The Egyptian Journal of Hospital Medicine (October 2025) Vol. 101, Page 4938-4945

# Impact of Sodium-Glucose Cotransporter-2 Inhibitors on Controlled Diabetic Patients Presenting with First Acute Anterior Myocardial Infarction Undergoing Primary Percutaneous Coronary Intervention

**Mohamed Saad El-Shetry*, Reem Ibrahim Gouda Ibrahim,**
**Magdy Mohamed Abdelsamie, Mohammad Gouda, Abdelrahman Ahmed Adel**
Department of Cardiology, Faculty of Medicine, Zagazig University, Egypt
***Corresponding author: Mohamed Saad El-Shetry**, **Mobile:** (+20) 01282595109, **Email:** melshetry@medicine.zu.edu.eg

## ABSTRACT

**Background:** People with type 2 diabetes (T2DM) face a markedly elevated risk of cardiovascular complications and death. Among contemporary glucose-lowering drugs, sodium–glucose cotransporter-2 inhibitors (SGLT2i) have exhibited broad cardio-renal benefits, lowering rates of heart-failure admission, major adverse cardiovascular events (MACE), as well as kidney injury.

**Objective:** This study explored whether starting an SGLT2i during hospitalization improves clinical and echocardiographic outcomes in T2DM patients experiencing their first acute anterior ST-elevation myocardial infarction (STEMI) managed utilizing primary percutaneous coronary intervention (PPCI).

**Patients and Methods:** Between June and December 2023, 115 consecutive candidates for PPCI who had never used SGLT2i were enrolled. After reperfusion, the treating physician either initiated dapagliflozin 5 mg once daily with the ongoing antidiabetic regimen (Group I) or maintained standard therapy alone (Group II). Ninety-eight participants completed 6-month follow-up.

**Results:** Compared with Group II, Group I exhibited significant 6-month reductions in left-ventricular end-diastolic diameter, end-systolic diameter, end-systolic volume index, and left-atrial volume index. The incidence of MACE was numerically higher in Group II, though not statistically different, and rates of contrast-induced nephropathy were similar. Notably, clinically important arrhythmias occurred less often in Group I.

**Conclusion:** Initiating SGLT2i therapy soon after primary PCI for anterior STEMI in patients with well-controlled T2DM was associated with fewer cardiovascular events involving all-cause mortality, heart-failure hospitalization, as well as MACE and with meaningful improvements in cardiac chamber dimensions and function.

**Keywords:** STEMI; SGLT2I, Diabetes mellitus, Primary PCI.

## INTRODUCTION

Cardiovascular diseases (CVDs) remain the major contributors to morbidity as well as death in individuals with type 2 diabetes (T2D), conferring a two- to fourfold higher incidence than in non-diabetic populations[(1)]. Roughly 60 % of people with T2D also have CVD, and their likelihood of acute myocardial infarction (AMI) is increased six- to tenfold[(2)].

ST-segment elevation myocardial infarction (STEMI) is associated with substantial morbidity and mortality; prompt recognition and rapid reperfusion are critical to minimizing ischemic damage, restricting infarct size, and lowering the subsequent risk of heart failure[(3)].

Large, randomized trials have demonstrated that SGLT2i reduce hospitalizations for heart failure, decrease MACE, and provide renal protection, regardless of diabetic status[(4)].

Consequently, SGLT2i are now recommended for T2D to lessen three-point MACE, particularly cardiovascular mortality [(5)], and they also decrease the incidence of contrast-induced nephropathy compared with non-users[(6)].

The present investigation aimed to determine whether initiating SGLT2i early improves outcomes in well-controlled T2D patients presented with a first acute anterior STEMI and managed utilizing primary percutaneous coronary intervention (PCI).

## PATIENTS AND METHODS

### Study Design and Population

In this prospective observational research that was carried out in the Cardiology Department of Zagazig University Hospitals, Faculty of Medicine, over a 6-month interval (June–December 2023), all consecutive adults with well-controlled type 2 diabetes mellitus (T2DM) who experienced a first acute anterior STEMI and underwent primary percutaneous coronary intervention (PPCI) within six hours of symptom onset were considered for inclusion. Among 115 eligible participants, 15 were lost to follow-up, leaving 98 patients for final analysis. None had previously received a SGLT2i.

### Treatment allocation

After successful PPCI, antidiabetic management was determined by the attending consultant. Some patients continued their preadmission antidiabetic therapy alone, whereas others were prescribed dapagliflozin 5 mg daily in addition to their existing regimen. According to in-hospital SGLT2i initiation, the cohort was divided into:

- **Group I (n = 44):** received dapagliflozin during the index admission.
- **Group II (n = 54):** maintained standard antidiabetic therapy without SGLT2i.



