Patient Preference and Adherence

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ORIGINAL RESEARCH

Medication Adherence to Semaglutide versus Empagliflozin in Adults with Type 2 Diabetes: A Retrospective Observational Study in Saudi Arabia

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Purpose: Sodium–glucose cotransporter-2 inhibitors (SGLT2i) and glucagon-like peptide-1 receptor agonists (GLP-1RA) are widely prescribed, yet medication adherence varies. This study evaluated real-world adherence and persistence to semaglutide and empagliflozin among adults with T2D and assessed the associations between adherence and clinical outcomes.

Patients and Methods: A retrospective observational study was performed using electronic health records and pharmacy dispensing data from a military hospital in Tabuk, Saudi Arabia, between July 1, 2023 and June 30, 2024. Adults with T2D (≥18 years old) prescribed semaglutide or empagliflozin were included. Medication adherence was quantified using proportion of days covered (PDC). Persistence was defined by absence of treatment gap ≥60 days. Associations between adherence and patient characteristics, and clinical out-comes, were examined.

Results: Among 5087 patients (mean age 57.9 ± 12.3 years, mean T2D duration 10.3 ± 7.6 years), 4020 received empagliflozin and 1067 initiated semaglutide. Adherence (PDC ≥ 80%) was observed in 57.7% of semaglutide and 60% of empagliflozin users. Persistence was lower 40% (semaglutide) and 45% (empagliflozin) met the criteria. Sociodemographic variables were not significant predictors of medication adherence.

Conclusion: Medication adherence and persistence to both semaglutide once-weekly injection and oral empagliflozin were sub-optimal among T2D patients. Adherent patients to both medications experienced a significant improvement in glycemic control. Targeted strategies are needed to enhance patient motivation for consistent medication use and timely refills.

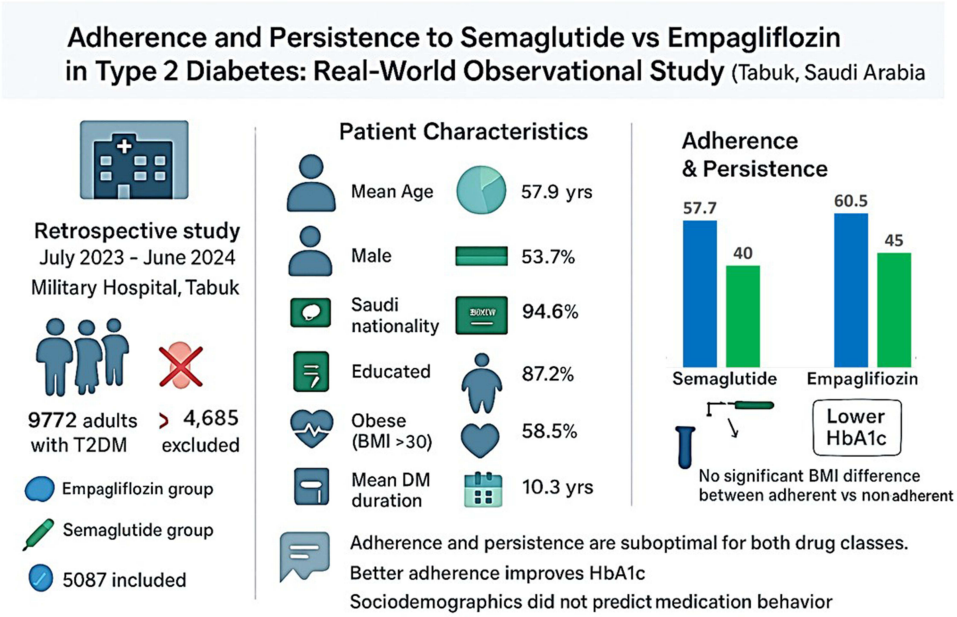
Keywords: medication adherence, empagliflozin, semaglutide, type-2 diabetes, observational study

Introduction

Type 2 diabetes (T2D) is a chronic condition characterized mainly by elevated blood glucose levels resulting from insulin resistance.[1] The global prevalence of T2D in 2025 is estimated at 589 million adults (aged 20–79 years), representing approximately 11.1% of adults and is expected to increase to 853 million by 2050.[2] T2D represents a major and growing public health challenge in Saudi Arabia. The World Health Organization (WHO) currently ranks Saudi Arabia as the seventh highest prevalence of diabetes worldwide. As of 2024, estimates from the International Diabetes Federation indicate that approximately 23.1% of Saudi adults live with diabetes, representing over 5.3 million cases among adults.[3] Recent pooled analyses have placed the average prevalence of T2D among the Saudi population at around 16.4%, with the rates being even higher in certain studies and regions—some projecting increases to as high as 44% with current trends in obesity and aging.[4]

