Antihyperlipidemic use among adults aged 40 years and more with type 2 diabetes: Assessment of racial disparities.

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Background

Epidemiology
According to 2017 National Diabetes Statistics Report[1]
- 30.3 million people in the US have diabetes
- 23.1 million are diagnosed
- 7.2 million are undiagnosed
- Burden of diabetes in the US is $245 billion per year

Racial Disparities ±
- Exists in prevalence of diabetes complications and in the management of hypercholesteremia [4,5,6]
- African American were less likely to receive statins therapy for dyslipidemia than whites[7,8,9,10,11,12]
- Also, African American were less likely to reach their LDL-C goal (only 49.5%), while about 71.1% whites were able to reach the LDL-C goal[13]

LDL and Cardiovascular Disease
- LDL is a validated surrogate endpoint for cardiovascular disease(CVD)[2]
- LDL is used to support the approval of statins and other LDL- lowering drugs[2]
- American Diabetes Association : < 100 mg/dl LDL (goal therapy for diabetics)[3]
- ≥40 years diabetics are qualified for anti-hyperlipidemic treatment regardless of CVD risk factor[3]

Objectives

1) To evaluate whether there are any racial disparities of antihyperlipidemic agents among patients with type 2 diabetes who are 40 years of age or older.

2) To compare cardiovascular risk factors across racial/ethnic groups.

Methods

Inclusion criteria:
1) Adults who are 40 years of age and older at the time of survey interview, and
2) Diagnosed with diabetes at 35 years of age or older to identify those with type 2 diabetes.

Data Source & Study Design:
- National Health and Nutrition Examination Survey (NHANES) is a combination of interviews and physical examination.
- The survey examines a nationally representative sample of about 5,000 person every year, who are located in counties across the country.
- This is a secondary database analysis of NHANES using cohort years from 2011 to 2016.

Study groups:
- Non-Hispanic White, Hispanic (Mexican American and other Hispanic), Non-Hispanic Black, Asian.
- Since 2011, NHANES design was changed to oversample Asian persons, in addition to the ongoing oversample of other minorities.
- Asians included all the peoples of the Far East, Southeast Asia, or the Indian subcontinent.

Outcomes:
- Use of any antihyperlipidemic agent (Statins, Fibrate, Niacin, Bile Acid, Ezetimibe) across the four races.

Statistical Plan:
- The association of race/ethnicity and antihyperlipidemic agent use was evaluated using chi-square test.
- The comparison of descriptive variables and cardiovascular risk factor variables across race/ethnic groups was compared using chi-square for categorical variables and One-way ANOVA for continuous variables.
- All the estimates were adjusted for complex sampling design and are nationally representative.

Results

Table 1 : General Description

Variables (SE)/Race		Hispanic N= 526	Whites N= 586	Blacks N= 523	Asians N=193	P-Value
Age, Mean years		59.32 (0.68)	64.39 (0.487)	61.95 (0.50)	63.71 (1.05)	<0.05
Gender	F%	48.8 (2.2)	45.2 (0.48)	52.7 (0.5)	47.6 (4.1)	0.107
	M%	51.2	54.8	47.3	52.4	
Income	Low%	66.8 (3.0)	46.6 (2.6)	59.0 (2.6)	46.5 (5.0)	
	Middle %	25.5 (2.4)	33.2 (2.5)	29.1 (2.2)	34.5 (4.2)	<0.05
	High %	7.7 (1.8)	20.2 (2.4)	11.9 (2.1)	19.0 (3.8)	
Education	Less than high school %	55.8 (3.1)	15.0 (1.8)	27.5 (2.5)	29.2 (29.2)	
	High school graduate or some college degree %	37.9 (2.8)	58.6 (3.0)	54.5 (1.9)	35.0 (3.5)	
	College graduate or above%	6.3 (1.5)	26.4 (2.8)	18.0 (2.1)	35.8 (4.2)	<0.05
Insurance coverage	Yes%	76.4 (2.4)	96.1 (0.9)	92.7 (1.1)	85.5 (3.1)	<0.05
	No%	23.6	3.9	7.3	14.5	
Prescription coverage	Yes%	92.8(1.4)	92.4(1.3)	95.8(1.0)	91.2(2.3)	0.147
	No%	7.2	7.6	4.2	8.8	
	No %	91.4	85.9	91.7	93.2	