Received: 09/05/2025
Accepted: 11/07/2025

**Eligibility criteria**

Inclusion criteria comprised adults with controlled T2DM (HbA1c < 7%, average disease duration 5 ± 3 years), no prior SGLT2i use, and first-episode anterior STEMI treated with PPCI within six hours of symptom onset. Exclusion criteria encompassed age < 18 years; previous myocardial infarction; inferior STEMI, NSTEMI, or unstable angina; type 1 diabetes or uncontrolled T2DM (HbA1c ≥ 7%); prior coronary artery bypass grafting; significant valvular disease or prosthetic valves; estimated glomerular filtration rate < 30 mL/min; chronic hepatic disease or malignancy; decompensated heart failure; clinically significant tachyarrhythmias or bradyarrhythmias; morbid obesity (BMI ≥ 40 kg/m²); severe pulmonary hypertension or pulmonary embolism; severe anemia; chronic inflammatory or autoimmune disorders; and congenital heart disease.

**Clinical and laboratory evaluation**

Detailed demographic and cardiovascular risk assessments were performed for all patients. Diabetes was defined according to American Diabetes Association guidelines, hypertension according to ESC/ESH criteria, smoking status documented, and dyslipidemia diagnosed per National Cholesterol Education Program recommendations. Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared.

Comprehensive cardiovascular examination included blood pressure and heart-rate measurement, inspection for abnormal precordial pulsations, and auscultation for pathological heart sounds or murmurs. Fasting venous blood samples were obtained between 8:00 and 10:00 AM following an overnight fast of at least 8 hours. Tests included complete blood count, fasting plasma glucose, glycated hemoglobin (HbA1c), cardiac enzymes, and renal function profiles to provide an integrated metabolic and cardiac assessment.

**Echocardiographic assessment**

Transthoracic echocardiography was performed within 24 hours of the index STEMI and repeated at 6 months using a GE Vivid E9 system with a 1.5–3.6 MHz phased-array probe, USA. Left-ventricular (LV) volumes and ejection fraction (EF) were measured using M-mode and the modified Simpson method; LV systolic dysfunction was defined as LVEF < 52% in men or < 54% in women. Diastolic function was assessed by pulsed-wave and tissue Doppler imaging to record mitral inflow velocities (E and A), E/A ratio, deceleration time, isovolumic relaxation time, systolic (S′) and early diastolic (e′) annular velocities, and the mean E/e′ ratio. A left-atrial volume index (LAVI) > 34 mL/m² was considered indicative of elevated left-atrial pressure.

**Ethical approval**

**All participants gave written informed consent, and the protocol was approved by the Zagazig University Institutional Review Board (ZU-IRB #10799-21-5-2023). The study adhered to the Helsinki Declaration throughout its execution.**

***Statistical analysis***

All statistical procedures were carried out with IBM SPSS Statistics version 26 (IBM Corp., Chicago, IL, USA). Data integrity and distribution were verified before analysis. Quantitative variables were summarized as mean ± standard deviation, range, and median and were compared between groups using the independent (unpaired) Student's t-test, while categorical variables were presented as counts and percentages and evaluated with the Chi-square test. Two-tailed p values < 0.05 were interpreted as statistically significant, and results with $p < 0.001$ were considered highly significant, indicating strong evidence against the null hypothesis.

**RESULTS**

This study included 98 cases. We divided them into 2 groups: **Group I (44 cases)**: Those who received SGLT-2 inhibitors during hospital admission. **Group II (54 cases)**: Those who did not receive SGLT-2 inhibitors at all.

**Baseline Characteristics**

Table 1 outlines the demographic data, comorbidities, and laboratory profiles of the study population. No significant differences emerged between the two groups regarding baseline clinical variables. Similarly, the prevalence of hypertension, use of antihypertensive agents, duration of hypertension or diabetes, and serum levels of LDL, HDL, and HbA1c were statistically comparable.