Received: 5 October 2025
Accepted: 10 December 2025
Published: 19 December 2025

Graphical Abstract



Medication adherence is defined as the "active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behavior to produce a therapeutic result".[5] Consistently taking prescribed antidiabetic medications helps patients achieve better metabolic control, which leads to improved quality of life, fewer hospitalizations, and lower mortality rates.[6] Conversely, poor adherence is associated with higher rates of diabetic complications, increased healthcare costs, suboptimal glycemic control, and a greater disease burden.[7–9]

Sodium–glucose cotransporter 2 inhibitors (SGLT2i) and glucagon-like peptide 1 receptor agonists (GLP-1RA) are among the most commonly prescribed antihyperglycemic medications for the management of type 2 diabetes, including weight management.[10] Their use has risen substantially in recent years due to robust evidence of glycemic effectiveness, as well as significant cardiovascular and renal benefits, leading to strong recommendations for their use in clinical guidelines for patients with T2D, especially those with comorbidities such as cardiovascular or kidney disease.[10,11] Real-world data from the United States demonstrated that prevalent use of GLP-1RA and/or SGLT2i among people with T2D increased from 9.2% in 2018 to 27.1% in 2022, reflecting the benefit of these drug classes as paradigm-shifting cardiometabolic therapies in the long-term care of diabetes.[12] Real-world clinical studies demonstrated that subcutaneous and oral semaglutide significantly improved quality of life (QoL) in patients with T2D. Observational data showed that patients using semaglutide experienced marked increases in both treatment satisfaction with their treatment and mental health scores mediated by clinically significant improvements in glycemic control, weight reduction, waist circumference and cardiometabolic parameters.[13–15]

Likewise, adding empagliflozin to conventional anti-diabetic therapy in patients with T2D leaded to significant improvements in QoL alongside better glycemic control and weight management (body mass index and central obesity).[16,17] Patients with heart failure reported enhanced functional capacity and better QoL alongside clinical and therapeutic impact on biomedical parameters.[18]

Once-weekly dosing of GLP-1 RAs has demonstrated better medication adherence and persistence among T2D patients than daily dose regimen, and this was closely correlated with positive clinical outcomes.[9,19–21] Numerous researchers have measured medication adherence to GLP-1 RA and SGLT2i using the proportion of days covered (PDC) for refilling medications.[22] The PDC indirectly tracks medication adherence and provides a feasible way to monitor adherence for large patient populations over time.

Since semaglutide was approved for weight loss in June 2021, medication management has become more complex, partially because of patient preferences for semaglutide. This has led to issues such as potential drug shortages and difficulties in monitoring adherence, particularly in complicated clinical scenarios.[23,24]

Direct real-world head-to-head or cohort studies of semaglutide and empagliflozin are limited in Saudi Arabia, but meta-analyses and registry findings consistently show daily oral agents like empagliflozin achieving higher average adherence compared to injectable weekly GLP-1 agents outside tightly controlled clinical trial environments.[22,25] Through this study, we aimed to narrow the gap between randomized trial efficacy and real-world clinical effectiveness, offering insights to guide treatment decisions. Therefore, the primary objectives of the study were to compare real-world medication adherence to SGLT2i versus GLP-1RA among patients with T2D and identify factors influencing medication adherence.

Materials and Methods

Study Design and Data Source

In this retrospective observational study, medication adherence was assessed utilizing integrated medical data and pharmacy records retrieved from electronic health records between July 1, 2023, and June 30, 2024. The study site is a military multispecialty tertiary care hospital equipped with adequate facilities for managing T2D including emergency department, intensive care units, outpatient clinics, supportive services of pharmacies, laboratories, and radiology, as well as qualified healthcare professionals. The electronic health records included demographic information, laboratory test results, diagnoses, prescriptions, admission, discharge and medication refill dates. The study design and manuscript preparation followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline for cohort studies[26] (Supplementary File).

