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Racial Differences in Patients with Heart Failure

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Summary

Background and hypothesis: Limited data exist regarding racial differences in heart failure. The objective of this prospective study was to document racial differences in the baseline demographics and patterns of health care utilization and outcomes in patients with heart failure.

Methods: The data on 163 consecutive patients (113 black, 50 white) admitted with a diagnosis of heart failure confirmed by pulmonary congestion on chest x-ray were prospectively evaluated. Patient demographics, physical examination findings at admission, comorbid conditions, and medications at admission and discharge were analyzed. Follow-up was performed to document visits to the physician's office after discharge and readmission rate during a 6-month time period.

Results: Compared with whites, blacks were younger in age (mean age 63.8 ± 13.7 years vs. 70.8 ± 13. l, p = 0.003), and had a higher prevalence of hypertension (86 vs. 66%, p = 0.004), left ventricular hypertrophy (24 vs. 8%, p = 0.02), ejection fraction < 40% (64 vs. 43%, p = 0.03), and readmission rate (33 vs. 18%, p = 0.05). Whites had a higher prevalence of atrial fibrillation (42 vs. 21%, p = 0.006) and more frequently followed up with their cardiologists as outpatients (58 vs. 39%, p = 0.04).

Conclusion: Significant racial differences exist in patients with heart failure with regard to age, incidence, etiologic factors, left ventricular hypertrophy, left ventricular function, and clinical follow-up. It is important to consider these racial differences in the evaluation and management of patients with heart failure.

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Introduction

Heart failure is a major cause of morbidity and mortality, affecting 4.7 million Americans and 15 million patients worldwide. In the United States, about 470,000 new cases are reported each year. It is also among the leading cause for hospitalization in patients > 65 years of age, resulting in 875,000 admissions in 1993.[1,2] Heart failure is estimated to cost $10 billion dollars annually.[3] Mortality due to heart failure is approximately 2.5 times higher among blacks than whites < 65 years of age.[4,5] The age-adjusted death rate in 1990 for heart failure among patients aged > 65 years was 143.9 for black men compared with 117.8 for white men, and 113.4 for black women compared with 97.5 for white women.[5] Hospitalization rates for heart failure are also higher among blacks, with 33% greater risk of hospitalization compared with white men and 50% higher rates compared with white women.[6–8] An analysis of Medicare data from 1988 also revealed that the rate of patients aged > 65 years discharged with a diagnosis of heart failure was higher among blacks.[4] In another analysis of the Medicare data, the rate of initial hospitalization for heart failure in 1993 compared with 1986 was higher among blacks.[4]

A better understanding of the racial differences in the population with heart failure is essential for optimal management. The objective of this prospective study was to document racial differences in the baseline demographics and patterns of health care utilization and outcomes in hospitalized patients with heart failure.

Methods

Henry Ford Hospital, Detroit, Michigan, is a 750-bed urban hospital with direct admissions from hospital emergency room, suburban clinics, and transfer from several community hospitals. The racial mix of admissions is 45% black, 53% white and 2% other minorities including Asians, Arabs, and Hispanics. This study comprises a prospective evaluation of 163 consecutive patients (113 black, 50 white) admitted with

heart failure exacerbation during a 6-month time period between July and December 1996. The race of patients was determined from the demographic section of their charts and confirmed at interview by a study investigator. The disparity in racial mix in our study population compared with the general racial mix in the hospital may be explained on the basis that this was a select group of patients with a specific diagnosis that is associated with more frequent hospitalizations in blacks. The study group comprised patients admitted to the cardiology floor or a representative medical floor. Patients with symptoms and chest radiograph consistent with heart failure were included in the study. Patients with chest radiograph not diagnostic of heart failure, patients admitted to the intensive care unit, or those with enzymatic evidence of myocardial infarction were excluded. Complete history and physical examination of each patient was performed by one of the study investigators within 24 h of admission. The severity of heart failure was documented by evaluating for jugular venous pressure, rales, S3 gallop, and pedal edema. The list of medications at admission and discharge was documented. Follow-up evaluation was performed by means of a telephone questionnaire at 2, 4, and 6 months after discharge.

TABLE I Sociodemographics and risk factors

Variables	Blacks (%)	Whites (%)	p Value
Number of patients	113	50	
Age (years)	63.8 ± 13.7	70.8 ± 13.1	0.003
Male	49	46	0.75
Hypertension	86	66	0.004
Diabetes	49	34	0.08
Smokers	42	42	0.96
Previous myocardial infarction	30	34	0.62
Previous stroke	17	8	0.14
Employed	14	4	0.06
High school education	47	52	0.56
Length of stay (days)	5.2	5.7	0.98
Insurance			0.76
Medicare	51	52	
HMO	18	26	
Blue Cross/Blue Shield	7	2	
Medicare plus supplemental	4	4	
Medicaid	4	2	
No insurance	16	13	

Statistical Analysis

Racial comparisons of the categorical study variables were performed using the chi-square test of association. The Fisher's exact test was used if the expected number of patients within any category was less than five. Racial comparisons of the numeric study variables were performed using the Student's two-sample *t*-test. The Wilcoxon rank sum test rather than the *t*-test was used if the assumption of distributional normality was significantly violated. The two-sided alpha level of 0.05 was used in determining statistical significance. Logistic and linear regression models were used to predict the occurrence of readmission rate and hospital length of stay.

