Diabetes, Metabolic Syndrome and Obesity

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ORIGINAL RESEARCH

Exploring the Real-World Effectiveness of Empagliflozin and Linagliptin Fixed-Dose Combination in Type 2 Diabetes Patients of Bangladesh: A Prospective Multi-Center Observational Study

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Purpose: The fixed-dose combination (FDC) of empagliflozin and linagliptin is a promising treatment for type 2 diabetes mellitus (T2DM), but real-world data from Bangladesh is limited. This study aimed to assess the effectiveness and safety of empagliflozin 10 mg/linagliptin 5 mg [Empa/Lina (10/5)] FDC among T2DM patients at real-world settings in Bangladesh.

Patients and Methods: This prospective, multicenter, observational study enrolled 822 adults with T2DM across Bangladesh. Patients receiving Empa/Lina (10/5) FDC either alone or with other antidiabetic medications at practice were enrolled. Glycemic control, body mass index (BMI), blood pressure, and adverse events were assessed over three months.

Results: Mean HbA1c decreased significantly from baseline to three months in both the Empa/Lina (10/5) FDC alone group (9.13% to 8.18%, $p<0.001$) and the FDC plus other antidiabetics group (10.20% to 8.12%, $p<0.001$). Fasting and post-prandial blood glucose levels also improved significantly ($p<0.001$). BMI decreased from 26.81 kg/m^2 to 25.90 kg/m^2 ($p=0.008$). Systolic and diastolic blood pressure reduced by 11.09 mmHg and 4.41 mmHg, respectively ($p<0.001$). The estimated glomerular filtration rate remained stable. Improvements were consistent across patient subgroups with various comorbidities. Adverse events were infrequent, with hypoglycemia (10.95%), genital mycotic infection (3.04%), and urinary tract infections (2.80%) being the most common.

Conclusion: Empa/Lina (10/5) FDC demonstrated significant improvements in glycemic control, BMI, and blood pressure with a favorable safety profile in Bangladeshi patients with T2DM. These real-world findings support its use as an effective treatment option in this population.

Keywords: type 2 diabetes mellitus, empagliflozin, linagliptin, fixed-dose combination, Bangladesh

Received: 22 May 2025
Accepted: 9 October 2025
Published: 4 December 2025

Introduction

Diabetes mellitus is the most common form of metabolic disease in the world. The global prevalence of diabetes, including in Bangladesh,[1] continues to rise at an alarming rate. Impaired pancreatic β-cell activity and insulin resistance in organs such as the liver, skeletal muscle, and adipose tissue lead to type 2 diabetes mellitus (T2DM).[2–5] Around 422 million persons experienced DM-related issues in 2014, and 1.5 million fatalities were recorded in 2012.[6,7] More than any other major region in the world, South East Asia has seen a significant increase in the prevalence of diabetes.[8] According to published research, type 2 diabetes accounts for 90–95% of all diagnosed cases in this region.[9,10] The predicted incidence of diabetes among adults in Bangladesh was 9.7% in 2011, which is estimated to affect 13.7 million people by 2045.[1,8] In 2016, diabetes was responsible for 3% of all fatalities in Bangladesh, while it afflicted 8% of the total population (12.88 million people).

The standard pharmacotherapy of T2DM calls for starting with monotherapy (typically metformin) unless there are contraindications or intolerance, and then adding other single agents sequentially if the desired level of glycemic control is not achieved or maintained after three months.[11] However, when glycated hemoglobin (HbA1c) at admission is significantly above the limit, one therapeutic option is to begin with combination therapy as the first line of treatment. The American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) have collaborated on a position statement that recommends initiating treatment with combination therapy in patients who have a baseline HbA1c ≥9% and who are less likely to achieve treatment goals when using monotherapy alone.[5] Rapid reduction in HbA1c, avoiding prolonged hyperglycemic state and deleterious consequences of glucotoxicity, and avoiding maximal doses of monotherapy (which may amplify harmful effects associated with that monotherapy) are all potential benefits of combination therapy.[5]

To treat type 2 diabetes, doctors recommend empagliflozin, a highly specific SGLT2 inhibitor.[2] In people with type 2 diabetes, empagliflozin decreases the amount of glucose reabsorbed by the kidneys. This results in greater amounts of glucose excreted in the urine and lower blood sugar levels without insulin.[5] In a Phase 3 trial, empagliflozin was reported to be well-tolerated and had little chance of hypoglycemia in patients with T2DM. It decreased HbA1c, fasting plasma glucose (FPG), weight, and blood pressure (BP) compared to the placebo.[4] The improvements in HbA1c, FPG, and body weight seen with empagliflozin were maintained up to week 76 in a double-blind extension of this trial.[3]

Linagliptin is another powerful, potent, and specific dipeptidyl peptidase-4 (DPP-4) inhibitor[12] widely used for treating T2DM patients. Linagliptin promotes insulin release, suppresses glucagon secretion, and stops the inactivation of incretin peptides like glucagon-like peptide-1 (GLP-1).[13] In participants with type 2 diabetes who participated in a phase 3 trial, linagliptin 5mg as monotherapy for 12 weeks augmented glycemic control without leading to weight gain. The treatment was also well endured and posed a minimal risk of hypoglycemia.[14] In trial extension, the effects of linagliptin on lowering HbA1c were found to be maintained up to week 102.[2]

However, multiple medications for various patient populations used to treat diabetes mellitus can result in an overwhelming pill burden and medication non-adherence. The availability of a dual sodium-glucose co-transporter 2/ dipeptidyl peptidase-4 inhibitor combination in a fixed dose or single-tablet combination (STC) represents a new therapeutic option for patients with type 2 diabetes. The Food and Drug Administration (FDA) approved the combination of empagliflozin and linagliptin STC to treat T2DM patients.[5] Although combination agents of these two medications are becoming popular in clinical practice, the effects of combination therapy on β-cells remain unknown.[15]

Clinical trials are frequently constrained in terms of length, patient count, and baseline traits. Moreover, the outcomes of the interventions may not be replicated in the real-world environment. Data on the safety and effectiveness of empagliflozin and linagliptin fixed-dose combination usage in real-world settings are very scarce in Bangladesh. Therefore, the purpose of this study was to evaluate the effectiveness and safety of a fixed-dose combination of empagliflozin (10 mg) and linagliptin (5mg) in patients with T2DM who were prescribed and taking it in practice in the country.

Materials and Methods

Study Design, Population, and Site

This prospective observational study was conducted among adult (≥ 18 years) patients diagnosed with type 2 diabetes mellitus in the outdoors of 20 tertiary care hospitals and 10 consultancy centers covering all eight divisions of Bangladesh. Patients attending the outpatient clinic for management or consultation were considered eligible if they had HbA1c >7.5%, an estimated glomerular filtration rate (eGFR) >25 mL/min/1.73 m^2, were prescribed a fixed-dose combination (FDC) of empagliflozin and linagliptin (10mg/5mg) by the consulting physician, and provided informed consent to participate. Patients were excluded if they had a history of severe hypoglycemia or severe hypovolemia within six months prior to enrollment; any episode of diabetic ketoacidosis, recurrent urinary tract infections, acute coronary syndrome, stroke, or transient ischemic attack within the preceding four weeks; decompensated liver cirrhosis or end-stage renal disease (eGFR <25 mL/min/1.73 m^2); known hypersensitivity to empagliflozin, linagliptin, or both; pregnancy or lactation; significant psychiatric or cognitive impairment; or required emergency admission due to any critical illness. Patients were followed up at 1.5 months (±7 days) and 3 months (±7 days) after enrollment".

Sample Size and Sampling Method

The sample size was estimated using G*Power Version 3.1.9.4. Considering the level of significance (α) of 95%, power (β) of 80%, and an expected effect size of 10%, the sample size was calculated to be 620. To account for the random sampling error due to the multi-center design, it was multiplied by a design effect of 1.5, finally yielding a sample size of 930. Assuming a 10% attrition rate, it came to be 930+10% = 1023. However, a total of 1200 patients could be approached during the stipulated time, and 952 patients gave their consent to participate. Out of 952, 130 patients were excluded due to variations in fixed-dose combinations prescribed at baseline and at 1.5 months follow-up, including-patients who were prescribed with Empa/Lina (10/5) FDC at baseline, and then switched to (25/5mg) FDC during the follow-up (n=36), or who were started with Empa/Lina (10/5) FDC single daily dose, but the dose was either doubled (n=39) or halved (n=55) during the follow-up. No patients were lost from follow-up (Figure 1).

