Patient-level factors associated with the use of second-generation antidiabetic medications among patients with type 2 diabetes: results from a nationally representative sample

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INTRODUCTION

- Existing studies have showed the benefits of second-generation antidiabetic medications in patients with type 2 diabetes for antihyperglycemic and beyond-antihyperglycemic effects [1].
- Cost is the main barrier for the uptake of second-generation antidiabetic medications [2].
- The associations between other patient factors and the use of second-generation antidiabetic agents remain unknown.

OBJECTIVES

To explore the utilization of second-generation antidiabetic medication and patient factors associated with the use of second-generation antidiabetic medications in a nationally representative sample of patients with type 2 diabetes.

METHODS

- Study design: retrospective cross-sectional study
- Data source: National Health and Nutrition Examination Survey (NHANES) data 2005-2018.
- Eligibility criteria
  - Inclusion: NHANES adult participants aged ≥18 either with a diagnosis of diabetes by ADA criteria OR having been told having diabetes, AND have taken any antidiabetic medication in the last 30 days
  - Exclusion:
    - individuals <20 years of age AND using only insulin
    - pregnant women
    - individuals with non-positive sampling weights
- Outcomes: the prescription of any second-generation antidiabetic medication (GLP-1 receptor agonists, DPP-4 inhibitors and SGLT-2 inhibitors).
- Patients factor: variables including 6 domains (demographics socioeconomic, access to care, health behavior, diabetes-related factors, comorbidities and medication use) – **Table 1**
- Statistical analysis: descriptive statistics and multivariable analysis. We used weighted stepwise logistic regression modeling and assessed the fluctuation of effect estimate (adjusted Odds Ratio-OR with 95% confidence interval (CI)) with an additional domain. We also tested the interactions between race/ethnicity and prescription coverage using the F test.
- Sensitivity analysis and subgroup analyses: individual drug classes GLP-1 receptor agonist, DPP-4 inhibitors, and SGLT-2 inhibitors (1) and before-after 2015 (2)

RESULTS

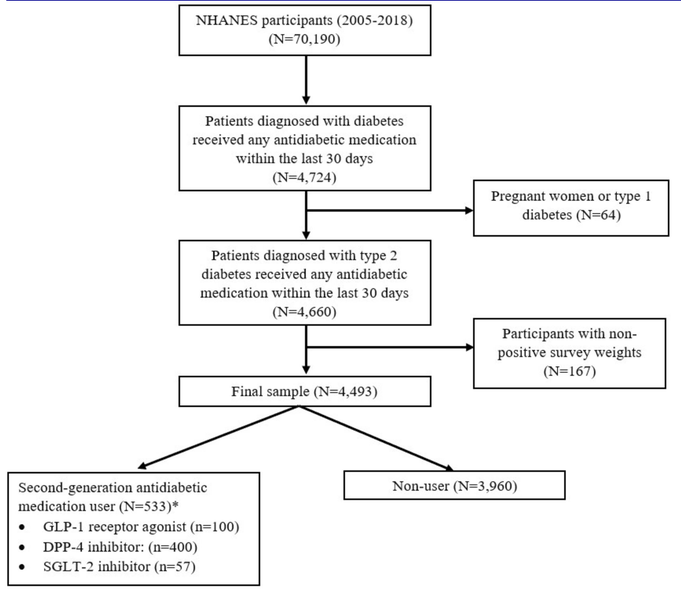

Figure 1. Flowchart diagram of study sample

- 533 (weighted proportion: 13.67%) among 4,493 patients with type 2 diabetes treated with antidiabetic medications reported the use of at least one second-generation drugs.
- The most prescribed second-generation antidiabetic drug class was DPP-4 inhibitors (weighted: 70.62%, 95% CI 64.70-76.54%).
- In multivariable analyses, patients with income of ≥400% poverty level (OR 2.30, 95% CI 1.58-3.34), higher HbA1c level (OR 1.10, 95% CI 1.02-1.18), and taking more medications (OR 1.14, 95% CI 1.09- 1.20) were more likely to use second-generation antidiabetic drugs compared to their counterparts. The interaction between race/ethnicity and prescription coverage was not significant (p = 0.47).
- Sensitivity analysis and subgroup analyses showed consistent findings.

CONCLUSIONS

- The uptake of second-generation antidiabetic medications was low among patients with type 2 diabetes in the United States.
- Prescription benefit design targeting lower out of pocket payment for these newer drugs may improve patient access and clinical outcomes for patients with type 2 diabetes.

