

Frequency of Urinary Tract Infections among the Patients of Type-II Diabetes Mellitus taking Sodium-Glucose Co-Transporter-2 inhibitors (SGLT-2 inhibitor), Attending the Out-Patient Department, Government General Hospital, Samanabad, Faisalabad

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ABSTRACT

Background: Sodium Glucose Co-Transporter-2 (SGLT-2) inhibitors are medications commonly used to treat Type II Diabetes mellitus. Their primary action is to inhibit the Sodium Glucose Co-transporter 2 protein. Due to their glycosuric effect, these drugs are associated with recurrent urinary tract infections and normoglycemic Diabetic Ketoacidosis. **Objective:** To assess the frequency of urinary tract infections among patients with Type II Diabetes Mellitus taking SGLT-2 inhibitors. **Study Design:** Cross-sectional descriptive study. **Settings:** outpatient department of Government General Hospital, Samanabad, Faisalabad Pakistan. **Duration:** 6 months, from 12-01-2025 to 12-07-2025. **Methods:** We enrolled 138 patients based on inclusion and exclusion criteria. After starting SGLT-2 inhibitors during the first month, patients were monitored for urinary tract infections. Diagnosis was made using signs, symptoms, and a complete urine examination. Data collected included age, gender, HbA1c levels, and presence of urinary tract infection signs or symptoms. We calculated frequencies, percentages, and analyzed data using the chi-square test. A p-value of <0.05 was considered statistically significant. **Results:** Out of 138 patients, only 11 patients reported having Urinary Tract Infections (7.97%). Out of 11 patients, 10 were female and only one was male. **Conclusion:** This study found a 7.97% incidence of UTIs in T2DM patients initiated on SGLT-2 inhibitors, with a significantly higher risk observed in female patients. These findings highlight the importance of patient counseling and monitoring for UTIs, particularly in women, when prescribing this class of medication.

Keywords: Sodium-Glucose Co-Transporter-2 inhibitors, Urinary tract infections, Diabetes mellitus.

INTRODUCTION

Diabetes is one of the most common systemic diseases worldwide, especially in Pakistan.¹ The pooled prevalence of Type 2 diabetes and pre-diabetes in Pakistan was found to be 10% and 11% respectively, equating to approximately 24 million individuals affected with type 2 diabetes and 26 million individuals with pre-diabetes.² SGLT-2 inhibitors are a group of medications that are frequently used to treat type II diabetes mellitus.³ Their primary mechanism of action is to inhibit sodium glucose co-transporter 2 protein, located in proximal

convoluted tubules, the primary function of which is to reabsorb glucose from PCT into the bloodstream. The inhibition of SGLT-2 proteins results in the loss of glucose through urine, thereby controlling blood glucose levels.⁴ Due to their cardio-protective and renal-protective profile, these agents are widely used today for the treatment of diabetes mellitus, especially in patients with cardiac and renal failure.⁵ However, because of their glycosuric effect, these drugs have documented side effects of recurrent urinary tract infections⁶ and normoglycemic diabetic ketoacidosis.

Objective: To assess the frequency of Urinary Tract infections among patients with type Diabetes Mellitus taking SGLT-2 inhibitors, attending the outpatient department, Government General Hospital, Samanabad, Faisalabad.

Rationale: Although SGLT-2 inhibitors are often prescribed with caution due to the perceived risk of urinary tract infections, the true prevalence of this adverse effect in our local diabetic population is not well established. This study was conducted to determine the frequency of urinary tract infections in such patients, to support safer and more rational prescribing practices.

METHODS

This cross-sectional descriptive study was conducted at Out-Patient Department, Government General Hospital, Samanabad, Faisalabad Pakistan. The duration of this study was 06 months, i.e., 12-01-2025 to 12-07-2025. Non-probability consecutive sampling technique was used. After getting approval from concerned hospital authorities vide letter no 4406/E-GGHS, the sample size was calculated using the WHO sample size criteria: $p = 6.7\%$, absolute precision = 5%, Confidence level = 95%, Calculated sample size = 138.

