

## A retrospective study of microalbuminuria in patients of diabetes and hypertension

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### Abstract

**Introduction:** The microalbuminuria is defined as urinary excretion rate of albumin is between 20 µg/min and 200 µg/min or between 30 mg/24 hrs and 299 mg/24 hrs. Proteinuria as well as microalbuminuria are independent predictors of cardiovascular morbidity and mortality in patients with essential hypertension. Microalbuminuria is an early marker of diabetic nephropathy. Early recognition of microalbuminuria in diabetic nephropathy permits successful therapeutic intervention and significant postponement of terminal renal failure.

**Aim:** The purpose of present study was to evaluate the prevalence of microalbuminuria in patients with diabetes and hypertension and to check relationship between severity of hypertension with extent of renal dysfunction and its associated coronary artery disease and target organ damage.

**Materials and Methods:** This retrospective study was conducted in central clinical laboratory of pathology department at Sir Takhatsinhji General Hospital attached with Government Medical College, Bhavnagar, Gujarat, India. In present study we included 100 participants of both sexes having diabetes and hypertension. We also included 25 normal healthy, non-diabetics, non-hypertensive people as control group.

**Results:** Duration of diabetes in all patients varies from 6 to 25 years. All patients were positive for microalbuminuria in diabetes ranging from 16-20 years. Most of the patients (80%) were having hypertension for more than 7.5 years were positive for microalbuminuria.

**Conclusion:** 'Micral test' is a rapid, simple, reliable and cost effective diagnostic tool for detection of microalbuminuria. Blood pressure, blood glucose, serum creatinine and serum cholesterol levels are significantly higher in microalbuminuria patients. Hence, the elevations in diabetic patients mark the need for 'Micral test' for detection of early renal involvement.

**Keywords:** Diabetes, Hypertension, Microalbuminuria, LVH.

### Introduction

Diabetes is a group of metabolic disorders, sharing the common underlying feature of hyperglycemia.<sup>1</sup> It is associated with long term vascular damage and dysfunction and the failure of various organs, especially heart, brain, kidney, eyes, nerves.<sup>2</sup> Microalbuminuria is an early marker of diabetic nephropathy. Hypertension affects approximately 1 billion people world wide.<sup>4</sup>

Coronary heart disease is the most important cause of mortality and morbidity. The significance of hypertension as a risk factor for coronary heart disease is well established.<sup>5</sup> Considerable evidence, accrued over the past decade, indicates that the presence of even relatively small amounts of protein in the urine is an important early sign of kidney disease and is a strong predictor of an increased risk for cardiovascular mortality and morbidity in certain high risk groups like hypertension, diabetes, obese and positive family history of cardiovascular and renal disease.<sup>6</sup>

Microalbuminuria, reported in 10-40% of non-diabetics with hypertension, may serve as an early indicator of risk to develop subsequent proteinuria and progressive renal impairment.<sup>7</sup>

### Aims and Objectives

1. To detect the prevalence of microalbuminuria in patients with diabetes and hypertension.

2. To correlate microalbuminuria with age at onset, duration and severity of diabetes and hypertension in the respective group of patients.
3. To correlate degree of microalbuminuria with blood sugar levels in diabetic patients.
4. To predict possible onset of deterioration of renal function in diabetes mellitus.
5. To associate microalbuminuria with target organ damage in hypertensive and diabetic patients.

### Materials and Methods

This retrospective study was conducted in central clinical laboratory of pathology department at Sir Takhatsinhji General Hospital attached with Government Medical College, Bhavnagar, Gujarat, India. In present study we included 100 participants of both sexes having diabetes and hypertension. We also included 25 normal healthy, non-diabetics, non-hypertensive people as control group.

All these participants were very well explained about this study. After taking proper consent, under aseptic precaution, venous blood was collected in two different vacutainer containing Sodium fluoride as an anticoagulants and plain vacutainer after two hours of lunch. All these samples were analysed for blood sugar (PPBS), blood urea, serum creatinine, serum cholesterol level estimation.

Early morning urine samples were also collected from all these participants and analysed for routine physical, chemical and microscopy examination and for microalbuminuria. Those urine samples were negative for proteinuria by multi reagent analysis strips were checked for microalbuminuria by Micral test manufactured by Roche Diagnostics India Pvt. Ltd. This method is semi quantitative based on immunoprecipitation technique.