**Table (1):** Baseline characteristics, comorbidities and laboratory investigations of the studied groups

| Variable | | Group I (Conv+SGLT2I) (n=44) | | Group II (Conventional) (n=54) | | T | P |
|---|---|---|---|---|---|---|---|
| **Age: (years)** | Mean ±Sd<br>Range | 56.48±7.08<br>41-67 | | 56.81±7.83<br>40-78 | | 0.22 | 0.83 |
| **Height: (cm)** | Mean ±Sd<br>Range | 164.95±7.91<br>151-180 | | 167.94±7.23<br>152-184 | | 1.95 | 0.06 |
| **Weight: (Kg)** | Mean ±Sd<br>Range | 90.27±13.47<br>65-115 | | 87.15±6.26<br>75-100 | | 1.51 | 0.13 |
| **BMI: (Kg/m$^2$)** | Mean ±Sd<br>Range | 33.22±4.89<br>24.24-45.79 | | 31.61±3.16<br>23.04-37.11 | | 1.97 | 0.051 |
| | | **No** | **%** | **No** | **%** | **$\chi^2$** | **P** |
| **Sex:** | Female<br>Male | 25<br>19 | 56.8<br>43.2 | 24<br>30 | 44.4<br>55.6 | 1.48 | 0.22 |
| **Smoking:** | No<br>Yes | 29<br>15 | 65.9<br>34.1 | 36<br>18 | 66.7<br>33.3 | 0.01 | 0.94 |
| **HTN:** | No<br>Yes | 23<br>21 | 52.3<br>47.7 | 24<br>30 | 44.4<br>55.6 | 0.60 | 0.44 |
| **HTN TTT:** | No<br>Yes | 26<br>18 | 59.1<br>40.9 | 28<br>26 | 51.9<br>48.1 | 0.51 | 0.47 |
| **Duration of HTN: (years)** | Median<br>Range | 7<br>3-15 | | 7<br>2-12 | | **MW**<br>0.43 | 0.67 |
| **SBP: (mmHg)** | Mean±Sd | 124.89±16.62 | | 126.67±16.37 | | **t**<br>0.53 | 0.60 |
| **DBP: (mmHg)** | Mean±Sd | 79.43±12.77 | | 82.78±14.06 | | 1.22 | 0.23 |
| **Duration of DM: (years)** | Mean±Sd<br>Range | 6.27±1.13<br>4-8 | | 6.19±1.07<br>4-8 | | 0.39 | 0.69 |
| **LDL: (mg/dl)** | Mean±Sd | 151.43±34.22 | | 159.78±36.65 | | 1.16 | 0.25 |
| **HDL: (mg/dl)** | Mean±Sd | 50.77±12.54 | | 45.74±11.31 | | 2.09 | 0.04* |
| **HbA1c:** | Mean±Sd | 5.79±1.18 | | 5.93±1.47 | | 0.51 | 0.61 |

Sd: Standard deviation; t: Independent t test; MW: Mann Whitney test; $\chi^2$: Chi square test; *: Significant

**Left Ventricular Function**

Initial echocardiographic measurements showed no significant intergroup differences in LV end-systolic size (LVESS), end-systolic diameter (LVESD), ejection fraction (EF) by either the Simpson method or M-mode, or LV end-systolic volume index (LVESVI). By the 6-month evaluation, however, **Group I** demonstrated marked reductions in LV end-diastolic diameter (LVEDD), LVESD, and LVESVI compared with **Group II** (Table 2).

**Table (2):** Left ventricle echo parameters at baseline and after 6 months between the studied groups

| Variable | | Group I (Conv+SGLT2I) (n=44) | Group II (Conventional) (n=54) | t | P |
|---|---|---|---|---|---|
| **LVEDD: (mm) (Baseline)** | Mean ±Sd<br>Range | 56.84±7.36<br>40-69 | 57.84±7.21<br>40-68 | 0.68 | 0.50 |
| **LVESD: (mm) (baseline)** | Mean ±Sd<br>Range | 38.05±6.24<br>24-47 | 37.58±4.36<br>24-46 | 0.44 | 0.66 |
| **EF by SM: (%) (Baseline)** | Mean ±Sd<br>Range | 43.05±14.47<br>23-74 | 46.96±18.34<br>25-80 | 1.15 | 0.25 |
| **EF by MM: (%) (Baseline)** | Mean ±Sd<br>Range | 47.80±14.42<br>28-77 | 48.56±16.01<br>29-73 | 0.24 | 0.81 |
| **LVESVI: (ml/m$^2$) (Baseline)** | Mean ±Sd<br>Range | 29.26±7.88<br>16.68-45.42 | 30.60±6.31<br>18.39-43.32 | 0.94 | 0.35 |
| **LVEDD: (mm) (After 6 months)** | Mean ±Sd<br>Range | 53.61±7.04<br>38-65 | 57.78±7.46<br>42-70 | **2.82** | **0.006*** |
| **LVESD: (mm) (After 6 months)** | Mean ±Sd<br>Range | 35.84±6.14<br>22-46 | 38.46±5.93<br>25-47 | **2.14** | **0.04*** |
| **EF by SM: (%) (After 6 months)** | Mean ±Sd<br>Range | 46.16±13.85<br>26-76 | 47.41±17.21<br>25-82 | 0.89 | 0.70 |
| **EF by MM: (%) (After 6 months)** | Mean ±Sd<br>Range | 50.93±13.80<br>31-78 | 49.87±14.56<br>29-75 | 0.37 | 0.71 |
| **LVESVI: (ml/m$^2$) (After 6 months)** | Mean ±Sd<br>Range | 27.23±7.3<br>15.66-41.4 | 30.61±6.30<br>18.39-43.32 | **2.46** | **0.02*** |

