Acute Myocardial Infarction in the West Indies

Early Observations, Current Issues and Future Concerns

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ABSTRACT

In the epidemiological transition from infectious diseases in the Caribbean, chronic non-communicable diseases, including cardiovascular disease, have emerged as important public health interest. Although hypertensive heart disease predominates in Afro-Caribbean populations, ischaemic heart disease and acute myocardial infarction have also been present, but the prevalence has been somewhat under-appreciated.

Infarto Agudo del Miocardio en el Caribe Occidental

Primeras Observaciones, Problemas Actuales, e Inquietudes Futuras

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RESUMEN

En la transición epidemiológica de las enfermedades infecciosas en el Caribe, las enfermedades crónicas, no comunicables, incluyendo las enfermedades cardiovasculares, se han convertido en asunto de importante interés para la salud pública. Aunque la cardiopatía hipertensiva predomina en las poblaciones afrocaribeñas, la cardio-patía isquémica y el infarto agudo del miocardio también han estado presentes, pero su prevalencia ha sido de cierto modo subestimada.

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EARLY OBSERVATIONS

The first reports of myocardial disease in the West Indies began to appear in the early 1960s (1, 2). These included reports on myocardial disease in a rural population in Jamaica (1) and a series of myocardial infarction in Puerto Rico (2). Miall and colleagues investigated risk factors for heart disease and electrocardiographic changes in a rural population in Jamaica in the early 1970s (3–5). Differences in coronary artery disease frequency were reported for different ethnic groups, including those in the Caribbean, in the early 1970s (6). In the early 1980s, research interest in hypertension and its consequences in Jamaica began to emerge with the publication of the work of Grell and colleagues at the University of the West Indies (7–10). Risk factors for ischaemic heart disease were identified and the response to pharmaceutical agents was found to vary somewhat based on ethnicity (7–10).

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In the 1980s, the major contributors to heart disease in African and Afro-Caribbean patients were felt to be hypertension, rheumatic heart disease and cardiomyopathies (11). It was suggested that "… ischaemic heart disease is as yet distinctively uncommon in these societies…" (11). Around the same time, the St James survey in Port-of-Spain, Trinidad and Tobago, reported that persons of South Asian or East Indian ethnicity were at high risk for cardiovascular disease, seemingly independent of other major cardiac risk factors (12). These findings suggested an ethnic specificity for coronary artery disease in the Caribbean region.

The first report on myocardial infarction in patients of primarily Afro-Caribbean ethnicity was from Barbados in 1991 (13). This brief report suggested a relatively high mortality rate but few details were given. The experience with myocardial infarction in Antigua and Barbuda from 1990 to 1995 was reported in 1997 (14). This was followed by reports of series of patients experiencing myocardial infarction in 1996 from Trinidad and Tobago (15) and in The Bahamas in 1996 and 1997 (16), both published in 2000. The demographic information, cardiac risk factors and medications used in patients in these three reports are shown in the Table.

Table: Demographic factors, cardiac risk factors and medications used in patients experiencing myocardial infarction in Antigua and Barbuda, Trinidad and Tobago and the Bahamas, 1990–1997.

	Antigua and Barbuda	Trinidad and Tobago	Bahamas
Number of patients	39	61	52
Mean age (years)	60	60	64
Male 67%	62%	44%	
Ethnicity:			
Afro-Caribbean	74%	33%	94%
Indo-Caribbean	0%	62%	0%
Visitors	26%	5%	6%
Pain Duration < 6 hours	33%	54%	1%
Risk Factors:			
Hypertension	36%	18%	77%
Diabetes	28%	53%	35%
Lipid abnormality	13%	58%	8%
Obesity	10%	NA	62%
Tobacco use	15%	30%	25%
Medications Used:			
Streptokinase	0%	38%	8%
Aspirin	53%	NA	NA
Heparin	24%	NA	90%
Nitrates	97%	NA	96%
Beta-blocker	37%	NA	65%
Calcium-blocker	47%	NA	NA
ACE Inhibitor	21%	NA	10%
Early mortality	13%	23%	19%

The standard risk factors including hypertension, diabetes, lipid abnormalities, obesity and tobacco use were seen. Medication use varied among reports. The early mortality associated with myocardial infarction in these series was 13 to 23% (14–16).