Data Collection Method

Data was collected in a semi-structured case record form. When a patient came to the outpatient department or consultancy centers, he/she was screened, evaluated, and approached by the trained data collectors (all graduates) as per the inclusion criteria. The study rationale and objectives were described to potential participants in a language appropriate for them, and those who gave consent were enrolled. At baseline, data on patients' demographic characteristics, height, medical history (the duration of T2DM, diabetic complications, and comorbidities), and treatment history were collected. Every patient undergoes measurements of weight and blood pressure on their visits. Also, the glycemic tests, including FBS, PPBS, and HbA1c, are routinely done for these patients at practice. Assessment of serum fasting lipid profile, creatinine, and estimated glomerular filtration rate (eGFR) may be undertaken on a case-by-case basis at the discretion of the prescribing specialist. Hence, patients' weight, systolic and diastolic blood pressure, HbA1c, fasting blood glucose (FBG), post-prandial blood glucose (PPBG), fasting lipid profile, serum creatinine, and e-GFR level were taken from their medical records at baseline and during follow-up visits. All adverse events (AEs) observed during the follow-up period in patients who received at least one dosage of the study drug were recorded.

Study Treatment

Empagliflozin plus linagliptin is the first-in-class dual inhibitor combination therapy (SGLT2 plus DPP-4), recently approved by the US Food and Drug Administration (FDA). The fixed-dose combination (FDC) of empagliflozin and linagliptin is available in two strengths: empagliflozin 10 mg/linagliptin 5 mg, and empagliflozin 25 mg/linagliptin 5 mg. This study observed the effect of Empa/Lina (10/5) FDC single daily dosing on the glycemic profile of patients, over a period of three months (+7 days) from the baseline.

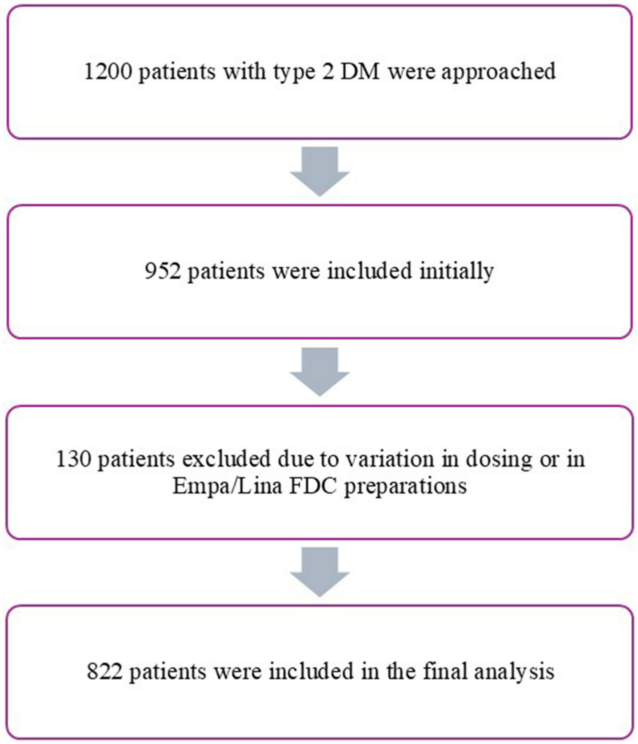

Figure 1 Flow-chart of patient selection.

Outcomes

The primary outcome of the study was the changes in fasting blood sugar (FBS), post-prandial blood sugar (PPBS) two hours after breakfast, and glycated hemoglobin levels (HbA1c). The mid-point changes (ie, at 1.5 months) in the fasting and post-prandial blood sugar were also observed. Secondary outcomes included changes in BMI, blood pressure, lipid profile, and eGFR. The safety outcomes included any incidence of common adverse events (AEs) associated with the FDC, including hypoglycemia, urinary tract infection, and genital fungal infection. Serious AEs were defined as events that result in death or need for critical care, hospitalization, or disability.

Statistical Analysis

All categorical variables were presented using frequency (percentage), and all continuous variables were presented using mean (standard deviation [SD]) or median (interquartile range [IQR]). The normality of the continuous data was tested using the histogram normal curve and Shapiro–Wilk test. An available case analysis approach was taken to deal with missing values. Bivariate analysis between two categorical variables was done using Chi-square or Fisher's exact test, and between a continuous variable and a categorical variable with two categories using the Welch-two samples test if the data is parametric or using the Wilcoxon rank sum test if the data is non-parametric. The changes in glycemic profiles (FBS and PPBS) were assessed using repeated measures analysis of variance (ANOVA) across three time points, and in HbA1c was assessed using a paired-sample *t*-test between two time points. Table 1 describes the statistical tests used for the analysis with more details. A p-value of <0.05 was considered significant for all statistical analyses. All analyses were done, and graphs were generated using R Studio Version 2024.04.2 and Microsoft Excel 365.

Ethical Considerations

The study was approved by the ethical review committee of Dhaka Medical College Hospital (Memo No. ERC-DMC /ECC/2023/93). Informed written consent was taken from the patients before participation. All procedures were conducted following the latest guidelines laid out in the Declaration of Helsinki.

Table 1 Statistical Analyses Used in This Study

Context	Outcome Variable	Factor Variables	Test Used
Comparison of baseline characteristics between patients who were only on Empa/Lina (10/5) FDC and who had other antidiabetic medications in addition to Empa/Lina (10/5) FDC	Other antidiabetic medications prescribed with Empa/Lina (10/5) FDC	Sex, residence, education, Occupation	Pearson's Chi-square test
		Monthly family income (BDT), and duration of diabetes (years) (Distribution: nonparametric)	Wilcoxon rank sum test
		Age, BMI, Systolic blood pressure, Diastolic blood pressure (Distribution: parametric)	Welch Two-Samples *t*-test
		Comorbidities (Hypertension, COPD, Bronchial Asthma, CAD, Dyslipidemia, CKD) Complications (Retinopathy, Neuropathy, Nephropathy, Dermopathy, Diabetic foot)	Pearson's Chi-square test for all except for Dyslipidemia and CKD, where Fisher's exact test was used as the expected count was less than 5 in >25% of the cells.
		FBS, PPBS, HbA1c (Distribution: parametric)	Welch Two-Samples *t*-test
		Serum creatinine, total cholesterol, low-density lipoprotein, high-density lipoprotein, and triglyceride (Distribution: nonparametric)	Wilcoxon rank sum test
Changes in FBS, PPBS, and HbA1c from baseline to follow-up and endline	FBS, PPBS, HbA1c (Distribution: Normal)		Repeated measures one-way ANOVA for three time points Paired samples *t*-test for two time points

Abbreviations: BMI, Body Mass Index; CAD, Coronary Artery Disease; COPD, Chronic Obstructive Pulmonary Disease; CKD, Chronic Kidney Disease; FBS, Fasting Blood Sugar; FDC, Fixed Dose Combination; PPBS, Post-prandial Blood Sugar.

Results

Baseline Characteristics of Patients

Socio-Demographic Characteristics

A total of 822 patients with type 2 diabetes were included in the study. The median age was 52 years (SD: 12; IQR: 43–60), with 53.17% being male. Approximately 41.98% resided in urban areas, 37.79% in rural areas, and 20.23% in semi-urban areas. The most common education levels were graduation (21.13%), higher secondary (21.28%), and primary education (20.09%). The predominant occupations were housewife (41.23%) and business (22.62%). The median monthly income was 40,000 BDT (IQR: 25,000–60,000). The median duration of diabetes was 7 years (IQR: 4–10.5). A significantly higher proportion of patients who were receiving other anti-diabetic medications alongside empagliflozin (10mg) and linagliptin (5mg) fixed-dose combination, were doing business (p=0.028), had higher median monthly family income (p<0.001) and had a higher median duration of diabetes (years) (p=0.005) (Table 2).

