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Race-Ethnic Differences of ST-Elevation Myocardial Infarction: Findings from a New York Health System Registry

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Background: Race and ethnicity are major considerations in the incidence, management, and long-term outcome of ST-elevation myocardial infarction (STEMI) in the United States, but there is limited existing comparative data.

Methods: We assembled a registry in a health system serving Bronx, NY of STEMI patients from 2008-2014 and analyzed differences in presentation, treatment and mortality between Hispanic/Latino (H/L), non-Hispanic Black (NHB) and non-Hispanic White (NHW). Upon discharge post-treatment for STEMI, all patients were followed for a median of 4.4 years (interquartile range 2.5, 6.0). Out of 966 STEMI patients, mean age was 61 years, 46% were H/L and 65% were male. H/Ls and NHBs had a higher prevalence of hypertension and diabetes mellitus than their NHW counterparts, coinciding with a lower socioeconomic status (SES).

Results: The number of critically diseased vessels found at cardiac catheterization and mean troponin levels did not vary by race-ethnicity; neither did the adjusted hazard ratios (HR) for death. However, age-sex adjusted rates of general hospital readmission were higher in NHBs vs NHWs (HR 1.30, P=.03). Age-sex adjusted cardiovascular readmissions rates were higher in H/Ls than NHWs (HR 1.42, P=.03). Age-sex adjusted heart failure readmissions were increased for both H/Ls (HR 2.14, P=.01) and NHBs (HR 2.12, P=.02) over NHWs.

Conclusions: Among STEMI patients, a higher prevalence of modifiable cardiovascular risk factors and a lower SES was seen among NHBs and H/Ls compared to NHWs. Despite similar coronary disease severity and in-hospital death, NHBs and H/Ls had a greater risk of general, cardiovascular and heart failure readmissions post-STEMI compared to NHWs. *Ethn Dis.* 2022;32(3):193-202; doi:10.18865/ed.32.3.193

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Introduction

The Global Burden of Disease Study ranks ischemic heart disease as first among the leading causes of mortality for eight regions in the world.[1] Cardiovascular (CV) risk factors such as smoking, diabetes mellitus (DM), hypertension (HTN), dyslipidemia, obesity and sedentary lifestyles play a major role in coronary heart disease (CHD).[2] Race-ethnicity is an independent predictor of CV events and adverse outcomes in atherothrombotic CHD.[3] There is clear epidemiological evidence, including cross-sectional coronary angiographic studies and registry data, showing significant differences between race-ethnic groups diagnosed with acute coronary syndrome (ACS) in terms of risk factors, presentation, coronary vessel diameters, prognoses and outcomes.[4-6] However, conventional CV risk factors do not fully account for the differences in CV morbidity and mortality seen among race-ethnic groups, leading to the possible existence of alternative explanations for these dissimilarities.[3, 7]

Few studies have been truly representative of the demographics of diverse populations to address race-ethnic differences in ST-elevation myocardial infarction (STEMI)) presentation, treatment and outcomes in the United States. A large prospective cohort study found that the risk of

incident CHD in Black females was higher than that in their White counterparts.[8,9] A study of two myocardial infarction (MI) registries comparing non-Hispanic Blacks (NHB) and non-Hispanic Whites (NHW) found significant disparity unfavorable to NHBs in the context of several clinical and socioeconomic characteristics, as well as correlation between NHB race and post-MI mortality.[10] A registry report comparing Hispanics/Latinos (H/L) and NHW STEMI patient characteristics, hospital treatment, in-hospital outcomes and discharge therapies revealed higher risk factors, lower likelihood of prior treatment, less access to medical care and longer waiting times for treatment in the H/L group, but with similar short-term in-hospital clinical outcomes.[11]

We utilized a contemporary inner-city health care system STEMI registry to better understand race-ethnic differences in STEMI management and long-term outcomes.

All these studies looked at aspects of the management of CHD among race-ethnic groups, but most were not specific for STEMI and only focused on short-term in-hospital treatments and outcomes; failing to address long-term hospital CV-specific readmissions as well as lacking in generalizability as few studies included H/Ls. Therefore, we utilized a contemporary inner-city health care system STEMI registry to better understand race-ethnic differences in STEMI management and long-term outcomes.

