



## To study the Association of Microalbuminuria in Prediabetes

Authors

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### Abstract

**Aims and Objectives:** *To study the association of microalbuminuria in pre-diabetes in patients above 30 years of age.*

**Methods:** *The patients attending the medical out-patient unit in Rajah Muthiah MEDICAL College and Hospital, Chidambaram during a period starting from February 2018- February 2019 with age above 30 years and excluding those patients from the exclusion criteria, a 2 hr oral glucose tolerance test was done and according to the ADA criteria, those patients with venous sample of 2hrs plasma glucose levels between 140-199mg/dl were included in the study. In these patients the presence of micro-albuminuria was assessed.*

**Results:** *The prevalence of micro-albuminuria in this study was 13.9%. The prevalence of microalbuminuria in the prediabetic state was more among those in the higher range between 180-199 (33.3%) than those in the lower range 140-159 (4.8%) IGT. When the blood sugar rises in the pre-diabetic range the association of microalbuminuria is present.*

**Conclusion:** *There is significant correlation between microalbuminuria in prediabetic patients.*

**Keywords:** *Microalbuminuria, Prediabetic.*

### Introduction

Diabetes mellitus is a disease that affects 150 million individuals<sup>1</sup> worldwide. Diabetes is a group of common metabolic disorders that share the phenotype of hyperglycemia. The metabolic derangements associated with diabetes causes secondary pathophysiological changes in multiorgan systems that poses a tremendous burden on individuals with diabetes. Prediabetes raises short term absolute risk of type 2 diabetes five to six fold, and in some populations this may be even higher.<sup>2</sup> Epidemiologic evidence suggests that these complications of diabetes begin early in the progression from normal glucose tolerance to frank diabetes<sup>3</sup>. Early identification and treatment

of persons with pre-diabetic conditions has the potential reduce both the incidence of diabetes and related complications. Early diabetic nephropathy in the prediabetic state can be detected by micro-albuminuria. Microalbuminuria<sup>4</sup> possibly reflects a state of increased renal endothelial permeability and is an easily measured marker of rather diffuse endothelial dysfunction, low grade inflammation and vascular disease burden. This study aims to study the association of microalbuminuria in pre-diabetes.

### Aims and Objectives

To study the association of microalbuminuria in pre-diabetes in patients above 30 years.

**Inclusion Criteria**

1. Patients above 30 years of age.
2. Impaired glucose tolerance after screening [OGTT done using 75 gram of glucose in 250 ml of water (8 ounces)] according to ADA criteria by 2hrs plasma glucose levels between 140-199 mg/dl.

**Exclusion Criteria**

1. Patients with age <30 years of age.
2. Patients with Hypertension (Systolic Blood Pressure ≥140 and/or Diastolic blood pressure ≥90mmHg measured by sphygmomanometer).
3. Patients with Renal disease and urinary tract infection by history or investigations.
4. Patients with known history of ischemic heart disease.
5. Pregnant patients.

**Methodology**

Patients attending the OPD above 30 years of age are included. A detailed case record was prepared for each patient. In the study population depending on Fasting blood sugar {FBS} / IFG or 2 hour Oral Glucose tolerance test (OGTT) / IGT they were diagnosed as prediabetes according to the ADA criteria.

**Investigations done included**

1. 2 Hour Oral Glucose Tolerance Test.
2. The patients BP was measured using sphygmomanometer.
3. Serum creatinine – Only those patients with normal value were taken up for the study.
4. Urine examination – Albumin, RBC, WBC, Bacteria, Urine culture, ketones. Only those patients with normal urine examination results were included.

Colour	-	Yellow
PH	-	4.5 – 8
Specific gravity	-	1.005 – 1.025
Albumin	-	Nil
Sugar	-	Nil
Ketone	-	Negative
RBC	-	≤2 / HPF
WBC	-	Male – 0 to 1
Female	-	<5
Bacteria	-	Nil
Urine culture	-	No growth

5. ECG- Ischemic heart disease is diagnosed if anyone or more than one of the following is present in 12 lead ECG ST elevation > 1mm above baseline in any of following group of leads

- II, III, aVF – inferior wall MI
- I, aVL, V5, V6 – Lateral wall MI
- V1, V2, V3, V4 – Anterior wall MI
- V1 to V6, I, aVL – Anterolateral MI
- V1, V2 – Septal MI