Baseline Clinical Profile of Patients

The mean body mass index (BMI) of the patients was 26.8 (SD: 4.2) kg/m^2. It was significantly higher among those who required other antidiabetic medications besides Empa/Lina (p<0.001). The mean systolic and diastolic blood pressures were 137.9 mmHg (SD 18.3) and 82.9 mmHg (SD 8.9), respectively. The combination therapy group had higher systolic blood pressure (138.5 vs 134.8 mmHg, p=0.009), while diastolic blood pressure showed no significant difference (p=0.153). Hypertension was the most prevalent comorbidity (58.88%), followed by dyslipidemia (35.04%) and chronic kidney disease (16.91%). Among diabetes-related complications, neuropathy was most common (28.83%), followed by retinopathy (15.45%) and nephropathy (10.46%). A significantly higher proportion of patients with stroke, chronic

Table 2 Sociodemographic Characteristics of Patients

Characteristic	Overall, N = 822[a]	Other Antidiabetic Medications Prescribed with Empa/Lina (10/5) FDC		p-value
		No, N = 384[a]	Yes, N = 438[a]	
Age	52 (12)	52 (12)	52 (11)	0.240[b]
Sex				0.743[c]
Female	377 (46.83)	177 (47.45)	200 (46.30)	
Male	428 (53.17)	196 (52.55)	232 (53.70)	
Residence				0.226[c]
Rural	198 (37.79)	55 (32.54)	143 (40.28)	
Semiurban	106 (20.23)	38 (22.49)	68 (19.15)	
Urban	220 (41.98)	76 (44.97)	144 (40.56)	
Education				0.584[c]
Graduation	142 (21.13)	62 (22.38)	80 (20.25)	
HSC	143 (21.28)	66 (23.83)	77 (19.49)	
No formal education	99 (14.73)	41 (14.80)	58 (14.68)	
Post-graduation	55 (8.18)	20 (7.22)	35 (8.86)	
Primary	135 (20.09)	53 (19.13)	82 (20.76)	
SSC	98 (14.58)	35 (12.64)	63 (15.95)	
Occupation				**0.028[c]**
Business	147 (22.62)	44 (16.79)	103 (26.55)	
Housewife	268 (41.23)	113 (43.13)	155 (39.95)	
Job holder	116 (17.85)	50 (19.08)	66 (17.01)	
Others	119 (18.31)	55 (20.99)	64 (16.49)	
Monthly Family Income (BDT)	40,000 (25,000, 60,000)	30,000 (20,000, 50,000)	45,000 (30,000, 80,000)	**<0.001[d]**
Duration of Diabetes (years)	7.0 (4.0, 10.5)	5.5 (3.0, 10.0)	8.0 (4.0, 11.0)	**0.005[d]**

Notes: [a]Median (IQR); n (%). [b]Welch two samples *t*-test. [c]Pearson's Chi-squared test. [d]Wilcoxon rank sum test. Significant p-values were shown in bold.

kidney disease, retinopathy, neuropathy, nephropathy, and diabetic foot needed other antidiabetic medications besides Empa/Lina ($p<0.05$). On the other hand, a significantly lower number of patients with hypertension, and dyslipidemia required other medications ($p<0.05$). However, medications did not differ by the presence of COPD, bronchial asthma, coronary artery disease and dermopathy (Table 3).

Table 3 Clinical Profile of Patients at Baseline

Characteristic	Overall, N = 822[a]	Other Antidiabetic Medications Prescribed with Empa/Lina (10/5) FDC		p-value
		No, N = 384[a]	Yes, N = 438[a]	
BMI (kg/m^2)	26.8 (4.2)	26.3 (4.3)	27.2 (4.1)	**0.005[b]**
Systolic blood pressure (mmHg)	137.9 (18.3)	134.8 (18.9)	138.5 (17.8)	**0.009[b]**
Diastolic blood pressure (mmHg)	82.9 (8.9)	82.4 (9.2)	83.4 (8.8)	0.153[b]
Comorbidities				
Hypertension	484 (58.88)	254 (66.15)	230 (52.51)	**<0.001[c]**
COPD	46 (5.60)	23 (5.99)	23 (5.25)	0.646[c]
Bronchial Asthma	55 (6.69)	21 (5.47)	34 (7.76)	0.189[c]
Stroke	51 (6.20)	14 (3.65)	37 (8.45)	**0.004[c]**
CAD	97 (11.80)	39 (10.16)	58 (13.24)	0.171[c]

(*Continued*)

Table 3 (Continued).

Characteristic	Overall, N = 822[a]	Other Antidiabetic Medications Prescribed with Empa/Lina (10/5) FDC		p-value
		No, N = 384[a]	Yes, N = 438[a]	
Dyslipidemia	288 (35.04)	153 (39.84)	135 (30.82)	**0.008[d]**
CKD	139 (16.91)	51 (13.28)	88 (20.09)	**0.009[d]**
Complications				
Retinopathy	127 (15.45)	44 (11.46)	83 (18.95)	**0.003[c]**
Neuropathy	237 (28.83)	65 (16.93)	172 (39.27)	**<0.001[c]**
Nephropathy	86 (10.46)	26 (6.77)	60 (13.70)	**0.001[c]**
Dermopathy	60 (7.30)	34 (8.85)	26 (5.94)	0.109[c]
Diabetic foot	24 (2.92)	3 (0.78)	21 (4.79)	**<0.001[c]**

Notes: [a]n (%); Mean (SD). [b]Welch Two-Samples *t* test. [c]Pearson's Chi-squared test. [d]Fisher's exact test. Significant p-values were shown in bold.
Abbreviations: BMI, Body Mass Index; CAD, Coronary Artery Disease; CKD, Chronic Kidney Disease; COPD, Chronic Obstructive Pulmonary Disease.

Baseline Investigation Profile

Glycemic control parameters showed mean fasting blood sugar of 11.9 mmol/L (SD 3.8), post-prandial blood sugar of 16.6 mmol/L (SD 4.9), and HbA1c of 10.1% (SD 2.3) at baseline. Kidney function was assessed with a median serum creatinine of 1.10 mg/dL (IQR 0.90–1.30) and median eGFR of 71 (IQR 56–80). The lipid profile showed median total cholesterol of 210 mg/dL (IQR 182–248), LDL of 120 mg/dL (IQR 90–157), HDL of 40 mg/dL (IQR 34–47), and triglycerides of 238 mg/dL (IQR 165–323). Notably, patients receiving Empa/Lina (10/5) with other antidiabetic medications (n=438) demonstrated significantly poorer glycemic control compared to those on Empa/Lina (5/10) alone (n=384). Glycemic parameters were significantly higher in the combination group: fasting blood sugar (12.5 vs 10.9 mmol/L, $p<0.001$), post-prandial blood sugar (17.1 vs 15.9 mmol/L, $p=0.002$), and HbA1c levels (10.5% vs 9.5%, $p<0.001$). However, kidney function parameters and lipid profiles were similar between the two groups (Table 4).

Baseline Treatment Profile

At baseline before Empa/Lina (10/5) was started, 38.69% of patients were on insulin therapy. Metformin was the most commonly prescribed oral antidiabetic (44.89%), followed by gliclazide (17.88%) and glimepiride (13.02%). SGLT2 inhibitors were prescribed to 13.26% of patients (Table 5).

Table 4 Investigation Profile of Patients at Baseline

Characteristic	Overall, N = 822[a]	Other Antidiabetic Medications Prescribed with Empa/Lina (10/5) FDC		p-value
		No, N = 384[a]	Yes, N = 438[a]	
Fasting blood sugar (mmol/L)	11.9 (3.8)	10.9 (2.9)	12.5 (4.2)	**<0.001[b]**
Post prandial blood sugar (mmol/L)	16.6 (4.9)	15.9 (4.8)	17.1 (4.9)	**0.002[b]**
HbA1c (%)	10.1 (2.3)	9.5 (2.3)	10.5 (2.2)	**<0.001[b]**
Serum Creatinine (mg/dl)	1.10 (0.90, 1.30)	1.10 (0.97, 1.30)	1.10 (0.90, 1.38)	0.756[c]
eGFR	71 (56, 80)	63 (48, 90)	72 (60, 80)	0.276[c]
Total cholesterol (mg/dl)	210 (182, 248)	210 (176, 249)	210 (189, 248)	0.294[c]
Low-density lipoprotein (mg/dl)	120 (90, 157)	128 (90, 163)	111 (93, 153)	0.512[c]
High-density lipoprotein (mg/dl)	40 (34, 47)	40 (35, 47)	40 (32, 48)	0.089[c]
Triglyceride (mg/dl)	238 (165, 323)	250 (170, 322)	230 (161, 323)	0.880[c]

Notes: [a]n (%); Mean (SD); Median (IQR). [b]Welch two sample *t*-test. [c]Wilcoxon rank sum test. Significant p-values were shown in bold.

