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Original Research Article

A Study on the Prevalence of Microalbuminuria in Newly Detected Hypertensive Patients and its Association with Systolic Blood Pressure (SBP) and Pulse Pressure (PP)

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Conflict of interest: Nil

Abstract

Introduction: One of the main risk factors for cardiovascular morbidity and mortality and renal dysfunction is Hypertension, which is a serious global health concern. Early on, the illness is frequently asymptomatic, but it is linked to gradual harm to important organs such as the brain, retina, kidneys, and heart. Preventation of long term complications requires early detection of hypertension and diagnosis of subclinical organ damage.

Aims: To detect the Presence and levels of Micro albumin in urine (Spot Urine ACR 30-300) in newly detected Hypertensive patients (>=140/90mm of Hg) and its association with Systolic Blood Pressure(SBP) and Pulse Pressure(PP) attending Out Patient Department(OPD) and admitted in Indoor patient Department (IPD) of Medicine Dept. Of COMJNM&H. Kalyani Nadia, West Bengal.

Materials & Methods: The study was designed as an observational cross-sectional study and was conducted in the Department of Medicine, JNM College of Medicine, West Bengal, over a period of one year, from December 2019 to December 2020, with a total sample size of 124 patients.

Result: In our study, The mean ± SD of pulse pressure was 59.05 ± 9.46 mmHg in patients without microalbuminuria and 70.77 ± 12.52 mmHg in those with microalbuminuria, showing a statistically significant difference ($P < 0.0001$).

Conclusion: In our study, microalbuminuria was present in 21% of newly diagnosed hypertensive patients, most commonly in the 41–50-year age group, with a male preponderance but no significant gender difference. It showed strong associations with smoking, elevated pulse pressure, impaired fasting blood sugar, and abnormal ECG findings, indicating early target organ involvement. These findings emphasize the importance of routine screening for microalbuminuria in newly diagnosed hypertension for early risk assessment and prevention of cardiovascular morbidity.

Keywords: Microalbuminuria, SBP, ACR, Cardiovascular Risk And Renal Dysfunction.

Introduction

Hypertension is one of the established risk factors for cardiovascular mortality and morbidity. Early on the illness is frequently asymptomatic but in the long term uncontrolled Hypertension causes harm to important organs such as brain, retina, kidneys, heart. Prevention of long term complications of Hypertension requires early diagnosis of the subclinical target organ damage. Among numerous indicators, microalbuminuria has emerged as an important predictor of both renal and cardiovascular risk [1].An early sign of renal endothelial dysfunction is microalbuminuria, which is characterized by urinary albumin excretion of 30–300 mg/day or an albumin-to-creatinine ratio (ACR) of 30–300 mg/g in spot urine [2]. It denotes increased glomerular basement membrane permeability, which frequently happens as a result of chronically elevated blood pressure and vascular damage. Microalbuminuria has been found to be an independent risk factor for myocardial

infarction, stroke, and cardiovascular death in addition to being a sign of renal disease [3]. Therefore, it is essential to detect microalbuminuria in newly diagnosed Hypertensive patients in order to intervene promptly. Microalbuminuria and Hypertension have a complex interaction. Increased renal vascular pressure and endothelial damage are largely caused by elevated systolic blood pressure (SBP) and widening pulse pressure (PP) in particular [4].Compared to diastolic blood pressure (DBP), SBP is thought to be a more reliable indicator of cardiovascular and renal problems. Additionally, arterial stiffness and vascular age are reflected in pulse pressure, which is the difference between systolic and diastolic pressures. These factors also lead to microvascular injury and albuminuria [5]. Evaluating the relationship between microalbuminuria, systolic blood pressure (SBP), and pulse pressure (PP) provides valuable insights into early hypertensive end-organ damage. Several epidemiological studies have shown that microalbuminuria is common among individuals with hypertension, with prevalence rates ranging from 15% to 40%, depending on the study population, urine collection methods, and presence of comorbidities such as diabetes or obesity. This study aims to assess the presence and levels of microalbuminuria (defined as spot urine ACR 30–300 mg/g) in newly diagnosed hypertensive patients (SBP ≥140 mmHg and/or DBP ≥90 mmHg), and to examine its association with SBP and PP. The study population includes patients attending the Outpatient Department (OPD) and those admitted to the Inpatient Department (IPD) of the Department of Medicine at COMJNM&H, Kalyani, Nadia, West Bengal.

