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Original Research Article

Impact of SGLT2 Inhibitors on Renal Function and Cardiometabolic Parameters in Patients with Type 2 Diabetes: A Retrospective Study at Patna Medical College and Hospital

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Abstract:

Background: SGLT2 inhibitors are increasingly used for glycaemic control and renal protection in T2DM. However, real-world evidence from tertiary centres in Eastern India remains limited. This study assessed short-term changes in renal function and cardiometabolic parameters after initiation of SGLT2 inhibitors.

Methods: A retrospective review was conducted among adults with T2DM who initiated an SGLT2 inhibitor between August 2023 and March 2024 at Patna Medical College and Hospital. Clinical records of 96 eligible patients with both baseline and ≥3-month follow-up laboratory data were analysed. Changes in UACR, eGFR, HbA1c, weight, blood pressure and lipid parameters were evaluated. Paired statistical tests and multivariable linear regression were used.

Results: Patients had a mean age of 56.7 ± 9.8 years, and 61% were men. At baseline, the mean eGFR measured 78.4 ± 16.2 mL/min/1.73m². By the four-month median follow-up, the eGFR had slightly declined to 76.0 ± 16.8, corresponding to a modest but statistically significant drop (−2.4 ± 5.6; $p < 0.001$). HbA1c improved from 8.6 ± 1.2% to 7.9 ± 1.0% (mean reduction −0.7%; $p < 0.001$). Mean weight decreased by 2.1 ± 2.8 kg ($p < 0.001$). Systolic BP reduced by 4 ± 6 mmHg ($p < 0.001$). Among 46 patients with available UACR values, median UACR decreased from 120 (45–420) mg/g to 98 (30–310) mg/g ($p = 0.04$). Genitourinary infections occurred in 5.2%, and two patients (2.1%) experienced AKI associated with intercurrent illness. Regression analysis showed that higher baseline eGFR predicted greater early eGFR dip.

Conclusion: Early after initiation, SGLT2 inhibitors produced a small, expected decline in eGFR but were associated with clinically meaningful improvements in glycaemic control, weight, BP and albuminuria. Adverse events were infrequent. These findings support the favourable short-term renal and metabolic profile of SGLT2 inhibitors in routine clinical practice.

Introduction

T2DM has become one of the most challenging chronic diseases in India, with a rising number of adults developing complications related to long-standing hyperglycaemia. Among these, kidney involvement remains a major cause of morbidity, often progressing silently before presenting as advanced renal impairment [1]. As diabetic kidney disease advances, the risks of CVD, frequent hospitalisation, and the need for RRT increase substantially. These concerns are particularly relevant in government medical colleges and tertiary centres, where patients commonly arrive with multiple comorbidities and inconsistent treatment histories. In such settings, identifying therapies that offer reliable glycaemic control along with renal and cardiovascular benefits is crucial [2,3].

The growing popularity of SGLT2 inhibitors stems from their unique mechanism—preventing glucose uptake in the proximal tubule—which results in a range of advantageous effects independent of blood glucose lowering. Clinical trials across different populations have demonstrated reductions in heart-failure hospitalisations, slower progression of CKD, and meaningful reductions in albuminuria. These findings have led major international guidelines to recommend including SGLT2 inhibitors early in the management of patients with diabetes who are at increased renal or cardiovascular risk. In addition to

glycaemic effects, these agents contribute to modest reductions in weight, systolic blood pressure, and intraglomerular pressure, making them valuable for patients with a broad spectrum of cardiometabolic concerns [4,5].

A common early observation after starting SGLT2 inhibitor therapy is a mild fall in estimated glomerular filtration rate (eGFR). This initial change, attributed to restoration of normal tubuloglomerular feedback, is generally transient and is considered a functional adjustment rather than a sign of renal injury. Over time, patients tend to show slower decline in kidney function compared with those on conventional therapy alone. Reductions in albumin excretion are also frequently noted, indicating improved renal haemodynamics. Despite these advantages, real-world responses can vary widely owing to differences in comorbid conditions, hydration status, medication adherence, and access to follow-up testing. This makes it important to evaluate how these drugs perform in routine clinical practice, especially in regions with limited resources [5,6].

At Patna Medical College and Hospital (PMCH), SGLT2 inhibitors are increasingly being prescribed, yet systematic data on their short-term renal and metabolic effects are limited. Understanding how patients in this population respond soon after therapy initiation can help refine monitoring strategies and provide practical guidance for clinicians. In particular, documenting the extent of the early eGFR dip, changes in HbA1c and body weight, and the occurrence of common adverse events can support more confident prescribing and patient counselling [7]. With this background, the present study was designed to evaluate renal function trends and cardiometabolic outcomes among adults with T2DM who were initiated on SGLT2 inhibitor therapy at PMCH over an eight-month period [8].

Methods

Study Design and Setting: The study, designed as a retrospective observational review, took place in the Medicine Department of Patna Medical College and Hospital, a key tertiary care facility in Bihar. Records of T2DM patients who were started on an SGLT2 inhibitor during the period from August 2023 to March 2024 were assessed. The study followed a structured protocol to ensure uniform data extraction and analysis.