Study Population

The study included patients with T2D aged 18 years or above with or without metabolic comorbidities, including obesity, hypertension, cardiovascular disease and cerebrovascular accidents. Patients were required to have at least one medical claim with a diagnosis of T2D, defined according to the International Classification of Disease, Tenth Edition, Clinical Modification (ICD-10-CM) codes E11 and pharmacy prescription refill data for antidiabetic medications, such as GLP-1RA (semaglutide), SGLT-2i (empagliflozin), dipeptidyl peptidase-4 (DPP-4) inhibitor (linagliptin) and metformin during the 365-day study period. Patients were excluded if they had a medical claim with a diabetes diagnosis ICD-10-CM codes E8-10 and E13-14 (gestational diabetes, diabetes because of underlying conditions, chemical-induced diabetes, or other specified diabetes). Patients with prescription refill data for less than three months (90 days) were excluded (Figure 1).

Sample Size Calculation

The sample size calculation was done using a single proportion sample size calculation formula based on the prevalence of T2D in Saudi Arabia 28% (0.28),[27] with a correction for incomplete records. The following formula was used.

Sample size (n) = Z2. p. (1-p)/d2

n = sample size.

Z2 = confidence interval (CI) at 95% CI or 5% level of significance (type-I error), it is 1.96.

p = prevalence or based on previous research = 1-p.

d = Margin of error or precision considered 2% (0.02)

Sample size (n) = (1.96)2 × (0.28) × (1–0.28)/(0.02)2

n = 1936

after adjusting for 10% incomplete records, then the final required sample size was 2152 patient records.

Study Measures

Evaluation of Medication Adherence

During the study period, the received dataset contained pharmacy claims of antidiabetic medications for 9772 patients. Data obtained for this study included medical claims (demographic data, enrolment history, date of service, biomarkers used in routine clinical practice for the diagnosis, diagnoses received, and procedures performed), pharmacy claims (order dates,

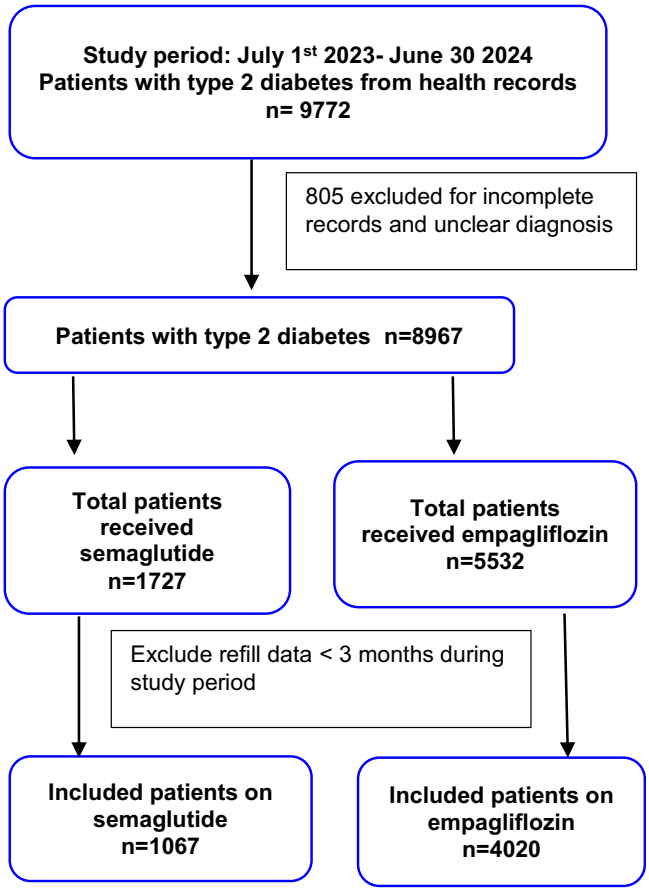


Figure 1 Flowchart of identification of the study sample.

refill dates, quantity prescribed, and daily regimen). One-year medication adherence and persistence (study period) were assessed and compared for a subset of patients who were treated with GLP-1RA (semaglutide) and SGLT-2i (empagliflozin).

Principles of PDC Calculation

Adherence was measured as the proportion of days covered (PDC). The numerator was the number of days covered by the prescription fills with semaglutide or empagliflozin during the denominator period. The denominator was the number of days from the first identified fill of medication (index date) to the end of a measurement period of interest (365 days in this study). Patients who had less than 3 months (90 days) duration of medication supply were excluded from PDC calculation. PDC values ≥80% considered adherence, and values <80% were nonadherence. Patients were classified as persistent if there was no gap in medication refill exceeding 60 days during the 365 days follow-up period [25]. This means that a patient who discontinued the medication during the measurement period was still be tracked through the end of the year, and thus the non-persistence is accounted for in the PDC.