Results

Significant racial differences were seen in patients with heart failure exacerbation with regard to sociodemographics, laboratory data, and health care utilization.

Sociodemographics, Physical Examination, and Laboratory Data

As described in Table I, blacks compared with whites were significantly younger (mean age 63.8 ± 13.7 years vs. 70.8 ± 13.1 years, p = 0.003), had a higher prevalence of hypertension (86 vs. 66%, p = 0.004), and a trend toward a higher incidence of diabetes mellitus (49 vs. 34%, p = 0.08). There were trends toward a lower number of black patients having completed high school education (47 vs. 52%, p = 0.56), and a slightly higher number being employed at the time of admission (14 vs. 4%, p = 0.06). Length of hospital stay was similar in the two groups (blacks, 5.2 ± 5.4 days; whites, 5.7 ± 6.4 days; p = 0.98). On linear regression analysis and after accounting for other predictors, race was not associated with length of stay.

Physical examination findings described in Table II revealed that black patients were less likely to have an S3 gallop (blacks 15% vs. whites 35%, p = 0.003). The rest of the physical examination findings, including jugular venous distension, S4 gallop, and rales were similar in the two groups. Laboratory data showed slightly higher prevalence of renal insufficiency, based on creatinine more than 2 mg/dl among blacks (23 vs. 18%, p = 0.44). Black patients had a higher prevalence of left ventricular hypertrophy (24 vs. 8%, p = 0.02) and lower prevalence of atrial fibrillation (21 vs. 42%, p = 0.006) on electrocardiography. Blacks were also found to have a higher prevalence of ejection fraction (EF) < 40% (64 vs. 43%, p = 0.03).

TABLE II Physical examination and laboratory findings

Findings	Blacks (%)	Whites (%)	p Value
Jugular venous pressure (cm)	6.4	6.7	0.14
S3 gallop	15	36	0.003
S4 gallop	21	14	0.28
Rales	87	86	0.9
Serum sodium < 130	3	6	0.38
Creatinine > 2.0	23	18	0.44
Left ventricular hypertrophy	24	8	0.02
Atrial fibrillation	21	42	0.006
Ejection fraction < 40%	64	43	0.03
Cardiomegaly on x-ray	89	82	0.26
Pleural effusion on x-ray	38	52	0.1
Pulmonary congestion on x-ray	63	60	0.76

Discharge Medications and Follow-Up

No significant differences were noted in the discharge medications, as described in Table III. Follow-up revealed significant differences in outpatient visits and readmission rates. Black patients were less likely to keep their appointments after discharge with their cardiologists (39 vs. 58%, p = 0.04), and primary care physicians (78 vs. 88%, p = 0.13). The 6-month readmission rate was higher among black patients (33 vs. 18%, p = 0.05) (Table III). However, on logistic regression analysis, race was not found to be associated with high readmission rate after accounting for other predictors.

There was no significant association between readmission rate and outpatient follow-up with cardiologist: 45% of the patients who were readmitted compared with 44% of the patients who were not had a follow-up with cardiologist, (p = 0.96). Similarly, no significant association was found between lower EF (< 40%) and readmission rate: 33% of the patients with EF < 40% compared with 24% with EF > 40% were readmitted (p = 0.23).

TABLE III Discharge medications and follow-up

Variables	Blacks (%)	Whites (%)	p Value
Digoxin	54	42	0.16
Diuretics	78	74	0.59
Calcium blockers	21	22	0.91
Beta blockers	19	18	0.93
Angiotensin-converting enzyme inhibitors	63	56	0.41
Follow-up with primary care physician	78	88	0.13
Follow-up with cardiologist	39	58	0.04
Readmission rate	33	18	0.05

Discussion

Our prospective study analyzes the racial differences in hospitalized patients with heart failure and attempts to provide explanations for the different outcomes. Blacks had earlier onset of heart failure, a higher prevalence of hypertension, left ventricular hypertrophy, and diabetes mellitus. During follow-up, they were less likely to keep appointments and had a higher hospital readmission rate. Previous studies have documented a higher rate of morbidity, mortality, and hospitalization rates secondary to heart failure in blacks than in whites.[6,7] In a recent retrospective analysis of the Study of Left Ventricular Dysfunction (SOLVD) prevention and treatment trials, the overall mortality rates for blacks versus whites were 8.1 versus 5.1 per 100 person-years and 16.7 versus 13.4 per 100 person-years, respectively.[8] After adjustment for age, coexisting conditions, severity and causes of heart failure, and use of medications, blacks still had a higher risk of death from all causes in both the prevention and treatment arms. They were also at higher risk for death due to pump failure and for the combined endpoint of death from any cause or hospitalization for heart failure. The reasons for these racial differences are not well known and have been attributed to differences in the prevalence of underlying risk factors or sociodemographic variables.