Methods

Study Population

The Montefiore STEMI Registry includes all STEMI patients who came to Montefiore Health System (MHS) for treatment from May 2008 to December 2014. All individuals presented with new-onset STEMI from the catchment area inclusive of Westchester County, the lower Hudson Valley, and the Bronx; and were referred for primary revascularization. The STEMI registry protocol was approved by the Institutional Review Board of the Albert Einstein College of Medicine. Informed consent was obtained from all participants.

Inclusion and Exclusion Criteria

Inclusion criteria consisted of symptoms of coronary ischemia lasting ≥ 20 minutes, ST-segment elevation of ≥ 2mm, or ≥1.5 mm in women, in V2-V3 or ≥ 1mm in ≥2 other contiguous leads, or new left bundle branch block on EKG, and elevation in circulating cardiac troponin T or CKMB mass > 99th percentile of the upper reference limit. Where biomarkers were not measured, the clinical symptoms, electrocardiographic changes, and angiographic findings consistent with acute atherothrombosis or segmental wall motion abnormalities on cardiac imaging satisfied the same. Exclusion criteria were patients with end-stage renal disease on hemodialysis, diabetic ketoacidosis and pregnancy, and between 2008-2009, cardiogenic shock. Shock cases were included from 2010 on.

Data Acquisition and Management

Data collection was performed by physician and nurse abstractors, and this consisted of obtaining clinical, laboratory and procedural information on all eligible patients. Looking Glass Clinical Analytics (LGCA) (Streamline Health, Atlanta, Georgia), an interactive software application used across the MHS, was used to supplement the collected information by way of integration of clinical and administrative data. Where missing data were not directly searchable by LGCA, a review of electronic medical records was undertaken by physicians trained in gleaning the necessary information. The data on cardiac catheterization were obtained from a database containing standardized angiographic and procedural information reported to New York State. The National Death Index was the source of the mortality data. LGCA was also used to capture rehospitalizations at the MHS after the index STEMI hospitalization. Information on rehospitalizations was supplemented by cross-linking to the larger North Bronx Health Network (NBHN) electronic medical records as that health care system is a common source of STEMI referrals to the MHS. The study was approved by the Institutional Review Board of the Albert Einstein College of Medicine, as well as the NBHN.[12]

Definition of Predictors

Both the ethnicity and race of the patient were self-identified. Of the initial 1208 patients in the registry, we excluded 234 patients who did not identify with any race/ethnicity, reported "other race," or multiple races/ethnicities, or declined to participate in the study. This resulted in a subset of 966 individuals in the major race/ethnic groups: NHW, NHB and H/L. Socioeconomic status (SES) was calculated according to factor analyses of census-block data. These census-block groups were used as proxies for neighborhoods, and a summary neighborhood score was used as the main SES indicator. Six variables were included to represent dimensions of wealth and income; (log of median household income, log of median value of housing units, percentage of households receiving interest, dividend or net rental income) education; (percentage of adults 25 years of age or older who had completed high school or completed college), and occupation (the percentage of employed persons 16 years or older in executive, managerial or professional specialty occupations). For each variable, a z score for each census-block group was estimated. The neighborhood summary score was then constructed by summing the z scores for each of the six variables[13,14] with increasingly positive scores commensurately correlating with neighborhood SES advantage.

HTN, DM and dyslipidemia were defined by history or use of corresponding medication. Current smoking was defined as use of at least one cigarette in the past 30 days. Heavy alcohol use was defined as >14 drinks a week for men and >7 drinks a week for women or history of alcohol abuse. Previous CV disease (CVD) was defined as history of CHD, stroke, or heart failure. Human immunodeficiency virus (HIV) seropositivity was based on a positive HIV ELISA or a positive HIV viral load and confirmed through linkage to the MHS Center for AIDS Research database. Hepatitis C virus (HCV) status was defined by the detection of anti-HCV antibodies, detection of HCV RNA in the blood, or documented history of HCV infection at any time point before and through hospitalization by chart review. Left ventricular ejection fraction (LVEF) was obtained from ventriculography when available or echocardiography otherwise. Critically diseased coronary artery narrowing was defined by ≥70% stenosis of at least one vessel in the distribution of the left anterior descending (LAD), left circumflex or right coronary artery (RCA), or a 50% stenosis in the left main (LM) coronary artery. Further, a greater than 50% occlusion of the LM coronary artery was deemed here as equivalent to two-vessel disease and stenosis >50% in the LM and >70% LAD was equivalent to two-vessel disease. Greater than 50% occlusion of LM and >70% of the RCA was equivalent to triple-vessel disease.

