

# Cardio Vascular Autonomic Dysfunction in Type 2 Diabetes Patients with Microalbuminuria

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## ABSTRACT

**Objective:** Main objective of this study is to determine the prevalence of cardiovascular autonomic dysfunction in type-2 diabetes patients with microalbuminuria.

**Study Design:** Descriptive/ observational study

**Place and Duration:** Department of Cardiology, DHQ Hospital Alpurai, Shangla, from December, 2021 to May, 2022.

**Methods:** Total 70 patients of both genders diagnosed diabetes 2 mellitus were presented in this study. Patients were aged between 20-80 years. Patients details demographics were recorded after taking written consent. Prevalence of cardiovascular autonomic dysfunction with microalbuminuria was assessed by statistical analysis. Microalbuminuria was diagnosed among patients if urinary albumin excretion was >30-300mg/g and graded into mild, moderate and severe according to value of urinary albumin excretion was (20–50 mg/24 hr, 50–100 mg/24 hr, 100–300 mg/24 hr). Complete data was analyzed by SPSS 20.0 version.

**Results:** Out of 70, 38 (54.3%) were males and 32 (45.7%) were females. Mean age of the patients were 49.71±17.8 years with mean BMI 28.41±9.42 kg/m<sup>2</sup>. Mean ACR of microalbuminuria was 166.7±47.8 mg/gm. Among 70 cases, mild microalbuminuria was found in 28 (40%) cases, moderate microalbuminuria was among 31 (44.3%) and 11 (15.7%) was severe microalbuminuria. Lethargy was the most common symptom found in 25 (35.7%) followed by anorexia 20 (28.6%). Frequency of Cardiac autonomic neuropathy was 58 (82.86%), Parasympathetic dysfunction found in 59 (84.3%) and sympathetic dysfunction was among 62 (88.6%).

**Conclusion:** We concluded in this study that the cardiovascular autonomic dysfunction in type-2 diabetes patients highly associated with microalbuminuria with increased systolic diastolic pressure and heart rate.

**Keywords:** Microalbuminuria, Type 2 Diabetes, Cardio autonomic dysfunction

## INTRODUCTION

A greater risk of cardiovascular diseases and mortality is connected with microalbuminuria. [1] Another recognized cardiovascular risk element is independent of this association: hypertension, dyslipidemia, obesity, tabaking, poor renal function, etc. [1,2] Several factors have been suggested to explain, at least in part, the higher risk of cardiovascular mortality for those with microalbuminuria, including endothelial dysfunction and low-level inflammation. [3] Another such mechanism could be Cardiovascular autonomic dysfunction (C-AD).

In fact, we and others already have established that C-AD is related with microalbuminuria, in particular in those with GMI and type 2 diabetes.

[4–6]

First, a disturbance of glomerular arteriolar selfregulation that in turn may lead to incapacity to counter glomerular hypertension is two theories hypothesized to explain such a combination. [7] and, second, a lower blood pressure decrease due to C-AD, which may lead to microalbuminuria both at night. [8] Further, C-AD is related with cardiovascular mortality[9,10] and may, for example, via promoting vascular calcification and arterial rigidity, potentially relate microalbuminuria to cardiovascular mortality through arrhythmia or atherogenic effects. [11] A number of studies indicate that individuals with diabetes are interrelated with reduced cardiovascular autonomy and higher urine albumins excretion. The majority of the investigations were carried out in diabetes type 1. Similar investigations were somewhat small in type 2 diabetes. [12] Therefore, the pattern of autonomous dysfunction and prevalence in microalbuins was planned for investigation and an attempt was made to determine whether there was a separate relationship between higher excretion of urine albumin and subclinical autonomy.

## MATERIAL AND METHODS

This descriptive/ observational study was conducted at Department of Cardiology, DHQ Hospital Alpurai, Shangla, from December,

2021 to May, 2022 and comprised of 70 type 2 diabetes mellitus patients. Patients details demographics were recorded after taking written consent. Patients with cardiac failure, uncontrolled hypertension, other severe medical illness and those did not give any written consent were excluded from this study.

Patients were aged between 20-80 years. Patients details demographics age, sex and body mass index were recorded after taking written consent. Prevalence of cardiovascular autonomic dysfunction with microalbuminuria was assessed by statistical analysis. Microalbuminuria was diagnosed among patients if urinary albumin excretion was 30-300mg/g and graded into mild, moderate and severe according to value of urinary albumin excretion was ((20–50 mg/24 hr, 50–100 mg/24 hr, 100–300 mg/24 hr). Categorical variables were assessed by frequency and percentage but descriptive variables were calculated by standard deviation Complete data was analyzed by SPSS 20.0 version.