Table 2: Lipid Profile and CVD conditions

Variables (SE)/Race		Hispanic N= 526	Whites N= 586	Blacks N= 523	Asians N=193	P-Value
Systolic BP (mm Hg)	Mean	130.90 (0.97)	129.30 (0.95)	136.30 (0.87)	130.74 (1.72)	<0.05
	Normal% (less than 130)	56.3 (2.5)	57.3 (2.2)	43.0 (2.3)	61.7 (4.1)	<0.05
	Abnormal% (more than 130)	43.7	42.7	57.0	38.3	
Diastolic BP (mm Hg)	Mean	69.3 (0.63)	67.48 (0.65)	71.45 (0.69)	70.49 (1.09)	<0.05
	Normal% (less than 80)	85.4(1.8)	90.3(1.6)	76.2(2.4)	83.0(2.8)	<0.05
	Abnormal% (more than 80)	14.6	9.7	23.8	17.0	
LDL Cholesterol (mg/dL)	Mean	107.65 (4.07)	95.58 (2.36)	103.83 (2.64)	87.11 (3.63)	<0.05
	Normal% (less than 100)	43.1(4.9)	60.4(3.7)	50.3(3.3)	71.4(5.5)	0.03
	Abnormal% (more than 100)	56.9	39.6	49.7	28.6	
Direct HDL Cholesterol (mg/dL)	Mean	46.79 (0.747)	45.62 (0.703)	53.44 (0.918)	48.81 (1.30)	<0.05
	Normal% (more than 50 for males and more than 40 for females)	51.1(2.6)	52.0(2.6)	69.3(2.6)	61.6(4.1)	<0.05
	Abnormal% (less than 50 for males and more than 40 for females)	48.9	48.0	30.7	38.4	
Triglyceride (mg/dL)	Mean	194.07 (38.87)	159.06 (7.6)	110.74 (5.31)	133.12 (8.63)	<0.05
	Normal% (more than 150)%	58.6(3.2)	54.3(4.9)	84.1(2.9)	71.8(4.2)	<0.05
	Abnormal% (less than 150)%	41.4	45.7	15.9	28.2	
Total Cholesterol (mg/dL)	Mean	188.72 (3.31)	174.34 (2.30)	181.47 (2.45)	173.69 (3.39)	<0.05
	Normal% (less than 200)	61.8(3.1)	77.4(2.2)	72.1(2.0)	71.5(3.5)	<0.05
	Abnormal% (more than 200)	38.2	22.6	27.9	28.5	
BMI	Mean	32.37 (0.33)	33.02 (0.46)	33.60 (0.39)	26.44 (0.37)	<0.05
	Normal/Underweight% (less than 25)	10.7 (1.7)	8.6 (1.5)	12.9 (1.5)	43.7 (3.8)	<0.05
	Overweight% (more than 25)	89.4	91.4	87.1	56.3	
Ever told had Congestive heart failure	Yes%	9 (1.8)	10.3 (1.3)	12.2 (1.7)	3.2 (1.2)	0.067
	No %	91	89.7	87.8	96.8	
Ever told had Stroke	Yes%	6.5 (0.7)	9.4 (1.2)	8.0 (1.5)	7.4 (2.2)	0.282
	No %	93.5	90.6	92	92.6	
Ever told had Coronary heart disease	Yes%	7.1 (1.1)	15.4 (1.3)	6.4 (1.1)	9.3 (2.5)	<0.05
	No %	92.9	84.6	93.6	90.7	
Ever told had Angina	Yes%	4.3 (1.1)	11.1 (1.2)	3.1 (0.7)	3.8 (1.4)	<0.05
	No %	95.7	88.9	96.9	96.2	
Ever told had Heart Attack	Yes%	8.6 (1.5)	14.1 (1.5)	8.3 (1.1)	6.8 (1.7)	<0.05
	No %	91.4	85.9	91.7	93.2	

Table 3: Utilization of Anti-hyperlipidemic Medications

Variables (SE)/Race	Hispanic N= 526	Whites N= 586	Blacks N= 523	Asians N=193	P-Value
Taking Anti-hyperlipidemic Medication.	34.5% (2.8)	49.8% (2.8)	38.6% (2.5)	44.7% (3.4)	<0.05
Not taking Anti-hyperlipidemic Medication.	65.5%	50.2%	61.4%	55.3%	

Overall results:
- We found 1,830 individuals who met our inclusion criteria and these individual were representative of 18 million of the US population.
- Significant differences in utilization of the anti-hyperlipidemic agents was found amongst the races, whites (49.8%) being in majority who were taking the anti-hyperlipidemic agents followed by Asians (44.7%), Blacks (38.6%) and Hispanics (34.6%), $p= <0.05$.
- Statins were the most common anti-hyperlipidemic drug class being used across different races, $p= <0.05$
- Statistical significance was also observed among the racial groups for all the lipid profile variables.
- For CVD conditions, statistical difference was found for all variables ($p= <0.05$), except for congestive heart failure and stroke.

