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ORIGINAL RESEARCH

Study of prevalence of microalbuminuria in patients of essential hypertension and its correlation with target end organ damage

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Abstract
Introduction: Microalbuminuria in essential hypertension is associated with the increased mortality. Microalbuminuria is the independent risk factor to develop cardiovascular and cerebrovascular diseases. Furthermore, Microalbuminuria has been described as an early sign of kidney damage and a predictor for end stage renal disease and cardiovascular disease.
Aims & objectives: 1:-To study the prevalence of microalbumiuria in patients of essential hypertension. 2:-To study the relationship between microalbuminuria and target end organ damage in essential hypertensive patients: hypertensive retinopathy, left ventricular hypertrophy and cerebrovascular accident.
Materials & methods: This is a cross sectional study conducted over 90 patients of essential hypertension admitted in department of general medicine, R D Gardi medical college and C R Gardi Hospital, Ujjain (M.P) during the period from Jan 18 to June 19 after applying the inclusion and exclusion criteria.
Observation and results: Chi-square test showed that there was significant association between i) abnormality in fundus($p<0.00005$) ii) presence of LVH($p<0.001$) iii) abnormal CT scan of brain ($p=0.02$) with the microalbuminuria. The risk of abnormality of fundus was 4.94 times more, presence of LVH was 7.06 times more and abnormal CT scan of brain was 5.0 times more in patients with microalbuminuria as compared with the patients without microalbuminuria. The risk was significant.
Discussion: 46.7% of the patients had abnormal fundus and the risk of abnormal fundus was 4.94 times more in the patients having microalbuminuria. 18.9% of the patients of had LVH and the risk of LVH was 7.06 times more among the patients having microalbuminuria. 50% of the patients had abnormal CT scan findings and risk of abnormal CT scan of brain was 5 times more in patients having microalbuminuria. Studies conducted by Hitha B *et al* ($p<0.001$), Badiger S ($p=0.011$), Dayal A ($p<0.05$), Agarwal B ($p<0.001$), Yuyun MF ($p<0.001$ for stroke), showed a significant association between target end organ damage with microalbuminuria.
Conclusion: Microalbuminuria was significantly associated with duration and severity of hypertension and target organ failure; left ventricular hypertrophy, retinopathy and cerebrovascular accidents. Therefore measurement of microalbuminuria should be incorporated with in standard management protocols for all patients with hypertension.
Keywords: microalbuminuria, left ventricular hypertrophy, cerebrovascular accident

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Introduction

Hypertension is the growing issues of public health problem of adult population in both developed as well as developing world, affecting single person in every four people. The exact cause for hypertension is difficult to predict because hypertension results from a complex interaction of genes and environmental factors. It has been stated that 40% of hypertension is attributable to genetics. The genes involved in the renin- angiotensin system have been suggested as candidate genes for Essential Hypertension (EH) because they play an important role in the regulation of blood pressure (BP). Essential hypertension produces clinical proteinuria and a significant reduction in renal function in 5–15% of patients.

Microalbuminuria (MA) is defined as an abnormal urinary excretion of albumin between 20–200 μg /min (i.e. 30-300 mg/day), a value below the detection threshold of conventional tests but which can be accurately measured by several widely available sensitive methods (ELISA, RIA, Nephelometry). The study of microalbuminuria in essential hypertension has been of increasing interest in recent years since this abnormality has proved to be a strong predictor of cardiovascular morbidity and mortality. The advent of more sensitive methods to quantitate the urinary albumin excretion (UAE) has revealed higher frequency (25–100%) of microalbuminuria in patients with hypertension than in normotensive population. This wide variability in the incidence of microalbuminuria in these studies may be related to the severity of hypertension, selection criteria, racial difference and in some cases, to smaller number of patients studied. Moreover 25% of patients with End stage renal disease (ESRD) have hypertension as the primary diagnosis. Microalbuminuria in essential hypertension is associated with the increased mortality. Microalbuminuria is the independent risk factor to develop cardiovascular and cerebrovascular diseases. Furthermore, Microalbuminuria has been described as an early sign of kidney damage and a predictor for end stage renal disease and cardiovascular disease.

Cardiovascular risk factors such as age, overweight, diabetes, insulin resistance and dyslipidemia is usually clustered with essential hypertension. Subtle target end organ damage such as left ventricular hypertrophy, microalbuminuria and cognitive dysfunction takes place early in course of hypertension. Though the prevalence of hypertension is high in India, the relationship between microalbuminuria and target end organ damage in hypertension is not well studied. It becomes of paramount importance to study urine albumin excretion and progression of nephropathy in hypertensive patients.

Aims & objectives

1. To study the prevalence of microalbumiuria in patients of essential hypertension.
2. To study the relationship between microalbuminuria and target end organ damage in essential hypertensive patients: hypertensive retinopathy, left ventricular hypertrophy and cerebrovascular accident.

Materials & methods

This is a cross sectional study conducted over 90 patients of essential hypertension admitted in department of general medicine, R D Gardi medical college and C R Gardi Hospital, Ujjain (M.P) during the period from Jan 18 to June 19 after applying the inclusion and exclusion criteria.