ST depression ≥ 1mm below the baseline in any of following group of leads

- II, III, aVF – Inferior wall MI
- I, aVL, V5, V6 – Lateral wall MI
- V1, V2, V3, V4 – Anterior wall MI
- V1 to V6, I, aVL – Anterolateral MI
- V1, V2 – Septal MI
- V1 to V6 – Extended

Anterior wall MI

Symmetrical T wave inversion ≥ 2mm in any of following group of leads

- II, III, aVF – Inferior wall MI
- I, aVL, V5, V6 – Lateral wall MI
- V1, V2 – Septal MI
- V3, V4 – Anterior wall MI
- V5, V6 – Lateral wall MI
- V1 to V6, I, aVL – Anterolateral MI
- V1 to V6 – Extensive

Anterior wall MI

Pathological Q wave (≥0.03 seconds in duration and ≥1mm in depth).

- II, III, aVF – Inferior wall MI
- I, aVL, V5, V6 – Lateral wall MI
- V1, V2, V3, V4 – Anterior wall MI
- V1 to V6, I, aVL – Anterolateral MI
- V1, V2 – Septal MI
- V1 to V6 – Extended

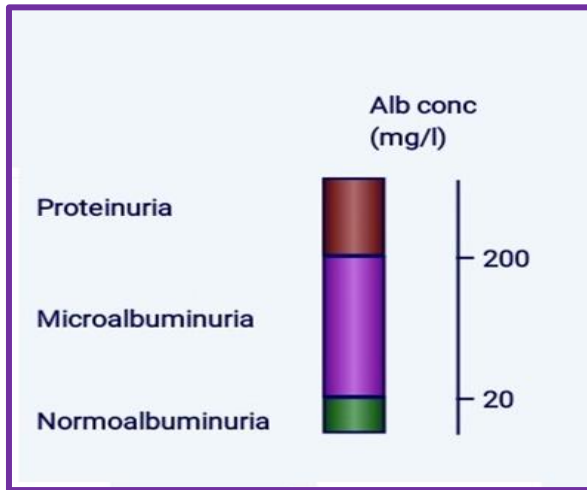
Anterior wall MI

**Microalbuminuria**

Was assessed by micral II test strips based on immune assay using monoclonal antibodies IgG to human albumin labelled with colloidal gold. Data indicate that micral test II test strip permits an immediate and reliable, semi quantitative determination of low albumin concentration in urine samples with an almost user independent colour interpretation.

Results are obtained by direct visual comparison with the colour scale printed on the vial label. In order to determine albumin concentration above 100mg/l, the urine sample can be diluted by mixing one part of urine with two parts of water the original albumin concentration is then calculated by multiplying the result obtained by 3. Those patients with albumin excretion rate of 20-200mg/L were included.

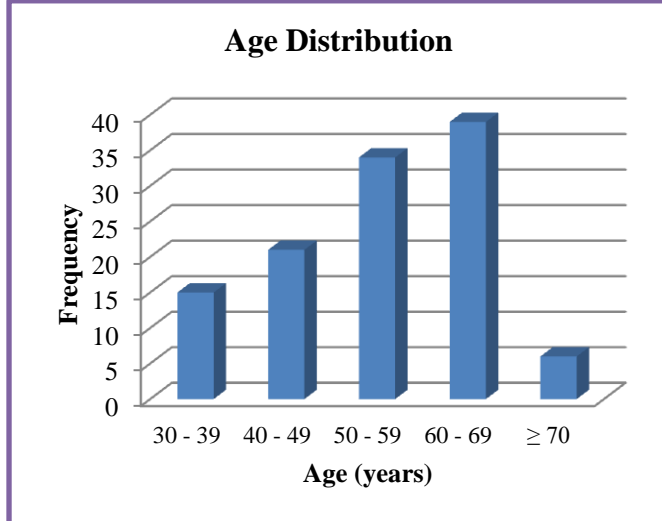
**Fig.1.** Micral test results for Microalbuminuria



**Table no: 1** Distribution of age among study Population

Age (in years)	No. of Patients	Percentage (%)
30 – 39	15	13
40 – 49	21	18.3
50 – 59	34	29.6
60 – 69	39	33.9
≥ 70	6	5.2
Total	115	100