t: Independent t test

Within-group comparisons revealed that **Group I** experienced significant declines in LVEDD, LVESD, and LVESVI, along with improvements in EF measured by both Simpson's method and M-mode over the 6-month follow-up. No parallel changes were observed in **Group II** during the same interval (Table 3).

**Table (3):** Comparison between left ventricle echo parameter at base line and at 6 months among group I and group II

| **Group I (Conv+SGLT2I)** | | | | | |
|---|---|---|---|---|---|
| **Variable** | | **Baseline (n=44)** | **6 months (n=44)** | **t** | **P** |
| **LVEDD: (mm)** | Mean±Sd<br>Range | 56.84±7.36<br>40-69 | 53.61±7.04<br>38-65 | **10.59** | **<0.001**** |
| **LVESD: (mm)** | Mean±Sd<br>Range | 38.05±6.24<br>24-47 | 35.84±6.14<br>22-46 | **23.15** | **<0.001**** |
| **EF by SM: (%)** | Mean±Sd<br>Range | 43.05±14.47<br>23-74 | 46.16±13.85<br>26-76 | **16.87** | **<0.001**** |
| **EF by MM: (%)** | Mean±Sd<br>Range | 47.80±14.42<br>28-77 | 50.93±13.80<br>31-78 | **18.37** | **<0.001**** |
| **LVESVI: (ml/m$^2$)** | Mean±Sd<br>Range | 29.26±7.88<br>16.68-45.42 | 27.23±7.3<br>15.66-41.4 | **15.78** | **<0.001**** |
| **Group II (Conventional)** | | | | | |
| **Variable** | | **Baseline (n=54)** | **6 months (n=54)** | **t** | **P** |
| **LVEDD: (mm)** | Mean ±Sd<br>Range | 57.84±7.21<br>40-68 | 57.78±7.46<br>42-70 | 0.04 | 0.97 |
| **LVESD: (mm)** | Mean ±Sd<br>Range | 37.58±4.36<br>24-46 | 38.46±5.93<br>25-47 | 0.88 | 0.38 |
| **EF by SM: (%)** | Mean ±Sd<br>Range | 46.96±18.34<br>25-80 | 47.41±17.21<br>25-82 | 0.13 | 0.90 |
| **EF by MM: (%)** | Mean ±Sd<br>Range | 48.56±16.01<br>29-73 | 49.87±14.56<br>29-75 | 0.44 | 0.66 |
| **LVESVI: (ml/m$^2$)** | Mean ±Sd<br>Range | 30.60±6.31<br>18.39-43.32 | 30.61±6.30<br>18.39-43.32 | 1 | 0.32 |

t: Paired t test

**Left Atrial Parameters**

At baseline, left-atrial indices—including left-atrial volume index (LAVI), mitral valve E/A ratio, and E/e′ ratio—did not differ significantly between groups. At 6 months, LAVI was significantly lower in **Group I** compared with **Group II** (Table 4).

**Table (4):** Left atrium echo parameters at baseline and after 6 months between the studied groups

| **Baseline LA echo parameters** | | | | | |
|---|---|---|---|---|---|
| **Variable** | | **Group I (Conv+SGLT2I) (n=44)** | **Group II (Conventional) (n=54)** | **t** | **P** |
| **LAVI: (mL/m$^2$)** | Mean ±Sd<br>Range | 34.13±5.43<br>21.78-43.65 | 35.90±4.99<br>24.71-46 | 1.68 | 0.10 |
| **MV E/A ratio:** | Mean ±Sd<br>Range | 0.89±0.26<br>0.57-1.55 | 0.96±0.28<br>0.33-1.51 | 1.22 | 0.23 |
| **E/e' Ratio:** | Mean ±Sd<br>Range | 13.92±3.76<br>6.3-19.89 | 12.91±4.06<br>5.3-18.5 | 1.27 | 0.21 |
| **LA echo parameters after 6 months** | | | | | |
| **LAVI: (mL/m$^2$)** | Mean ±Sd<br>Range | 33.19±4.05<br>22.87-40.2 | 36.70±4.88<br>26.08-45.8 | **3.83** | **<0.001**** |
| **MV E/A ratio:** | Mean ±Sd<br>Range | 0.94±0.20<br>0.57-1.53 | 0.97±0.30<br>0.57-1.87 | 0.58 | 0.56 |
| **E/e' Ratio:** | Mean ±Sd<br>Range | 11.19±3.16<br>6.3-16.55 | 12.40±4.15<br>5.3-18.65 | 1.59 | 0.12 |

t: Independent t test

Longitudinal analysis showed that **Group I** exhibited significant reductions in LAVI and E/e′ ratio and a rise in the mitral valve E/A ratio relative to baseline. Conversely, **Group II** showed no meaningful changes in these measures (Table 5).