Endpoint Ascertainment and Definitions

The primary long-term outcome measures were: 1) death; 2) general readmission for any cause; 3) readmission due to CVD defined by discharge diagnosis, using *International Classification of Diseases, Ninth Revision (ICD-9), or Current Procedural Terminology, Fourth Edition* (CPT4) codes consistent with CAD (angina pectoris, MI, percutaneous coronary intervention, coronary artery bypass grafting [CABG]), heart failure HF, stroke, atrial fibrillation or flutter (supplementary table available from corresponding author); and 4) readmission due to (HF). Readmission was defined as any hospital admission lasting ≥24 hours. These were limited to MHS and NBHN. As shown, HF was included in the CVD readmission category but then HF specific readmissions were also analysed separately. Follow-up time was defined as time to the event of interest or through December 2015, whichever occurred earlier.

Statistical Analysis

Data were stratified according to self-reported race-ethnic groups: H/L, NHB and NHW. Continuous variables are described as median and interquartile range, while categorical variables are presented as count and percent. Characteristics of baseline clinical and medical information by race-ethnicity were subjected to Wilcoxon rank-sum test for continuous variables and chi-square tests or Fisher's exact test as appropriate for categorical variables to compare the differences for each variable in unadjusted analysis between NHW vs H/L, NHW vs NHB, and H/L vs NHB. Average incidence rates were calculated

as the number of events divided by follow-up time, and differences were computed with Poisson 95% confidence intervals. Cox proportional hazards models were used to compare the time to events between race-ethnic groups, and five sequential adjusted models were created. Model 1 adjusted for age and sex; Model 2 for Model 1 as well as HTN, DM, dyslipidemia, prior CVD, prior HF and initial creatinine; Model 3 for Model 2 and smoking status, cocaine use and heavy alcohol use; Model 4 for Model 3, HIV and HCV status and Model 5 for Model 4 and SES. Sequentially adjusted hazard ratios (HRs) were used to compare the events between any two race-ethnic groups. P<.05 was considered statistically significant for all comparisons.[12]

Results

Characteristics of the Study Population

Tables 1 and 2 represent the sociodemographic and clinical characteristics of the study population by race-ethnic group, respectively. Overall, the mean age at STEMI presentation was 60 years, with 65% being male. The average LVEF at baseline was 48%. Of the study population, 270 were NHW, 448 were H/L and 248 were NHB. All groups had similar median values of body mass index (BMI), systolic blood pressure (SBP) and diastolic blood pressure (DBP). Critically diseased coronary vessels, type of intervention and frequency of CABG did not vary by race-ethnicity. Creatine phosphokinase was higher in NHBs and H/Ls compared to NHWs in light of non-different troponins, suggesting no differences in MI severity across race-ethnicity. Catheterization was not performed on 4.7% of the patients within 24 hours due to either early death or medical contraindications. H/L patients exhibited the lowest SES, coupled with a 70% and 43% prevalence of HTN and DM, respectively. At discharge, 77% of NHB and H/L patients received renin-angiotensin-aldosterone system (RAAS) antagonists compared to 68% of NHWs. Ninety six percent of all patients received statins at discharge, and 94% received thienopyridine agents. H/L and NHB patients received hypoglycemic agents in similar numbers but these were more than twice that prescribed to NHWs. HIV and HCV infections were prevalent in small numbers in all

Table 1. Sociodemographic characteristics by race-ethnic group[a]