Materials and Methods

Type of study: Observational cross sectional study

Place of study: Department of medicine, JNM college of medicine, West Bengal.

Study Duration: From December 2019 to December 2020.

Sample Size: 124 Hypertensivepatients.

Inclusion Criteria

All Newly Detected Hypertensive Patients who gave informed Consent for the study.

Exclusion Criteria

- On Anti-Hypertensive Medications.
- Known case of Type 2 (T2) DM
- Known case of CKD, AKI, Hematuria, any bladder Pathology.
- Urinary Tract Infections (UTI), any acute febrile illness.
- After strenuous exercise.
- Pregnant and Menstruating Female.

Study Variables

- Age
- Sex
- Microalbuminuria status
- Urine ACR
- Systolic Blood Pressure
- FBS
- ECG findings

Statistical Analysis: Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages.

Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

Result

Table 1: Association between Age in group: Microalbuminuria

Age in group	Absent	Present	Total	P-value
≤40	15(15.3%)	4(15.4%)	19(15.3%)	0.0323
41-50	41(41.8%)	3(11.5%)	44(35.5%)	
51-60	30(30.6%)	12(46.2%)	42(33.9%)	
61-70	11(11.2%)	7(26.9%)	18(14.5%)	
71-80	1(1%)	0(0%)	1(100%)	
Total	98(100%)	26(100%)	124(100%)	

Table 2: Association between Sex: Microalbuminuria

Sex	Absent	Present	Total	P-value
Female	47(48%)	10(38.5%)	57(46.0%)	0.3876
Male	51(52%)	16(61.5%)	67(54.0%)	
Total	98(100%)	26(100%)	124(100%)	

Table 3: Association between Smoking: Microalbuminuria

Smoking	Absent	Present	Total	P-value
No	66(67.3%)	12(46.2%)	78(62.9%)	0.0467
Yes	32(32.7%)	14(53.8%)	46(37.1%)	
Total	98(100%)	26(100%)	124(100%)	

Table 4: Association between ECG Findings: Microalbuminuria

ECG Findings	Absent	Present	Total	P-value
LVH	0(0%)	11(42.3%)	11(8.9%)	<0.0001
LVH, T↓	0(0%)	2(7.7%)	2(1.6%)	
SB	5(5.1%)	1(3.8%)	6(4.8%)	
ST↓, T↓	3(3.1%)	1(3.8%)	4(3.2%)	
T↓	13(13.3%)	6(23.1%)	19(15.3%)	
WNL	77(78.6%)	5(19.2%)	82(66.1%)	
Total	98(100%)	26(100%)	124(100%)	

Table 5: Distribution of mean SBP,DBP, FBS,TLC andPulse Pressure: Microalbuminuria

		Number	Mean	SD	Minimum	Maximum	Median	p- value
SBP	Absent	98	150.418	6.5957	140	168	150	<0.0001
	Present	26	164.308	12.1943	146	186	166	
DBP	Absent	98	91.3673	6.7814	30	100	92	0.114
	Present	26	93.5385	2.8458	90	100	94	
FBS	Absent	98	93.7653	7.8515	68	112	94	<0.0001
	Present	26	110.192	10.5679	90	125	111	
TLC	Absent	98	6968.37	1258.593	4600	10600	7200	0.1275
	Present	26	7400	1336.563	4600	9600	7400	
Pulse Pressure	Absent	98	69.5918	4.2689	62	84	68	<0.0001
	Present	26	77.8846	8.5057	62	88	80	

