**Original Research Article**

# ASSESSMENT OF RELATION OF SERUM URIC ACID & MICRO ALBUMINURIA IN THE PATIENTS OF DIABETES MELLITUS FOR EARLY DETECTION OF DIABETIC NEPHROPATHY




## ABSTRACT

**Background:** Diabetic Nephropathy is one of the serious and life perilous complications of diabetes mellitus. Prolong duration of diabetes, no proper care and management, poor glycemic control in diabetic nephropathy can lead to End Stage Renal Disease (ESRD).

**Objective**: To assess the relation of serum uric acid & micro albuminuria in the patients of diabetes mellitus for early detection of diabetic nephropathy.

**Methodology:** This cross-sectional study was conducted in the Department of Medicine, LUMHS Jamshoro, with a total of 80 diabetic patients as case study subjects and 80 non-diabetic healthy participants as controls. Random glucose was measured using the gluco oxidase technique, and serum uric acid was measured using the uricase enzyme method in a calorimeter. Immunoterbidimetory kit technique was used to calculate microalbuminuria.

**Results**: The mean value of random blood sugar (RBS) in the control group was 135 ± 10.11 mg/dl, but RBS in the case study group was 224 ± 13.52 mg/dl, indicating that RBS in the case study group was extremely significant ($P < 0.001$). The mean serum uric acid level in the control group was 4.7 ± 0.6 mg/dl, while it was 6.6 ± 1.4 mg/dl in the case study group, which is highly significant ($P <0.001$) with correlation ($r= 0.34$). Albumin in urine in the control group

was 10 .2 ± 1.78 mg/gm, while it was 54± 10.34mg/gm in the case study group, which is a significant (P< 0.05) increase in the case study group with correlation (r= 0.28). In diabetics, serum uric acid and microalbuminuria show a positive connection.

**Conclusion:** This study concluded that there is strong positive relation of serum uric acid and micro albuminuria in diabetic patients for the early detection of diabetic nephropathy.

**Key Words**: Serum Uric Acid, Micro albuminuria, Diabetes Mellitus, Diabetic nephropathy

## INTRODUCTION

Hyperglycemia, as well as disturbances in carbohydrate, protein, and lipid metabolism, are characteristics of the metabolic syndrome, which is associated with diabetes mellitus (DM).[1] Diabetes mellitus is the leading cause of morbidity worldwide.[2] Diabetes today affects more than 4% of the world's population.[3] Diabetic mellitus is more common in underdeveloped nations. Nearly 10% of Pakistan's population is affected with diabetes mellitus.[4] Sedentary behaviour, high BMI, obesity, and poor eating habits are all risk factors for the development of diabetes and related consequences such as nephropathy, retinopathy, and atherosclerosis.[5,6] Diabetic nephropathy is one of the most significant consequences of glomerulosclerosis, and if left untreated, it can lead to end-stage renal disease, which is fatal to humans.[7,8] Diabetic patients with nephropathy have a higher risk of death, with a 37 to 40 times increase in mortality.[9] Micro albumin is one of the predictive factors for nephropathy in people with type 2 diabetes.[10] When diabetic nephropathy progresses, albumin may be present in the urine sample at the time of diagnosis, but levels between 30 and 300 mg/day indicate micro albuminuria. When diabetic nephropathy progresses, macro albumin urea may develop.[11,12]

The purine metabolism produces uric acid as a byproduct molecule.[13] Nearly 30% of it is used in the small intestine, with the remaining 50-60% excreted through the renal system.[14] Due to a lack

of the uricase enzyme in humans and a significant amount of uric acid in serum, humans have a higher rank of serum uric acid levels than other animals. Uric acid in serum is mostly excreted by urine.[15] When renal activities are interrupted owing to a disease in the kidney, it can lead to an increase in blood uric acid levels due to a decrease in uric acid outflow through the urine.[16] Serum uric acid levels differ by gender, with a typical range of up to 7mg/dl in men and up to 6mg/dl in women.[17] Different investigations have found increased blood uric acid levels in many renal conditions, including early kidney diseases, diabetes, metabolic syndrome, hypertension, and so on.[18]

The goal of this study was to see if there was a link between microalbuminuria and serum uric acid in type 2 diabetes patients.