Table 5 Ongoing Treatment Pattern of Patients Before the Prescription of Empa/Lina (10/5) FDC

Characteristic	Overall[a] N = 822
Insulin	318 (38.69)
Metformin	369 (44.89)
Gliclazide	147 (17.88)
Glimepiride	107 (13.02)
SGLT-2 inhibitors	109 (13.26)

Note: [a]n (%). Multiple responses considered

Changes in Glycemic Profile from Baseline to Endline

Figure 2 shows that the mean FBS, PPBS, and HbA1c levels considerably decreased from baseline to endline at 3 months for all patients.

For patients on Empa/Lina (10/5) FDC alone, the mean FBS decreased from 10.36 mmol/L at baseline to 8.16 mmol/L at the endline (p<0.001). Mean PPBS decreased from 14.84 mmol/L to 11.11 mmol/L (p<0.001) and mean HbA1c decreased from 9.13% to 8.18% (p<0.001). While for patients on empagliflozin/linagliptin FDC plus other antidiabetics, the mean FBS decreased from 12.08 mmol/L to 8.05 mmol/L (p<0.001), the mean PPBS decreased from 16.87 mmol/L to 10.59 mmol/L (p<0.001), and the mean HbA1c decreased from 10.20% to 8.12% (p<0.001). See Table 6 for details.

From baseline to endline, DM patients who were only on Empa/Lina (10/5) FDC experienced 2.2 mg/dl, 3.73 mg/dl, and 0.95% reduction in FBS, PPBS, and HbA1c, respectively. In patients taking other antidiabetics in addition to Empa/Lina (10/5) FDC, the reductions were 4.03 mg/dl, 6.31mg/dl and 2.08% respectively (Figure 3).

Significant improvements in FBS, PPBS, and HbA1c were observed across all subgroups of patients with various comorbidities (hypertension, stroke, coronary artery disease, chronic kidney disease, and dyslipidemia) and complications (retinopathy, neuropathy, nephropathy, dermopathy, and diabetic foot) over the three time points (p<0.001 for all comparisons) (Table 7 and 8).

Changes in Body Mass Index, Blood Pressure, Estimated GFR and Lipid Profile

Table 9 illustrates changes in body mass index (BMI), estimated glomerular filtration rate (eGFR), and blood pressure over the 3-month study period. BMI decreased significantly from 26.81 kg/ m^2 at baseline to 25.90 kg/m^2 in 3 months (p=0.008). eGFR remained stable, with no significant change from baseline (70.40 mL/min/1.73m^2) to 3 months (71.18 mL/min/1.73m^2) (p=0.922). Both systolic and diastolic blood pressure showed significant reductions. Systolic blood pressure decreased from 136.95 mmHg at baseline to 125.86 mmHg at 3 months (p<0.001), while diastolic blood pressure reduced from 82.94 mmHg to 78.53 mmHg (p<0.001) over the same period.

Table 10 shows that between baseline and endline, 478 patients did not require any anti-hypertensive drug ever, 256 had their anti-hypertensives either omitted or reduced at follow-up or at endline, and 88 patients were on anti-hypertensives. The mean SBP and DBP were significantly reduced from baseline to endline, irrespective of whether anti-hypertensive treatment was required or not.

From baseline, DM patients who were only on Empa/Lina (10/5) FDC experienced respectively 1.9 kg and 2.25 kg reductions at follow-up and endline, and in patients taking other antidiabetics in addition to Empa/Lina (10/5) FDC the weight increased 0.65 kg at follow-up and decreased 0.49 kg at endline (Figure 4).

In patients taking only Empa/Lina (10/5) FDC (10/5), the mean eGFR increased at follow-up and then decreased at endline. While in patients taking Empa/Lina (10/5) FDC plus other anti-diabetics, the mean eGFR increased at follow-up and decreased at endline (Figure 5).

The average values of TC and LDL steadily decreased from baseline to endline in patients taking only Empa/Lina (10/5) FDC. However, HDL and TG levels showed an initial increase during the follow-up and a decrease at the endline. The average values of TC and TG showed an increase in patients taking Empa/Lina (10/5) FDC plus other antidiabetics.

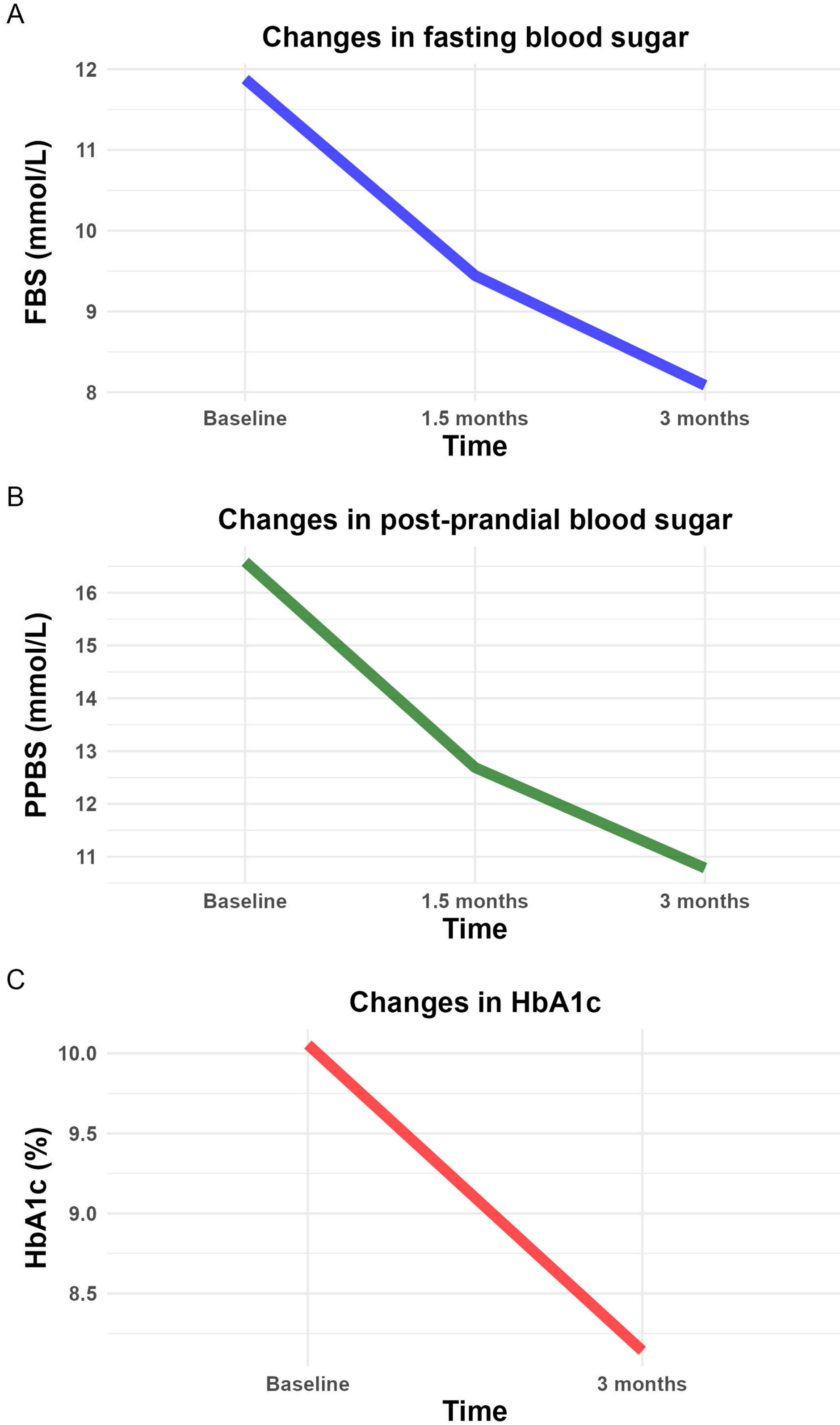

Figure 2 Changes in mean FBS (**A**), PPBS (**B**) and HbA1c (**C**) levels from baseline to endline (3 months).
Abbreviations: FBS, Fasting Blood Sugar; PPBS, Post Prandial Blood Sugar.