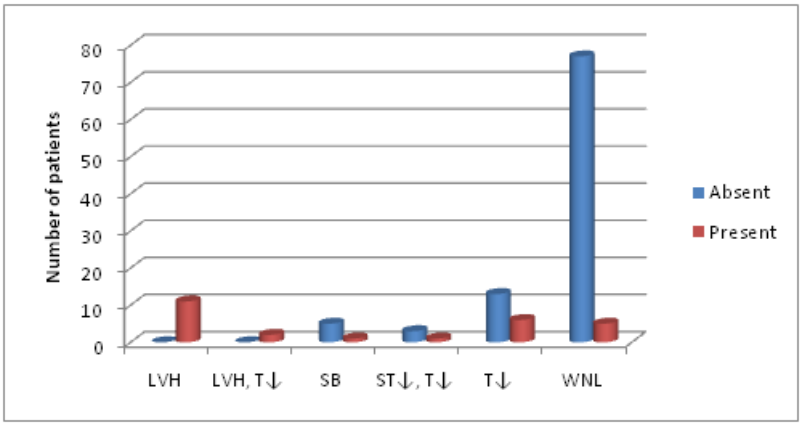

Figure 1: Association between ECG Findings: Microalbuminuria

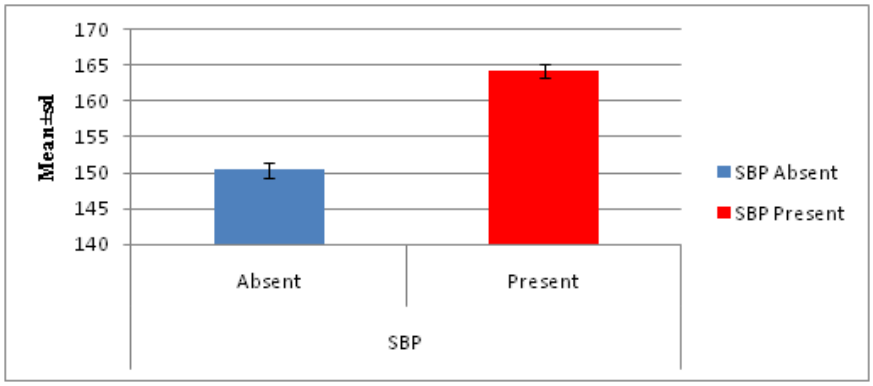

Figure 2: Distribution of mean SBP: Microalbuminuria

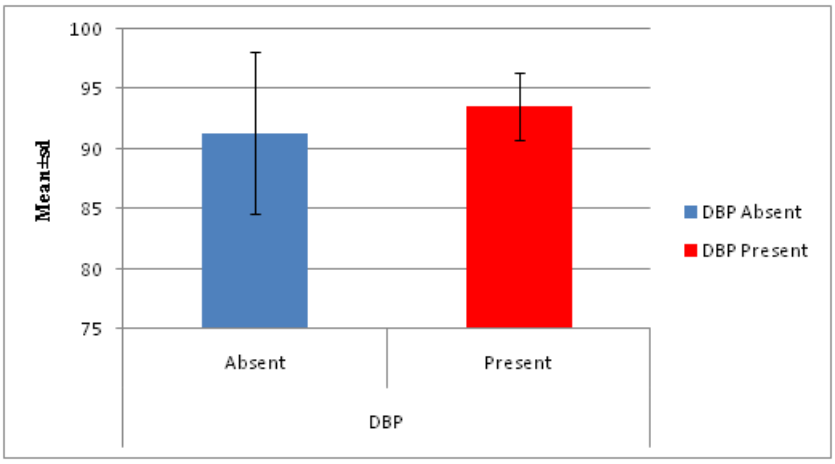

Figure 3: Distribution of mean DBP: Microalbuminuria

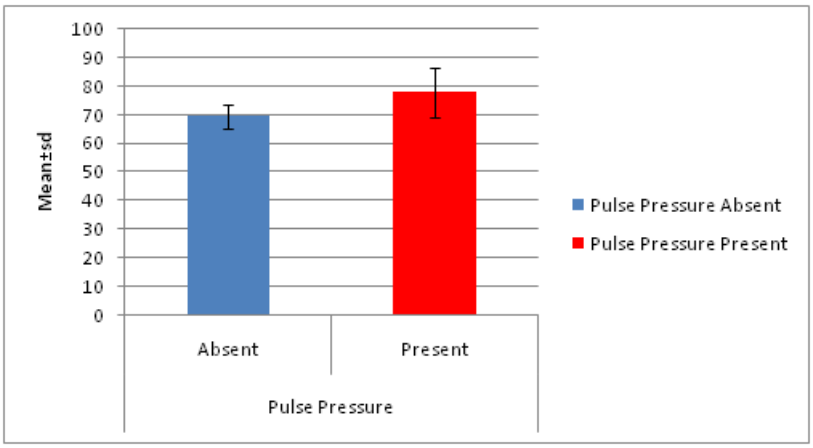

Figure 4: Distribution of mean Pulse Pressure: Microalbuminuria

In our study, among patients without microalbuminuria, 15 patients (15.3%) were aged ≤40 years, 41 patients (41.8%) were 41–50 years, 30 patients (30.6%) were 51–60 years, 11 patients (11.2%) were 61–70 years, and 1 patient (1%) was 71–80 years. In the microalbuminuria group, 4 patients (15.4%) were ≤40 years, 3 patients (11.5%) were 41–50 years, 12 patients (46.2%) were 51–60 years, 7 patients (26.9%) were 61–70 years, and none (0%) were 71–80 years. The age distribution between the groups was statistically significant (P = 0.0323). In our study, among patients without microalbuminuria, 47 patients (48%) were female and 51 patients (52%) were male. In with microalbuminuria group, 10 patients (38.5%) were female and 16 patients (61.5%) were male. The difference in sex distribution between the groups was not statistically significant (P = 0.3876). In our study, among patients without microalbuminuria, 66 (67.3%) were non-smokers and 32 (32.7%) were smokers, whereas in the microalbuminuria group, 12 (46.2%) were non-smokers and 14 (53.8%) were smokers, and it was statistically significant (p = 0.0467).In our study, among patients without microalbuminuria, ECG