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REVIEW ARTICLE

Racial and Ethnic Disparities in Cardiovascular Disease: Impact of Social Determinants of Health and Regional Variations

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ABSTRACT

Racial and ethnic disparities in cardiovascular diseases (CVDs) remain a significant public health challenge, influenced largely by social determinants of health (SDoH). While genetic predispositions play a minor role, inequities in healthcare access, quality, and outcomes are more prominent. This review highlights the impact of race and ethnicity on cardiovascular risk factors, disease prevalence, and management outcomes. Hypertension, diabetes, obesity, coronary artery disease, and valvular heart diseases exhibit pronounced disparities, with minority populations facing higher disease burdens and suboptimal care. In India, the epidemiological shift toward non-communicable diseases has further exacerbated regional disparities. Culturally tailored interventions, equitable healthcare access, and increased representation in clinical research are essential to mitigate these disparities. Addressing SDoH through policy reforms and community-based initiatives can significantly improve cardiovascular health outcomes across racial and ethnic groups.

KEYWORDS

• Race • Ethnicity • Cardiovascular • Risk factors • Epidemiology • Outcomes

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KEY MESSAGES:

- Race and ethnicity are socio-political constructs that significantly influence healthcare disparities, including access, quality, and disease outcomes.
- Minority populations, especially Black individuals, have higher hypertension prevalence, poorer blood pressure control, and greater target organ damage due to socioeconomic and environmental factors.
- Racial and ethnic minorities, particularly South Asians and African Americans, face a higher burden of obesity and type 2 diabetes, with earlier disease onset and worse metabolic profiles contributing to cardiovascular disease risk.
- Despite a high burden of cardiovascular risk factors, racial and ethnic minorities experience disparities in CAD diagnosis, treatment, and outcomes, with lower rates of guideline-directed therapy, reperfusion strategies, and invasive procedures.
- Racial and ethnic disparities exist in the diagnosis and treatment of valvular heart diseases, with lower access to surgical and transcatheter interventions.

INTRODUCTION

Race and ethnicity are now understood as socio-political constructs rather than biological ones. "Race" is based on phenotypic traits like skin color, while "ethnicity" refers to shared cultural, ancestral, and social characteristics. Healthcare disparities in access, quality, and disease outcomes are well-documented among different racial and ethnic populations. It is pertinent to highlight at this point the social determinants of health (SDoH) which include economic stability, education access and quality, healthcare access and quality, neighborhood and built environment, and social and community context.

India has undergone an epidemiological transition from communicable diseases to non-communicable diseases (NCDs), with cardiovascular diseases (CVDs) emerging as the leading cause of disability adjusted life years (DALYs). The Global Burden of Disease Study (2016) categorized Indian states by epidemiologic transition level (ETL). High ETL states report a higher burden of CVDs, while low ETL states experience more respiratory diseases.

This review examines the influence of race and ethnicity on cardiovascular risk factors and disease outcomes, primarily referencing Western literature due to the limited availability of Indian data. Relevant Indian insights are included where applicable.

Hypertension

Racial and ethnic disparities exist in the epidemiology and clinical care of hypertension. The prevalence of hypertension is highest in African-Americans/blacks (59%) as compared to white (47%), Asian (45%) and Hispanic (44%) adults.[1] Asian adults are less likely to be treated for hypertension (74%) and hence more likely to have uncontrolled hypertension. The lifetime risk of hypertension in people without hypertension at age 45 years is highest for blacks (92.7%) and Hispanics (92.4%) as compared to Whites (86%) and Chinese adults (84.1%).[2] The African-Americans are more likely than whites to be diagnosed with hypertension at a younger age and develop target organ damage at an earlier age.[3]

In India, hypertension prevalence is rising. The Great India BP Survey reported a prevalence of 30.7% in adults, with higher rates in men (32.8%) than women (29.7%).[4] The Fourth District Level Household Survey (DLHS-4) found rates of 27.4% in men and 20% in women, indicating over 200 million hypertensive individuals. Unlike in the US, hypertension is more common in urbanized states with greater social development.

Minority groups often face treatment access barriers. Community-based interventions, telemedicine, and polypill strategies may bridge these gaps. For instance, the Barber Shop Trial used barbershops as health hubs for Black men, achieving BP control in two-thirds of participants through pharmacist-led care.[5,6] Addressing social factors and implementing culturally tailored, community-based strategies can enhance hypertension control and reduce disparities in cardiovascular care.

