Uptake of Newer Second-Line Diabetes Medications in Real-World Vulnerable Populations.

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BACKGROUND

- Diabetes is one of the most prevalent chronic metabolic conditions in the United States (U.S). It is associated with various comorbidities, including cardiovascular diseases and renal failure.
- More than 14% of U.S adults have diabetes, and 80% of those diagnosed with diabetes use oral hypoglycemic agents.
- Optimal management of diabetes and its comorbidities is based on the use of the most appropriate and evidence-based oral hypoglycemic agents specific to a patient situation and combined with lifestyle management.
- Newer second-line glycemic agents have proven to have additional benefits. Specifically, glucagon-like peptide 1 receptor agonists (GLP-1RA) and sodium-glucose cotransporter 2 inhibitors (SGLT2i) have cardio and renal protective effects in addition to their glucose-lowering properties.
- Despite this strong evidence of benefits, uptake of newer glycemic agents has been poor.

OBJECTIVE

- Examine the uptake of GLP-1RA or SGLT2i compared to dipeptidyl peptidase 4 inhibitors (DPP-4i) or sulfonylureas (SFU).
- Examine the uptake of GLP-1RA or SGLT2i among high-risk cardio/renal patients and socioeconomically disadvantaged populations.

STUDY SIGNIFICANCE

- This study adds to the literature by examining the association of neighborhood-level factors with the uptake of newer second-line glycemic agents.

METHODS

Study Design and Population

- A retrospective cohort analysis was conducted using 2019 to 2021 electronic medical records from a large health care delivery system, which is part of the Tennessee Population Health Data Network (TNPOPnet).
- The health care delivery system predominantly serves African Americans and patients from medically underserved areas.
- 2019 was the baseline period, and 2020-2021 served as the follow-up period.
- The study included: 1) adult patients aged 18 years or older, 2) diagnosed with type 2 diabetes, and 3) using metformin in the baseline period.
- Patients were excluded if they were prescribed any second-line glycemic agents in the baseline period.
- The initiation of second-line glycemic agents was defined as the first prescription of SFU, DPP-4i, GLP-1RA, SGLT2i, or their combination in the follow-up period.
- Patients prescribed both newer and older second-line glycemic agents were classified as receiving newer agents.

Outcomes

- The primary outcome was the initiation of newer second-line diabetes medications (Yes/No).

Exposure Variables

- Diabetes comorbid conditions including any diagnosis of cerebrovascular disease (CVD), obesity, coronary artery disease (CAD), congestive heart failure (CHF), and chronic kidney disease (CKD). There are evidence-based benefits of improved outcomes when patients with these conditions preferentially use GLP-1RA or SGLT2i.
- Neighborhood level factors which include Median Household Income, Educational Attainment, and HPSA designation
- Patient demographic characteristics including age, gender, and race.

Data Analysis

- We used patient residence zip code information to link their zip codes with neighborhood-level risk factors.
- Differences between groups were assessed using chi-square tests for categorical measures and ANOVA for continuous measures
- Using a multivariable logistic regression model, we examined the association of cardio/renal comorbidities and neighborhood-level risk factors with the uptake of newer second-line diabetes agents
- All data analysis was conducted at patient level using SAS version 9.4

RESULTS

Baseline characteristics table showing mean (SD) and frequencies (%) for newer and older second-line medications with p-value.

	GLP-1RA initiators (n = 81)	SGLT2i initiators (n =45)	DPP-4i initiators (n =87)	SFU initiators (n = 120)	p-value
Demographics					
Age, years, mean (SD)	53.6 (10.3)	59.2 (10.2)	59.6 (11.6)	59.4 (12.2)	0.001
Sex, n (%)					
Female	60 (74.1)	22 (48.9)	45 (51.7)	62 (51.7)	0.004
Male	21 (25.9)	23 (51.1)	42 (48.3)	58 (48.3)	
Race/ethnicity, n (%)					
White	37 (46.8)	27 (60.0)	39 (45.9)	46 (40.7)	0.315
Black	40 (50.6)	17 (37.8)	40 (47.1)	60 (53.1)	
Other Race	2 (2.5)	1 (2.2)	6 (7.1)	7 (6.2)	
Comorbidities, n (%)					
CVD	4 (17.3)	2 (8.7)	7 (30.4)	10 (43.5)	0.679
CAD	3 (8.3)	5 (13.9)	7 (19.4)	21 (58.3)	0.016
CHF	2 (10.0)	2 (10.0)	5 (25.0)	11 (55.0)	0.252
CKD	6 (27.3)	6 (27.3)	5 (22.7)	5 (22.7)	0.205
Obesity	78 (30.7)	33 (13.0)	61 (24.0)	83 (32.7)	<.001
Neighborhood Level Factors, n (%)					
Bachelor's degrees, mean (SD)	12.4 (6.8)	14.9 (8.4)	13.7 (7.4)	10.8 (6.8)	0.003
HPSA designation	44 (26.4)	19 (11.4)	38 (22.3)	67 (40.1)	0.193
Median Household Income LT 100%	4 (23.5)	1 (5.9)	3 (17.7)	9 (52.9)	0.454
All statistical tests were 2-sided, and significance level was set at 0.05					

RESULTS - continued

Multivariable Association of Cardio/Renal Comorbidities and Neighborhood Factors with Use Of Newer Second line Diabetic Medications

Factors/Characteristics	Newer vs older glycemic agents OR (95% CI)	p-value
Demographics		
Age	0.97 (0.95 - 0.99)	0.015
Sex		
Male	Reference	—
Female	1.72 (1.03 - 2.87)	0.037
Race/ethnicity		
White	Reference	—
Black	0.67 (0.39 - 1.16)	0.153
Other race	0.34 (0.08 - 1.36)	0.127
Comorbidities		
CVD	0.77 (0.27 – 2.20)	0.626
CAD	0.72 (0.28 - 1.83)	0.484
CHF	0.40 (0.11 - 1.50)	0.175
CKD	3.75 (1.35 - 10.50)	0.012
Obesity	2.39 (1.22 - 4.68)	0.011
Neighborhood Level Factors		
Bachelor's degrees	1.05 (1.01 - 1.09)	0.010
HPSA designation	1.59 (0.91 - 2.79)	0.103
Median Household Income LT 100% FPL	1.08 (0.32 - 3.64)	0.900
All statistical tests were 2-sided, and significance level was set at 0.05.		

- Of 331 patients who initiated second-line diabetes therapy, 37.4% started GLP-1RA or SGLT2i.
- Patients with obesity and those with CKD were significantly more likely to start GLP-1RA or SGLT2i than DPP-4i or SFU (OR 2.39 [95% CI 1.22–4.68] for obesity, and OR 3.75 [95% CI 1.35–10.50] for CKD).
- Patients who lived in neighborhoods with a higher proportion of individuals with at least bachelor's degrees were significantly more likely to receive GLP-1RA or SGLT2i (OR 1.05 [95% CI 1.01–1.09]).
- Newer medications were more likely to be started by females and younger patients.

CONCLUSIONS

- Our findings highlight a suboptimal uptake of newer diabetic agents among vulnerable populations in the Mid-South, especially among those with cardiovascular disease and lower education levels. Thus, a need for more awareness of the benefits of these agents beyond their glycemic properties.
- The study is limited because of the small sample size. However, the findings are consistent with previous studies that showed a lower uptake of newer agents amongst the population most likely to benefit.

Please send your questions to the corresponding author (dogunsan@uthsc.edu)