

# EVALUATION OF ALBUMINURIA, TOTAL PLASMA PROTEINS, AND SERUM ALBUMIN IN DIABETICS

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## ABSTRACT

**Background:** Diabetes Mellitus is fast becoming one of the biggest epidemics of this century. According to World Health Organization, there are 194 million diabetics world-wide (4% of the population) and the figure may reach 300 million by the year 2025. Diabetic nephropathy is one of the serious chronic microvascular complications of diabetes mellitus. Diabetes mellitus presents in its earliest stage with low levels of albumin (microalbuminuria) in the urine. The objective of this study was to evaluate albuminuria, total plasma proteins and serum albumin in diabetics.

**Material & Methods:** This study comprised of 105 subjects, 35 type 1 diabetics, 35 type 2 diabetics & 35 were healthy non-diabetic controls. The urinary albumin excretion rate, total plasma proteins, and serum albumin were determined in all the three groups.

**Results:** The Urinary Albumin Excretion Rate per 24 hours, Total plasma proteins, and Serum albumin of type 1 and type 2 diabetics were compared with urinary albumin excretion rate per 24 hrs, total plasma proteins, and serum albumin of control group in three separate tables. The Urinary Albumin Excretion Rate per 24 hours was 181.06mg in type 1 diabetics, 182.67mg in type 2 diabetics, and 11.34mg in controls. Total plasma proteins was 77.98 g/l was in type 1 diabetics, 76.86 g/l in type 2 diabetics, and 72.46 g/l in controls. Serum albumin was 41.34 g/l in type 1 diabetics, 41.82 g/l in type 2 diabetics, and 43.17 g/l in controls.

**Conclusion:** In type 1 and type 2 diabetics the total plasma proteins and urinary albumin excretion rate are significantly increased, while serum albumin is decreased.

**Key Words:** Albuminuria, Type 1 & type 2 diabetes, Total plasma proteins.

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**This article may be cited as:** Rehman A, Zamir S, Bhatti A, Jan SS, Ali S, Wazir F. Evaluation of albuminuria, total plasma proteins and serum albumin in diabetics. *Gomal J Med Sci* 2012; 10: 198-200.

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## INTRODUCTION

Diabetes mellitus (DM) is a syndrome of impaired carbohydrates, fats, and protein metabolism caused by either lack of insulin secretion or decreased sensitivity of the tissues to insulin.<sup>1</sup> It is a chronic illness that requires continuing medical care, patient self-management and education to prevent acute complications and to reduce the risk of long-term complications.<sup>2</sup> DM is fast becoming one of the biggest epidemics of this century.<sup>3</sup> DM confers a substantial burden on any health care system because of its increasing prevalence and its associated economic impact. Evidence-based diabetes management that addresses blood pressure, lipids

and glycemic control can reduce morbidity and mortality, and may decrease health care costs.<sup>4</sup>

Complications resulting from uncontrolled diabetes include heart disease, stroke, blindness, periodontal disease, retinopathy, nephropathy, neuropathy, stroke, ischemic heart disease, and diabetic foot. Monitoring of glycemic status is considered a corner-stone of care in diabetes.<sup>5</sup>

Diabetic Nephropathy (DN) presents in its earliest stage with low levels of albumin (microalbuminuria) in the urine. This often is referred to as incipient nephropathy.<sup>6</sup> Microalbuminuria (MAU) is defined as level of albumin ranging from 30 to 300 mg in a 24-hours urine collection. Overt albuminuria, macroalbuminuria, or proteinuria is defined as urinary albumin excretion of  $\geq 300$  mg / 24 hours.<sup>7</sup>

Microalbuminuria is a sensitive and early marker of diabetic nephropathy, other forms of renal dysfunction, and endothelial permeability

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throughout the vascular tree. It predicts progression of kidney disease leading to end stage renal disease (ESRD), development of cardiovascular disease, retinopathy, peripheral vascular disease and total mortality.<sup>8-11</sup> Albumin and fibrinogen synthesis are increased in albuminuric type 2 diabetes as compared to type 2 diabetes patients with normoalbuminuria, showing an up-regulation of hepatic secretory proteins in this clinical condition.<sup>12</sup>

This study was aimed to evaluate albuminuria, total plasma proteins, and serum albumin in both type-1 and type-2 diabetics with complications.