Diabetes and obesity

Obesity and Type 2 diabetes mellitus together affect more than two-thirds of the US population, with disproportionate involvement of racial/ethnic minority groups.[7] Non-Hispanic Blacks have the highest obesity prevalence (50%), followed by Hispanics (45%), Whites (42%), and Asian-Americans (17%).[7] T2DM prevalence is highest in American Indians/Alaska Natives (15%), followed by Hispanics and Blacks (12%), Asians (9%), and Whites (7.5%).[8] Among Asian subgroups, Asian Indians (12.6%) and Filipinos (10.4%) have the highest rates, while the Chinese have the lowest (5.6%). Additionally, minorities often develop diabetes at younger ages and lower BMIs. South Asians, for example, face a threefold higher risk (HR 3.40) of developing diabetes at a lower BMI compared to Whites.[9,10] Using data from the Mediators of Atherosclerosis of South Asians Living in America (MASALA, n=906) and Multi-Ethnic Study of Atherosclerosis (MESA; n= 2622 Whites, 803 Chinese, 1893 Blacks and 1496 Hispanics) studies, Shah et.al, showed that south Asians as compared to other races/ethnicities have greater intermuscular and visceral fat. South Asians also had lower adiponectin and higher resistin levels. This higher body fat composition and abnormal adipokine profile possibly mediates the excess risk of cardiovascular disease in south Asians.[11]

The prevalence of diabetes in India increased from 5.5% in 1990 to 7.7% in 2016 as per the global burden of disease study.[12] There was a significant variation between different states of India with higher prevalence of DM in states like Tamil Nadu, Kerala and Delhi followed by Punjab and Goa. The age standardized prevalence of diabetes and DALYs increased in all the states, however, some states with previously low prevalence recorded higher percentage increase like Jammu and Kashmir, Uttar Pradesh, Bihar, Chhattisgarh, Nagaland and Arunachal Pradesh.[12]

Glycemic control remains a challenge in minority groups. Socioeconomic and environmental factors, including limited access to healthy food, inadequate healthcare, and lower physical activity, contribute to these disparities.[7] Treatment response also varies. GLP-1RAs and SGLT-2Is, though effective in general, showed no significant cardiovascular benefit in Black patients and limited benefits in Asians in some trials.[13,14]

Cultural and language barriers further hinder diabetes management. South Asians, for instance, face challenges such as lack of culturally tailored dietary advice and exercise facilities, poor health literacy, and reluctance to take medications. Addressing these gaps requires culturally concordant care and interventions that consider social determinants of health.

Coronary artery disease

Racial and ethnic minorities bear a disproportionate burden of ASCVD due to a high prevalence of traditional risk factors, health disparities, and limited access to preventive therapies. Underrepresentation in clinical trials further limits evidence-based care for these populations.[15,16]

Coronary artery disease (CAD) and stroke impact over 25 million US adults and 230 million globally. CAD prevalence varies by ethnicity, being highest in Blacks and lowest in American Indians/Alaska Natives.[17] Despite a higher burden of risk factors, Hispanics experience a lower CAD prevalence, termed the "Hispanic paradox." Blacks have higher stroke prevalence (3.9%) than non-Hispanic Whites (2.6%), with greater mortality.[15] While stroke incidence is declining, the lifetime risk remains high due to an aging population and increasing risk factors.

Socioeconomic disadvantage, neighborhood factors, and racial discrimination contribute to adverse outcomes by limiting access to care and promoting psychosocial stressors.[18,19] South Asians, particularly Indian Americans, exhibit a heightened CAD risk with earlier onset and increased mortality despite lower CAD prevalence. Excess visceral fat, metabolic abnormalities, and subclinical atherosclerosis contribute to this risk.[19,20] In India, CVD remains the leading cause of death, with 54.6 million cases in 2016. Urbanization, pollution, and lifestyle changes have increased risk factors. State-level variations exist, with Kerala having the highest CVD risk and Jharkhand the lowest. Socioeconomic disparities further influence risk factor prevalence.[21,22]

Primary prevention strategies, including risk estimation using pooled cohort equations (PCE), often lack accuracy for minorities. Minorities are less likely to receive guideline-directed therapies like statins and aspirin, contributing to poorer outcomes.[23–26]

Disparities extend to acute coronary syndrome (ACS) management. Blacks and Hispanics experience longer delays in treatment and lower rates of reperfusion therapy. Despite improvements in door-to-balloon times, gaps persist, with minorities receiving fewer invasive procedures and experiencing worse post-MI outcomes.[27,28] South Asians also face higher mortality following CABG. Studies from Canada and the UK demonstrate increased operative mortality among South Asians, attributed to a higher prevalence of diabetes and other comorbidities.[29]