	Non-Hispanic Whites (n=270)	Hispanic/Latinos (n=448)		Non-Hispanic Blacks (n=248)	
			P[b]		P[b]
Age	62 (54, 75)	59 (50, 69)	<.001	59 (50, 71)	.008
Males	181 (67.0)	300 (67.0)	.984	149 (60.1)	.100
Socioeconomic score	-0.8 (-2.0, 0.2)	-3.7 (-6.4, -1.7)	<.001	-2.0 (-5.1, -1.0)	<.001
BMI	28.0 (24.7, 32.0)	28.4 (25.6, 31.7)	.115	28.3 (24.6, 32.0)	.847
Systolic blood pressure	136 (119, 152)	137 (115, 156)	.917	136 (118, 155)	.932
Diastolic blood pressure	77 (66, 91)	79 (67, 92)	.488	81 (68, 94)	.133
Heart rate	78 (66, 89)	80 (69, 91)	.075	81 (70, 91)	.049
Hypertension	163 (60.4)	314 (70.1)	.008	187 (75.4)	<.001
Diabetes	46 (17.04)	192 (42.86)	<.001	93 (37.50)	<.001
Dyslipidemia	137 (50.74)	249 (55.58)	.208	136 (54.84)	.351
Current smoking	110 (40.74)	151 (33.78)	.061	106 (42.74)	.645
Cocaine use	12 (4.44)	23 (5.13)	.678	19 (7.66)	.123
Heavy alcohol use	25 (9.26)	56 (12.50)	.184	17 (6.85)	.317
Family history of CAD	88 (33.08)	137 (30.72)	.511	73 (29.44)	.373
Prior CVD	69 (25.56)	118 (26.34)	.817	73 (29.44)	.323
Prior HF	15 (5.56)	21 (4.69)	.606	19 (7.66)	.334
HIV infection	2 (0.74)	18 (4.02)	.010	7 (2.82)	.095
HCV infection	2 (0.74)	18 (4.02)	.010	9 (3.63)	.023

a. Categorical variables are expressed as counts (%) and continuous variables as medians (interquartile range)
b. P for difference when compared to non-Hispanic Whites
BMI, body mass index; BMS, bare metal stent; CAD, coronary artery disease; HF, heart failure; CVD, cardiovascular disease; HCV, hepatitis C virus; HIV, human immunodeficiency virus.

Table 2. Clinical characteristics by race-ethnic group[a]

	Non-Hispanic Whites, n=270	Hispanic/Latinos, n=448		Non-Hispanic African Americans, n=248	
			P[b]		P[b]
Non-sinus rhythm	25 (9.26)	30 (6.71)	.214	19 (7.66)	.515
Killip class					
1	222 (82.22)	387 (86.38)	.132	202 (81.45)	.820
2	15 (5.56)	24 (5.36)	.909	15 (6.05)	.810
3	8 (2.96)	14 (3.13)	.903	6 (2.42)	.703
4	25 (9.26)	23 (5.13)	.032	25 (10.08)	.752
TIMI STEMI	3.5 (2.0, 5.0)	3.0 (2.0, 5.0)	.168	3 (2, 5)	.453
Initial glucose	145 (119, 195)	165 (128, 244)	<.001	157 (124, 234)	.021
WBC count	10.9 (8.7, 13.9)	10.8 (8.7, 13.6)	.406	10.0 (7.7, 12.8)	.002
Peak CPK	1282 (508, 2605)	1570 (692, 3006)	.024	1653 (768, 3403)	.006
Peak Troponin T	4.34 (1.59, 8.21)	4.35 (1.95, 8.48)	.345	4.53 (2.07, 9.42)	.128
Initial creatinine	.9 (0.8, 1.2)	.9 (.8, 1.2)	.571	1.0 (.9, 1.3)	<.001
CABG during index hospitalization	14 (5.19)	23 (5.13)	.976	10 (4.03)	.533
Catheterized within 24 hours	258 (95.56)	431 (96.21)	.668	231 (93.15)	.233
Critically diseased vessels[c]					
0	23 (8.91)	41 (9.51)	.794	23 (9.96)	.694
1	118 (45.74)	190 (44.08)	.673	116 (50.22)	.322
2	82 (31.78)	116 (26.91)	.172	55 (23.81)	.050
3	35 (13.57)	84 (19.49)	.047	37 (16.02)	.445
Intervention type[c]					
None	27 (10.47)	51 (11.83)	.583	26 (11.26)	.779
PTCA	19 (7.36)	32 (7.42)	.977	27 (11.69)	.102
BMS	90 (34.88)	160 (37.12)	.554	76 (32.90)	.644
DES	122 (47.29)	188 (43.62)	.349	102 (44.16)	.488
LVEF	49 (39, 57)	49 (39, 59)	.935	50 (38, 60)	.700
Discharge medications[d]					
Aspirin	254 (98.83)	422 (99.29)	.678	237 (98.75)	1.000
Beta blocker	234 (91.05)	397 (93.41)	.256	222 (92.50)	.557
RAAS antagonist	176 (68.48)	325 (76.47)	.022	184 (76.67)	.041
Statin	243 (94.55)	410 (96.47)	.229	230 (95.83)	.506
Thienopyridine	240 (93.39)	401 (94.35)	.606	224 (93.33)	.982