**MATERIAL AND METHODS**

This was a descriptive study carried out in the Department of Physiology Federal Postgraduate Medical Institute, Lahore. The study comprised of 105 subjects between 20-60 years of age. They were divided into three groups, 35 subjects were diagnosed type 1 diabetics and the rest of 35 subjects were diagnosed type 2 diabetics selected from medical OPD, diabetic clinic of Sheikh Zayed Hospital Lahore. The rest of 35 were control healthy subjects. The patients with known type 1 and type 2 diabetes having albuminuria (>30 mg of urinary albumin excretion in 24 hours urine or >20 microgram/min) were included in the other groups. Diabetic subjects having other acute illnesses (dehydration, hemorrhage, and acute renal failure) or chronic illnesses (tuberculosis, chronic lymphadenitis) and with any metabolic disorder e.g., Cushing syndrome, Hyperthyroidism, or Hyperpituitarism were excluded from the study.

After obtaining the informed consent, proper history, general physical and systemic examination was done and the relevant necessary informations were recorded on the predesigned proforma. Pulse and blood pressure was measured. Twenty four hours' urine samples were collected from all the subjects for UAER. The blood sample was withdrawn for estimation of serum total protein, and serum albumin. Statistical analysis was done by using SPSS version 16.0, and described by mean ± S.D. ANOVA was used to compare quantitative variables among the three groups (type-1 and type-2 diabetics, and control subjects). P<0.05 was considered statistically significant while p<0.001 was taken as highly significant.

**RESULTS**

There were a total of 105 subjects, 82 were males and 23 were females. Out of these, 28 males and 7 females were in control group, 27 males and 8 females were type 1 diabetics, and 27 males and 8 females were type 2 diabetics.

**Table 1: Comparison of urinary albumin excretion rate /24 hours**

Group	UAER/ 24 hrs	Control	P value
Type 1 diabetics	181.06 ± 16.98 mg	11.34 ± 2.02 mg	p<0.001
Type 2 diabetics	182.67 ± 27.35 mg	11.34 ± 2.02 mg	p<0.001

**Table 2: Comparison of total plasma proteins in type 1 and type 2 diabetics with control**

Group	Total plasma proteins	Control	P value
Type 1 diabetics	77.98±1.79 g/L	72.46 ± 3.67 g/L	p<0.001
Type 2 diabetics	76.86±2.22 g/L	72.46 ± 3.67 g/L	p<0.001

**Table 3: Comparison of Serum albumin in type 1 and type 2 diabetics with control group**

Group	Serum albumin	Control	P value
Type 1 diabetics	41.34±1.23 g/L	43.17±3.85 g/L	p<0.001
Type 2 diabetics	41.82 ± 2.14 g/L	43.17±3.85 g/L	p<0.001

Table-1 shows comparison of urinary albumin excretion rate (UAER) /24 hour in type 1 and type 2 diabetics with control group which was highly significant with p<0.001.

Table-2 shows the comparison of total plasma proteins in type 1 diabetics and type 2 diabetics with control group which was also significant (p<0.05).

Table-3 shows comparison of Serum albumin in type 1 and type 2 diabetics with control group which was significant with p<0.05.

**DISCUSSION**

Diabetes Mellitus is a group of chronic metabolic disorders of carbohydrates, fats, and protein metabolism, characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both leading to various complications including nephropathy.<sup>13</sup> Microalbuminuria is a marker for diabetic nephropathy (DN) and cardiovascular disease (CVD) in patients with type 1 & type 2 diabetes.<sup>14</sup>

The early detection of microalbuminuria and early control of diabetes retards the development of structural changes in early DN.<sup>15</sup> In our study uri-

nary albumin excretion rate was significantly increased in both type 1 and type 2 diabetics. Similar results have also been reported by other researchers in their studies. Thus a quantitative measurement of albumin in 24 hrs urine is both specific and cost-benefit to the diabetic patient and the health system of a country.<sup>14,15</sup>

Total plasma proteins were also significantly increased in both type 1 and type 2 diabetics in our study. Similar results are also corroborated by other studies.<sup>16</sup> Increased plasma concentration of acute-phase proteins have been reported in adult patients with either type 2 or type 1 diabetes. These parameters are significantly increased with  $p < 0.05$ .<sup>17</sup> Fibrinogen is elevated in DM which is associated with increased cardiovascular risk. Diabetics may exhibit hypergammaglobulinemia (IgA and IgG).<sup>18</sup>

Serum albumin was significantly decreased in both type 1 and type 2 diabetics compared to control group in this study. These results are in agreement with those reported in a study conducted by Upchurch *et al.* In their study, albumin level was low in diabetics compared with controls.<sup>19</sup>

## CONCLUSION

In type 1 and type 2 diabetics the total plasma proteins and urinary albumin excretion rate are significantly increased, while serum albumin is decreased.

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CONFLICT OF INTEREST  
Authors declare no conflict of interest.  
GRANT SUPPORT AND FINANCIAL DISCLOSURE  
None declared.