## METHODOLOGY

Between July and December 2019, a cross-sectional research was undertaken at LUMHS Jamshoro. A total of 80 diagnosed cases of type-2 diabetes (59 men and 21 females) with an age range of 40 to 60 years were recruited from medical OPDs and the LUMHS diabetic clinic as case study participants, while 80 healthy people (60 males and 20 females) in the same age range served as control subjects. This study excluded individuals with diabetic retinopathy, type 1 diabetes, hypertension, and those on diuretic or ACE inhibitor medicines. On the spot, a blood sample of 5 cc was taken for examination of random blood glucose levels, serum uric acid, serum creatinine, and HbA1c percent, while a urine sample was taken for albumin detection. The hexokinase technique was used to assess the random blood glucose level. Serum creatinine was determined using a kit, and serum uric acid was determined using a calorimeter and the uricase enzyme technique. Albumin in urine samples is measured using an immunoterbidimetory kit. SPSS version 22 was used for the statistical analysis.

## RESULTS

The relationship of several factors between the control and s=case study groups is given in Table 1. In the case study group, random blood glucose levels were significantly higher, and HbA1c percent levels were also significantly higher. In the case study group, blood creatinine and serum uric acid levels increased considerably, following the same pattern as in microalbuminuria. Micro albuminuria was found in only 11 cases of control people, whereas it was found in 49 cases of type-2 diabetes mellitus.

These findings also revealed a substantial relationship between serum uric acid, microalbuminuria, and random blood sugar levels.

## Table: No: 01

## Parameters under study with their significant & correlation values

| Parameter | Control Group | Case Study Group | P.value | r. value |
|---|---|---|---|---|
| **RBS (mg/dl)** | 135 ± 10.11 | 224 ± 13.52 ** | < 0.001 | 0.30 |
| **HbA1c%** | 5.3 ± 0.5 | 9.7 ± 2.1* | < 0.05 | 0.26 |
| **S.Creatinine (mg/dl)** | 0.71 ± 0.34 | 1.51 ± 0.52* | <0.05 | 0.11 |
| **S. Uric Acid (mg/dl)** | 4.7 ± 0.6 | 6.6 ± 1.4** | <0.001 | 0.34 |
| **Albumin in urine (mg/gm)** | 10 .2 ± 1.78 | 54± 10.34 * | <0.05 | 0.28 |