Inclusion criteria

1. Patients undergoing treatment as well as untreated cases of hypertension.
2. Newly detected Hypertensives with Systolic Blood Pressure ≥140mmHg and Diastolic Blood Pressure ≥ 90mmHg

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

3. Age group: 30-80 years.
4. Gender: Both males and females.

Exclusion criteria

1. Patients with Overt proteinuria
2. Patients with Renal failure
3. Patients with Diabetes mellitus
4. Patients with Urinary tract infection
5. Patients with Obstructive Uropathy and Nephrolithiasis
6. Pregnant women

Statistical analysis

Statistical Analysis was performed with help of SPSS 20 version. Using this software, basic cross-tabulation and frequency distributions were prepared. Chi-Square test was used to test the association between different study variables under study. Z-test was used to test the significant difference between two proportions. Odds ratio (OR) with 95% Confidence Interval (CI) was calculated to measure the different risk factor. Multiple Logistic Regression Analysis was also performed to find the risk factors after adjusting the risk factors. Significance level was set at 0.05 and confidence intervals were at 95 percent level. $P \leq 0.05$ was considered statistically significant.

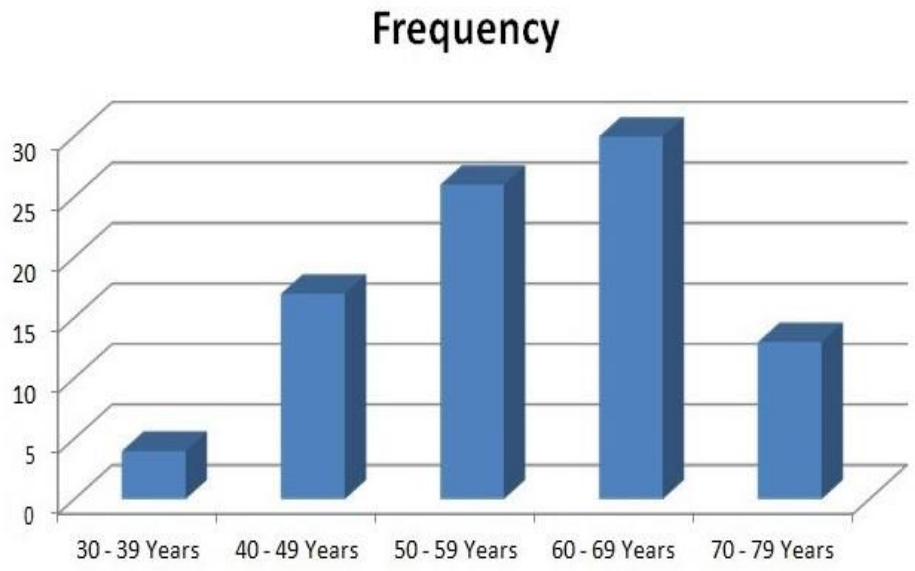
Observation and results

Table 1: Age Distribution- Essential Hypertension

Age Groups	Frequency	Percent
30 - 39 Years	04	4.4
40 - 49 Years	17	18.9
50 - 59 Years	26	28.9
60 – 69Years	30	33.3
70 - 79 Years	13	14.4
Total	90	100.0

The mean age (mean ± s.d.) of the patients was 57.38±10.8 years with range 31-78 years and the median age was 58.0 years (Table-1) (Graph-1)

Graph 1:- Age Distribution- Essential Hypertension



ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 2: **Duration of hypertension and microalbuminuria**

Duration of hypertension (In Years)	**Microalbuminuria**		**Total**
	Yes	No	
< 5 Years	13	22	35
	37.1%	62.9%	100.0%
5 - 10 Years	10	24	34
	29.4%	70.6%	100.0%
> 10 Years	13	8	21
	61.9%	38.1%	100.0%
Total	36	54	90
	40.0%	60.0%	100.0%
Chi-Square = 5.906, p = 0.05			

Chi-square test showed that there was significant association between duration of hypertension and microalbuminuria (Table-2).

Table 3: Distribution of Microalbuminuria according to HTN stage

HTN	**Microalbuminuria**		**Total**
	Yes	**No**	
Normal	02	15	17
	11.8%	88.2%	100.0%
Stage 1	09	16	25
	36.0%	64.0%	100.0%
Stage 2	25	23	48
	52.1%	47.9%	100.0%
Total	36	54	90
	40.0%	60.0%	100.0%
Chi-square=8.734, p=0.013			

Chi-square test showed that there was significant association between the stages of HTN and microalbuminuria (p=0.01) (Table-3).