Table 1. Study sample characteristics and association between patient factors and second-generation antidiabetic medications

	Second-generation antidiabetic users (n=533)	Non-users (n=3,960)	p-value**	Adjusted ORs (95% CI)***
Age group				
18-44	9.46 (5.59-13.33)	13.11 (11.30-14.92)	0.01	Ref.
45-64	54.27 (48.11-60.43)	44.20 (41.80-46.59)		1.41 (0.80-2.50)
≥65	36.26 (30.33-42.20)	42.68 (40.29-45.08)		0.97 (0.50-1.88)
Missing (n=22)				
Sex				
Male	55.30 (49.04-61.57)	49.90 (47.57-52.24)	0.11	0.90 (0.64-1.25)
Female	44.70 (38.43-50.97)	50.10 (47.76-52.43)		Ref.
Race/Ethnicity				
Hispanic	11.55 (8.18-14.93)	14.23 (11.98-16.48)	0.04	0.91 (0.65-1.27)
Non-Hispanic Black	12.27 (9.06-15.48)	15.91 (13.80-18.01)		0.76 (0.55-1.05)
Non-Hispanic White	66.97 (61.00-72.95)	60.94 (57.81-64.07)		Ref.
Others	9.20 (6.20-12.20)	8.92 (7.46-10.38)		1.27 (0.78-2.07)
Education				
< High school	17.77 (13.35-22.19)	24.05 (21.91-26.20)	0.06	1.12 (0.74-1.69)
High school	29.87 (22.43-37.30)	24.18 (22.05-26.31)		1.46 (0.96-2.21)
≥ College	52.36 (44.95-59.77)	51.77 (49.00-54.53)		Ref
Missing (n=43)				
Poverty				
<100%	18.78 (13.76-23.79)	23.45 (21.39-25.52)	0.0002	1.28 (0.92-1.76)
100-200%	14.72 (11.40-18.03)	24.14 (22.21-26.07)		Ref.
200-400%	29.52 (21.09-37.95)	27.33 (25.15-29.51)		1.69 (1.10-2.59)
>400%	36.98 (29.43-44.54)	25.08 (22.76-27.39)		2.30 (1.58-3.34)
Health Insurance				
Insured	96.39 (94.30-98.48)	91.16 (89.98-92.33)	0.001	NA
Uninsured	3.61 (1.52-5.70)	8.84 (7.67-10.02)		
Prescription Coverage				
Yes	91.25 (88.52-93.98)	85.21 (83.68-86.74)	0.0008	1.30 (0.89-1.90)
No	8.75 (6.02-11.48)	14.79 (13.26-16.32)		Ref.
Physical activity				
Low	38.38 (31.51-45.25)	40.55 (38.29-42.81)	0.51	Ref.
Moderate	33.85 (27.58-40.11)	35.23 (33.02-37.44)		0.94 (0.64-1.40)
Rigorous	27.77 (22.44-33.11)	24.22 (22.00-26.45)		1.26 (0.82-1.94)
Missing (n=4)				
Alcohol use				
Non-use	41.67 (34.97-48.36)	48.27 (45.60-50.95)	0.18	Ref.
Moderate	27.85 (21.40-34.31)	25.67 (23.06-28.28)		1.05 (0.70-1.57)
Heavy	30.48 (24.59-36.36)	26.06 (24.18-27.93)		1.24 (0.83-1.83)
Body Mass Index				
<30 kg/m^2	30.54 (25.31-35.77)	38.68 (36.45-40.92)	0.0036	Ref.
≥30 kg/m^2	69.46 (64.23-74.69)	61.31 (59.08-63.55)		1.17 (0.90-1.52)
Smoking				
Never	52.64 (45.09-60.18)	50.53 (48.61-52.44)	0.16	Ref.
Former	37.82 (31.01-44.62)	35.19 (33.42-36.97)		0.51 (0.28-0.94)
Current	9.55 (6.01-13.08)	14.28 (12.72-15.83)		0.90 (0.64-1.27)
Diabetic complications	17.68 (12.84-22.52)	19.05 (17.29-20.81)	0.61	0.77 (0.52-1.15)
Diabetic diet	25.08 (18.78-31.37)	19.71 (17.82-21.59)	0.10	1.29 (0.86-1.93)
HbA1c*	7.50 (0.10)	7.29 (0.03)	0.046	1.10 (1.03-1.18)
Comorbidities				
CVD	28.35 (23.11-33.59)	26.78 (24.91-28.66)	0.56	0.79 (0.53-1.16)
HF	12.14 (7.98-16.31)	9.55 (8.38-10.71)	0.19	1.19 (0.66-2.15)
CKD	34.66 (29.24-40.09)	34.68 (32.55-36.83)	0.99	0.96 (0.70-1.31)
Number of comorbidities*	3.93 (0.16)	3.74 (0.05)	0.26	NA
Number of medications*	7.24 (0.23)	5.92 (0.07)	<.0001	1.14 (1.09-1.20)

Descriptive statistics displayed as weighted proportion (95% CI), * described as mean (standard deviation), **p-values from Rao-Scott Chi-square test, ***ORs obtained from the last step of logistic regression modeling. Health insurance and number of comorbidities were dropped out of the multivariable model due to high correlation with prescription coverage and number of medications

REFERENCES