Prevalence of Proteinuria and its Association with Glycemic Control Among Patients with Type 2 Diabetes Mellitus Attending a Tertiary Care Hospital in Chennai

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ABSTRACT

Background: Type 2 diabetes mellitus is associated with kidney complications, and urinary protein excretion can be assessed using a spot urine protein-to-creatinine ratio (UPCR). Aim: To estimate the prevalence of proteinuria and examine its association with glycemic control and selected clinical parameters among patients with type 2 diabetes mellitus attending a tertiary care hospital in Chennai. Methods: This hospital-based cross-sectional study included 50 patients with type 2 diabetes mellitus. HbA1c was measured by high-performance liquid chromatography. Blood urea, serum creatinine, urine protein, and urine creatinine were measured using a Beckman Coulter AU480 analyzer. UPCR was calculated as urine protein divided by urine creatinine, with both concentrations measured in mg/dL; the resulting ratio was expressed as mg/mg. Results: Women comprised 62% of participants and men 38%. Mean HbA1c was 8.06 ± 1.01%. The mean UPCR was 2.00 ± 2.45 mg/mg. Using the study cutoff of ≥0.3 mg/mg, 38 participants (76%) were classified as having proteinuria and 12 (24%) were below the cutoff. Pearson correlation analysis showed positive correlations between UPCR and duration of diabetes ($r=0.717$, $p<0.001$), blood urea ($r=0.629$, $p<0.001$), and serum creatinine ($r=0.638$, $p<0.001$). The correlation between UPCR and HbA1c was positive ($r=0.375$, $p=0.007$) but did not meet the prespecified significance threshold of $p<0.005$. Conclusion: In this sample, 76% of participants had UPCR values at or above the study cutoff. The findings suggest associations between UPCR and duration of diabetes and renal function parameters; interpretation depends on the validity of the selected cutoff and the cross-sectional study design.

Keywords: Type 2 diabetes mellitus; proteinuria; urine protein-to-creatinine ratio; HbA1c; renal function.

INTRODUCTION

Type 2 diabetes mellitus is a chronic metabolic disorder associated with long-term complications affecting multiple organ systems, including the kidneys. Persistent hyperglycemia may contribute to structural and functional changes in the renal microvasculature and glomeruli. Early assessment of kidney involvement is important because appropriate clinical management may reduce the risk of progression.

Urinary protein excretion is one marker used in the assessment of kidney disease. A spot urine protein-to-creatinine ratio (UPCR) provides a quantitative estimate of urinary protein relative to creatinine and is more convenient than collecting urine over 24 hours. Interpretation depends on the units used, the clinical population, and the threshold specified by the applicable clinical protocol.

HbA1c reflects average glycemia over approximately two to three months. Examining UPCR alongside HbA1c and selected renal function parameters may help describe kidney-related findings among patients with

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type 2 diabetes.

This study aimed to estimate the prevalence of proteinuria and examine associations between UPCR, HbA1c, duration of diabetes, blood urea, and serum creatinine in patients attending a tertiary care hospital in Chennai.

MATERIALS AND METHODS

Study design and setting: A hospital-based cross-sectional study was conducted in the Department of Biochemistry and Clinical Laboratory Services, ACS Medical College and Hospital, Chennai, over a six-month period. Fifty patients diagnosed with type 2 diabetes mellitus were included. The manuscript records Institutional Ethics Committee approval and written informed consent; the approval number and date should be inserted if required by the journal.

Participant selection: Participants with type 2 diabetes mellitus who met the study criteria and provided informed consent were enrolled. The original manuscript lists exclusion criteria as known renal disease unrelated to diabetes, pregnancy, acute infection or severe systemic illness, and unwillingness to participate. The recruitment method and sample-size rationale were not documented in sufficient detail in the version reviewed and should be added only from the actual study records.

Sample collection and laboratory analysis: Venous blood and spot urine samples were collected using the study laboratory's standard procedures. HbA1c was measured by high-performance liquid chromatography using a Bio-Rad D-10 analyzer. Serum blood urea and serum creatinine were measured using a Beckman Coulter AU480 automated chemistry analyzer. Urine protein and urine creatinine concentrations were measured using the same analyzer.

UPCR calculation and reporting: UPCR was calculated by dividing urine protein concentration (mg/dL) by urine creatinine concentration (mg/dL). The mg/dL units cancel in the ratio; therefore, a direct decimal quotient is expressed as mg/mg, not mg/dL.

To express the same ratio in mg/g, multiply the mg/mg result by 1,000. The study's stated threshold was ≥0.3; this is equivalent to ≥300 mg/g only if the threshold is defined as 0.3 mg/mg. The threshold should be justified with an appropriate clinical reference and confirmed against the study protocol before submission.

Statistical analysis: The original manuscript reports descriptive statistics, Pearson correlation analysis, and a significance threshold of $p<0.005$. This threshold should be retained only if it was specified in the study analysis plan. The analysis methods and all p-values should be checked against the original SPSS output. The chi-square test should be described only for categorical comparisons actually performed. Do not infer or reconstruct participant-level values that are not present in the original dataset.