**Fig.2** Distribution of age among study population

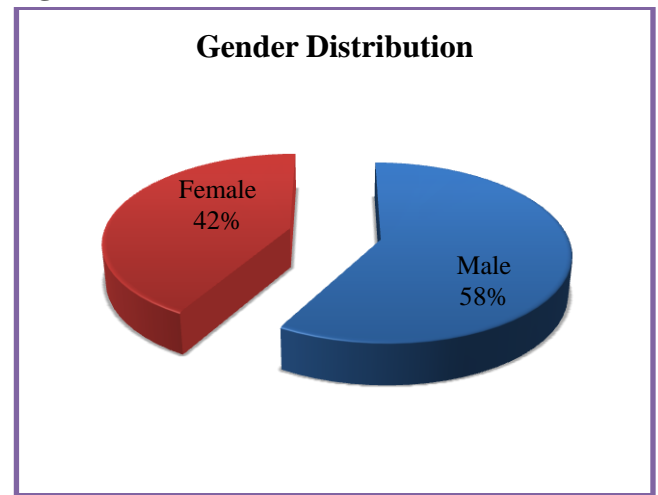


**Table No: 2** Distribution of sex among study population

Sex	No. of Patients	Percentage (%)
Male	67	58.3
Female	48	41.7
Total	115	100

Table 2 shows that the number of males patients are more compared to female patients in the study group.

**Fig.3** Distribution of Gender

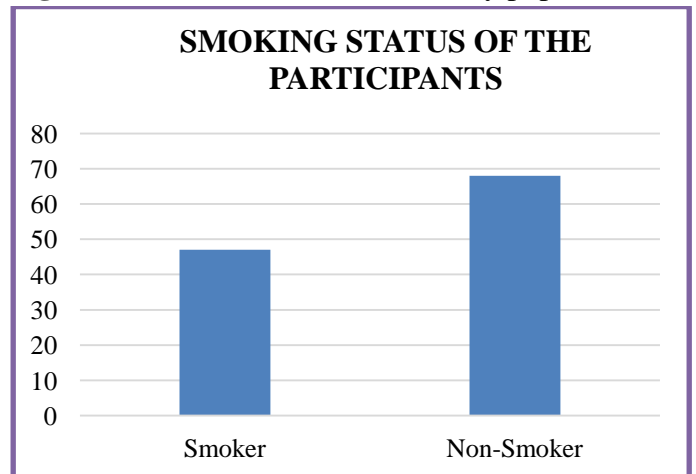


**Table no: 3** Distribution of smokers in study population

Smoking status	Smoking (N=115)	
	Number	Percentage
Smoker	47	40.1
Non-Smoker	68	59.9

Table 3: This table shows that the number of non smokers are more than the smokers in the study group.

**Fig.4** Distribution of smokers in study population



**Table no: 4** Distribution of study population according to method of screening

Screening test	Prediabetic N=115
IGT	115

**IGT-** Impaired glucose tolerance

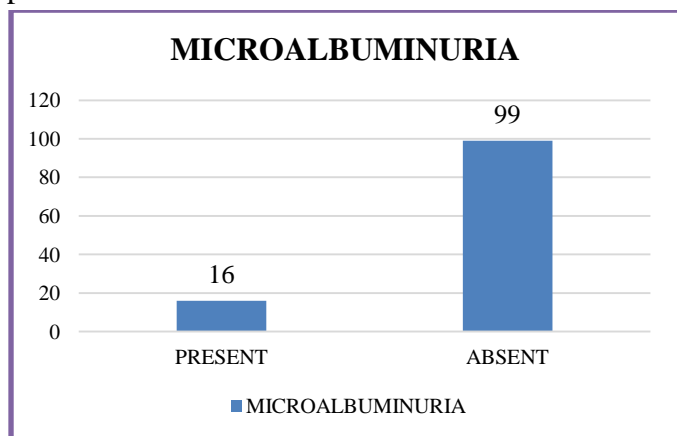
Table 4: shows the method of test done among study participants to diagnose prediabetes.