This study also evaluated the associations between adherence and sociodemographic factors as well as clinical outcomes, which included HbA1c and BMI values, assuming better outcomes are associated with adherence to medication. Glycemic control was evaluated by determining HbA1c levels measured nearest to the 12-month follow-up endpoint (at least two measurements of HbA1c per patient at nine up to 12 months after the index date were averaged). BMI values were also compared between patient subgroups treated with empagliflozin and semaglutide.

Data Management

The data were extracted from the medical health and pharmacy refill records by a trained pharmacist (coauthor). Each patient was assigned with a unique study identifier number. The data were entered and stored on a computer, and the

information was password protected. De-identified data were used for all analyses, and only authorized investigators could access the linkage between identifiers and individual participants. Prior to analysis, the dataset underwent quality checks to ensure completeness and accuracy. Records with essential missing information—such as unidentified diagnosis codes, absent refill dates, or incomplete prescription quantities or durations—were excluded from the analysis (Figure 1). No data imputation was performed; only complete cases were analyzed. This approach was chosen to minimize bias and prevent misleading results from invalid assumptions about the mechanism of missing data.

Statistical Analysis

The demographic profiles of the patients receiving semaglutide and empagliflozin were compared using the Chi-square test with Yates correction. Mean ± standard deviation (SD) values for PDC were evaluated using the Wilcoxon-Mann–Whitney test. Comparative analyses of patient characteristics between the adherent subgroups of semaglutide and empagliflozin users employed the Chi-square test with Yates correction. HbA1C and BMI values were compared between adherents and non-adherent patients using the Wilcoxon-Mann–Whitney test. Statistical significance was defined as a two-sided p value less than 0.05, with 95% confidence intervals reported. All analyses were performed using Stata statistical software, ver 16, StataCorp.

Results

Patient Characteristics

The initial health records contained 9772 adult patients with T2D during the study duration, of whom 805 were excluded because of an unclear diagnosis or incomplete medication records (Figure 1). Excluding refill data of less than three months, a total of 4020 adult patients were commenced on empagliflozin and 1067 were prescribed semaglutide. Most patients were at age of 40–64 years (56.9%) with a mean age of 57.9±12.3 years. Most of the patients were Saudi (94.6%); educated (87.2%); males (53.7%), and the mean duration of DM disease was 10.3±7.6 years. Many patients (58.5%) were obese (BMI>29.99), and history of hypertension was reported as a comorbidity in 1263 (25%) patients (Table 1).

Table 1 Demographic and Clinical Characteristics of Patients

Patient Characteristics	Frequency (%)			
	Total n=5087	Semaglutide Users n= 1067 (%)	Empagliflozin Users n=4020 (%)	p value
Age (years)				
18-39	317 (6.2)	161 (15.9)	156 (3.9)	<0.001
40-64	3339 (65.6)	750 (70.3)	2589 (64.4)	
≥ 65	1431 (28.1)	156 (14.6)	1275 (31.7)	
Gender				
Male	2734 (53.7)	649 (60.8)	2085 (51.9)	<0.001
Female	2353 (46.3)	418 (39.2)	1935 (48.1)	
Nationality				
Saudi	4814 (94.6)	1055 (98.9)	3759 (93.5)	0.001
Non-saudi	373 (5.4)	12 (1.1)	261 (6.5)	
Education				
Educated	4439 (87.2)	860 (80.6)	3578 (89)	0.001
Illiterate/Primary school	649 (12.8)	207 (19.4)	442 (11)	

(*Continued*)

https://doi.org/10.2147/PPA.S569096

Table 1 (Continued).