Table 6 Changes in Glycemic Profile from Baseline to End of Study by Treatment Groups

Group	Characteristic	Time Point[a]			p-value
		Baseline	Follow-Up	Endline	
Only Empa/Lina (10/5) FDC (n=384)	FBS	10.36 (2.53)	8.99 (2.40)	8.16 (2.12)	**<0.001[b]**
	PPBS	14.84 (4.32)	12.33 (3.62)	11.11 (3.24)	**<0.001[b]**
	HbA1c	9.13 (2.26)		8.18 (1.47)	**<0.001[c]**
Empa/Lina (10/5) FDC plus other antidiabetics (n=438)	FBS	12.08 (3.93)	9.68 (2.55)	8.05 (1.63)	**<0.001[b]**
	PPBS	16.87 (4.97)	12.90 (3.34)	10.59 (2.42)	**<0.001[b]**
	HbA1c	10.20 (2.27)		8.12 (1.55)	**<0.001[c]**

Notes: [a]Mean (SD). [b]Repeated measure ANOVA. [c]Paired sample *t*-test. Significant p-values were shown in bold.
Abbreviations: FBS, Fasting blood sugar; PPBS, Post-prandial blood sugar.

However, LDL showed a steady decrease, and HDL followed an initial decrease at baseline followed by an increase at endline (Figure 6).

Adverse Events

Only 2.8% of patients experienced urinary tract infections, 3.04% had genital mycotic infections, 10.95% had hypoglycemia, and eight patients (0.97%) had episodes of severe hypoglycemia leading to hospitalization (Table 11). The majority of urinary tract infections, and severe hypoglycemia episodes occurred in those who were prescribed Empa/Lina (10/5) FDC only.

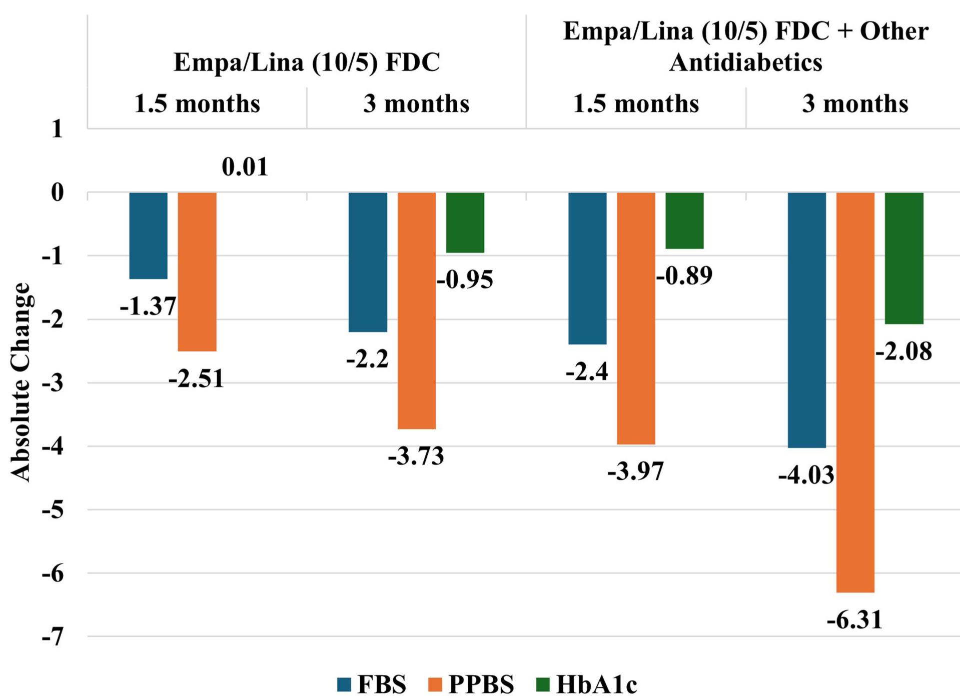

Figure 3 Absolute reductions in FBS (mg/dl), PPBS (mg/dl), HbA1c (%) from baseline to endline (3 months) among diabetic patients taking only Empa/Lina (10/5) FDC or Empa/Lina (10/5) FDC plus other antidiabetics.
Abbreviations: FBS, Fasting Blood Sugar; PPBS, Post Prandial Blood Sugar.

Table 7 Changes in Glycemic Profile Over Time by Comorbidities

Group	Characteristic	Time Points[a]			p-value
		Baseline	Follow-Up	Endline	
Hypertension present (n=587)	FBS	11.73 (3.99)	9.25 (2.51)	7.90 (1.80)	**<0.001**[b]
	PPBS	16.54 (5.03)	12.57 (3.42)	10.69 (2.77)	**<0.001**[b]
	HbA1c	10.04 (2.24)	–	8.12 (1.43)	**<0.001**[c]
Hypertension absent (n=235)	FBS	12.20 (3.43)	9.83 (2.52)	8.47 (1.77)	**<0.001**[b]
	PPBS	16.70 (4.74)	12.92 (3.53)	10.98 (2.75)	**<0.001**[b]
	HbA1c	10.10 (2.42)	–	8.19 (1.69)	**<0.001**[c]
Stroke present (n=51)	FBS	13.29 (4.54)	10.61 (3.26)	8.35 (1.57)	**<0.001**[b]
	PPBS	17.68 (5.56)	13.27 (3.97)	10.84 (3.06)	**<0.001**[b]
	HbA1c	11.03 (2.45)	–	8.39 (1.22)	**<0.001**[c]
Stroke absent (n=771)	FBS	11.78 (3.76)	9.36 (2.45)	8.07 (1.82)	**<0.001**[b]
	PPBS	16.51 (4.88)	12.65 (3.42)	10.78 (2.74)	**<0.001**[b]
	HbA1c	9.98 (2.27)	–	8.12 (1.54)	**<0.001**[c]
CAD Present (n=97)	FBS	11.64 (3.56)	9.35 (2.64)	8.07 (1.89)	**<0.001**[b]
	PPBS	15.14 (4.67)	11.46 (3.25)	9.90 (2.59)	**<0.001**[b]
	HbA1c	10.77 (2.51)	–	8.55 (1.61)	**<0.001**[c]
CAD Absent (n=771)	FBS	11.91 (3.86)	9.46 (2.51)	8.09 (1.80)	**<0.001**[b]
	PPBS	16.79 (4.94)	12.86 (3.45)	10.91 (2.77)	**<0.001**[b]
	HbA1c	9.97 (2.25)	–	8.09 (1.50)	**<0.001**[c]
CKD Present (n=139)	FBS	12.72 (4.68)	9.99 (2.89)	8.40 (1.65)	**<0.001**[b]
	PPBS	17.01 (6.32)	12.86 (3.96)	10.93 (3.39)	**<0.001**[b]
	HbA1c	10.89 (2.56)	–	8.48 (1.58)	**<0.001**[c]
CKD Absent (n=675)	FBS	11.68 (3.57)	9.33 (2.43)	8.01 (1.84)	**<0.001**[b]
	PPBS	16.49 (4.57)	12.65 (3.34)	10.75 (2.58)	**<0.001**[b]
	HbA1c	9.88 (2.19)	–	8.06 (1.50)	**<0.001**[c]
Dyslipidemia Present (n=139)	FBS	11.94 (3.81)	9.49 (2.56)	8.06 (1.79)	**<0.001**[b]
	PPBS	16.57 (4.90)	12.66 (3.29)	10.69 (2.68)	**<0.001**[b]
	HbA1c	10.19 (2.28)	–	8.22 (1.54)	**<0.001**[c]
Dyslipidemia Absent (n=675)	FBS	11.53 (3.92)	9.20 (2.32)	8.22 (1.91)	**<0.001**[b]
	PPBS	16.66 (5.13)	12.80 (4.13)	11.34 (3.19)	**<0.001**[b]
	HbA1c	9.17 (2.19)	–	7.67 (1.32)	**<0.001**[c]

Notes: [a]Mean (SD). [b]Repeated measure one-way ANOVA. [c]Paired sample *t*-test. Significant p-values were shown in bold.
Abbreviations: CAD, Coronary Artery Disease; CKD, Chronic Kidney Disease; FBS: Fasting Blood Sugar; PPBS: Post-Prandial Blood Sugar.