Valvular heart disease (VHD)

Racial and ethnic disparities are relatively easy to appreciate in VHDs as low-income regions have disproportionate burden of rheumatic heart disease (RHD) while high income populations have increased burden of calcific/degenerative aortic and mitral valve disease.[30]

VHDs with genetic basis like mitral valve prolapse (MVP) and bicuspid aortic valve (BAV) have similar prevalence across different racial/ethnic groups, around 2-3% in MVP and 0.5 – 1.5% in BAV.[31] RHD is the prototype disease of disparities in cardiovascular health and care with low-middle income countries harboring majority of the cases. As part of the Global Burden of Disease study (2015), Watkins and colleagues estimated that in 2015, there were 33.4 million cases of RHD globally and 319,400 deaths were attributed to RHD globally in 2015. The highest prevalence and age-standardized mortality were observed in Oceania, South Asia and central sub-Saharan Africa.[32] The prevalence of RHD is very low in high income countries, however, even in those places RHD hits the disadvantaged racial/ethnic minorities.[30] There have also been remarkable shifts in infective endocarditis patterns, with high income countries now having more cases related to degenerative valve diseases, prosthetic valves and cardiac implantable electronic device (CIED) while, low income places still have RHD as the major underlying risk factor.

The medical therapy of VHDs involves the GDMT for CV risk factors like hypertension and hypercholesterolemia. However, there are disparities in the control of these CV risk factors among different races/ethnicities e.g., black and Hispanic patients are less likely to receive statin therapy for secondary prevention of CV diseases. The latest ACC/AHA guidelines on atrial fibrillation (AF) in patients with VHD recommend non-vitamin K oral anticoagulant (NOAC) in preference to VKA in patients with AF and native valve heart disease (except rheumatic MS).[33] In a multicenter cohort study of 12,147 patients (Black 5.2%; Hispanics 5.4%) with AF, black patients were less likely to receive any anticoagulation than whites and less likely to receive a NOAC. After adjusting for socioeconomic factors, oral anticoagulant use was no longer different in black patients, however, NOAC use remained significantly low in black individuals [OR: 0.73 (0.55 – 0.95)]. Among patients receiving warfarin, black individuals had a lower time in therapeutic range (TTR) than white individuals (57.1% vs 67.1%).[34]

The definitive therapy for severe symptomatic AS is surgical or transcatheter aortic valve replacement (SAVR/TAVR). A retrospective study done on 96,728 patients (African Americans: 4259) with a diagnosis of AS and undergoing SAVR between 2003 and 2014 revealed that African Americans were less likely to undergo SAVR as compared to white patients (6.7% vs 11.3%). Also, blacks were more likely to be hospitalized for longer duration (12 ± 12 days vs 10 ± 9 days; P<.001) and had higher costs of hospitalization.[35] The transcatheter valve therapy (TVT) registry data reporting 70,221 TAVR cases done between 2011 and 2016 showed that this modality is used in significantly less percentage of AS cases from racial/ethnic minority groups as compared to their representation in overall population.[36]

Heart failure

Black individuals have the highest prevalence and incidence of heart failure (HF). In the Multi-Ethnic Study of Atherosclerosis (MESA), a cohort study of 6814 patients, African Americans had the highest incidence rate for heart failure followed by Hispanics, Whites and Chinese individuals (4.6, 3.5, 2.4 and 1 per 1000 person-years respectively). Also, African Americans were least likely to have myocardial infarction preceding the incident HF event.[37] HF related hospitalization and mortality are also higher in African Americans than their white counterparts.[38] Heart failure has an onset at a younger age in African Americans along with higher mortality rates in them. The age-adjusted heart failure mortality was highest

in African American men (118.2 per 100,000) followed by white men (111.3 per 100,000), African American women (86 per 100,000) and white women (80.4 per 100,000).[39]

Life's simple 7, as proposed by AHA, are seven key determinants of CV health including smoking, physical activity, diet, weight, cholesterol and blood pressure. Black individuals are less likely to have these 7 parameters in the ideal criteria.[17] In addition, disparities on grounds of social determinants of health including higher psychosocial stress, neighborhood disadvantage, poor socioeconomic status, low employment rates and unequal health care add up to further increase the burden of heart failure related morbidity and mortality.[40] As an example, low SES has been reported to be associated with higher 1-year mortality and readmission rates following HF hospitalization. Racial/ethnic minority groups are less likely to be referred for advanced heart failure therapies like cardiac resynchronization therapy, mechanical circulatory support and heart transplant.[40] There is evidence of bias on part of treating healthcare professionals in favor of whites and against the individuals of minority groups in making clinical decisions like revascularization, advanced heart failure therapies or even cardiology consultation.[42] There are racial/ethnic differences at system level as well e.g., black individuals are less likely to receive care in ambulatory outpatient clinics or have a health insurance. They more often present to emergency departments, where also they are less likely to be admitted than their white counterparts.