**Table No: 5** Distribution of Microalbuminuria in Prediabetics

Microalbuminuria	N	%
Present	16	13.9
Absent	99	86.1
Total	115	100

Table 5: This table shows that the number of patients with no microalbuminuria was more than those with microalbuminuria

**Fig.5** Distribution of microalbuminuria in prediabetics

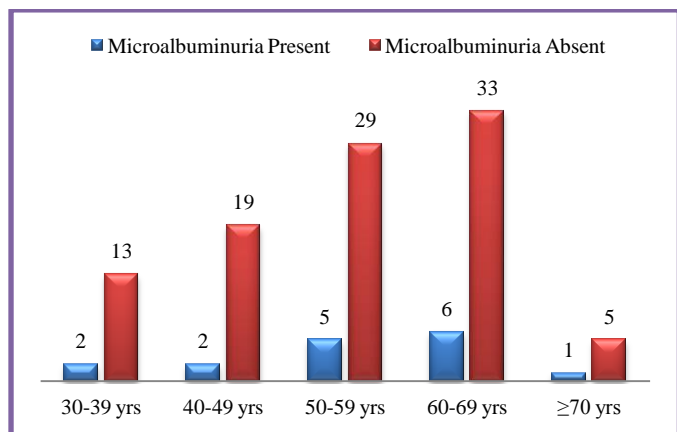


**Table no: 6** Association between age and microalbuminuria

Age (years)	Microalbuminuria (N=115)		P value
	Present (%)	Absent (%)	
30 – 39	2 (13.3%)	13 (86.7%)	0.71
40 – 49	2 (9.5%)	19 (90.5%)	
50 – 59	5 (14.7%)	29 (85.3%)	
60 – 69	6 (15.4%)	33 (84.6%)	
≥ 70	1 (16.7%)	5 (83.3%)	

Table 6: It was observed from the above table that as the age advances there is no statistically significant increase in microalbuminuria.

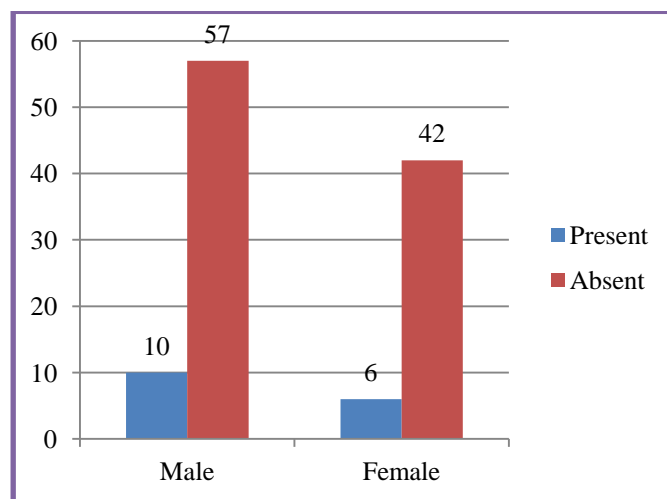
**Fig. 6** Association between age and microalbuminuria



**Table no: 7** Association of gender of the individual with microalbuminuria

Gender	Microalbuminuria		P value
	Present (%)	Absent (%)	
Male	10 (14.9%)	57 (85.1%)	0.71
Female	6 (12.5%)	42 (87.5%)	
Total	16(13.9%)	99(86.1%)	

Table 7 shows no statistically significant differences between microalbuminuria and the gender of the patient

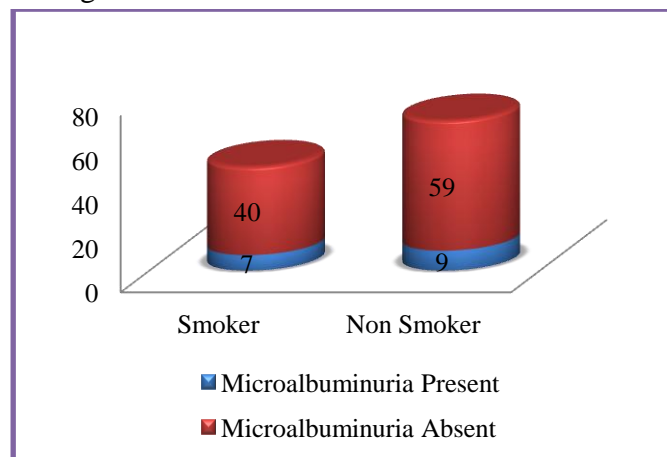


**Table no: 8** Association between microalbuminuria among smokers

	Microalbuminuria (N=115)		P value
	Present (%)	Absent (%)	
Smoker	7 (14.9%)	40 (85.1%)	0.8
Non-Smoker	9 (13.2%)	59 (86.8%)	

Table 8: There is no statistically significant difference between presence of microalbuminuria among smokers and non-smokers.