Table 8 Changes in Glycemic Profile Over Time by Diabetic Complications

Group	Characteristic	Time points[a]			p-value
		Baseline	Follow-Up	Endline	
Retinopathy present (n=127)	FBS	11.78 (3.56)	9.94 (2.94)	8.33 (2.26)	**<0.001**[b]
	PPBS	17.83 (4.58)	14.64 (3.56)	12.42 (3.33)	**<0.001**[b]
	HbA1c	10.74 (2.22)		8.26 (1.44)	**<0.001**[c]
Retinopathy absent (n=695)	FBS	11.90 (3.89)	9.36 (2.44)	8.05 (1.72)	**<0.001**[b]
	PPBS	16.32 (4.97)	12.33 (3.32)	10.44 (2.50)	**<0.001**[b]
	HbA1c	9.93 (2.29)		8.12 (1.53)	**<0.001**[c]
Neuropathy present (n=237)	FBS	12.40 (4.02)	9.62 (2.70)	8.17 (1.78)	**<0.001**[b]
	PPBS	17.25 (4.87)	12.79 (3.34)	10.88 (2.95)	**<0.001**[b]
	HbA1c	10.59 (2.23)		8.17 (1.22)	**<0.001**[c]

(*Continued*)

Table 8 (Continued).

Group	Characteristic	Time points[a]			p-value
		Baseline	Follow-Up	Endline	
Neuropathy absent (n=585)	FBS	11.64 (3.72)	9.37 (2.44)	8.05 (1.82)	**<0.001**[b]
	PPBS	16.27 (4.94)	12.64 (3.51)	10.74 (2.68)	**<0.001**[b]
	HbA1c	9.84 (2.28)		8.13 (1.63)	**<0.001**[c]
Nephropathy present (n=86)	FBS	13.25 (4.43)	10.57 (3.27)	8.61 (2.00)	**<0.001**[b]
	PPBS	17.76 (5.93)	13.08 (4.12)	11.42 (3.72)	**<0.001**[b]
	HbA1c	11.12 (2.66)		8.48 (1.69)	**<0.001**[c]
Nephropathy absent (n=736)	FBS	11.69 (3.71)	9.32 (2.39)	8.03 (1.78)	**<0.001**[b]
	PPBS	16.44 (4.78)	12.64 (3.37)	10.70 (2.61)	**<0.001**[b]
	HbA1c	9.93 (2.22)		8.10 (1.50)	**<0.001**[c]
Dermopathy Present (n=60)	FBS	11.67 (3.06)	10.41 (3.08)	8.98 (2.38)	**<0.001**[b]
	PPBS	17.67 (3.91)	14.65 (3.20)	14.08 (3.79)	**<0.001**[b]
	HbA1c	10.87 (2.21)		8.68 (1.30)	**<0.001**[c]
Dermopathy absent (n=762)	FBS	11.89 (3.89)	9.41 (2.49)	8.05 (1.78)	**<0.001**[b]
	PPBS	16.50 (5.00)	12.56 (3.43)	10.53 (2.50)	**<0.001**[b]
	HbA1c	10.00 (2.21)		8.11 (1.53)	**<0.001**[c]
Diabetic Foot Present (n=24)	FBS	14.44 (5.00)	10.64 (2.99)	8.38 (1.56)	**<0.001**[b]
	PPBS	17.77 (5.12)	12.84 (3.94)	10.17 (2.24)	**<0.001**[b]
	HbA1c	11.87 (3.25)		8.45 (1.27)	**<0.001**[c]
Diabetic Foot Absent (n=2394)	FBS	11.79 (3.76)	9.40 (2.49)	8.07 (1.82)	**<0.001**[b]
	PPBS	16.54 (4.93)	12.68 (3.44)	10.81 (2.78)	**<0.001**[b]
	HbA1c	10.00 (2.23)		8.13 (1.53)	**<0.001**[c]

Notes: [a]Mean (SD). [b]Repeated measure one-way ANOVA. [c]Paired sample *t*-test. Significant p-values were shown in bold.
Abbreviations: FBS, Fasting Blood Sugar; PPBS, Post-Prandial Blood Sugar.

Table 9 Changes in Blood Pressure, Body Mass Index, and Estimated GFR

Characteristic	Time Point[a]			p-value
	Baseline	Follow-Up	Endline	
BMI (kg/m^2)	26.81 (4.19)	26.74 (4.35)	25.90 (5.01)	**0.008**[b]
eGFR (mL/min/1.73m^2)	70.40 (28.10)	66.70 (24.12)	71.18 (26.69)	0.922[b]
SBP (mmHg)	136.95 (18.34)	129.95 (13.63)	125.86 (12.37)	**<0.001**[b]
DBP (mmHg)	82.94 (8.94)	80.12 (6.63)	78.53 (5.39)	**<0.001**[b]

Notes: [a]Mean (SD). [b]Repeated measure one-way ANOVA. Significant p-values were shown in bold.
Abbreviations: BMI, Body Mass Index; SBP, Systolic Blood Pressure; DBP, Diastolic Blood Pressure.

Table 10 Changes in Blood Pressure in Relation to Anti-Hypertensive Prescription

Anti-Hypertensive[a]	Characteristic	Baseline[b]	Follow-Up[b]	Endline[b]	p-value
Never prescribed (n=478)	SBP (mmHg)	132.13 (14.74)	126.71 (10.11)	124.66 (10.88)	**<0.001**[c]
	DBP (mmHg)	80.89 (7.70)	78.66 (5.76)	78.18 (5.39)	**<0.001**[c]
Omitted or reduced (n=256)	SBP (mmHg)	144.84 (20.41)	133.37 (16.04)	126.29 (14.01)	**<0.001**[c]
	DBP (mmHg)	86.11 (10.01)	81.09 (6.94)	78.17 (5.48)	**<0.001**[c]
Newly prescribed (n=88)	SBP (mmHg)	139.05 (20.46)	133.46 (15.65)	129.05 (13.20)	**<0.001**[c]
	DBP (mmHg)	84.21 (8.84)	82.85 (7.43)	80.39 (4.87)	**0.003**[c]

Notes: [a]Never prescribed: Not required at any point from baseline to endline; Omitted: Prescribed at baseline but omitted at either follow-up or endline; Prescribed: Prescribed at any time-point from baseline to endline. [b]Mean (SD). [c]Repeated measures one-way ANOVA. Significant p-values were shown in bold.
Abbreviations: SBP, Systolic Blood Pressure; DBP, Diastolic Blood Pressure;

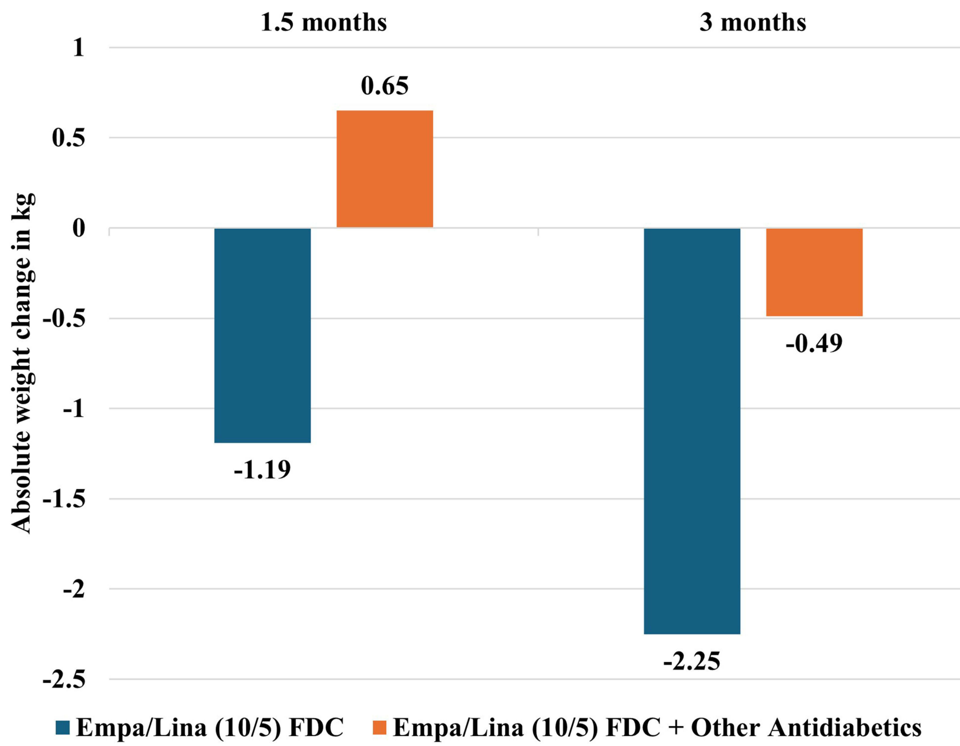

Figure 4 Absolute reductions in weight (kg) from baseline to follow-up (1.5 months) and endline (3 months) among diabetic patients taking only Empa/Lina (10/5) FDC or Empa/Lina (10/5) FDC plus other antidiabetics.