**Table (5):** Comparison between left atrium echo parameters at base line and at 6 months among Group I and Group II

| **Group I (Conv+SGLT2I)** | | | | | |
|---|---|---|---|---|---|
| **Variable** | | **Base line (n=44)** | **6 months (n=44)** | **t** | **P** |
| **LAVI: (mL/m$^2$)** | Mean ±Sd<br>Range | 34.13±5.43<br>21.78-43.65 | 33.19±4.05<br>22.87-40.2 | **2.41** | **0.02*** |
| **MV E/A ratio:** | Mean ±Sd<br>Range | 0.89±0.26<br>0.57-1.55 | 0.94±0.20<br>0.57-1.53 | **2.54** | **0.02*** |
| **E/e' Ratio:** | Mean ±Sd<br>Range | 13.92±3.76<br>6.3-19.89 | 11.19±3.16<br>6.3-16.55 | **6.18** | **<0.001**** |
| **Group II (Conventional)** | | | | | |
| **Variable** | | **Base line (n=54)** | **6 months (n=54)** | **t** | **P** |
| **LAVI: (mL/m$^2$)** | Mean ±Sd<br>Range | 35.90±4.99<br>24.71-46 | 36.70±4.88<br>26.08-45.8 | 0.65 | 0.52 |
| **MV E/A ratio:** | Mean ±Sd<br>Range | 0.96±0.28<br>0.33-1.51 | 0.97±0.30<br>0.57-1.87 | 1.13 | 0.27 |
| **E/e' Ratio:** | Mean ±Sd<br>Range | 12.91±4.06<br>5.3-18.5 | 12.40±4.15<br>5.3-18.65 | 1.27 | 0.21 |

t: Paired t test

**Adverse Cardiovascular Events**

As summarized in table 6, MACE occurred more frequently in **Group II** than in **Group I**, though the difference was not statistically significant. The types of MACE and the incidence of contrast-induced nephropathy (CIN) were similar in both groups. Importantly, the rate of clinically significant arrhythmias was markedly lower in **Group I** compared with **Group II**.

**Table (6):** Major adverse cardiovascular events (MACE) between the studied groups:

| Variable | | Group I (Conv+SGLT2I) (n=44) | | Group II (Conventional) (n=54) | | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|
| | | No | % | No | % | | |
| **MACE:** | No | 35 | 79.5 | 35 | 64.8 | 2.58 | 0.11 |
| | Yes | 9 | 20.5 | 19 | 35.2 | | |
| | Stroke | 4 | 9.1 | 4 | 7.4 | 4.97 | 0.29 |
| | Recurrent MI | 1 | 2.3 | 5 | 9.3 | | |
| | Heart failure | 2 | 4.5 | 4 | 7.4 | | |
| | Angina | 1 | 2.3 | 0 | 0 | | |
| | Unstable angina | 1 | 2.3 | 6 | 11.1 | | |
| **Arrythmia:** | No | 39 | 88.6 | 37 | 68.5 | **5.64** | **0.02*** |
| | Yes | 5 | 11.4 | 17 | 31.5 | | |
| **CIN:** | No | 40 | 90.9 | 51 | 94.4 | 0.46 | 0.50 |
| | Yes | 4 | 9.1 | 3 | 5.6 | | |

$\chi^2$:Chi square test

---

## DISCUSSION

Diabetes mellitus (DM) is a well-recognized independent determinant of mortality following AMI. Traditional risk factors such as hypertension (HTN), tobacco use, and physical inactivity further heighten AMI risk[(7)]. Roughly one quarter of patients presenting with acute coronary syndrome (ACS) have concomitant diabetes, and their outcomes are consistently poorer than those of non-diabetic patients[(8)].

Among glucose-lowering agents, sodium–glucose cotransporter-2 inhibitors (SGLT2i) stand out as the only class repeatedly linked to meaningful reductions in heart-failure (HF) hospitalization, MACE, and renal complications, independent of glycemic status[(4)]. Current guidelines therefore recommend SGLT2i as preferred therapy in type 2 diabetes for lowering three-point MACE, particularly cardiovascular death[(5)], and they have also been shown to lessen the incidence of contrast-induced nephropathy (CIN) [(6)].