Patient Characteristics	Frequency (%)			
	Total n=5087	**Semaglutide Users n= 1067 (%)**	**Empagliflozin Users n=4020 (%)**	**p value**
Smoking status				
Smokers	929 (18.3)	205 (19.2)	724 (18)	0.347
Non-smokers	4158 (81.7)	862 (80.8)	3296 (82)	
T2D duration				
<5 years	668 (13.1)	190 (17.8)	478 (11.9)	0.001
5-10 years	2733 (53.7)	473 (44.3)	2260 (56.2)	
>10 years	1686 (33.1)	404 (37.9)	1282 (31.9)	
Comorbidities				
Hypertension	1263 (24.8)	274 (25.7)	989 (24.6)	0.418
Cardiovascular diseases	614 (12.1)	164 (15.4)	450 (11.2)	<0.001
Obesity (BMI>29.9)	2975 (58.5)	815 (76.4)	2160 (53.7)	<0.001
Cerebrovascular accident	520 (10.2)	138 (12.9)	382 (9.5)	0.001
T2D management				
Metformin	4790 (94.2)	770 (72.2)	4020 (100)	<0.001
Linagliptin	3802 (74.7)	241 (22.6)	3561 (88.6)	<0.001
Gliclazide	3408 (67.0)	297 (27.8)	3111 (77.4)	<0.001
Insulin	1465 (28.8)	271 (25.4)	1194 (29.7)	0.003

Abbreviations: BMI, body mass index; T2D, Type-2 Diabetes; χ^2, Chi-square; p- probability value.

The history of diabetes management therapy included metformin (94.2%), linagliptin (74.7%), and gliclazide (67.0%), and 28.8% of the patients were prescribed a combination of insulin and semaglutide or empagliflozin (Table 1).

During the one-year study duration, 1579 of patients who received empagliflozin were commenced on 10 mg, of whom 398 increased to 25 mg dose and 2441 were prescribed 25 mg dose. Whereas patients on semaglutide usually started 0.25 mg dose and increased to 0.5 mg, then to 1 mg dose.

Adherence to Semaglutide and Empagliflozin Among T2D Patients

The calculated 1-year medication adherence (PDC cut-off ≥ 80%) was not significantly different between patients receiving semaglutide once weekly injection and daily oral empagliflozin (57.7% vs 60%, p=0.459). Low proportions of patients (40% semaglutide users versus 45% empagliflozin users) were identified as persistent to therapy using a 60-day gap definition during the 12-months follow-up period (Figure 2 and Table 2).

Association Between Patients' Demographics and Level of Adherence

Sociodemographic characteristics of the adherent patients prescribed semaglutide and empagliflozin were compared, as detailed in Table 3. Many of adherent individuals (65.7%) were within the 40- to 64-year age range, and a statistically significant difference in the age distribution was observed between the adherent subgroups of the two medication groups. Older age was associated with higher adherence to empagliflozin (32.8%) compared with semaglutide users (12.5%). No significant associations were identified between sex and nationality and adherence level across semaglutide and