Post-Hoc analysis (Bonferroni)
- Blood pressure(136.30/71.45 mmHg) and Direct HDL Cholesterol (53.44 ± 0.91) were found to be significantly different among Blacks compared to Asians, Whites and Hispanics.
- Asian had significantly lower BMI (26.44 ±0.37) compared to other Blacks, Whites and Hispanics.
- For Total Cholesterol, significant difference were found between Whites and Hispanics ($p= 0.01$).

Discussion

- Racial/ethnic disparities in antihyperlipidemic agent use was observed and was found highest among non-Hispanic whites and lowest among Hispanics.
- Many study participants did not achieve clinical guideline recommendations to reduce future cardiovascular disease.
- Differences observed in study outcomes could be attributed to differences in socio-demographics, access to care (insurance coverage) and other non-measured factors.
- According to the guidelines all of our study sample should be on antihyperlipidemic agent(100%), however we just found that more than 50% of our sample are not taking the antihyperlipidemic agents.
- This is the first national study to report antihyperlipidemic agent use in Asians.

Limitations

- NHANES does not specifically categorize patients into type 1 or type 2 diabetes. Hence, we might have falsely included type 1 diabetics into our sample and excluded type 2 diabetics who were diagnosed before age 35 from our sample.
- NHANES is a self-reported data. Hence may have self report bias.
- NHANES only surveys ambulatory non-institutionalized Americans.
- Antihyperlipidemic use was not controlled by confounding factors in this study which may have yielded different results.

Conclusion

- We observed racial/ethnic disparities in antihyperlipidemic agent use. Overall, use of these agents was low in a population that continues to have a high risk of cardiovascular disease.

References

1. Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2017
2. National Research Council (US) Chemical Sciences Roundtable. Assessing the Value of Research in the Chemical Sciences: Report of a Workshop. Washington (DC): National Academies Press (US);1998.
3. Mattew C, Riddle. (2019). American Diabetes Association Standards of Medical Care in Diabetes. The Journal of Clinical and Applied Research and Education Diabetes Care,42,0149-5995
4. Clark LT, Maki KC, Galant R, Maran DJ, Pearson TA, Davidson MH. Ethnic differences in achievement of cholesterol treatment goals. J Gen Intern Med. 2006; 21(4):320–326. [PubMed: 16686806]
5. Mann D, Reynolds K, Smith D, Muntner P. Trends in statin use and low-density lipoprotein cholesterol levels among US adults: impact of the 2001 National Cholesterol Education Program Guidelines. Ann Pharmacother. 2008; 42(9):1208–1215. [PubMed: 18648016]
6. Mensah GA, Mokdad AH, Ford ES, Greenlund KJ, Croft JB. State of disparities in cardiovascular health in the United States. Circulation. 2005; 111(10):1233–1241. [PubMed: 15769763]
7. Goff DC Jr, Bertoni AG, Kramer H, et al. Dyslipidemia prevalence, treatment, and control in the multi-ethnic study of atherosclerosis (MESA). Circulation. 2006; 113(5):647–656. [PubMed: 16461837]
8. Hendrix KH, Richie JE, Egan BM. Ethnic, gender, and age-related differences in treatment and control of dyslipidemia in hypertensive patients. Ethn Dis. 2005; 15(1):11–16. [PubMed: 15720044]
9. Massing MW, Foley KA, Carter-Edwards L, et al. Disparities in lipid management for African Americans and Caucasians with coronary artery disease: a national cross-sectional study. BMC Cardiovasc Disord. 2004; 4:15–20. [PubMed: 15317654]
10. Safford M, Eaton L, Hawley G, et al. Disparities in use of lipid-lowering medications among people with type 2 diabetes mellitus. Arch Intern Med. 2003; 163(8):922–928. [PubMed: 12719201]
11. Sonel AF, Good CB, Mulgund J, et al. Racial variations in treatment and outcomes of black and white patients with high-risk non-ST-elevation acute coronary syndromes. Circulation. 2005; 111(10):1225–1232. [PubMed: 15769762]
12. Trivedi AN, Zaslavsky AM, Schneider EC, Ayanian JZ. Trends in the quality of care and racial disparities in Medicare managed care. N Engl J Med. 2005; 353(7):692–700. [PubMed: 16107622]
13. Yood MU, McCarthy BD, Kempf J, et al. Racial differences in target low-density lipoprotein goal among individuals treated with prescription statin therapy. Am Heart J. 2006; 152(4):777–784. [PubMed: 16996658]