findings were within normal limits in 77 patients (78.6%), T-wave changes in 13 patients (13.3%), ST↓/T↓ changes in 3 patients (3.1%), and sinus bradycardia in 5 patients (5.1%); none of the patients had LVH or LVH with T↓. In the microalbuminuria group, 11 patients (42.3%) had LVH, 2 patients (7.7%) had LVH with T↓, 6 patients (23.1%) had T-wave changes, 1 patient (3.8%) had ST↓/T↓, 1 patient (3.8%) had sinus bradycardia, and 5 patients (19.2%) were within normal limits. The difference in ECG findings between the groups was highly significant (P < 0.0001). In our study, systolic blood pressure (SBP) in patients without microalbuminuria was 150.42 ± 6.60 mmHg, while in the microalbuminuria group it was 164.31 ± 12.19 mmHg, showing a statistically significant difference (P < 0.0001). The mean ± SD of diastolic blood pressure (DBP) was 91.37 ± 6.78 mmHg in the absent group and 93.54 ± 2.85 mmHg in the present group, which was not statistically significant (P = 0.114). Fasting blood sugar (FBS) was significantly higher in the microalbuminuria group, with a mean ± SD of 110.19 ± 10.57 mg/dL compared to 93.77 ± 7.85 mg/dL in patients without microalbuminuria (P < 0.0001). Total leukocyte count (TLC) was 6968.37 ± 1258.59 /mm³ in the absent group and 7400 ± 1336.56 /mm³ in the present group, with no statistically significant difference (P = 0.1275).In

our study the mean pulse pressure was 69.59 ± 4.27 mmHg in the without microalbuminuria group and 77.88 ± 8.51 mmHg in the microalbuminuria group, with a highly significant ($p < 0.0001$).