Patients with only Type 2 Diabetes mellitus, patients aged 30-60 years, patients of both male and female genders. Only patients presenting with urinary symptoms such as dysuria, frequency, urgency, suprapubic discomfort, or fever were considered to have symptomatic UTI. All such patients underwent urine complete examination to confirm the diagnosis. The study primarily included patients with uncomplicated urinary tract infections. Cases with pyelonephritis, indwelling catheters, urinary tract obstruction, or other structural abnormalities were not part of the study cohort.

Patients above the age of 60 years. Patients already have signs and symptoms of UTI. Patients having urinary obstruction or structural abnormalities of the urinary tract. Patients already taking an antibiotic course due to any infection, or immunocompromised patients. Pregnant females.

After getting approval from the concerned hospital authorities, the sample size was calculated using the WHO sample size criteria. 138 patients were enrolled in the first month of the study on the basis of inclusive and exclusive criteria. After the commencement of SGLT-2 inhibitors, patients were kept in follow-up and were observed to see whether they developed UTI. Diagnosis of UTI was made based on signs/symptoms and a complete examination of the urine. Data regarding age, gender, HbA1c levels, and presence of signs/symptoms of urinary tract infection were recorded. Patients were

stratified based on age, gender, and controlled and uncontrolled Diabetes mellitus.

Patients having < 7% HbA1c were labeled as having controlled diabetes.

Patients having > 7% HbA1c were labeled as having uncontrolled Diabetes Mellitus.

Frequency and percentages were calculated, and data were analyzed using the chi-square test. P-value of <0.05 was statistically significant.

RESULTS

Out of 138 patients who were given SGLT-2 inhibitors, only 11 patients (7.97%) developed UTI (diagnosed based on symptoms and complete urine examination).

- Out of 11 patients who developed UTI, 10 were female (91%) and only one was male (9%).
- 8 out of 11 patients who developed UTI were from the age group 46-60 years (72.7%), while three patients were from the age group 30-45 (27.3%).
- 8 out of 11 patients who developed UTI were having uncontrolled diabetes (72.7%), while three patients were having controlled diabetes (27.3%).

Table 1: Frequency of UTI among patients taking SGLT-2 inhibitors

UTI status	Number of Patients (n)	Percentage (%)
Present	11	7.97%
Absent	127	92.03%
Total	138	100%

Table 2: Gender wise Frequency of UTI among patients taking SGLT-2 inhibitors

Gender	UTI Present	UTI Absent	Total
Female	10 (11.9%)	70 (88.1%)	80 (100%)
Male	1 (1.7%)	57 (98.3%)	58 (100%)
Total	11 (7.97%)	127 (92.03%)	138 (100%)

Table 3: Age-wise frequency of UTI among patients taking SGLT-2 inhibitors

Age Group (years)	Gender	UTI Present	UTI Absent	Total
30-45	Female	2	44	46
	Male	1	32	33
Total		3	76	79
46-60	Female	8	26	34
	Male	0	25	25
Total		8	51	59
Grand Total		11	127	138

Table 4: Diabetes control-wise frequency of UTI among patients taking SGLT-2 inhibitors

Diabetes Status	Gender	UTI Present	UTI Absent	Total
Controlled	Female	2	60	62
	Male	1	33	34
Total		3	93	96
Uncontrolled	Female	7	10	17
	Male	1	24	25
Total		8	34	42
Grand Total		11	127	138