Serum creatinine estimation was also done in those samples showing positive albumin. This was estimated by kinetic method, modified jaffe's reaction manufactured by Transgenics, Ahmedabad.

Blood sugar estimation was done by glucose oxidase peroxidase method. Blood urea was estimated by UREAS-GLDH UV, Fixed time kinetic method, Trans-Bio, Transgenics, Ahmedabad.

Serum cholesterol was estimated by enzymatic colorimetric method manufactured by Trans-Bio, Transgenics, Ahmedabad.

## Results

Microalbuminuria was correlated with duration and severity of diabetes and hypertension in respective group of patients.

**Table 1**

Duration in Years	No. of Patients	Positive for Microalbuminuria	Negative for Microalbuminuria	Percentage Positive for Microalbuminuria
6-10	21	01	20	4.76
11-15	09	02	07	22.22
16-20	08	08	00	100
>20	12	02	10	16.66
Total	50	13	37	

This table 1 show that duration of diabetes in all patients varies from 6 to 25 years. 100% patients were positive for microalbuminuria in diabetes ranging from 16-20 years. Microalbuminuria was correlated with blood sugar in diabetic patients.

**Table 2**

PPBS mg/dl	No. of Patients	Positive for Microalbuminuria	Negative for Microalbuminuria	Percentage Microalbuminuria
<130	28	04	24	14.28
131-150	10	03	07	30
151-180	08	05	03	62.5
181-250	04	01	03	25
>250	00	00	00	00
Total	50	13	37	

This table 2 shows that 4 patients out of 28 (14.28%) had excellent control, 3 patients out of 10 (30%) had good control, 5 patients out of 8 (62.5%) had fair control and 1 patients out of 4 (25%) had poor control of diabetes.

**Table 3**

Urinary Protein	Total no. of Patients	Total no. of Controls	Percentage of Patients	Percentage of Controls
Positive for Microalbuminuria	23	00	46	00
Negative for Microalbuminuria	27	25	54	100

This table 3 shows that 23 patients (46%) were positive for microalbuminuria by Micral dipstick test and 54 patients (54%) were negative for microalbuminuria.

**Table 4**

Duration of Hypertension in Years	No. of Patients	Positive for Microalbuminuria	Negative for Microalbuminuria	Percentage Positive for Microalbuminuria
0-1.5	17	08	09	47.05
1.5-3	09	02	07	22.22

3-4.5	05	01	04	20
4.5-6	03	01	02	33.33
6-7.5	06	03	03	50
7.5-9	05	04	01	80
>9	05	04	01	80

This table 4 shows that 80% of patients were having hypertension for more than 7.5 years were positive for microalbuminuria.

**Table 5**

Urinary Proteins	Total no. of Patients	No. of Patients with target organ damage	Percentage of patients with target organ damage
Positive for Microalbuminuria	23	16	69.56
Negative for Microalbuminuria	27	12	44.44

This table 5 show that 56% of hypertensive patients had target organ damage. Prevalence of target organ damage in patients with microalbuminuria was 69.56% as compared to 44.4% in patients without microalbuminuria.

**Table 6**

Urinary Proteins	Total No. of Patients	No. of Patients with LVH	Percentage of Patients with LVH
Positive for Microalbuminuria	23	12	52.17
Negative for Microalbuminuria	27	08	29.62

This table 6 show that 40% of hypertensive patients had LVH, 52.17% of patients having microalbuminuria had LVH whereas only 29.62% of patients without microalbuminuria had LVH.

**Table 7**

Urinary Proteins	Total No. of Patients	No. of Patients with hypertensive retinopathy	Percentage of Patients with hypertensive retinopathy
Positive for Microalbuminuria	23	15	65.2
Negative for Microalbuminuria	27	05	18.5

This table 7 shows that 40% of patients had hypertensive retinopathy. Prevalence of hypertensive retinopathy in patients with microalbuminuria was 65.2% had in patients without microalbuminuria was only 18.5%.