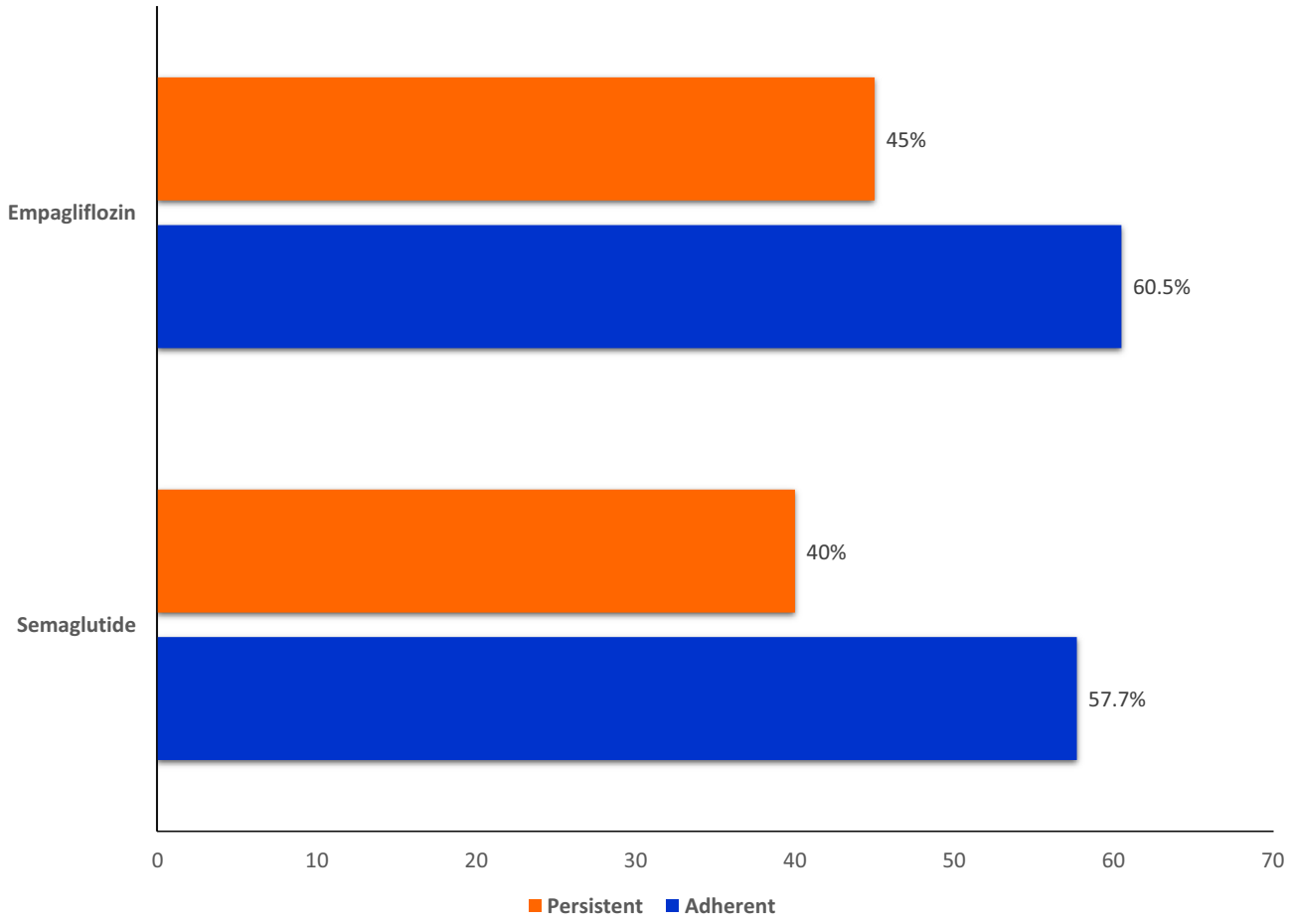


Figure 2 Proportions of adherence and persistence measurements among semaglutide and empagliflozin users.

empagliflozin users. Compared to empagliflozin users (35.4%), a higher proportion of adherence was evident among empagliflozin users (46.4%) with a diabetes diagnosis duration of less than five years. Obesity was present in 58.6% of adherent patients, followed by hypertension (10.7%). However, the distribution of these comorbidities among adherent individuals did not differ significantly between the treatment groups.

Association Between Medication Adherence and Clinical Outcomes

The differences in medication adherence and clinical outcomes were evaluated using the Wilcoxon-Mann–Whitney test (Table 4). Patients who exhibited greater adherence showed significantly lower HbA1c values ($p<0.001$) among the semaglutide and empagliflozin users. No significant difference was observed in mean BMI values between the adherent

Table 2 Adherence and Persistence to Semaglutide versus Empagliflozin

	Semaglutide n=1067	**Empagliflozin n=4020**	**p value**
Adherence (PDC), mean (SD)	0.80 (0.20)	0.82 (0.21)	0.345
Adherent (PDC ≥80%), n (%)	616 (57.7)	2433 (60.5)	0.459
Persistent without 60-day gap, n (%)	427 (40)	1809 (45)	0.004

https://doi.org/10.2147/PPA.S569096

Table 3 Association of Patients' Demographics with Level of Medication Adherence

Patient Characteristics	Total (3049)		Adherent Semaglutide (616)		Adherent Empagliflozin (2433)		Chi.sq	*df*	p value
	N	%	n	%	n	%			
Age (years)									
18 to 39	171	5.6	93	15.1	78	3.2	199.50	2	<0.001
40 to 64	2004	65.7	446	72.4	1558	64			
≥65	874	28.7	77	12.5	797	32.8			
Gender									
Male	1659	54.4	354	57.5	1305	53.5	2.91	1	0.088
Female	1390	45.6	262	42.5	1128	46.5			
Nationality									
Non-Saudi	101	3.3	26	4.2	75	3.1	1.99	1	0.158
Saudi	2948	96.6	590	95.8	2358	96.9			
Level of education									
Educated	2212	72.5	468	76	1744	71.7	4.55	1	0.033
Illiterate	837	27.5	148	24	689	28.3			
T2D duration (years)									
<5	1347	25.5	218	35.4	1129	46.4	24.19	2	<0.001
5-10	933	31.0	219	35.6	714	29.3			
>10	769	43.5	179	29.1	590	24.2			
Comorbidities									
Hypertension	326	10.7	92	14.9	234	9.6	0.76	3	0.868
CVD	178	5.8	51	8.3	127	5.2			
Obesity	1786	58.6	490	79.5	1296	53.3			
CVA	76	2.5	18	2.9	58	2.4			

Notes: p value of Chi-square statistics between the patient characteristics and medication adherence.
Abbreviations: CVA, cerebrovascular accident; CVD, cardiovascular disease; T2D, Type-2 Diabetes; χ^2, Chi-square.