a. Categorical variables are expressed as counts (%) and continuous variables as medians (interquartile range)
b. P for difference when compared to NHWs
c. Only in those catheterized within 24 hours
d. Only in those discharged alive
BMS, bare metal stent; CABG, coronary artery bypass graft; CPK, creatine phosphokinase; DES, drug eluting stent; LVEF, left ventricular ejection fraction; PTCA, percutaneous transluminal coronary angioplasty; RAAS, renin angiotensin aldosterone system; STEMI, ST-segment elevation myocardial infarction; TIMI, thrombolysis in myocardial infarction; WBC, white blood cell

three groups, H/L patients were more likely to be HIV positive compared to NHW (4% vs 1%, P=.01), as well as have HCV (4% vs 1%, P=.01).

Upon discharge post-treatment for STEMI, all patients were followed for a median of 4.4 years (interquartile range 2.5, 6.0). Table 3 represents crude incidence rates (IRs) per 100 person-years for death, general readmission, readmission for CVD and readmission for HF. The overall average crude IR of death was 4.8 per 100 person-years and did not vary significantly by race-ethnic group. Compared to their NHW counterparts, the IRs of HF readmission for both H/L and NHB patients were significantly higher.

Table 4 shows HRs of death, general readmission, readmission for CVD and readmission for HF. Neither adjusted nor unadjusted HRs for death varied between race-ethnic groups. Age and sex-adjusted HRs for general readmission were higher for NHB versus NHW (1.30, P=.033).

Table 3. Crude incidence rates

		Death	Readmission	CVD readmission	HF readmission
Non-Hispanic Whites (n=270)	Events	51	134	57	15
	IR (95% CI)	5.4 (3.9, 6.8)	22.6 (18.8, 26.5)	7.2 (5.3, 9.1)	1.6 (.8, 2.5)
Hispanic/Latinos (n=448)	Events	75	238	125	49
	IR (95% CI)	4.3 (3.3, 5.3)	25.1 (21.9, 28.3)	9.4 (7.7, 11.0)	3.0 (2.2, 3.9)
	P[a]	.227	.337	.096	.031
Non-Hispanic Black (n=248)	Events	50	142	66	28
	IR (95% CI)	5.3 (3.9, 6.8)	27.7 (23.2, 32.3)	8.9 (6.7, 11.0)	3.3 (2.1, 4.5)
	P[a]	.990	.093	.242	.029

a. P for difference when compared to NHWs
HF, heart failure; CI, confidence interval; CVD, cardiovascular disease; IR, crude incidence rate per 100 person years

Age-sex adjusted HRs for readmissions due to CVD were higher in H/Ls vs NHWs (1.42, P=.031). Admissions attributable to HF were significantly higher among H/Ls and NHBs compared to NHWs when similarly adjusted (HR 2.14, P=.011 and 2.12, P=.019 respectively). After adjusted for demographics and risk factors however, this higher risk for CVD and HF readmission was not significant.

Discussion

Main Findings

In this registry dataset of STEMI patients from a socioeconomically disadvantaged urban community, NHB and H/L race-ethnic groups had higher morbidity levels than NHWs at presentation. Post-STEMI, significantly higher age-sex adjusted rates of HF readmission were seen in H/Ls and NHBs, as well as for CVD readmissions in H/Ls, although this difference was not significant after adjustment for demographic and risk factors. No differences in mortality were seen between the race-ethnic groups, bearing testimony to a complex paradoxical relationship between mortality and readmission among minorities seen in other studies. [9,15-17] Hospital readmissions are highly sensitive to factors outside the hospital and what happens after discharge.[18] It is known that NHB and H/L race-ethnic groups face disadvantages that may differentially affect health care access and health outside of the hospital.[19,20] For example, access to care out of the hospital is probably not similar among minorities due to a lack of experience navigating the health care system, barriers related to primary language or immigration status and availability of healthy food, which impact readmissions rates.[19]