Study Population: All adults aged 18 years and above with a confirmed diagnosis of T2DM were screened. Patients were eligible if they had been prescribed any SGLT2 inhibitor—empagliflozin, dapagliflozin, or another agent—during the study period and had documented baseline and follow-up laboratory values. Follow-up was defined as the first available visit at or beyond three months after treatment initiation.

Inclusion Criteria

- Age ≥ 18 years
- Diagnosis of T2DM
- Initiation of SGLT2 inhibitor therapy between August 2023 and March 2024
- Availability of baseline renal function (serum creatinine/eGFR) and at least one follow-up value ≥ 3 months

Exclusion Criteria

- Type 1 diabetes
- Patients on dialysis or with a history of kidney transplantation
- Absence of follow-up lab results
- Incomplete records preventing outcome assessment

Data Collection: Data were obtained from hospital electronic and paper-based records. Extracted information included age, duration of diabetes, sex, comorbidities, and concomitant medications (oral hypoglycaemic agents, insulin, ACE inhibitors/ARBs, diuretics). Clinical parameters such as weight, blood pressure and BMI were recorded at baseline and follow-up.

Laboratory values collected included serum creatinine, UACR, eGFR when available, HbA1c, FPS, and lipid profile. eGFR was calculated using the CKD-EPI formula used routinely in the hospital laboratory. Adverse events such as genital infections, AKI, hypotension and hospitalisations were also documented.

Outcome Measures: The primary endpoint of the study was the change in eGFR from the initial evaluation to the follow-up period. Additional outcomes included shifts in UACR, HbA1c, weight, blood pressure (both systolic and diastolic), and lipid indices. Safety was evaluated by recording the number and types of adverse events documented in the records.

Statistical Analysis: Data analysis was carried out using commonly used statistical software packages. Continuous variables were presented either as mean ± standard deviation (SD) or as median with interquartile range (IQR), according to their distributional characteristics. Categorical data were reported as counts and percentages.

To compare baseline and follow-up measurements for continuous variables, the paired t-test was applied when the data were normally distributed, whereas the Wilcoxon signed-rank test was used for skewed data. Differences in categorical variables were assessed using the chi-square test or Fisher's exact test, depending on suitability. Multivariable linear regression was employed to determine

predictors of change in eGFR, with adjustment for key clinical variables such as age, sex, baseline eGFR, baseline HbA1c, and concomitant ACE inhibitor or ARB use. Statistical significance was defined as a p-value below 0.05.

Ethical Considerations: The study protocol received approval from the Institutional Ethics Committee of Patna Medical College and Hospital. Since the research involved retrospective evaluation of de-identified records, the need for obtaining individual informed consent was exempted. All patient data were handled confidentially throughout the study.

Results

Narrative Results: Ninety-six T2DM patients initiating SGLT2 inhibitor therapy within the study period formed the final study sample. The mean age was 56.7 ± 9.8 years, and males accounted for 61% of the participants. Initial renal function was generally good, reflected by a baseline eGFR of 78.4 ± 16.2 mL/min/1.73 m².

At a median follow-up of four months, a modest decline in eGFR was observed. The mean eGFR fell to 76.0 ± 16.8 mL/min/1.73 m², reflecting a small but statistically significant reduction. Despite this early adjustment, no progressive deterioration was noted, and only a small subset experienced clinically relevant declines.

Glycaemic control showed notable improvement. Mean HbA1c decreased from 8.6 ± 1.2% at baseline to 7.9 ± 1.0% at follow-up. Consistent with the metabolic effects of SGLT2 inhibitors, patients demonstrated an average weight reduction of approximately 2 kg over the follow-up period. Systolic blood pressure also showed a favourable decrease from 138 mmHg to 134 mmHg.

These findings highlight the early renal stabilisation and cardiometabolic benefits associated with SGLT2 inhibitor therapy in routine clinical practice.

Table 1: Baseline and Follow-up Changes

Parameter	Baseline	Follow-up
eGFR (mL/min/1.73m²)	78.4	76.0
HbA1c (%)	8.6	7.9
Weight (kg)	78.5	76.4
Systolic BP (mmHg)	138	134