Table 4 Differences in HbA1C and BMI Values Between the Adherents and Non-Adherents

Variable	Adherence to Semaglutide				p-Value	Adherence to Empagliflozin				p-Value
	Adherent (n=616)		Non-Adherent (n=451)			Adherent (n=2433)		Non-Adherent (n=1587)		
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
PDC score	0.95	0.06	0.60	0.14	–	0.95	0.06	0.59	0.14	–
HbA1C	7.05	1.87	7.50	2.15	<0.001	7.81	1.83	8.23	1.90	<0.001
BMI	34.36	5.96	34.90	5.85	0.166	31.01	6.04	31.5	6.35	0.227

Notes: p- is value of the Wilcoxon-Mann–Whitney test of mean between adherents and non-adherent patients.
Abbreviations: BMI, Body mass index; HbA1C, Glycosylated hemoglobin; PDC, Proportion to days covered; SD, Standard deviation.

and non-adherent groups within either medication group. It was observed that semaglutide was more commonly prescribed to individuals with a higher BMI than was empagliflozin.

Discussion

This study compared medication adherence between two classes of guidelines-recommended antidiabetic medications; GLP-1RA (semaglutide users) and SGLT2i (empagliflozin users). The findings revealed suboptimal adherence and poor persistence for both mediations, and adherence was not significantly different between two medications (p=0.459). This poor adherence levels were not associated with the patients' demographic characteristics. The present study supports the concept that adequate medication adherence was linked to favorable clinical outcomes, such as improved control of HbA1C levels. This real-world data analysis of patients' adherence provided the ability to capture real-world behavior across larger study populations including those with complex health conditions compared with closely monitored clinical trials.

A recent meta-analysis analyzed eight studies including approximately 200,000 patients with T2D in the United States and western Europe between 2012 and 2020 and reported no difference in nonadherence to SGLT2i use versus GLP-1RA use.[22] The included studies concluded variable nonadherence proportions that ranged from 27% to 80% to either GLP-1RA and SGLT2i, related to high degree of heterogeneity in study designs, inclusion and exclusion criteria and definitions.[22]

Although some previous studies have already documented good medication adherence to once-weekly semaglutide injection.[19,28,29] A recent study showed higher medication nonadherence proportion (67.5%) to semaglutide injection using both ARMS self-report scale and PDC among T2D patients.[30]

In the current study, no significant difference was observed between overall medication adherence to semaglutide and empagliflozin, despite the fundamental relationship between dosing frequency and medication adherence, which is well-established in chronic diseases including type 2 diabetes.[31] This may be attributed to patient preference, as several studies have suggested that individuals with diabetes often favor oral medications over injectable forms.[32,33] Our finding was consistent with a recent meta-analysis, that specifically compared medication adherence between SGLT-2 inhibitors and GLP-1 receptor agonists, which reported no overall difference in adherence between the two drug classes globally (relative risk = 0.86; 95% confidence interval = 0.72–1.02). However, when analysis was restricted to United States studies, SGLT-2 inhibitor use was associated with a 23% lower risk of nonadherence compared to GLP-1 receptor agonist use.[22] This finding was interpreted based on the patient preference to once-daily oral dosing than weekly GLP-1 receptor agonist injections.