Table 4: Distribution of Microalbuminuria according to eye fundus

EYE FUNDUS	**Microalbuminuria**		**Total**
	Yes	**No**	
Normal	11	37	48
	22.9%	77.1%	100.0%
I	1	9	10
	10.0%	90.0%	100.0%
II	8	7	15
	53.3%	46.7%	100.0%
III	9	1	10
	90.0%	10.0%	100.0%
IV	7	0	7
	100.0%	0.0%	100.0%
Total	36	54	90
	40.0%	60.0%	100.0%
Chi-square=31.615, p<0.00005			

Chi-square test showed that there was significant association between abnormality of fundus and microalbuminuria (p<0.00005).The risk of presence of abnormality in fundus was 4.94

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

times more among the patients with microalbuminuria as compared with the patients without microalbuminuria and the risk was significant.[OR-4.94(1.98,12.32)p=0.001]

Table 5: Distribution of Microalbuminuria according to LVH

	Microalbuminuria		Total
LVH	**Yes**	**No**	
Yes	13	4	17
	76.5%	23.5%	100.0%
No	23	50	73
	31.5%	68.5%	100.0%
Total	36	54	90
	40.0%	60.0%	100.0%
Chi-square=11.616, p=0.001			

Chi-square test showed that there was significant association between the presence of LVH and microalbuminuria (p=0.001).The risk of presence of LVH was 7.06 times more among the patients with microalbuminuria as compared with the patients without microalbuminuria and the risk was significant.[OR-7.06(2.07,24.04);p=0.002]

Table 6: CT finding of brain and microalbuminuria

CT BRAIN	Microalbuminuria		Total
	Yes	**No**	
Abnormal	18	12	30
	50.0%	22.2%	33.3%
Normal	3	10	13
	8.3%	18.5%	14.4%
ND	15	32	47
	41.7%	59.3%	52.2%
Total	36	54	90
	100.0%	100.0%	100.0%
Chi-Square = 7.831 , p = 0.02			

Chi-square test showed that there was significant association between abnormal finding by CT scan of brain and microalbuminuria (p=0.02).The risk of abnormal finding by CT scan of brain was 5.0 times more among the patients with microalbuminuria as compared with the patients without microalbuminuria the risk was significant.[OR-5.0(1.13,22.02);p=0.03].

Discussion

In our study, most of the cases of Essential Hypertension were in the age ≥50 years (76.7%) which were significantly higher. It was seen that microalbuminuria was more prevalent in the age group between 50-59 years and the risk of microalbuminuria was 0.8 times more among the patients with age ≥ 60 years as compared with the patients with age < 60years [OR-0.8(0.34, 1.8); p= 0.60].However, there was no significant association between age and microalbuminuria of the patients (p=0.60) which was similar to the studies conducted by Busari O, Poudyal N which also did not show any significant correlation between age and microalbuminuria which was on contrary to studies conducted by Dayal A, Agrawal B.

It was found that most of the patients were having duration of hypertension ≥5 years (61.1%) which was significantly higher. The mean duration of hypertension (mean ± s.d.) of the patients was 7.23±4.35.The risk of microalbuminuria was 3.25 times more among the patients with duration of hypertension ≥ 10 years as compared with the patients with duration of hypertension <10 years [OR-3.25(1.18, 8.95);p=0.023] and and the risk was significant. Our results were comparable to studies conducted by Hitha B *et al* (p<0.001*)*, Badiger S (p=0.036) , Agrawal B(p<0.05).

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

It was found that 46.7% of the patients with essential hypertension were having abnormal fundus. The risk of presence of abnormality in fundus was 4.94 times more among the patients with microalbuminuria as compared with the patients without microalbuminuria [OR-4.94(1.98, 12.32); p= 0.001] and the risk was significant. Studies conducted by Hitha B *et al* (p<0.001), Badiger S (p=0.011), Dayal A (p<0.05) also found a significant association between fundus changes and microalbuminuria.

It was found that 18.9% of the patients of essential hypertension had LVH. The risk of presence of LVH was 7.06 times more among the patients with microalbuminuria as compared with the patients without microalbuminuria [OR-7.06(2.07, 24.04); p= 0.002] and the risk was significant. Our results were comparable to studies conducted by Pontremoli R *et al (*p<0.0001), Busari O (p=0.001), Dayal A **(**p<0.05), Agrawal B (p<0.001), Hitha B *et al* (p<0.001*).*

50% of the patients had abnormal CT scan findings in cases of essential hypertension. The risk of abnormal finding by CT scan of brain was 5.0 times more among the patients with microalbuminuria as compared with the patients without microalbuminuria [OR-5.0(1.13, 22.02); p= 0.03] and the risk was significant. Studies conducted by Yuyun MF (p <0.001 for stroke), Beamer NB (p<0.001 for stroke), Agrawal B (p<0.001),also showed a significant association between abnormal CT scan findings and microalbuminuria.

Conclusion

Hypertension is a major public health problem. There is high prevalence of microalbuminuria in essential hypertension. It is known that Microalbuminuria is a highly sensitive, readily assessed marker of incipient nephropathy and systemic endothelial damage. It is an independent predictor of either renal failure or cardiovascular morbidity and mortality. Microalbuminuria was significantly associated with duration and severity of hypertension and target organ failure; left ventricular hypertrophy, retinopathy and cerebrovascular accidents. Therefore measurement of microalbuminuria should be incorporated with in standard management protocols for all patients with hypertension. Diagnosing microalbuminuria at early stages in patients with essential hypertension will also guide us in instituting appropriate management of patients and the earliest treatment will save many precious human lives.

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ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

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