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Original Research Article

# Microalbuminuria and Its Clinical Importance in Essential Hypertension: A One-Year Cross-Sectional Study

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**Abstract:**

**Background:** Microalbuminuria is an early marker of renal and systemic vascular involvement in essential hypertension. This study evaluated the prevalence of microalbuminuria and its association with clinical profile and target-organ complications in patients with essential hypertension.

**Methods:** This hospital-based cross-sectional study included 100 patients with essential hypertension admitted to the medical wards of BRIMS Bidar, during 1 April 2024 to 31 March 2025. Hypertension was diagnosed using JNC VII criteria. Twenty-four-hour urinary albumin excretion was measured by an immunoturbidimetric assay. Clinical examination, blood pressure measurement, biochemical investigations, fundus examination, ECG, echocardiography and, where indicated, CT brain were performed. Associations between microalbuminuria and clinical/target-organ variables were assessed using the statistical tests reported in the source study.

**Results:** Microalbuminuria was present in 48 of 100 patients (48%). Patients with microalbuminuria were older than those with normoalbuminuria (59.65±11.49 vs 54.12±11.18 years; p=0.017), had a longer duration of hypertension (11.06±5.24 vs 4.12±2.22 years; p<0.001), and higher systolic blood pressure (169.9±29.49 vs 150.6±18.10 mmHg; p<0.001). Diastolic blood pressure was not significantly different (99.38±13.89 vs 94.54±14.49 mmHg; p=0.92). Total cholesterol and serum creatinine were higher in the microalbuminuric group (211.1±30.36 vs 178.7±13.68 mg/dL, p<0.001; and 1.10±0.32 vs 0.97±0.27 mg/dL, p=0.030, respectively). Microalbuminuria was significantly associated with hypertensive retinopathy, left ventricular hypertrophy and cerebrovascular disease; the source study also reported a significant association with ischemic heart disease.

**Conclusion:** In this study, microalbuminuria was common among patients with essential hypertension and was associated with longer disease duration, greater systolic blood pressure, higher cholesterol and creatinine levels, and target-organ damage. Routine assessment of urinary albumin excretion may help identify hypertensive patients with a higher burden of vascular complications.

**Keywords:** Essential hypertension; Microalbuminuria; Urinary albumin excretion; Target-organ damage; Retinopathy; Left ventricular hypertrophy.

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## Introduction

Essential hypertension is a major public health problem and is frequently asymptomatic until target-organ damage becomes established. Persistent elevation of arterial pressure contributes to cerebrovascular, cardiac, retinal and renal complications. Microalbuminuria has emerged as an early marker of target-organ damage and may reflect generalized vascular endothelial dysfunction rather than isolated renal injury.

Previous studies cited in the source dissertation reported variable prevalence of microalbuminuria among patients with essential hypertension. Microalbuminuria has also been associated with cardiovascular disease, hypertensive retinopathy, left ventricular hypertrophy and cerebrovascular disease. Early recognition may therefore identify patients who require closer assessment of cardiovascular and renal risk.

The present study was undertaken to determine the prevalence of microalbuminuria in patients with essential hypertension and to study its correlation with the clinical profile and complications of essential hypertension.

**Aims and Objectives**

1. To determine the prevalence of microalbuminuria in patients with essential hypertension.
2. To study the correlation of microalbuminuria with the clinical profile and complications of essential hypertension.

**Materials and Methods**

**Study Design and Setting:** A hospital-based cross-sectional study was conducted in patients with essential hypertension admitted to the medical wards of BRIMS Bidar, during the one-year period from 1 April 2024 to 31 March 2025. A total of 100 patients satisfying the study selection criteria were included.

**Case Definition and Selection:** Essential hypertension was diagnosed clinically and classified according to the JNC VII criteria. Stage I hypertension was defined as systolic blood pressure 140–159 mmHg or diastolic blood pressure 90–99 mmHg, and stage II as systolic blood pressure ≥160 mmHg or diastolic blood pressure ≥100 mmHg. Patients receiving antihypertensive medication were also considered hypertensive. Blood pressure was assessed using repeated measurements as described in the source protocol, and secondary hypertension was excluded by clinical examination and appropriate investigations.