This investigation assessed the effect of introducing an SGLT2i in well-controlled type 2 diabetic patients admitted with their first acute anterior STEMI. From June through December 2023, we prospectively enrolled 115 consecutive patients undergoing primary PPCI; none had prior SGLT2i exposure. During hospitalization, dapagliflozin 5 mg daily was initiated in 44 patients (**Group I**), while 54 patients (**Group II**) continued their usual antidiabetic regimen. After accounting for follow-up losses, 98 participants completed the study.

Demographic features—including age, sex, body weight, height, and body-mass index (BMI)—did not differ significantly between groups, consistent with findings from **Elrabat *et al.* [(9)],** who observed similar age and sex distributions in a prospective cohort of diabetic patients with acute STEMI treated by primary PCI. Comparable observations were reported in a multicenter randomized trial by **Soni *et al.* [(7)],** which enrolled 856 diabetic AMI patients across 24 Indian centers and found no baseline demographic differences after adjusting for age, gender, education, and physical activity. Cardiovascular risk factors such as smoking status, hypertension, antihypertensive therapy, duration of diabetes or hypertension, and mean systolic/diastolic pressures were likewise similar between our groups.

Other reports contrast with these findings. **Mukhopadhyay *et al.* [(5)]** documented higher BMI and greater prevalence of dyslipidemia and hypertension in diabetic compared with non-diabetic AMI patients, and more ex-smokers among diabetics, whereas non-diabetics were more often current smokers. **Patel *et al.* [(10)]** likewise described higher rates of prior myocardial infarction and comorbidities—hypertension, angina, cerebrovascular disease, and peripheral vascular disease—in a comparable diabetic cohort. In our series, the primary distinction was the initiation of SGLT2i therapy.

Baseline echocardiography revealed no significant differences between the groups in LV end-systolic size (LVESS), end-systolic diameter (LVESD), ejection fraction (EF) by Simpson or M-mode, LV end-systolic volume (LVESV) and volume index (LVESVI), left-atrial (LA) areas in four- and two-chamber views, body-surface area, or mitral inflow E velocity and E/A ratio, in line with the findings of **Araszkiewicz *et al.* [(11)].**

Our observations diverge, however, from those of **Hoogslag *et al.* [(12)],** who reported greater impairment of LV end-diastolic volume (LVEDV), wall-motion score index (WMSI), and LV global longitudinal strain (LVGLS) in diabetics after acute STEMI—likely reflecting different enrollment criteria, as every patient in our study had diabetes.

By 6 months, **Group I** exhibited marked reductions in LV end-diastolic diameter (LVEDD), LVESD, LVESV, and LVESVI, accompanied by higher EF on both Simpson and M-mode analyses. These results parallel the work of **Voors *et al.* [(13)],** who demonstrated favorable effects of SGLT2i—particularly empagliflozin—in both acute and decompensated chronic HF regardless of EF or diabetic status.

Multiple randomized trials similarly report significant reductions in mortality and HF hospitalizations with empagliflozin in AMI patients, irrespective of EF or diabetes[14-17], and **von Lewinski *et al.*** [18] documented decreases in NT-proBNP levels and echocardiographic improvements in post-AMI patients receiving empagliflozin versus placebo.

Several mechanisms may underlie these benefits. Early SGLT2i administration after AMI can enhance endothelial function, improve myocardial contractility, and optimize cardiac energy metabolism. Mild diuretic action lowers blood pressure and LV filling pressures, reducing afterload. Experimental work further indicates that early SGLT2i therapy limits myocardial fibrosis through inhibition of the TGF-β1/Smad3 pathway, independent of hemodynamic effects[19].

Clinical application requires careful timing. Because acute HF is common in anterior MI, SGLT2i should be initiated only after hemodynamic stabilization. Large contrast loads during primary PCI may heighten CIN risk, especially in diabetics or those on diuretics. Patients scheduled for cardiac surgery—such as for left-main or multivessel disease—should discontinue SGLT2i preoperatively to mitigate the risk of diabetic ketoacidosis (DKA) [18].

Nonetheless, recent randomized data support cardioprotective effects of SGLT2i even in non-diabetics, suggesting advantages that extend into the acute MI phase when HF and recurrent events are common[18].