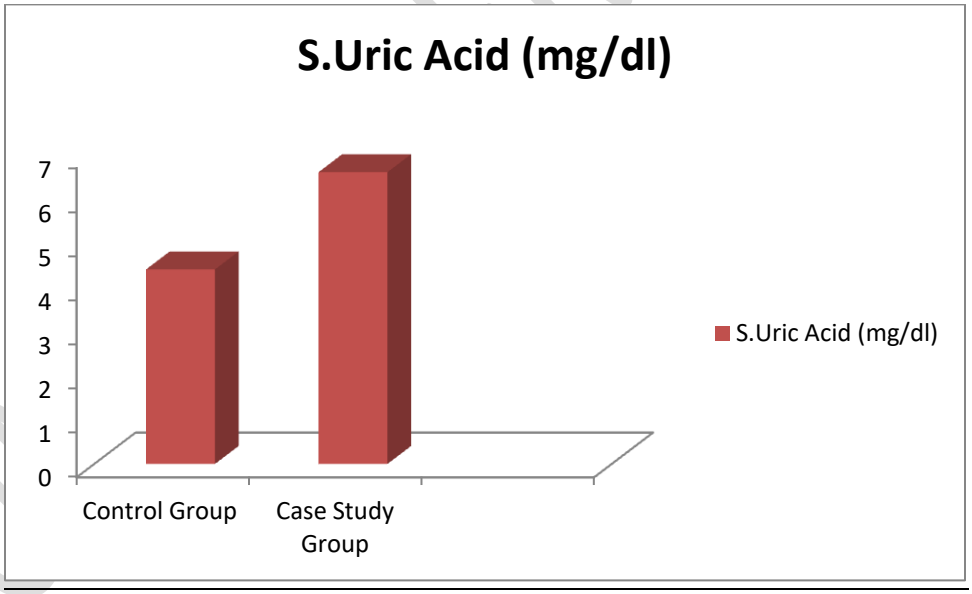


**Figure No: 01 Serum Uric Acid Level**

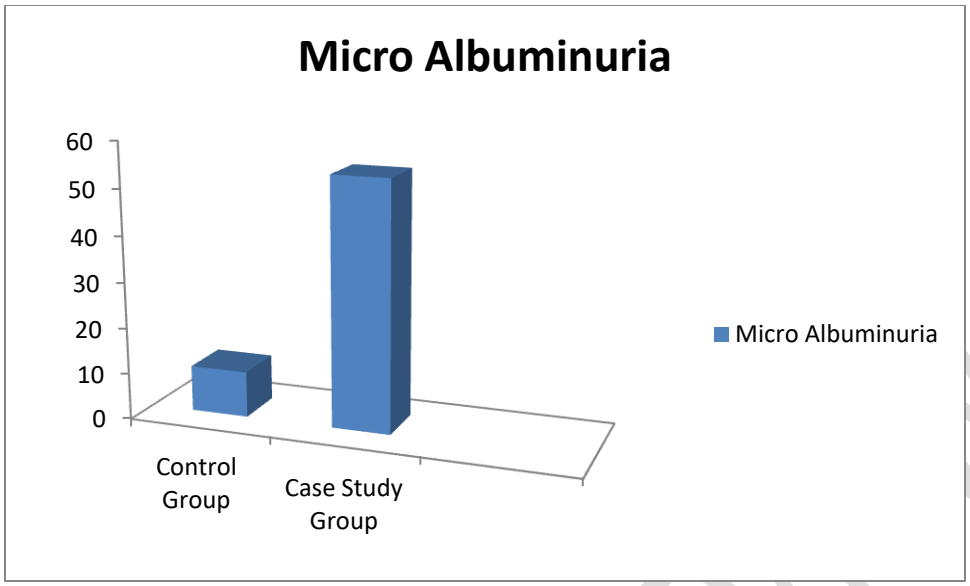


**Figure No: 02Albumin Level in Urine**

## DISCUSSION

Diabetes and its consequences have a significant negative influence on human health. Diabetic nephropathy is a diabetic condition that damages the kidney over time, eventually leading to end-stage renal failure (ESRD). 8Nephropathy caused by diabetes increases the risk of kidney injury by a factor of ten.[9] In diabetic nephropathy, serum creatinine levels can be used as a predictor for assessing kidney function.[19] The presence of albumin in the urine is also a warning sign that kidney damage is beginning.[20] Kidney damage in diabetics is linked to hyperglycemia for a variety of reasons, including hexosamine activation, an increase in intracellular reactive oxygen species, and non-enzymatic glycation of proteins, which raises renal capillary pressure and, eventually, the appearance of protein in urine.[21,22] As a result, DM combined with micro albuminuria implies renal impairment. This study reveals that there is strong relation with DM, hyper uricemia and micro albuminuria.

Uric acid is one of the components associated with glucose metabolism.[23] Uric acid levels may rise as a result of oxidative stress, which may contribute to the development of diabetes. Another mechanism linking uric acid to the development of diabetes is that it inhibits the formation of endothelial nitric oxide, resulting in endothelial dysfunction and insulin resistance, as evidenced by the higher levels of uric acid found in DM by several researchers in their investigations.[24]

Serum uric acid levels were higher in newly diagnosed cases of diabetes, according to Anju Gill et al (2013).[25] According to Abbas Dehghan et al (2008)[26], those with high blood uric acid levels are more likely to acquire type 2 diabetes. After doing study, C.K. Kramer et al. (2009)[27] proposed that hyperuricemia can induce glucose intolerance. Our findings backed with the findings of RanparvarAlamdarM et al.(2006)[28], who found that blood glucose levels are directly related to micro albuminuria. Our findings are backed up by ShokoofehBonakdaran et

al.(2011)[29], who found a substantial link between hyperuricemia and microalbuminuria. The development of nephropathy in diabetes mellitus persistently declines the renal functions which can be irreversible in nature. Treatments available not for the restorations of renal damage which has been done but for the back up support for further renal damage which can lead ESRD.

## CONCLUSION

This study revealed that serum uric acid and microalbuminuria in diabetic individuals had a strong positive relationship for the early diagnosis of diabetic nephropathy.

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