Inclusion criterion: patients with essential hypertension admitted to the medical wards BRIMS Bidar. Exclusion criteria: diabetes mellitus, secondary hypertension and pregnancy-induced hypertension.

**Clinical and Laboratory Assessment:** All participants underwent detailed history and examination, including duration of hypertension, previous blood pressure recordings, drug history and symptoms/signs suggestive of target-organ damage. Investigations included complete urine analysis, haemogram, urea, serum creatinine, fasting blood sugar, serum electrolytes and fasting lipid profile. ECG, echocardiography, chest radiography, fundus examination and CT brain when indicated were also performed.

Twenty-four-hour urinary albumin excretion was measured by immunoturbidimetric assay. Microalbuminuria was defined in the source study as urinary albumin excretion of 30–300 mg/day; values below this range were considered normoalbuminuria for the study analysis. Fundus examination assessed hypertensive retinopathy using the Keith-Wagener-Barker classification. Left ventricular hypertrophy was assessed using ECG criteria and confirmed by echocardiography. Ischemic heart disease was considered on the basis of previous history and/or ECG evidence of ischemia/infarction/dysrhythmia.

**Statistical Analysis:** Data were collected, tabulated and analyzed using the statistical approach reported in the dissertation. Continuous variables were summarized as mean±standard deviation and categorical variables as frequencies and percentages. Student's t-test was used for comparisons of continuous variables and chi-square testing for categorical associations, with $p<0.05$ considered statistically significant. Reported p-values are reproduced from the source study; no new statistical calculations have been added.

**Ethics Statement:** The source dissertation documents participation of human subjects but a specific institutional ethics committee approval number/date was not identifiable in the supplied material. Before submission, the authors must insert the correct ethics committee approval statement and approval/reference number if available. The journal requires an ethics-committee statement for human research and may request documentary evidence of approval.

**Results**

The study included 100 patients with essential hypertension. The mean age was 56.77±11.61 years, mean duration of hypertension was 7.55±5.29 years, mean systolic blood pressure was 159.2±24.27 mmHg, mean diastolic blood pressure was 96.86±14.34 mmHg, mean fasting blood sugar was 99.68±8.51 mg/dL, mean serum creatinine was 1.03 mg/dL, and mean total cholesterol was 193.8±25.68 mg/dL.

Microalbuminuria was present in 48 patients (48%), while 52 patients (52%) had normoalbuminuria. The microalbuminuric group had a higher mean age, longer duration of hypertension and higher systolic blood pressure than the normoalbuminuric group. The difference in diastolic blood pressure was not statistically significant.

There were 64 males and 36 females. Microalbuminuria was present in 32 males (50%) and 16 females (44.4%), with no significant association with sex ($\chi^2=0.285$, $p=0.594$). Stage II hypertension showed a substantially higher proportion of microalbuminuria than stage I hypertension (69.56% vs 29.62%; $\chi^2=15.871$, $p<0.001$).

The prevalence of microalbuminuria increased with duration of hypertension: 11.1% in those with disease duration <1 year, 10.3% at 1–5 years, 68.9% at 6–10 years, and 100% at 11–15 years and >15 years. The source study reported this association as statistically significant ($p<0.001$).

Hypertensive retinopathy showed a graded association with microalbuminuria. Microalbuminuria was present in 46.88% of grade I, 96% of grade II, and 100% of grade III and grade IV retinopathy cases ($\chi^2=64.185$, $p<0.001$). Left

ventricular hypertrophy was present in 49 patients; 42 (85.7%) of these were microalbuminuric compared with 7 (14.3%) normoalbuminuric ($\chi^2$=54.751, p<0.001). Among patients with a history of stroke/TIA, 17 of 20 (85%) were microalbuminuric compared with 31 of 80 (38.75%) without such history ($\chi^2$=13.711, p<0.001). Ischemic heart disease was reported in 23 patients, of whom 15 (65.22%) had microalbuminuria. Serum total cholesterol was significantly higher in the microalbuminuric group (211.1±30.36 vs 178.7±13.68 mg/dL; p<0.001), as was serum creatinine (1.10±0.32 vs 0.97±0.27 mg/dL; p=0.030).