Discussion

In our study, out of 124 patients most of the patients were 41-50 years old [44 (35.5%)] but this was not statistically significant (p=0.0323).In similar study by Reddy NL et al [6] (2022) showed that individuals aged 41–50 comprised a significant portion of patients with microalbuminuria, though the association was not statistically significant.

We found that, male population was higher [67 (54.0%)] than the female population [57 (46.0%)]. Male: Female ratio was 1.1:1 but this was not statistically significant (p=0.3876).In other study by Khan TM et al [7] (2022) observed that higher frequency of microalbuminuria among males, although with variable significance across subgroups and also Pointer MA et al [8] (2015) showed that males were more likely than females to develop microalbuminuria in prediabetes, being 2.5 times more likely despite comparable glycemic status.

We found that, smoking was significantly more common in with microalbuminuria group, seen in 14 patients (53.8%), compared to 32 patients (32.7%) in the without microalbuminuria group, and it was statistically significant ($p = 0.0467$).

We observed that ECG within WNL was highest in patients without microalbuminuria group seen in 77 patients (78.6%), and it was much lower in the with microalbuminuria group, observed in only 5 patients (19.2%). This difference was highly significant ($P < 0.0001$).In other study by Shi Yet al [9] (2022) observed that patients with albuminuria had nearly double the frequency of abnormal ECG patterns compared to those without albuminuria (62% vs 31%).

We found that the systolic blood pressure (SBP) was higher in the microalbuminuria group (164.31 ± 12.19 mmHg) compared to those without microalbuminuria (150.42 ± 6.60 mmHg), showing a highly significant difference ($P < 0.0001$). The diastolic blood pressure (DBP) was also slightly higher in the microalbuminuria group (93.54 ± 2.85 mmHg) than in the absent group (91.37 ± 6.78 mmHg), though not statistically significant ($P = 0.114$). Fasting blood sugar (FBS) was significantly higher in the microalbuminuria group (110.19 ± 10.57 mg/dL) compared to the absent group (93.77 ± 7.85 mg/dL) ($P < 0.0001$). Total leukocyte count (TLC) was also higher in the microalbuminuria group (7400 ± 1336.56 /mm³) than in those without microalbuminuria (6968.37 ± 1258.59 /mm³), but the difference was not statistically significant ($P = 0.1275$).Pulse pressure was significantly higher in the microalbuminuria group (77.88 ± 8.51 mmHg) compared to the without microalbuminuria group (69.59 ± 4.27 mmHg), and this difference was highly significant ($p < 0.0001$).In similar study by Hellemons ME et al [10] (2011) observed that microalbuminuria was strongly associated with systemic inflammation, with elevated leukocyte counts and CRP levels among affected individuals.

Conclusion

We concluded than MAU (Micro albuminuria) was seen in a considerable percentage of newly diagnosed hypertensive patients in our study 26 patients (that is 21%). Pulse pressure was more in MAU than without MAU ptsas also impaired fasting blood sugar levels. Microalbuminuria was seen in a considerable percentage of newly diagnosed Hypertensive patients in our study; most of these individuals were between the ages of 41 and 50. Although there was a male preponderance, there was no statistically significant gender difference. Microalbuminuria was strong associated with smoking and Microalbuminuria's strong correlation with metabolic and cardiovascular risk factors was demonstrated by the noticeably elevated fasting blood sugar levels in patients with the condition. Pulse pressure and fasting blood sugar levels were more in patients with microalbuminuria compare to patients without microalbuminuria .This group also had a much greater rate of aberrant ECG readings, which suggests early target organ involvement. These results highlight the significance of microalbuminuria as an indicator of cardiovascular morbidity in patients with hypertension. Therefore, for early risk assessment, preventive measures, and improved long-term results, routine screening for microalbuminuria in newly diagnosed Hypertensive patients is essential.

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