Low proportions of patients were persistent with treatment according to our study definition, with higher persistence favoring daily oral empagliflozin over weekly semaglutide injections. This result was consistent with a longitudinal modelling from Danish and Australian registries found adherence at three years post-initiation was higher for SGLT2i (49.9%) than GLP-1RA (35.0%), indicating greater long-term persistence for empagliflozin relative to semaglutide. However, a large-scale analysis found that the absolute five-year risk of discontinuing therapy was 45% for GLP-1RA users compared to 56% for SGLT-2i users.[34] Weekly injectable semaglutide specifically demonstrated median persistence of 9 months, substantially higher than daily injectable formulations.[34] The real-world adherence and persistence data also favored semaglutide over other GLP-1 RAs and showed higher patients satisfaction and superior outcomes.[20,28,35]

In the present study, the patients' demographics did not significantly affect the level of adherence, suggesting that influencing factors, such as patient preference, polypharmacy, and side effect profiles may alter adherence patterns. Monthly income data were not available, but it was not anticipated to influence medication adherence as medications were provided free of charge at the study site, which is under the governance of the Ministry of Defense, Saudi Arabia. A comprehensive analysis of prescription co-payment effects found that individuals with higher co-payment levels demonstrated significantly lower adherence rates to both GLP-1As and SGLT-2 inhibitors. Specifically, for SGLT-2 inhibitors, 77.1% of patients with low co-payments achieved 12-month adherence compared to 72.1% with high co-payments, suggesting that economic factors may compound the inherent adherence challenges of daily dosing.[36]

The present study suggests that adequate medication adherence was linked to favorable clinical outcomes, as observed by significantly lower values of measured HbA1C, particularly in favor to semaglutide users than in

nonadherents. However, this result should be interpreted carefully because of potential influence of co-administered medications and insulin. Moreover, glycemic control and weight loss are affected by various factors beyond medication adherence, including dietary habits, physical activity levels, the extent of insulin deficiency, and the effectiveness of prescribed medications.[37]

Perspectives for Clinical and Assistive Practice

The findings of this study suggest several critical implications for the clinical management and support of patients with type 2 diabetes receiving GLP-1 receptor agonists or SGLT2 inhibitors. First, individualized treatment selection that incorporates patient preferences—particularly regarding the route and frequency of administration—may optimize adherence and persistence. Shared decision-making is essential to align therapeutic regimens with patients' lifestyles and expectations, thereby enhancing engagement.[38]

Second, fostering collaboration among endocrinologists, primary care providers, diabetes educators, pharmacists and case manager nurses through motivational interviewing about diabetes self-management, healthy lifestyle choices, impact of adherence and assessment of barriers to adherence could improve continuity and quality of care. This multidisciplinary approach ensures timely adjustments, reinforcement of adherence behaviors and better clinical outcomes in diabetes management.[39–41]

Third, the deployment of e-health technologies, including digital reminder systems, adherence monitoring applications, and user-friendly administration devices, represents a promising avenue to alleviate both intentional and unintentional nonadherence, especially with injectable therapies requiring less frequent dosing.[42]

Strength and Limitations

Patient adherence was assessed in a real-world context using a large, representative prescription refill dataset, which likely provides a more accurate reflection of adherence patterns commonly observed by clinicians in routine practice and limits selection bias. The study underscores the importance of monitoring adherence and its potential influence on clinical outcomes. Nevertheless, several limitations should be noted. First, as this was a single-center study, the findings may have limited generalizability to other hospital settings in the region, or healthcare systems since practices since available resources and standard of care can vary between settings. Second, the patients were prescribed additional medications beyond the study drugs, which could have affected adherence levels and their association with outcomes. Third, the analysis did not comprehensively evaluate glycemic control, cardiovascular events, healthcare costs, or barriers to prescription refilling. Additionally, baseline measures such as HbA1c and BMI were not collected, which may have significantly impacted the results. Other critical factors, including patient preferences, personal beliefs about medication necessity, adverse effects such as gastrointestinal side effects, and overall health perceptions, were also not explored. Finally, the study did not examine the influence of baseline concomitant therapy, treatment duration, switching between GLP-1 RAs and SGLT2 inhibitors, or medication discontinuation.

Conclusion

Adherence and persistence level to both semaglutide and empagliflozin were suboptimal among patients with T2D. Adherent patients to both medications experienced a significant improvement in glycemic control (HbA1C), along with comparable reductions in body weight. Future studies need to explore the barriers to non-adherence, the patient's refilling ability and the non-glycemic healthcare outcomes.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Research Ethics Committee of the King Salman Armed Forces Hospital (protocol code KSAFH-REC-2023-541).

Data Sharing Statement

Because of privacy and ethical restrictions, data are available based upon request from the corresponding author.

Informed Consent Statement

Patient consent was waived as the study used anonymized electronic health records with no direct recruitment. The received dataset contained only medical file numbers linked to drug utilization.

Funding

This research received no external funding.

Disclosure

The author(s) report no conflicts of interest in this work.

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