Atrial fibrillation

The age-standardized prevalence rates of AF vary on regional basis with highest prevalence in United States and Western Europe and least prevalence in Sub-Saharan Africa, Oceania and South Asia. There is a positive correlation between AF prevalence and increasing sociodemographic index (SDI). The prevalence of AF in high SDI regions is almost 7-fold higher as compared to low SDI regions (1212 vs 175 per 100,000 population).[43] In the US, African-Americans have the lowest prevalence of AF and Whites have the highest, with Asians and Hispanics in between. This is in contrast to what one would otherwise expect as African Americans have a higher burden of CV risk factors (AF paradox). The lower prevalence of AF in blacks or racial minorities could at least partially be explained by lack of access to health care and screening.

There are data to suggest that despite having high CV risk factor burden and CHA2DS2VASc score, black individuals receive anticoagulation less often. When prescribed, they are more likely to receive warfarin instead of DOACs and those on warfarin therapy are have a propensity to labile INRs and excess bleeding risk. Similar data also exist for other minority groups like American Indians/Alaska Natives, who are also less likely to receive anticoagulation and rhythm control therapies as compared to non-Hispanic whites as shown by an analysis of PINNACLE AF registry.[46]

Black patients are again less likely to receive rhythm control therapies than other racial/ethnic groups. In an analysis of 9542 AF patients (91% white, 5% black, 4% Hispanic), black patients had a worse quality of life, higher symptom burden and less likely to be treated with rhythm control strategy as compared to other racial groups. Similar data exists for American Indian/Alaska Native individuals who are less likely to receive a rhythm control therapy.[46] White patients with AF more often receive ablation therapy, Maze procedureand cardioversion as compared to other races.

There is a pressing need to study the epidemiology and clinical outcome in larger studies having equal representation of racial/ethnic minority groups. Increasing the screening in these minority populations and ensuring equitable access to health care should enable us to realize the bigger goal of culture of health.

Role of genetic differences between races/ethnicities

While most of the disparities highlighted in above sections are primarily because of social determinants, genetic factors could also play a role given the polygenic nature of most cardiovascular disorders. In addition, various lifestyle factors like excess calorie intake and physical inactivity may unfavorably tilt the balance towards metabolic derangements of obesity and diabetes at genetic/molecular level. The so called "thrifty genes" had evolved for efficient utilization of metabolic fuel during the periods of "feast and famine" which our ancestor humans had to face. The evolutionary conserved thrifty genes may

become counterproductive in the current era of excess intake and low physical activity, leading to unhealthy accumulation of fuel stores and precipitating metabolic syndrome.[47] There are data available from genome wide association studies (GWAS) on polymorphisms at various loci which predispose to coronary artery disease.[48] On similar lines, GWAS identified at least 16 loci predisposing to hypertension and its complications like stroke and coronary artery disease.[49] Genetic variants in α - adducin have been demonstrated to be associated with differential vasopressor or blood pressure changes with saline loading.[50] With inflammation being one key player in progression of coronary atherosclerosis, there is data on association of cyclooxygenase-2 gene polymorphisms with interleukin-6 levels and coronary artery disease.[51] Despite the abundance of GWAS, there is almost no data on comparisons between various races and ethnicities to explain any risk differences at genetic level. Here lies the need of more GWAS including data on racial/ethnic minority groups to uncover the true genetic risk differences, if there are any.

CONCLUSION

This manuscript underscores the significant racial and ethnic disparities in cardiovascular health, shaped by social determinants of health and systemic inequities. Minority populations face higher burdens of hypertension, diabetes, coronary artery disease, heart failure, and atrial fibrillation, often with worse outcomes due to limited healthcare access and cultural barriers. In India, the rising prevalence of cardiovascular diseases reflects an epidemiological shift driven by urbanization and lifestyle changes. Addressing these disparities requires culturally tailored interventions, equitable healthcare access, and targeted public health strategies to promote better cardiovascular outcomes for all populations.

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