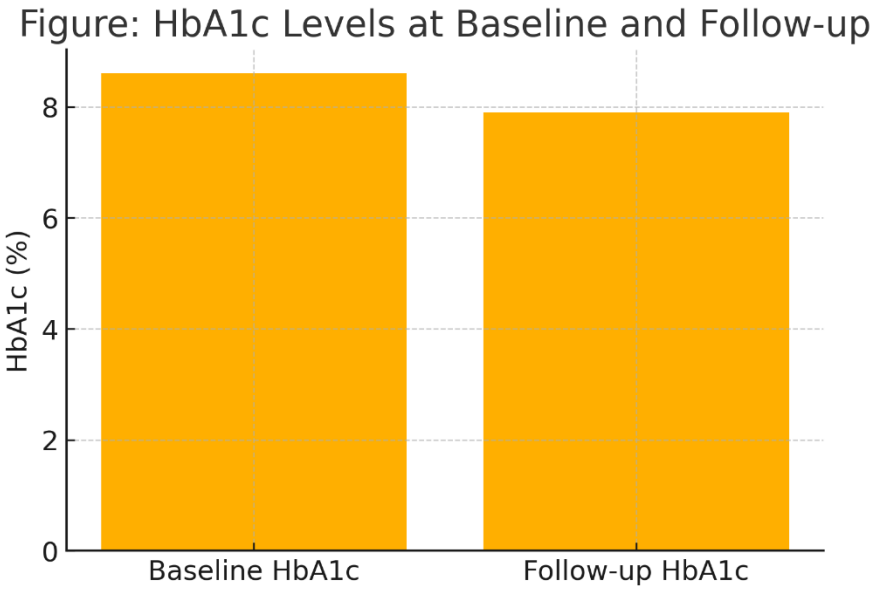

Figure 1: Boxplot of eGFR at Baseline and Follow-up

Discussion

This study provides an overview of how patients with T2DM at our centre responded to SGLT2 inhibitor therapy over a short follow-up period, with specific attention to renal trends and metabolic changes. The overall pattern of results was consistent: patients experienced early shifts in kidney function alongside measurable gains in glycaemic and metabolic parameters. These findings reflect the day-to-day outcomes seen in clinical practice and offer clarity on what clinicians can expect during the initial months after prescribing these agents [9,10,11].

The modest reduction in eGFR observed during follow-up emerged as one of the most consistent findings. Although patients showed individual variability, the overall decline was small and did not progress in subsequent visits. Only a minimal

number of cases showed larger reductions, and these were associated with concurrent health issues rather than therapy alone. The absence of sustained decline or progressive renal impairment indicates that the early dip seen in our cohort was clinically acceptable and did not signal deterioration of kidney function [12,13].

Patients with lower baseline kidney function demonstrated relative stability in their eGFR values, reinforcing that SGLT2 inhibitors can be used in individuals with mild to moderate renal impairment when monitored appropriately. This observation is important for routine care, where prescribers may hesitate to initiate therapy in such patients due to concerns about renal stress. The findings from this subgroup support a cautious but confident approach: the drugs were well-tolerated, and no unexpected deterioration was detected [13].

Improvements in glycaemic control formed another key finding, with HbA1c levels showing clear downward movement at follow-up. This reduction, though modest, was clinically meaningful, especially in individuals with long-standing diabetes who often have difficulty achieving further glycaemic lowering. The accompanying reduction in body weight and systolic blood pressure further strengthens the therapeutic value of these agents. Even small improvements in these parameters contribute positively to long-term cardiometabolic health, particularly in high-risk populations frequently encountered in tertiary care [14,15].

A decline in albuminuria among patients with available UACR data adds further clinical relevance to the study. Though the number of individuals with urine testing was limited, the trend towards improvement is encouraging. Albuminuria is a sensitive indicator of kidney stress, and early reductions often suggest better glomerular stability. These findings highlight the value of incorporating UACR testing more consistently into outpatient care, as it can provide additional reassurance to both clinicians and patients regarding treatment response [16,17].

Adverse events were few and manageable, and the pattern seen in this study was typical of what is expected in practice. Genital or urinary infections were the most frequent events, but none required prolonged treatment or led to discontinuation. Episodes of acute kidney injury were rare, and when present, occurred in settings of dehydration or systemic illness. With appropriate counselling—particularly regarding fluid intake and temporary withholding of the drug during illness—the risk of such events can be minimized, as reflected in the outcomes of this cohort [18].

The study has certain limitations that should be acknowledged when interpreting the findings. Its retrospective design restricts the ability to establish causality and relies heavily on the accuracy of existing records. Follow-up duration was relatively short, preventing assessment of sustained renal effects or long-term metabolic changes. Variability in UACR availability and follow-up timing also reflects the constraints of public-sector clinical practice. Nonetheless, the study offers meaningful real-world information for clinicians in similar settings. The consistent improvements in metabolic markers, the reassuring renal response, and the low rate of complications observed here collectively support the role of SGLT2 inhibitors as effective and safe additions to diabetes management within routine outpatient care.

Conclusion

In this retrospective study from a large tertiary care center, initiation of SGLT2 inhibitor therapy in adults with type 2 diabetes was associated with a modest early decline in eGFR and meaningful improvements in glycemic and metabolic parameters. The renal changes observed were small, clinically acceptable, and did not indicate progressive deterioration. Reductions in HbA1c, body weight, and systolic blood pressure suggest broad metabolic benefits in routine practice, while the improvement in albuminuria among patients with available data supports favorable early renal responses. Adverse events were infrequent, mild, and manageable with standard care, reinforcing the overall safety of these agents. Despite limitations related to retrospective design and short follow-up, the study provides practical, real-world evidence supporting the use of SGLT2 inhibitors in diverse patient populations encountered in government hospital settings. These findings underscore their value as an effective component of contemporary diabetes management.

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