Data on black patients with heart failure are limited because they are often underrepresented in studies of patients with heart failure.[9] Earlier data suggest an earlier onset and greater severity of heart failure and poor compliance with follow-up among these patients.[10] Blacks are known to have higher prevalence of hypertension, left ventricular hypertrophy, diabetes, and renal insufficiency.[11–18] The higher prevalence of risk factors may be responsible for greater target organ damage at an earlier age in the blacks. Mathew *et al.* prospectively analyzed data on 301 black patients with heart failure and studied their baseline characteristics. Systemic hypertension was found to be the most common underlying cause for heart failure followed by coronary artery disease, alcohol-related cardiomyopathy, and idiopathic dilated cardiomyopathy.[9] Blacks with hypertension exhibit greater day and night time variability, which may be associated with an increase in target organ damage.[19] Left ventricular hypertrophy was associated with a greater risk than traditional measures of coronary artery disease among these patients.[20]

Philbin *et al.* assessed the effect of race and gender on process of care, resource utilization, and hospital-based outcomes in patients with heart failure.[21] Data were reviewed for 45,894 patients (8,120 black, 37,774 white) with an ICD-9-CM diagnosis of heart failure, discharged from all New York State hospitals in 1995. Blacks were found to have higher prevalence of hypertensive heart disease, diabetes, and renal disease, and a lower prevalence of ischemic heart disease and prior cardiac surgery. Such patients in the SOLVD trial were also found to have higher prevalence of hypertensive heart disease, and a lower prevalence of ischemic heart disease.[22] In our study, as documented in the previous studies, blacks were younger in age and had a higher prevalence of hypertension, diabetes, and electrocardiographic evidence of left ventricular hypertrophy. The incidence of prior myocardial infarction was, however, similar in the two groups. Blacks had a higher prevalence of EF < 40%, suggesting a greater severity of left ventricular systolic dysfunction.

Changes in the left ventricle due to hypertension consist of both myocyte hypertrophy and an increase in the collagen matrix.[18] Untreated hypertension has been demonstrated to lead to significantly higher left ventricular mass index, relative wall thickness, as well as greater impairment of left ventricular diastolic dysfunction in blacks than in whites.[18] Left ventricular hypertrophy has shown to be associated with higher morbidity and mortality in a multivariate analysis and is probably the most important factor accounting for the poor prognosis in blacks with heart failure.[20,23] Thus, one possible explanation for poor prognosis of heart failure in these patients may be explained by the evidence of significantly higher prevalence of hypertension and left ventricular hypertrophy.

After adjusting for other patient characteristics and hospital type and location, race was found to be an important determinant of length of hospital stay, hospital charges, and readmission rate in study by Philbin and DiSalvo.[21] The rate of hospital readmission was also reported to be higher in blacks in the SOLVD study.[22] Inadequate access to health care may explain poor outpatient follow-up and increased rates of hospitalization in these patients. In a study of patients with decompensated heart failure admitted to Cook County Hospital, Chicago, Illinois, 97% of whom were blacks and two-thirds of whom were unemployed, Ghali *et al.*[24] found that poor adherence to medication use or dietary recommendations contributed to 65% of the hospitalizations. In our analysis, there were no significant differences with regard to the education status, employment, medical insurance data, or medications prescribed, such as angiotensin-converting enzyme inhibitors at admission or discharge, to explain the differences between the two races. Our study, however, does not address the rate of compliance with the prescribed medications among these patients. Thus, precise reasons for higher readmission rate among blacks in our study is not clear; it was not associated with lower EF or poor outpatient follow-up. In contrast to the patients in a study by Ghali *et al.*, a slightly higher number of blacks in our study were employed. Length of hospital stay was also similar in the two groups in our study.

It is possible that blacks have a poor outcome for a variety of reasons, including lack of research focused on minority populations, limited access to health care resources, and poor patient education.[24] There is a need for further elucidation of the differences between the two races to improve management and to develop effective preventive strategies.

Conclusion

Significant racial differences exist between black and white patients with heart failure, with respect to demographics, risk factors, and clinical follow-up. Based on such differences, we propose that a different approach may be helpful for early recognition and effective management of the cardiac risk factors in black patients and that this might reduce significantly higher morbidity and mortality seen in this population.

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