**Table 8**

Year	Studies	No. of Cases	Percentage of Microalbuminuria
1996	Mehrok[16]	125	12
1996	Farkas et al[18]	804	25
2001	Giri[19]	82	57.4
2001	Parikh J.[17]	100	23
2009	Present Study	50	26

**Table 9**

Year	Studies	No. of Cases	Percentage of Microalbuminuria
1992	Bigazzi R et al[18]	123	40
1992	Biesenbach G et al[19]	38	34.2
1994	Binachi S et al[28]	63	40
1996	Agrawal B et al[31]	11343	30.02
1999	Gatzka CD et al[22]	704	42

1999	Calvino J et al[23]	319	40
2000	Tsioufis CP et al[25]	162	46.3
2003	Tsioufis C et al[38]	130	36.9
2004	Reddy Mohan G et al[26]	50	30
2009	Present Study	50	46

## Discussion

Microalbuminuria predicts future development of diabetic nephropathy.<sup>8-10</sup> Microalbuminuria also predicts cardiovascular morbidity and mortality in patients with essential hypertension.<sup>8,11,12</sup> Micral test method is based on immunoprecipitation principle and was used in this study. It has 92% sensitivity and 95% negative predictive value, with 63% specificity and 54% positive predictive value when compared with 24 hour nephelometry.

In present study, the prevalence of microalbuminuria was 26% which was compared with that of Park et al, Farkas et al,<sup>18</sup> Parikh J.<sup>17</sup> and James et al.<sup>20</sup> But the study done by Mehrok<sup>16</sup> showed very low (12%) prevalence rate while study done by Giri<sup>19</sup> showed very high (57.4%) prevalence rate. This change in prevalence is due to different criteria for patient selection. In 1996, a study done by Mehrok<sup>16</sup> showed that group of patients who had duration of diabetes >20 years had maximum percentage of patients (20%) with microalbuminuria. In 2000, a study done by Giri<sup>19</sup> showed all patients who had duration of diabetes between 11-15 years or >15 years showed microalbuminuria. In the present study, the group of patient having duration between 16-20 years had maximum (100%) of patients with microalbuminuria, which is comparable with study done by Giri.<sup>19</sup>

In present study, as the blood glucose level increased, the percentage of patients having microalbuminuria also increased. So there was correlation between microalbuminuria and blood sugar level as compared to that of non-microalbuminuria, which was comparable with studies done by Schmitz et al<sup>15</sup> and Farkas et al.<sup>18</sup> In present study, as serum cholesterol level increased the percentage of patients with microalbuminuria also increased. This correlation is comparable with study done by Parikh J.<sup>17</sup> and Giri.<sup>19</sup>

In the present study, the prevalence of microalbuminuria in non-diabetics essential hypertensive patients is 46%, which is well correlated with the studies done by Bigazzi et al,<sup>25</sup> Bidachi S et al,<sup>28</sup> Getzka CD et al,<sup>35</sup> Calvino J et al<sup>23</sup> and Tsioufis CP et al.<sup>25</sup> 80% of patients having hypertension for more than 7.5 years had microalbuminuria which is correlated with the studies done by Agrawal B et al<sup>21</sup> and Reddy Mohan G et al.<sup>26</sup>

Prevalence of target organ damage in patients with hypertension with microalbuminuria was 69.56% in the present study. Similar findings were also seen in study done by Agrawal B et al.<sup>21</sup> In present study, 52.17% of the microalbuminuria positive patients also had LVH demonstrating a higher prevalence of LVH in patients

positive for microalbuminuria, which is correlated with other studies as shown in table 9 and 10. In present study, 65.2% of hypertensive patients with microalbuminuria had hypertensive retinopathy, which is well correlated with studies done by Bisenbach G et al,<sup>26</sup> Cerasola G et al.<sup>27</sup>

## Conclusion

'Micral test' is a rapid, simple, reliable and cost effective diagnostic tool for detection of microalbuminuria. Elder patient of diabetes are at the greatest risk of premature death by diabetic nephropathy. This justifies the use of screening test in these patients to detect early renal injury. Blood pressure, blood glucose, serum creatinine and serum cholesterol levels are significantly higher in microalbuminuria patients. Hence, the elevations in diabetic patients mark the need for 'Micral test' for detection of early renal involvement.

Microalbuminuria is strongly associated with increasing age, male sex and severity of hypertension. Microalbuminuria is strongly associated with target organ damage in patients with essential hypertension. Microalbuminuria can be considered as the specific integrated marker of cardiovascular risk and target organ damage in essential hypertension. Microalbuminuria helps to identify vascular changes. Its detection can thus help to prevent the development of complications by aggressive treatment to attain target blood pressure.

As prevention is better than cure, it is reasonable to suggest that all patients with hypertension and diabetes mellitus should be screened for the presence of microalbuminuria.

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