Although the precise cardioprotective pathways remain incompletely defined, proposed mechanisms include a metabolic shift toward myocardial ketone utilization over fatty acids, which enhances energetic efficiency and contractile performance[20]. Additional effects may involve tubuloglomerular feedback activation, suppression of the renin–angiotensin–aldosterone system and sympathetic drive, osmotic diuresis with reduced LV preload, inhibition of the sodium–hydrogen exchanger ($Na^+/H^+$), attenuation of myocardial calcium overload, improved myocardial energetics, and elevated hematocrit through enhanced erythropoiesis or hemoconcentration[21].

Consistent with these mechanisms and prior clinical evidence, our study demonstrated that SGLT2i use was associated with a significant reduction in all-cause mortality and HF events, echoing outcomes observed in previous trials and observational studies across diverse patient populations[22].

This work has several notable strengths. First, the prospective, consecutive enrollment of patients over a defined 6-month window minimizes selection bias and reflects real-world practice in a high-volume tertiary center. Second, the cohort was clinically homogeneous—well-controlled T2DM presenting with a first acute anterior STEMI and treated with early PPCI (≤6 h)—which reduces clinical heterogeneity and strengthens internal validity. Third, antidiabetic strategies were clearly delineated at the index admission (in-hospital initiation of dapagliflozin 5 mg vs. continuation of standard therapy), enabling a pragmatic comparison that mirrors bedside decision-making. Fourth, outcomes were captured at two complementary levels: (i) hard clinical endpoints (all-cause mortality, HF hospitalization, MACE, arrhythmias, and CIN) and (ii) structured echocardiographic remodeling indices (LVEDD, LVESD, LVESV/VI, EF by Simpson and M-mode, and left-atrial parameters including LAVI and E/e′). Finally, baseline balance across key demographics, comorbidities, and laboratory measures supports the credibility of observed differences during follow-up and lessens the likelihood that results are driven by initial group imbalances.

## LIMITATIONS

Several constraints should temper interpretation. This was a single-center experience with a modest sample size (final n=98), which may limit precision and external generalizability. Treatment assignment was non-randomized and left to the treating consultant, introducing potential confounding by indication despite broadly similar baselines; we did not perform multivariable adjustment or propensity weighting, so residual confounding cannot be excluded. Loss to follow-up (15/115; ~13%) may bias estimates if attrition differed by prognosis. Medication adherence after discharge and changes in background cardioprotective therapy (e.g., ACEi/ARB, beta-blockers, MRA, statins) were not systematically quantified, which could influence remodeling and event rates. Echocardiography followed a standardized protocol, but we did not include deformation indices (e.g., GLS) or infarct characterization by CMR, limiting mechanistic insight into reverse remodeling. Safety was assessed indirectly (e.g., CIN, arrhythmias), without a formal adverse-event framework (e.g., volume depletion, genital infections, euglycemic DKA), and we used a single SGLT2i dose (dapagliflozin 5 mg) without dose-response exploration. The 6-month horizon may be insufficient to capture late remodeling, recurrent HF, or mortality divergence. Finally, events such as arrhythmias were not adjudicated by a blinded committee, which can introduce classification bias.

## CONCLUSION

Our findings underscore the potential value of early SGLT2 inhibitor initiation in controlled diabetic patients undergoing primary PCI for acute anterior STEMI. This strategy was linked to a significant reduction in cardiovascular events—including all-cause mortality, heart-failure–related hospitalizations, MACE, recurrent myocardial infarction, in-hospital mechanical complications, life-threatening arrhythmias, and renal impairment. Furthermore,

comprehensive echocardiographic assessment demonstrated significant improvement across all measured parameters.

## RECOMMENDATIONS

Early in-hospital use of SGLT2 inhibitors in well-controlled type 2 diabetic patients with acute anterior STEMI undergoing primary PCI may provide clinical benefit. Larger multicenter trials with extended follow-up are needed to confirm cardiovascular effects and clarify potential myocardial-protective and safety outcomes.

