as high as 63% have been reported in essential hypertensives (Sharan et al., 2011). Whereas most of these other studies utilized AER methods for their analyses, our study was semi-quantitative raising the likelihood of bias in comparison, given effects of hydration on non-AER based analysis. However it is imperative to also highlight that high prevalence rate data like ours cannot be discountenanced as some of the earlier studies of AER were conducted with imprecise, oftentimes turbidimetric methods which are less sensitive than immunoassays and nephelometric methods. These suggest that earlier studies might have under-reported the rates.

The finding that despite the high rate of MAU amongst these subjects, only about a third of these patients were

on reno-protective medications such as ACE inhibitors is worrisome. It is important to note that documentations from the case folders showed that 76% of the subjects in this study, had ACE inhibitors as part of their treatment regimen. The inclusion of ACE inhibitors is most likely empirical given that the urinalysis results, using conventional dipsticks, were all negative for the subjects. It was instructive that as noted most of these subjects were not on the ACE inhibitors and that was because, as many claimed, it was not the “main” drug for reducing their blood pressure and as such in the presence of decision influenced by cost, drugs such as calcium channel blockers are preferentially bought. Most studies in sub-Saharan Africa have implicated cost as one of the major contributors to non-adherence to antihypertensive therapy. (Kabir et al., 2004; Harries et al., 2005).

However it is important to state that proper patient education by physicians on treatment regimens and relevance of given drugs can lead to improved adherence even in the presence of cost issues. (Brown et al., 2011). There is no gainsaying the fact that this education will be buoyed by empirical evidence; for example a simple screening test for MAU will help to make informed decisions on further management processes. In our study, none of the subjects had any assessment for MAU given the ineffectiveness of conventional urinalysis to detect same.

In our study, the highest prevalence of MAU was found in the 50-59years age group. This is in contrast to the usual finding wherein MAU increases with age and expectedly would be commoner in the group of subjects ≥60years. This is most likely because the former age group constituted the bulk of the participants in the study (42%).

The ancillary finding of lack of association between BMI and MAU is similar to other reports. (Thoenes et al., 2009; Chowta et al., 2009; Sibal et al., 2006). In addition,

no association was also noted between the eGFR and MAU and this is similar to the report of (Basi et al., 2008). However it can be inferred that the categorization of MAU into four static zones due to the semi-quantitative evaluation we used, makes the establishment of such association and correlation a tenuous one.

## CONCLUSION

Microalbuminuria has a high prevalence amongst newly diagnosed hypertensives and is often unascertained at the clinic presentation because the commonly requested conventional urinalysis does not detect it. Given its role as an independent risk factor for CVD and the fact that AER evaluation is not routinely requested in our environment, it will be beneficial for physicians to include or even substitute the routine urinalysis using conventional dipsticks with MAU identifying strips. This will help with patient stratification for subsequent precise AER evaluation and also help to guide antihypertensive therapy given the challenge of affordability in our environment.

## Limitations of the study

In this study, we utilized only a single urine specimen for MAU assessment instead of the recommended three(3) samples over a one week period to eliminate the variability of albumin excretion. In addition, the eGFR used as an inclusion/exclusion criterion was calculated using the MDRD equation which unfortunately is not based on locally generated accuracy of creatinine assays but on reference intervals in the diagnostic kit inserts.

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