**Fig.7** Association between microalbuminuria among smokers

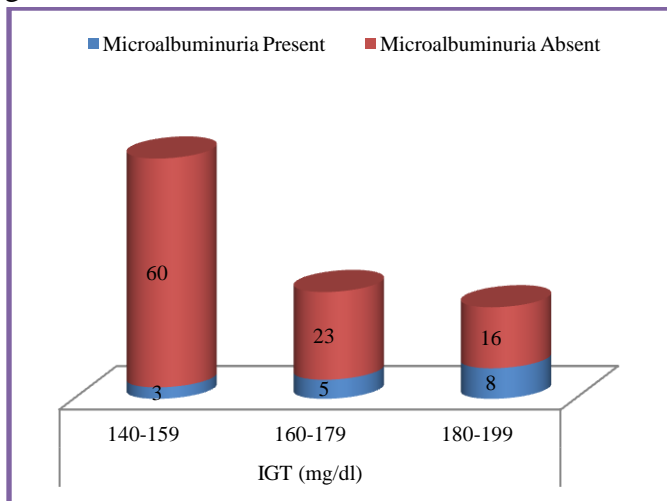


**Table no: 9** –Association between Microalbuminuria and level of blood glucose in IGT

IGT (Mg/dl)	Microalbuminuria (N=115)		P value
	Present (%)	Absent (%)	
140 – 159	3 (4.8%)	60 (95.2%)	0.0009
160 – 179	5 (17.9%)	23 (82.1%)	
180 – 199	8 (33.3%)	16 (66.7%)	

Table 9: The above table shows microalbuminuria increases as blood glucose level raises in prediabetic range in IGT and this difference is statistically significant (P = 0.0009)

**Fig.8.** Microalbuminuria and level of blood glucose in IGT



**Discussion**

The present study evaluated the prevalence of microalbuminuria in pre-diabetic patients above 30 years of age. The prevalence of microalbuminuria in this study was 13.9%. The prevalence of microalbuminuria in the prediabetic state was more among those in the higher range between 180-199 (33.3%) than those in the lower range 140-159 (4.8%) IGT.

A similar study by WangXL et al showed a prevalence of microalbuminuria as 11.1% in IGT<sup>5</sup>. When the blood sugar rises in the pre-diabetic range the prevalence of microalbuminuria is present.

Sex distribution of microalbuminuria: In the present study, there is no significant difference in the prevalence of microalbuminuria among

women and men. In the HUNT study (Norway), there was a stronger association between microalbuminuria and mortality in men than in women. That study showed a significant correlation between sex and Albumin Creatinine Ratio (ACR) which was statistically significant (P-0.0003), and it supported a sex difference, where the prevalence was more among men. This difference was attributed to the higher incidence of asymptomatic UTI in women. Although the albumin excretion levels are equal, since men have a greater muscle mass with a higher creatinine excretion than women, they suggested a different ACR cut off values in men and women (HUNT – Nord Trondelag Health Study).

The prevalence of microalbuminuria and was not statistically higher in the older age groups. The present study also looked into the relation between microalbuminuria and other risk factors for cardiovascular disease like smoking. No significant correlation was observed between smoking and microalbuminuria. This observation is discordant with that seen in previous studies on this aspect. One possible explanation for this variability may be an error in the classification of smokers and non-smokers. This was done on the basis of history.

**Conclusions**

- The microvascular complication like microalbuminuria is present in the pre-diabetic stage itself.
- The microvascular complications like microalbuminuria is more in prediabetic patients with a higher glucose level range.
- There is a correlation between microalbuminuria and higher blood sugar levels in prediabetic patients.
- It is recommended to screen for microalbuminuria in patients with prediabetes.

**References**

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