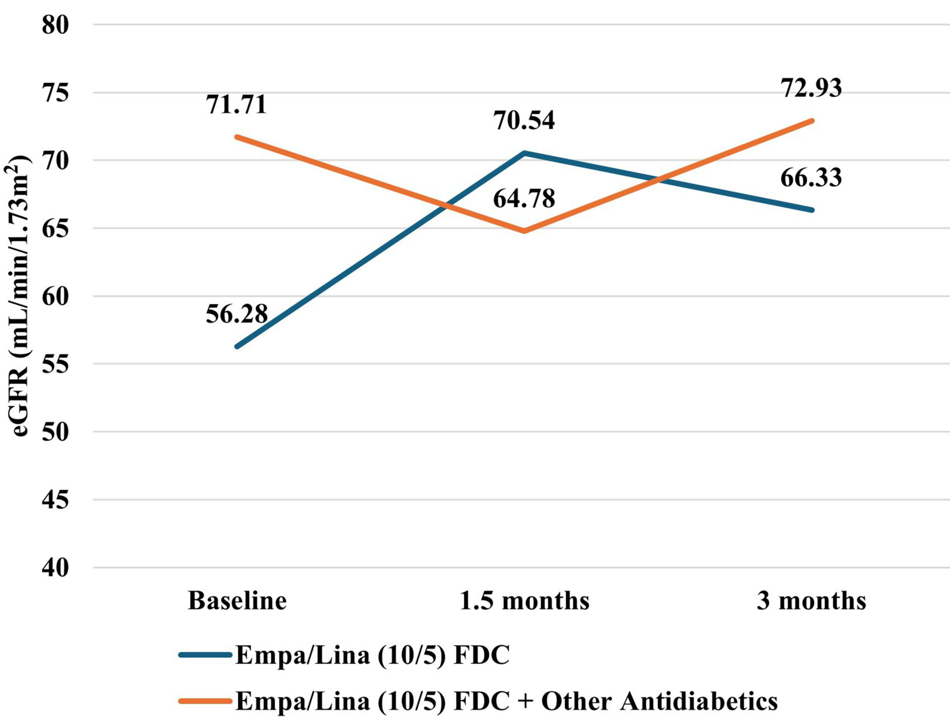

Figure 5 Mean eGFR at baseline, follow-up (1.5 months), and endline (3 months) among diabetic patients taking only Empa/Lina (10/5) FDC or Empa/Lina (10/5) FDC plus other antidiabetics.

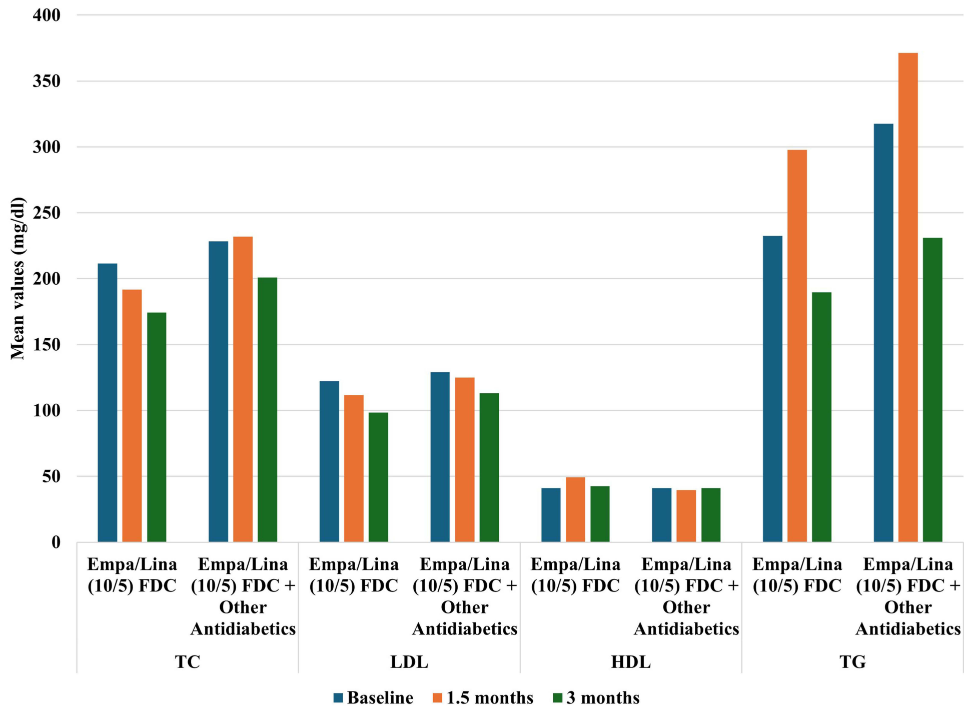

Figure 6 Mean total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL) and Triglyceride (TG) levels at baseline, follow-up (1.5 months) and endline (3 months) among diabetic patients taking only Empa/Lina (10/5) FDC or Empa/Lina (10/5) FDC plus other antidiabetics.

Discussion

This prospective, multi-center, observational study provides valuable real-world evidence on the effectiveness and safety of the fixed-dose combination (FDC) of empagliflozin 10 mg and linagliptin 5 mg in patients with type 2 diabetes mellitus (T2DM) in Bangladesh. The findings demonstrated significant improvements in glycemic control across various patient subgroups, with a favorable safety profile over 3 months.

Glycemic Control

We observed substantial reductions in fasting blood sugar (FBS), post-prandial blood sugar (PPBS), and HbA1c levels from baseline to the 3-month endpoint. These improvements were consistent across patients receiving Empa/Lina (10/5) FDC alone and those receiving it in combination with other antidiabetic medications. For patients on the FDC alone, mean HbA1c decreased from 9.13% to 8.18%, while for those on combination therapy with other antidiabetic drugs, it decreased from 10.20% to 8.12%. These results align with previous clinical trials and real-world studies on empagliflozin/linagliptin FDC, supporting its efficacy in improving glycemic control.[3,16–20] The magnitude of HbA1c reduction

Table 11 Adverse Events Following Empa/Lina (10/5) FDC Treatment

Adverse Event	Overall[a] N = 822	Other Antidiabetic Medications Prescribed with Empa/Lina (10/5) FDC	
		No[a] N = 384	Yes[a] N = 438
Urinary tract infection	23 (2.80)	17 (4.43)	6 (1.37)
Genital mycotic infection	25 (3.04)	15 (3.91)	10 (2.28)
Hypoglycemia	90 (10.95)	20 (5.21)	70 (15.98)
Severe hypoglycemia	8 (0.97)	1 (0.26)	7 (1.60)

Note: [a]n (%).

observed in our study (approximately 1% for FDC alone and 2% for combination therapy) is clinically noteworthy and comparable to findings from other studies. For instance, a meta-analysis by Katsiki et al reported HbA1c reductions ranging from 0.4% to 1.04% with Empa/Lina (10/5) FDC.[3] The slightly higher reductions seen in our study, particularly in the combination therapy group, may be attributed to better compliance of our patients with the treatment. The absolute changes in FBS and PPBS between baseline and endline were also noteworthy, with patients only on the FDC showing, respectively, 2.2 mmol/l and 3.73 mmol/l reduction and patients on FDC plus other antidiabetics showing a 4.03 mmol/l and 6.31 mmol/l reduction. The latter group had a higher baseline FBS and PPBS level, explaining the other antidiabetics provided along with Empa/Lina (10/5) FDC, as well as the higher reduction in absolute blood sugar values. The change in fasting plasma glucose was also higher compared to the pooled reduction of 1.6 mmol/l noted in the meta-analysis by Katsiki et al.[3] However, it should be noted that Katsiki et al reported the change over a period of 24 weeks, while our study observed the changes over a period of 12 weeks. A longer duration of the follow-up may show a reduced change at later time-points, which, as observed by Vigersky et al,[21] can be improved by continuous real-time monitoring. Nevertheless, patients on Empa/Lina (10/5) FDC with other antidiabetic medications showing greater absolute reductions in glycemic parameters compared to those on FDC alone suggest that the Empa/Lina (10/5mg) FDC can effectively complement existing diabetes management regimens, providing additional glycemic benefits in patients with more challenging glycemic control.