## RESULTS

Out of 70, 38 (54.3%) were males and 32 (45.7%) were females. Mean age of the patients were 49.71±17.8 years with mean BMI 28.41±9.42 kg/m<sup>2</sup>. Mean duration of diabetes was 8.16±4.46 years. Most of the patients 48 (64.3%) were from the age group > 40 years and the rest were 22 (35.7%) <40 years of age. (table 1)

Table 1: Baseline details of enrolled cases

Characteristics	Frequency	%age
Gender		
Male	38	54.3
Female	32	45.7
Mean age (years)	49.71±17.8	
Mean BMI (kg/m <sup>2</sup> )	28.41±9.42	
Mean Duration of the Diabetes (years)	8.16±4.46	
Age group		
<40 years	48	64.3
>40 years	22	35.7

Mean ACR of microalbuminuria was  $166.7 \pm 47.8$  mg/gm. Among 70 cases, mild microalbuminuria was found in 28 (40%) cases, moderate microalbuminuria was among 31 (44.3%) and 11 (15.7%) was severe microalbuminuria. (table 2)

Table 2: Association of microalbuminuria among patients

Characteristics	Frequency (n=70)	%age
Mean ACR	$166.7 \pm 47.8$	
Level of microalbuminuria (30-300mg/g)		
Mild	28	40
Moderate	31	44.3
Severe	11	15.7

Lethargy was the most common symptom found in 25 (35.7%) followed by anorexia 20 (28.6%). Frequency of Cardiac autonomic neuropathy was 58 (82.86%), Parasympathetic dysfunction found in 59 (84.3%) and sympathetic dysfunction was among 62 (88.6%). (table 3)

Table 3: Association of symptoms and autonomic dysfunction among patients

Characteristics	Frequency	%age
Symptoms		
Lethargy	25	35.7
Anorexia	20	28.6
Nausea	10	14.3
Vomiting	7	10
Dizziness	6	8.6
Bladder	2	2.9
CAN		
Yes	58	82.6
No	12	17.14
Parasympathetic dysfunction		
Yes	59	84.3
No	11	15.7
Sympathetic dysfunction		
Yes	62	88.6
No	8	11.4

We found that cardiovascular autonomic function highly affected by presence of microalbuminuria, Systolic and diastolic blood pressure increases among patients of diabetes type 2 mellitus with mild microalbuminuria BP was  $7.7 \pm 3.4$  and heart rate was  $5.8 \pm 7.4$ ,  $8.3 \pm 7.4$  among moderate microalbuminuria with heart rate  $7.9 \pm 5.4$  and  $9.6 \pm 1.9$  mmHg BP found in severe albuminuria with heart rate  $8.5 \pm 6.7$ . (table 4)

Table 4: Association of BP and heart rate among patients with microalbuminuria

Characteristics	Heart rate	Blood pressure (mmHg)
Level of microalbuminuria		
Mild	$5.8 \pm 7.4$	$7.7 \pm 3.4$
Moderate	$7.9 \pm 5.4$	$8.3 \pm 7.4$
Severe	$8.5 \pm 6.7$	$9.6 \pm 1.9$

## DISCUSSION

In this observational study, we tried to evaluate the prevalence of cardiovascular autonomic dysfunction in type 2 diabetes patients with microalbuminuria. Total 70 patients of both genders diagnosed diabetes 2 mellitus were presented in this study. Patients were aged between 20-80 years. Mean age of the patients were  $49.71 \pm 17.8$  years with mean BMI  $28.41 \pm 9.42$  kg/m<sup>2</sup>. Most of the patients 54.3% were males. These findings were comparable to the previous studies.[13]

Mean duration of diabetes was  $8.16 \pm 4.46$  years. Most of the patients 48 (64.3%) were from the age group > 40 years and the rest were 22 (35.7%) <40 years of age.[14] In our study mean ACR of microalbuminuria was  $166.7 \pm 47.8$  mg/gm. Among 70 cases, mild microalbuminuria was found in 28 (40%) cases, moderate microalbuminuria was among 31 (44.3%) and 11 (15.7%) was severe microalbuminuria. [13] Lethargy was the most common

symptom found in 25 (35.7%) followed by anorexia 20 (28.6%). Frequency of Cardiac autonomic neuropathy was 58 (82.86%), Parasympathetic dysfunction found in 59 (84.3%) and sympathetic dysfunction was among 62 (88.6%).[13-15] The results of each individual CART were compared by Pafili et al. to Ewing's test battery. The study consisted of 152 patients with 12 years of median diabetes and  $64,51 \pm 7,85$  years of age. The 30:15 ratio showed the strongest diagnostic sign for CAN with 96% sensitivity, 65% specificity, 94% negative predictive value, and OR with 21.14. [20]

We found that cardiovascular autonomic function highly affected by presence of microalbuminuria, Systolic and diastolic blood pressure increases among patients of diabetes type 2 mellitus with mild microalbuminuria BP was  $7.7 \pm 3.4$  and heart rate was  $5.8 \pm 7.4$ ,  $8.3 \pm 7.4$  among moderate microalbuminuria with heart rate  $7.9 \pm 5.4$  and  $9.6 \pm 1.9$  mmHg BP found in severe albuminuria with heart rate  $8.5 \pm 6.7$ . In the Deepak N study Parchwani et al. were significantly involved in the existence of microalbuminuria in the age, triglycerides, blood pressure and HbA1c. [16] Microalbuminuria evaluation is included in the paradigm based on studies which suggest that microalbuminuria is related. [17-19] 126 T-2DM patients were compared to 152 aging and sex-matched healthy controls in a research in a rural region in southern India. The most sensitive tests for parasympathy and sympathetic detection were 53.2% CAN prevalence in individuals with T2DM and HRV in depth breathing and DBP response to isometric exercise. [22] The Commission's recommendation is:

The current investigation has shown that the existence of microalbuminuria is linked with other worldwide investigations cardiovascular Autonomous Dysfunction.

## CONCLUSION

We concluded in this study that the cardiovascular autonomic dysfunction in type-2 diabetes patients highly associated with microalbuminuria with increased systolic diastolic pressure and heart rate.

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