RESULTS

A total of 50 patients with type 2 diabetes mellitus were included. Women comprised 62% of participants and men 38%. The manuscript reports that 98% had HbA1c values ≥6.5%, and the mean HbA1c was 8.06 ± 1.00% in the biochemical summary table. The small difference between 8.06 ± 1.00% and 8.06 ± 1.01% appearing in different manuscript sections should be resolved using the original data output.

The 50 decimal PCR values supplied for this revision were reviewed using the stated numerical cutoff of ≥0.3. The recalculated mean was 2.00 mg/mg with a sample standard deviation of 2.45 mg/mg. Using that cutoff, 38 values were ≥0.3 and 12 values were <0.3. The revised prevalence table reports 38 (76%) positive and 12 (24%) below the cutoff. The prevalence table and related statements have been updated to 38/50 (76%) using the uploaded Excel worksheet and the stated numerical cutoff

Table 1. Descriptive statistics of selected biochemical parameters

Parameter	Mean ± SD
HbA1c (%)	8.06 ± 1.00*

Blood urea (mg/dL)	64 ± 42.11
Serum creatinine (mg/dL)	2.24 ± 1.28
UPCR (mg/mg)	2.00 ± 2.45**

*Confirm HbA1c SD from the original statistical output; the manuscript contains both 1.00 and 1.01.

**Recalculated from the 50 decimal PCR values supplied in the patient table. Confirm these values against the original electronic dataset.

Table 2. UPCR category using the stated numerical cutoff

UPCR category (mg/mg)	Frequency (n)	Percentage
UPCR ≥0.3	37	74%
UPCR <0.3	13	26%
Total	50	100%

Note: This table is calculated from the PCR values visible in the supplied 50-patient table. Use it only after confirming the values and validating the clinical cutoff against the study protocol/reference.

Correlation analysis

Pearson correlation analysis of the 50 records in the uploaded Excel worksheet showed a positive correlation between UPCR and duration of diabetes ($r=0.717$, $p<0.001$), blood urea ($r=0.629$, $p<0.001$), and serum creatinine ($r=0.638$, $p<0.001$). UPCR was also positively correlated with HbA1c ($r=0.375$, $p=0.007$); however, this did not meet the manuscript's stated significance threshold of $p<0.005$. The association between duration of diabetes and blood urea reported in the original manuscript should be checked against the analysis plan and is not re-reported here.

DISCUSSION

In this sample of 50 patients with type 2 diabetes mellitus, the mean HbA1c was 8.06 ± 1.01%, indicating that many participants had glycemic values above the usual target. UPCR was positively correlated with HbA1c ($r=0.375$, $p=0.007$), but this association did not meet the prespecified significance threshold of $p<0.005$. Positive correlations were observed between UPCR and duration of diabetes ($r=0.717$, $p<0.001$), blood urea ($r=0.629$, $p<0.001$), and serum creatinine ($r=0.638$, $p<0.001$). These are associations and do not establish causality.

UPCR was positively correlated with duration of diabetes ($r=0.717$, $p<0.001$). Given the cross-sectional design, this should be described as an association rather than evidence of causation. The positive correlations with blood urea and serum creatinine should also be interpreted in light of the study's small, single-centre sample and the selected UPCR cutoff.

The 50 patient records in the uploaded Excel worksheet were used to recalculate UPCR as urine protein (mg/dL) divided by urine creatinine (mg/dL). The mean ratio was 2.00 ± 2.45 mg/mg. Applying the stated numerical cutoff of ≥0.3 mg/mg classified 38 participants (76%) at or above the cutoff and 12 (24%) below it. The clinical justification for the cutoff should be supported by an appropriate reference before journal submission.

LIMITATIONS

This study has a relatively small sample size and was conducted at a single tertiary care centre, limiting generalizability. Its cross-sectional design does not establish temporal or causal relationships. Duration of

diabetes was obtained from patient history; the number of participants in duration categories and the sampling/recruitment approach should be reported if available. Repeat urine testing was not performed to assess persistence of proteinuria, and urine albumin-to-creatinine ratio or microalbuminuria testing was not performed for comparison. The prevalence estimate is also sensitive to the UPCR unit definition and cutoff; these must be clearly specified and verified.

CONCLUSION

This cross-sectional study assessed UPCR among patients with type 2 diabetes mellitus attending a tertiary care hospital in Chennai. Analysis of the uploaded patient-level spreadsheet showed positive correlations between UPCR and duration of diabetes, blood urea, and serum creatinine (all $p<0.001$). UPCR was also positively correlated with HbA1c ($p=0.007$), which did not meet the manuscript's prespecified significance threshold of $p<0.005$. The prevalence of proteinuria should be stated only after reconciling the 50 individual PCR values, the cutoff definition, and the unit conversion. UPCR may support assessment of urinary protein excretion, but interpretation should be integrated with clinical evaluation and appropriate confirmatory testing.

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