Comorbidities and Complications

Our study population had a high prevalence of comorbidities, including hypertension (58.88%), dyslipidemia (35.04%), and chronic kidney disease (16.91%). Despite these comorbidities, significant improvements in glycemic control were observed across all subgroups of patients with various comorbidities. This finding is particularly important as it demonstrates the effectiveness of Empa/Lina (10/5mg) FDC in a real-world setting where patients often present with multiple comorbidities. The improvements in glycemic control among patients with CKD are noteworthy, given the challenges of diabetes management in this population. Previous studies[22] have shown that empagliflozin can be used safely in patients with reduced renal function and may even provide a renoprotective effect. Even linagliptin may give renoprotection through reduced proteinuria.[23] Our findings support the use of Empa/Lina (10/5) FDC in patients with comorbid chronic kidney disease, though further research is needed to evaluate long-term renal outcomes.

We noted that patients with complications are likely to have higher glycemic levels compared to those without complications. However, irrespective of the presence of any complication, patients showed a significant improvement in FBS, PPBS, and HbA1c levels from baseline to endline of the study. The Empa/Lina (10/5) FDC has been proven to exert renal and cardiac benefits in patients who are taking it.[3] The blood sugar-lowering effect of this combination among patients with complications may, to some extent, explain that effect.

Parallel Beneficial Changes

The significant reduction in weight and, therefore, BMI over the 3-month period aligns with the known effects of SGLT2 inhibitors like empagliflozin, likely due to caloric loss associated with increased urinary glucose excretion. Similarly, Althobaiti et al observed a reduction in body weight in type 2 DM patients in 12-week prospective observational study of Empa/Lina FDC.[24] This clinically meaningful weight loss may contribute to improved cardiovascular risk profiles in patients with type 2 DM. Like Althobaiti et al[24] we did not find an improvement in renal function in our patients. However, the stability of eGFR throughout the study period is reassuring, suggesting that the Empa/Lina (10/5) FDC did not negatively impact renal function in the short term, which is particularly important given the high prevalence of chronic kidney disease in our study population. Patients who were given Empa/Lina (10/5) FDC in addition to other antibiotics had poorer glycemic control and higher levels of complications and were found to have a lower absolute reduction in weight compared to patients who were only taking Empa/Lina (10/5) FDC. This could imply that the weight-reducing effects of Empa/Lina (10/5) FDC might be subverted by the cross-cutting influences of co-prescription of other anti-diabetic medications with weight-increasing effects, and the probable presence of non-compliance, or higher insulin resistance in these patient groups.

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In contrast to previous studies,[2,16,24] we found a significant reduction in both systolic and diastolic blood pressure among our patients. Although the fixed-dose combination of empagliflozin and linagliptin did not show a significantly higher reduction in blood pressure when they are used with other anti-diabetic agents compared to when they are used alone,[3] these blood pressure-lowering effects could have substantial clinical implications for cardiovascular risk reduction. The observed improvements in blood pressure without a significant change in eGFR suggest that the Empa/Lina (10/5) FDC may offer cardiovascular benefits without compromising renal function, which is particularly relevant for patients with diabetes who often have concomitant hypertension and are at increased risk for both cardiovascular and renal complications.

Our study also found reductions in mean total and LDL cholesterol levels in patients getting Empa/Lina (10/5) FDC over the follow-up period, which is contrary to the findings by Rau et al, who noted a net small increase in LDL cholesterol among diabetic patients on empagliflozin.[25] However, similar to our study, previously Inagaki et al[19] found a net reduction in mean TC and LDL levels among patients taking the fixed dose formulation. But the changes varied widely on an individual level. Hence, the link between Empa/Lina (10/5) FDC and cholesterol level reductions could not be inferred.

Safety Profile

The safety profile of Empa/Lina (10/5) FDC in our study was favorable, with low rates of adverse events. Only 2.8% of patients experienced urinary tract infections, and 3.04% had genital mycotic infections. These rates are lower than those reported in some clinical trials,[14] and comparable to others,[19] which may be due to differences in monitoring and reporting practices in real-world settings. The low incidence of adverse events supports the tolerability of this combination therapy in a diverse patient population. Katsiki et al[3] in their systematic review and meta-analysis noted that the Empa/Lina FDC produces a lower frequency of adverse events, including genital fungal infection, urinary tract infection, and hypoglycemia, compared to single agent preparations. Notably, there were no reported cases of severe hypoglycemia or diabetic ketoacidosis, which are potential concerns with SGLT2 inhibitor therapy. This aligns with the established safety profile of empagliflozin and linagliptin and suggests that the combination may be associated with a low risk of these serious adverse events.

Clinical Implications

The findings of this study have several important clinical implications for the management of T2DM in Bangladesh and similar settings:

1. Effectiveness in a diverse population: The study demonstrates the efficacy of Empagliflozin/Linagliptin (10/5 mg) FDC across a wide range of patients, including those with various comorbidities and complications. This supports its use as a versatile treatment option in real-world clinical practice in Bangladesh.
2. Complementary therapy: The greater glycemic improvements observed in patients receiving the FDC alongside other antidiabetic medications suggest that it can be effectively used as an add-on therapy for patients not achieving glycemic targets with current regimens.
3. Simplified treatment regimen: The use of a fixed-dose combination can potentially improve medication adherence by reducing pill burden, which is particularly beneficial in a setting where complex treatment regimens may be challenging to manage.
4. Favorable side effects: The Empagliflozin/Linagliptin (10/5 mg) FDC demonstrated favorable effects on body weight and blood pressure while maintaining stable renal function over a 3-month period. These findings, combined with the glycemic improvements noted earlier, support the use of this combination therapy as a multifaceted approach to managing type 2 diabetes and its associated cardiovascular risk factors in real-world clinical practice.
5. Safety in real-world use: The low incidence of adverse events observed in this study provides reassurance regarding the safety of Empagliflozin/Linagliptin (10/5 mg) FDC in routine clinical practice.

 https://doi.org/10.2147/DMSO.S542107

Limitations and Future Directions

While this study provides valuable insights, it has some limitations. The 3-month follow-up period, while sufficient to demonstrate short-term efficacy, does not allow for assessment of long-term outcomes or durability of effect. Future studies with longer follow-up periods are needed to evaluate the sustained effectiveness and safety of Empa/Lina (10/5) FDC FDC. The impact of variations in FDC preparation like using Empa/Lina 25/5 mg FDC preparation could not be observed in this study. Additionally, the observational nature of the study precludes causal inferences and may be subject to confounding factors. The effects on body weight and blood pressure were observed over a relatively short 3-month period. Hence, longer-term studies would be valuable to assess the durability of these effects and to explore potential mechanisms. Additionally, future research could investigate whether these improvements in BMI and blood pressure translate to meaningful reductions in cardiovascular events and mortality in the Bangladeshi population. Further research is also needed to explore the impact of Empa/Lina (10/5) FDC on the quality of life in the Bangladeshi population with type 2 DM.

Conclusion

This real-world study demonstrates that the fixed-dose combination of empagliflozin and linagliptin is effective in improving glycemic control in Bangladeshi patients with T2DM, including those with various comorbidities or complications. The favorable safety profile and significant reductions in HbA1c, FBS, and PPBS support its use as both monotherapy and in combination with other antidiabetic medications. The combination drug may potentially lower blood pressure and weight as well. These findings provide important evidence for clinicians managing T2DM in Bangladesh and similar settings, offering a promising treatment option for achieving glycemic targets in a diverse patient population.

Acknowledgment

The authors acknowledge Md. Mahbubur Rahman, Manager, and Farhana Afrose, Senior Executive, Marketing Division, The ACME Laboratories Ltd., for coordinating with the funding agency. Although this study was funded by the ACME Laboratories Ltd, the sponsor had no role in the study design, data collection, data analysis, manuscript preparation, or decision to publish.

Disclosure

The authors declare no conflicts of interest in this work.

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