Main Implications of Our Findings

The results of this study emphasize the impact of SES on outcomes. H/Ls had the lowest SES followed by NHBs. The comparatively lower levels of financial wellbeing seen among the minority groups may have impacted the clinical course post-discharge as well as long-term outcomes given the high levels of unmitigated risk factors seen at the initial presentation. This is reflected in the disproportionately higher prevalence of HTN and DM seen among NHB and H/L patients compared to their NHW counterparts at STEMI presentation. This may be a result of limited access to health care resources and prevalent social determinants of health seen with low SES, which has been previously documented,[13,20] will result in inadequate management and control of modifiable cardiovascular risk factors and patients presenting to the emergency department rather than to clinic. It is plausible to think that if CV morbidity had been better addressed, mortality rates among H/Ls and NHBs might have been even lower to that seen in NHWs rather than similar. Hospital readmissions possibly signal the greater severity of CV morbidity among H/Ls and NHBs, possibly attributable to continued poorer control of BP and DM, with a lower likelihood of being on proper therapies and poor compliance out of the hospital.[21-23] Regarding the similar numbers of deaths among all three race-ethnic groups of patients despite both H/L

Table 4. Hazard ratios of death, readmissions

	Hispanic/Latinos		Non-Hispanic Blacks	
	HR (95% CI)	p	HR (95% CI)	P
Death				
Model 1, n=966	1.08 (.75, 1.55)	.671	1.20 (.81, 1.55)	.358
Model 2, n=965	.90 (.61, 1.31)	.574	.82 (.54, 1.25)	.345
Model 3, n=965	.89 (.61, 1.31)	.564	.82 (.54, 1.25)	.355
Model 4, n=965	.83 (.56, 1.22)	.337	.77 (.50, 1.18)	.231
Model 5, n=928	.87 (.56, 1.35)	.535	.79 (.50, 1.25)	.318
Readmission				
Model 1, n=966	1.19 (.96, 1.48)	.107	1.30 (1.02, 1.64)	.033
Model 2, n=965	1.12 (.90, 1.40)	.318	1.16 (.91, 1.49)	.233
Model 3, n=965	1.15 (.92, 1.43)	.233	1.18 (.92, 1.51)	.189
Model 4, n=965	1.13 (.90, 1.41)	.297	1.17 (.91, 1.49)	.225
Model 5, n=928	1.08 (.84, 1.38)	.547	1.16 (.89, 1.51)	.261
CVD readmission				
Model 1, n=966	1.42 (1.03, 1.94)	.031	1.32 (.93, 1.89)	.126
Model 2, n=965	1.25 (.90, 1.73)	.182	1.08 (.75, 1.57)	.667
Model 3, n=965	1.27 (.92, 1.77)	.151	1.10 (.76, 1.60)	.599
Model 4, n=965	1.25 (.90, 1.74)	.181	1.09 (.75, 1.58)	.647
Model 5, n=928	1.21 (.84, 1.75)	.299	1.08 (.73, 1.60)	.707
HF readmission				
Model 1, n=966	2.14 (1.20, 3.84)	.011	2.12 (1.13, 3.98)	.019
Model 2, n=965	1.81 (.99, 3.31)	.053	1.57 (.81, 3.02)	.179
Model 3, n=965	1.80 (.98, 3.29)	.057	1.65 (.85, 3.17)	.137
Model 4, n=965	1.79 (.98, 3.27)	.059	1.64 (.85, 3.16)	.139
Model 5, n=928	1.53 (.77, 3.04)	.230	1.51 (.73, 3.11)	.269

Non-Hispanic Whites is the referent group; Model 1 adjusts for age, sex; Model 2 adjusts for Model 1, hypertension, diabetes, dyslipidemia, prior CVD, prior HF, creatinine; Model 3 adjusts for Model 2, smoking, cocaine use, heavy alcohol use; Model 4 adjusts for Model 3, HIV status, HCV status; Model 5 adjusts for Model 4, socioeconomic score

HF, heart failure; CI, confidence interval; CVD, cardiovascular disease; HCV, hepatitis C virus; HIV, human immunodeficiency virus; HR, hazard ratio

and NHB groups having higher cardiovascular morbidity and lower SES than NHWs, this may suggest minority groups as being more clinically resilient despite the socioeconomic odds not being in their favour.