CURRENT ISSUES

The early reports on myocardial infarction in the Caribbean suggest a delay in symptom recognition and the use of prompt and effective treatment. In The Bahamas, a recent report suggests that 75% of myocardial infarction deaths occurred outside the hospital and 15% of deaths occur on the first hospital day (17). It would appear from these reports that education on the recognition of ischaemic symptoms in the Caribbean is needed. A survey of persons in the United States of America, (USA), including the United States Virgin Islands, revealed that only 11% of people knew the signs of a myocardial infarction (18). Those with cardiac risk factors were no more aware, and persons of African ethnicity were less aware of these signs than the population as a whole (18). Autopsies in Jamaica showed a high discrepancy rate of 67% between clinical and post-mortem diagnosis of acute myocardial infarction (19). This would suggest that medical practitioners in the Caribbean also need to improve their recognition of the signs and symptoms of myocardial ischaemia.

There is a need for improvement in the use of cardiac biomarkers in the Caribbean region (20). A recent survey showed that the availability of creatine kinase MB band testing was only 20%, troponin I testing was 7% and myoglobin testing was 7% in regional clinical laboratories (20). There is a need in the Caribbean region for improved education in cardiopulmonary resuscitation and a need for improved availability and use of automatic defibrillators, as suggested by the pre-hospital mortality experience in the Bahamas (17). There is a greater need for the availability and use of thrombolytic agents early in myocardial infarction in developing countries, as suggested by the experience in Cuba (21, 22) and Puerto Rico (23).

Cardiovascular testing, including echocardiography, treadmill stress testing with electrocardiography, and ambulatory electrocardiography, has been available in the Caribbean region since the 1980s (24–27). There were reports on the use of coronary artery angiography in Jamaica in 1994 (28) and Puerto Rico in 1995 (29). The first reported experience with percutaneous transluminal coronary angioplasty (PTCA) in the Caribbean came from Jamaica in 1997 (30). Reports of coronary artery bypass grafting appeared in 1998 from Puerto Rico (31). Open heart surgery has been available for over 35 years in Jamaica, with coronary artery bypass grafting representing only 4% of cases from 1994 to 2003 (32). From the middle of the 1990s, open heart surgery was available in Trinidad and Tobago and Barbados. The use of PTCA with the placement of intracoronary artery stents was reported from both Trinidad and Tobago (33) and Jamaica in 2001 (34), with a recent report from Barbados (35). The technology for diagnosing and treating coronary artery disease is both available and effective in the region, making the diagnosis of early coronary artery disease that much more essential.

FUTURE CONCERNS

The major focus of current research on ischaemic heart disease in the Caribbean is identifying associated risk factors. These include ethnicity, hypertension, obesity and environmental factors. The St James survey continues to look at the contribution of lipid abnormalities, diabetes and cardiovascular fitness to cardiovascular disease in Trinidad and Tobago (36–38). South Asian or East Indian ethnicity has also been shown to be a risk factor for myocardial infarction in the United Kingdom, with hazard ratio of 1.2 to 2.0 compared with patients of European ethnicity (39–40). These studies reported a lower hazard ratio of 0.3 to 0.5 for Afro-Caribbean patients compared with European patients in the United Kingdom (39–40). In Antigua and Barbuda, admission for acute myocardial infarction was less than 20% of an age-matched, historical control group in the USA (41). Sudden cardiac death, another manifestation of ischaemic heart

disease, also appears less common in Afro-Caribbean compared with Caucasian people in the United Kingdom (42). Ethnicity probably represents genetic variation and the Caribbean region would appear to be fertile ground for examining these differences.