DISCUSSION

SGLT-2 inhibitors are frequently used agents to treat Type II diabetes mellitus. They primarily act on proximal convoluted tubules and inhibit glucose reabsorption, thus controlling blood glucose levels. The presence of glucose in urine creates a favorable environment for bacterial growth and colonization, particularly in the lower urinary tract. This glycosuria-associated alteration in urinary flora is considered a major mechanism for the increased risk of urinary tract infections observed with SGLT2 inhibitor therapy. We enrolled 138 patients based on inclusion and exclusion criteria. In our study, it was found that out of 138 patients, only 11 patients developed UTI (7.97%), which is consistent with various previous regional studies where UTI prevalence among the diabetics using SGLT-2 inhibitors ranged from 5.3% to 9%. A study conducted in Peshawar reported a prevalence of 6%, while another conducted in Sukkur showed the prevalence rate of 7.3%,^{8,9} results which are consistent with our study. Another such study showed a 7.01% prevalence of UTI among the patients using SGLT-2 inhibitors.¹⁰ In another study, the prevalence of UTI was found to be 5.3% (<10%), which is also consistent with our results.¹¹ In another study, the prevalence of UTI among patients taking Dapagliflozin was 4.3%¹² while among those having Empagliflozin was 6.5%, both groups had a prevalence <10%. Another study conducted in Pakistan showed a similar result, reporting a prevalence rate of 6.5%.¹³ Another Pakistani observational study by Ds *et al.* also supported the favorable safety profile of SGLT-2 inhibitors, showing no alarming increase in UTI incidence (7%) and highlighting their clinical utility in local diabetic populations.¹⁴

Our results are also consistent with international data. In a systematic review of landmark randomized controlled trials, Arshad *et al.* reported the prevalence of UTI to be 6.9% which is consistent with our study results.¹⁵ A large US-based observational cohort study involving over

235,000 patients found an increase in risk of developing UTI among new users of SGLT-2 inhibitors,¹⁶ supporting their relative safety in real-world settings. In another study, canagliflozin was evaluated for 12 weeks, and found urinary tract infection prevalence of 5% vs 3.8% in the placebo group.¹⁷ A comprehensive review by Pishdad *et al.* concluded that the incidence of urinary tract infections in patients taking SGLT-2 inhibitors ranged between 4-9%, and that severe infection remained rare, especially in patients with good glycemic control.³ Similarly, another study reported a UTI incidence of 6.2%, with the majority being mild and manageable without discontinuing the drug.¹⁸

Gender wise frequency of urinary tract infections among the patients receiving SGLT-2 inhibitors was evaluated using the Chi-square test, which revealed a statistically significant association ($p=0.0467$), with females being affected more than males. This is consistent with the results of another study, which showed the greater incidence of UTIs among the female patients taking SGLT-2 inhibitors as compared to males.¹⁹ Similarly, a Korean cohort study found a stronger risk of urinary tract infections among females as compared to males.²⁰

Consistent with our findings that uncontrolled diabetes significantly predisposed the patients to UTI, Li *et al.* found that elevated HbA1c was a significant predictor of urinary tract infection in patients taking SGLT-2 inhibitors.²¹

CONCLUSION

The prevalence of urinary tract infections among the patients using SGLT-2 inhibitors was found to be low (7.9%). These findings support the relative safety of this drug class concerning the risk of urinary tract infections. Considering their established cardio-protective and reno-protective benefits, SGLT-2 inhibitors may be considered as a preferred therapeutic option in the treatment of Type 2 Diabetes, particularly in those patients who do not have any predisposing risk factor for urinary tract infections.

LIMITATIONS

This study did not separately analyze complicated or febrile UTIs from uncomplicated infections, which may limit the generalizability of the findings. Although elderly patients (>60 years) and pregnant women were excluded, some degree of selection bias cannot be completely ruled out. Additionally, the study was conducted in a single center, which may affect external validity.

SUGGESTIONS / RECOMMENDATIONS

This study suggests that SGLT-2 inhibitors are not strongly associated with an increased risk of urinary tract infections. However, female patients showed a relatively

higher frequency of UTIs and should be monitored more closely. Further large-scale, multicenter studies are recommended to confirm these findings and assess gender-related risk factors.

CONFLICT OF INTEREST / DISCLOSURE

No conflict of interest to declare.

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