**Table 1: Clinico-demographic and biochemical profile according to albuminuria status.**

| Variable | Microalbuminuria (n=48) | Normoalbuminuria (n=52) | p value |
|---|---|---|---|
| Age, years | 59.65±11.49 | 54.12±11.18 | 0.017 |
| Duration of hypertension, years | 11.06±5.24 | 4.12±2.22 | <0.001 |
| Systolic BP, mmHg | 169.9±29.49 | 150.6±18.10 | <0.001 |
| Diastolic BP, mmHg | 99.38±13.89 | 94.54±14.49 | 0.92 |
| Serum creatinine, mg/dL | 1.10±0.32 | 0.97±0.27 | 0.030 |
| Total cholesterol, mg/dL | 211.1±30.36 | 178.7±13.68 | <0.001 |

**Table 2: Microalbuminuria according to severity and duration of hypertension.**

| Severity / duration | Microalbuminuria n (%) | Normoalbuminuria n (%) | Total |
|---|---|---|---|
| Stage I hypertension | 16 (29.62) | 38 (70.37) | 54 |
| Stage II hypertension | 32 (69.56) | 14 (30.43) | 46 |
| Duration <1 year | 1 (11.1) | 8 (88.9) | 9 |
| Duration 1–5 years | 4 (10.3) | 35 (89.7) | 39 |
| Duration 6–10 years | 20 (68.9) | 9 (31.1) | 29 |
| Duration 11–15 years | 16 (100) | 0 | 16 |
| Duration >15 years | 7 (100) | 0 | 7 |

**Table 3: Microalbuminuria in relation to target-organ damage.**

| Target-organ variable | Microalbuminuria n (%) | Normoalbuminuria n (%) | Total |
|---|---|---|---|
| Normal fundus | 0 (0) | 34 (100) | 34 |
| Grade I retinopathy | 15 (46.88) | 17 (53.12) | 32 |
| Grade II retinopathy | 24 (96) | 1 (4) | 25 |
| Grade III retinopathy | 7 (100) | 0 | 7 |
| Grade IV retinopathy | 2 (100) | 0 | 2 |
| LVH present | 42 (85.7) | 7 (14.3) | 49 |
| History of IHD | 15 (65.22) | 8 (34.78) | 23 |
| History of stroke/TIA | 17 (85) | 3 (15) | 20 |

## Discussion

The present study found microalbuminuria in 48% of patients with essential hypertension. This prevalence was higher than several studies cited in the original dissertation, where reported prevalence ranged approximately from 4.7% to 46%. The source authors suggested that the use of a 24-hour urine collection rather than an overnight collection may have contributed to the higher prevalence.

Microalbuminuria was associated with older age, longer duration of hypertension and higher systolic blood pressure. The association with systolic rather than diastolic pressure is clinically relevant because cumulative systolic pressure load may contribute substantially to glomerular and systemic vascular injury. The strong relationship with duration of hypertension also supports microalbuminuria as a marker of cumulative vascular burden.

The association with hypertensive retinopathy, LVH and cerebrovascular disease was marked. In particular, the increasing proportion of microalbuminuria across retinopathy grades supports the concept that urinary albumin leakage may reflect generalized vascular endothelial injury. The high prevalence of microalbuminuria among patients with LVH and prior stroke/TIA further supports its role as a marker of target-organ involvement.

Microalbuminuric patients also had higher serum cholesterol and creatinine. These findings are consistent with the interpretation that increased urinary albumin excretion accompanies a broader adverse cardiovascular and renal risk profile. However, because the study is cross-sectional, these associations should not be interpreted as proof that microalbuminuria causes target-organ damage or predicts future events. The findings should be interpreted in the context of the study's limitations,

including the single-centre hospital-based design, relatively small sample size, cross-sectional nature, and the absence of longitudinal outcome assessment. The source dissertation also does not provide a clearly identifiable ethics approval number in the supplied text, which must be verified before submission.

## Conclusion

Microalbuminuria was present in 48% of patients with essential hypertension in this one-year cross-sectional study. It was significantly associated with older age, longer duration of hypertension, higher systolic blood pressure, higher serum cholesterol and creatinine, hypertensive retinopathy, left ventricular hypertrophy and cerebrovascular disease. Microalbuminuria may therefore serve as a useful marker for identifying hypertensive patients with a greater burden of target-organ damage. Prospective studies with larger samples are required to determine its ability to predict progression of renal disease and future cardiovascular events.

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