The Plymouth-Bethesda Study in Tobago has developed an ongoing database on cardiovascular risk factors in an Afro-Caribbean population (43, 44). Patrick and colleagues have indentified an association of hypertension, diabetes mellitus and obesity with cardiovascular mortality in this population (43, 44). Research is being directed at the implications and control of these identified risk factors. Hypertension is poorly controlled in the Caribbean region, with only 10 to 30% of patients having systolic pressure below 140 mmHg and diastolic pressure below 90 mmHg (45–8). Diabetes is controlled (fasting blood glucose below 8 mmol/l) in 40% or less of patients in Jamaica (49, 50). Hyperlipidaemia awareness and adherence to treatment guidelines is suboptimal in the Caribbean (51). Obesity is becoming more prevalent in Caribbean populations (52, 53). End-organ damage, such as left ventricular hypertrophy, as a consequence of risk factors has been identified (48, 54) and linked to cardiac failure, atrial fibrillation and stroke in Afro-Caribbean patients (55–57). Improvement in control of risk factors will continue to be a future research goal.

Another interesting area of cardiovascular research in the Caribbean has been the contribution of the prenatal environment to the presence and expression of cardiovascular risk factors. Low birthweight in Jamaica is associated with higher early childhood systolic blood pressure (58, 59) but is modulated by later childhood weight gain (60). Blood pressure in older children is directly related to body size and composition in Jamaica (61). Cardiovascular risk factors present in childhood have been associated with cardiac disease in adulthood. Systolic blood pressure in adolescents in Tobago was directly and significantly associated with greater left ventricular mass on echocardiography (62). Increased left ventricular mass index for age was seen in 10% of school children in Antigua and Barbuda (including 18% of teenagers), and was significantly related to higher body mass index (63). The seeds for cardiovascular disease in adults appear to be sown prenatally and may be measurable in adolescence.

Environment seems to modify the expression of cardiovascular risk factors in persons of African ethnicity. Blood pressure in persons of West African ethnicity would appear to double going from Africa to the Caribbean and double again going to the USA or the United Kingdom (64, 65). In New York City, Afro-Caribbean men have about 50% of the rate of cardiovascular mortality of Afro-American men (66). Impaired vascular reactivity and increased intimal-medial thickness on ultrasound of the carotid artery are more common in Afro-Caribbean people living in the United Kingdom than in Afro-Caribbean people living in Jamaica (67). It seems as though it is not just who you are, but also where you are, that counts.

The inquiry into genetic factors responsible for ethnic differences in cardiovascular risk is underway. In Afro-Caribbean patients, angiotensinogen polymorphisms (AGT M235T) and RH genotypes have been related to systolic blood pressure and lipoprotein levels (68). Insertion/deletion (I/D) polymorphism of the angiotensin converting enzyme gene is associated with serum enzyme activity in Jamaican hypertensives (69). Hepatic lipase gene (LIPC) polymorphism -514T is higher in patients of African ethnicity, resulting in higher high density lipoprotein (HDL) levels (70). The Trp64Arg mutation of the beta3-adrenergic receptor is associated with hyperglycaemia and current body mass index in Jamaican women (71). Proprotein convertase, subtilisin-kexon type 9 (PCSK9) mutations 142X and 679X, which are associated with lower low density lipoprotein (LDL) levels, are found in 1/40 (2.5%) persons of African ethnicity, but not in persons of European ethnicity (72,73). In Curaçao, a single copy of the HFE C382Y gene (which results in haemochromatosis in homozygotic individuals) is seen in 10% of patients with coronary artery disease but in only 1% of control patients (74). In Europeans, 5% of the population carry this gene, compared with 0.3% in South Asia and 0.1% in Africa (74). Exploring the relationship of genotype to phenotype appears to be a fruitful area of future investigation in the Caribbean.

This brief summary would suggest that a level of ischaemic heart disease has always been present in persons in the Caribbean, in differing frequency in different ethnic groups, reflecting different genetic pools. There is room for improvement in the recognition and treatment of ischaemic heart disease, as well as in the recognition and treatment of cardiovascular risk factors in the Caribbean region. Heart disease risk factors may have roots in fetal life and may be identified early in life, allowing for prevention of end-organ damage. Exposure to a more Western lifestyle, including changing diet and lower activity, has been associated with increasing levels of obesity and Type 2 diabetes in the Caribbean (52, 53, 75, 76). The "perfect storm" of baseline hypertension, with increasing prevalence of obesity and diabetes in the Caribbean, could result in increasing levels of ischaemic heart disease, and will require identification of both effective and cost-effective interventions in the future (77, 78).

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