**No funding.**
**No conflict of interest.**

## REFERENCES

1. **Kim S, Lee S, Kim S *et al.* (2020):** SGLT2 inhibition modulates NLRP3 inflammasome activity via ketones and insulin in diabetes with cardiovascular disease. Nature Communications, 11(1): 2127. doi: 10.1038/s41467-020-15983-6.
2. **Afanasiev S, Garganeeva A, Kuzheleva E *et al.* (2018):** The impact of type 2 diabetes mellitus on long-term prognosis in patients of different ages with myocardial infarction. Journal of Diabetes Research, 18: 1780683. doi:10.1155/2018/1780683.
3. **Vogel B, Claessen B, Arnold S *et al.* (2019):** ST-segment elevation myocardial infarction. Nature Reviews Disease Primers, 5(1): 39. doi:10.1038/s41572-019-0090-3.
4. **Elrakaybi A, Shams M, Abdelazeem M *et al.* (2022):** Cardiovascular protection by SGLT2 inhibitors – Do anti-inflammatory mechanisms play a role? Pharmacological Research, 184: 106449. doi:10.1016/j.phrs.2022.106449.
5. **Mukhopadhyay P, Sanyal D, Chatterjee P *et al.* (2023):** SGLT2 inhibitors: effect on myocardial infarction and stroke in type 2 diabetes. Diabetes Research and Clinical Practice, 108(8): 2134-2140.
6. **Özkan U, Gürdoğan M (2023):** The effect of SGLT2 inhibitors on the development of contrast-induced nephropathy in diabetic patients with non-ST segment elevation myocardial infarction. Medicina (Kaunas), 59(3): 505. doi:10.3390/medicina59030505.
7. **Soni D, Ambalam C, Ajay V *et al.* (2018):** Cardiovascular risk factors among acute myocardial infarction patients with and without comorbid diabetes mellitus—Findings from the Yoga-CaRe Trial. Diabetes, 67(1): 2361. DOI:10.2337/db18-2361-PUB
8. **Castro M, Simon G, Cha S *et al.* (2016):** Statin use, diabetes incidence and overall mortality in normoglycemic and impaired fasting glucose patients. Journal of General Internal Medicine, 31(5): 502-508.
9. **Elrabat K, Elkeshk E, Elsayed M *et al.* (2018):** Impact of diabetes mellitus on myocardial reperfusion and left ventricular remodeling in patients with acute myocardial infarction treated with primary coronary intervention. Ar Clin Cardiol Research, 18: 104. DOI: 10.29011/ACCR-104/100004
10. **Patel P, Cubbon R, Sapsford R *et al.* (2016):** An evaluation of 20 year survival in patients with diabetes mellitus and acute myocardial infarction. International Journal of Cardiology, 203: 141-144.
11. **Araszkiewicz A, Janus M, Prech M *et al.* (2014):** Relations of diabetes mellitus, microvascular reperfusion and left ventricular remodelling in patients with acute myocardial infarction treated with primary coronary intervention. Kardiol Pol., 72(1): 20-26.
12. **Hoogslag G, Abou R, Joyce E *et al.* (2015):** Comparison of changes in global longitudinal peak systolic strain after ST-segment elevation myocardial infarction in patients with versus without diabetes mellitus. The American Journal of Cardiology, 116(9): 1334-1339.
13. **Voors A, Angermann C, Teerlink J *et al.* (2022):** The SGLT2 inhibitor empagliflozin in patients hospitalized for acute heart failure: a multinational randomized trial. Nature Medicine, 28(3): 568-574.
14. **McMurray J, Solomon S, Inzucchi S *et al.* (2019):** Dapagliflozin in patients with heart failure and reduced ejection fraction. N Engl J Med., 381(21):1995-2008.
15. **Packer M, Anker S, Butler J *et al.* (2020):** Cardiovascular and renal outcomes with empagliflozin in heart failure. New England Journal of Medicine, 383(15): 1413-1424.
16. **Anker S, Butler J, Filippatos G *et al.* (2021):** Empagliflozin in heart failure with a preserved ejection fraction. New England Journal of Medicine, 385(16): 1451-1461.
17. **Solomon S, McMurray J, Claggett B *et al.* (2022):** Dapagliflozin in heart failure with mildly reduced or preserved ejection fraction. New England Journal of Medicine, 387(12): 1089-1098.
18. **von Lewinski D, Kolesnik E, Tripolt N *et al.* (2022):** Empagliflozin in acute myocardial infarction: the EMMY trial. European Heart Journal, 43(41): 4421-4432.
19. **Daud E, Ertracht O, Bandel N *et al.* (2021):** The impact of empagliflozin on cardiac physiology and fibrosis early after myocardial infarction in non-diabetic rats. Cardiovascular Diabetology, 20: 132. doi:10.1186/s12933-021-01322-6
20. **Ferrannini E, Mark M, Mayoux E (2016):** CV protection in the EMPA-REG OUTCOME trial: a "thrifty substrate" hypothesis. Diabetes Care, 39(7): 1108-1114.
21. **Furtado R, Bonaca M, Raz I *et al.* (2019):** Dapagliflozin and cardiovascular outcomes in patients with type 2 diabetes mellitus and previous myocardial infarction: subanalysis from the DECLARE-TIMI 58 trial. Circulation, 139(22): 2516-2527.
22. **Kosiborod M, Cavender M, Fu A *et al.* (2017):** Lower risk of heart failure and death in patients initiated on sodium-glucose cotransporter-2 inhibitors versus other glucose-lowering drugs: the CVD-REAL study. Circulation, 136(3): 249-259.