Implications of Other Clinical Observations

The low-normal average LVEF seen at baseline across all race-ethnic groups may also have contributed to the outcomes seen post-discharge. Previous studies have shown a greater risk of morbidity and mortality in post-STEMI patients with reduced LVEF.[24,25] NHBs and H/Ls had more HF readmissions despite all groups having similar LVEF at STEMI presentation. One possible explanation is that NHBs and H/Ls are more likely to have early diastolic dysfunction and develop HF with borderline EF, linked to poorly control DM and HTN.[26,27] In addition, efforts to institute guideline-directed medical therapy in the acute post-infarct period at hospital discharge among NHBs and H/Ls highlights the attempt at aggressive risk factor modification before discharge, but it is unclear if this is maintained outside of the hospital. Otherwise, there would have been a positive impact on both readmissions and mortality post-STEMI.[28-30] In this study, there was no significant difference in the procedural care by race-ethnicity, in contrast to previous studies, which observed lower rates of drug-eluding stents in NHB and H/L participants than their counterparts.[31,32] While that points to greater equity of care inside the hospital, our results also point to inequity of health outcomes outside the hospital likely due to the more significant burden of social determinants of health, which impact individual health and health care delivery post-STEMI, carried by non-White minority populations.[20]

Our Study in Comparison with Previous Works

The current information on long-term post-STEMI outcomes in minorities underscores the crucial importance of our data collection and analysis to improve preventive efforts in socioeconomically disadvantaged race-ethnic groups. Our study focused on an urban population inclusive of H/Ls, a group poorly studied in the setting of STEMI. Prior studies either compared two race-ethnic groups, usually NHB vs NHW or H/L vs NHW; or were not specific for STEMI management and long-term outcomes.[8,10,11] Our dataset contained a large proportion of H/Ls, translating into a highly amplified geographic concentration of this race-ethnic group. The Bronx Hispanic population is mainly of Puerto Rican and Dominican descent, making our study unique compared to previous projects, where the Mexican population, a far larger group in the United States, would have represented the H/L component.[33]

In this registry dataset of STEMI patients from a socioeconomically disadvantaged urban community, non-Hispanic Black and Hispanic/ Latino race-ethnic groups had higher morbidity levels than non-Hispanic Whites at presentation.

Limitations of the Study

This project analyzed a dataset derived from an inner-city community experience, which limits the generalizability of our findings. Also, with research and development, STEMI and CVD treatment options and guidelines likely evolved during the course of the study, which may have influenced outcomes and we were unable to account for this factor in our analysis. In addition, CVD risk factor control was not assessed at or after initial hospital discharge as part of the scope of this study, although it should be mentioned that the majority of patients were equitably prescribed similar medications at discharge, emphasizing initiation of preventive efforts at that time. We did not have individual-level SES data such as income and education and this limited exploration of SES as the driver of the race-ethnic associations that we found. We did not have race-ethnic background information so we could not analyze Hispanic background groups separately. Lastly, for rehospitalization outcomes, we were only able to collect local data. However, MHS is the single largest health care provider to the population of the Bronx and in addition, we supplemented MHS readmission data with information from NBHN, a city-run public health system where patients without health insurance are more likely to receive care.

Conclusion

A major challenge in the practice of cardiology is the elimination of ethnic disparities in cardiac care. Registries containing longitudinal data on STEMI serve as important tools for analysis of the disease and its management.[34,35] Race-ethnic differences were clearly apparent in this urban population upon presentation and subsequent hospital readmission outcomes in STEMI patients. Our findings also underscore the contribution of socioeconomic disadvantage and the higher prevalence of unmitigated modifiable risk factors in underrepresented racial/ethnic groups. Therefore, although it would appear that strides in equitable in-hospital treatment and in-hospital outcomes have been achieved, our focus must shift to out-of-hospital equitable primary and secondary prevention efforts that would better reduce race-ethnic disparity, particularly in areas where socioeconomic differences are marked. Further efforts are needed to better identify and address the challenges faced by race-ethnic groups in accessing the necessary care needed for greater efforts at prevention in the secondary management of CAD.

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Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Zamora, Shitole, Kizer, Rodriguez; Acquisition of data: Shitole, Kizer; Data analysis and interpretation: Murray, Zamora, Shitole, Christa, Bortnick, Kizer, Rodriguez; Manuscript draft: Murray, Zamora, Christa, Lee, Bortnick, Rodriguez; Statistical expertise: Zamora, Shitole, Lee; Administrative: Murray, Zamora, Christa, Rodriguez; Supervision: Shitole, Bortnick, Kizer, Rodriguez

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