Indian Heart Journal xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Indian Heart Journal

journal homepage: www.elsevier.com/locate/ihj

Original Article

Presence of coronary artery disease in diabetic and non diabetic South Asian immigrants

Sunita Dodani[a,*], Gyanendra K. Sharma[b]

[a] Department of Medicine, College of Medicine, Mayo Clinic, Jacksonville, FL, United States
[b] Division of Cardiology, Department of Medicine, Medical College of Georgia, Augusta University, Augusta, Georgia

ARTICLE INFO

Article history:
Received 1 July 2016
Accepted 17 July 2017
Available online xxx

Keywords:
Coronary Artery Disease
South Asian Immigrants
Type 2 Diabetes
Risk Factors
Carotid Intima Media Thickness

ABSTRACT

Introduction: South Asian Immigrants (SAIs) are the second fastest growing Asian immigrant population in the US, and at a higher risk of type 2 diabetes (diabetes) and coronary artery disease (CAD) than the general US population. Objectives: We sought to determine in SAIs the; 1) the prevalence of CAD risk factors in diabetics and non-diabetics; and b) the high possibility of CAD in diabetic SAIs. We also assessed the prevalence of sub-clinical CAD in both diabetics and non-diabetics SAIs using common carotid artery Intima-media thickness (CIMT) as a surrogate marker for atherosclerosis.

Methods: In a cross-sectional study design, 213 first generation SAIs were recruited and based on the history, and fasting glucose levels were divided into two subgroups; 35 diabetics and 178 non-diabetics. 12-hour fasting blood samples were collected for glucose and total cholesterol levels. Exercise Tolerance Test (ETT) was performed to determine the possibility of CAD.

Results: Both diabetics and non-diabetics SAIs in general, share a significant burden of CAD risk factors. The prevalence of hypertension ($p = 0.003$), total cholesterol ≥ 200 mg/dl ($p < 0.0001$) and family history of diabetes ($p < 0.0001$) was significantly was significantly higher in diabetics compared to non-diabetics. Of the 22/29 diabetic participants without known history of CAD, 45% had positive ETT ($p < 0.001$). Similarly, 63.1% of diabetics and 51.8 % of non-diabetics were positive for sub-clinical CAD using CIMT as a marker.

Conclusion: The susceptibility to diabetes amongst SAIs promotes an adverse CAD risk, as evident by this small study. Further research, including larger longitudinal prospective studies, is required to validate the current small study findings with investigation of the temporal association.

1. Introduction

Though death rates attributable to cardiovascular diseases (CVDs) including coronary artery disease (CAD) have declined in the past decade, yet CAD is still number one killer globally and accounts for 30.8% of all deaths in the US.[1] The increasing frequency of global migration to US has highlighted the need for more information on CAD risk factors and diseases in migrant populations from different ethnic backgrounds. The prevalence of Type 2 Diabetes (henceforth, diabetes) worldwide was about 2.8% in 2000 and is projected to be 4.4% in 2030.[2,3] India leads the world with the largest number of diabetics (prevalence of approximately 10%), earning the dubious distinction of being termed the "diabetes capital of the world". South Asian Immigrants (SAIs), the people from Indian subcontinent (India, Pakistan, Bangladesh, Nepal, and Sri Lanka) represent a quarter of the world's population, and at 3.4 million, SAIs in the US has exploded over the past decade (over 106% growth rate), and is the second fastest growing immigrant group.[4] Many studies have reported high rates of diabetes and CAD among SAIs worldwide.[5,6] Furthermore, studies have found that SAIs' risk of CAD death is as high as 40% above whites', and they have a 2- to 4-fold higher incidence of diabetes.[2,7] A recent study on SAIs in the US found a diabetes prevalence of 30%.[8] Recently, the South Asian Association for Regional Cooperation (SAARC) reported that mortality and morbidity due to diabetes and CVDs are higher in SAIs than in any other expatriate ethnic group worldwide.[9,10] Metabolic syndrome (MS) is more prevalent in both men and women living in India or abroad.[11,12] Diabetes is a major problem among South Asians still living in Asia, as well as among SAIs who have migrated to other countries.

The principal cause of mortality globally, particularly in diabetics is CAD, as their CAD mortality risk is equal to that of non-diabetics who had a previous episode of myocardial infarction.[9] MS predisposes patients, especially women to CAD, stroke,

* Corresponding author.
E-mail address: soni.dodani@gmail.com (S. Dodani).

http://dx.doi.org/10.1016/j.ihj.2017.07.009

and diabetes.[10] Insulin resistance is postulated as a central feature of the MS, culminating in atherosclerosis, diabetes and CVD; a pathway potentially accelerated by migration/urbanization.

In the US, SAI population has doubled in the past decade, however, data on CAD with and without among diabetic SAIs is limited and mostly comes from Canada or UK. The awareness about high burden CAD in SAIs in general and in SAI diabetics in particular is low. Since prevalence of diabetes is high in SAIs and to our knowledge, no previous study has reported the incidence of CAD in diabetic SAI population; we sought to determine; a) the prevalence of CAD risk factors in diabetics and non-diabetics; and b) the possibility of CAD in diabetic SAIs living in the State of Georgia, US, which is home to a very large SAI population. We also assessed the prevalence of sub-clinical CAD in both diabetics and non-diabetics SAIs using common carotid artery Intima-media thickness (CIMT) as a surrogate marker for atherosclerosis. Through this small but an eye-opener study, the goal is to create awareness among SAI community of the diabetes and CAD burden and highlight that SAI with diabetes and a positive stress test need more aggressive risk management.

2. Methods and study design

The study was approved by Institutional Review Board (IRB) of the Medical College of Georgia, Augusta, Georgia. Using a cross-sectional study design, a total of 213 first generation SAIs (Hindus) were randomly recruited from Hindu Temples, major businesses and other organizations in Augusta and Atlanta, the two largest cities of Georgia. Study information was made available by distributing flyers in the temples and announcements through local newspapers outlining the purpose, rationale, and design of the study. The study included adult SAIs of age 25 years or more. Written informed consent was obtained. Information on socio-demographic status, ethnicity (based on spoken language), personal lifestyle characteristics, as well as CAD risk factors was obtained. Twelve-hour fasting blood samples were collected for measurements of total cholesterol and fasting glucose levels. We also assessed sub-clinical CAD in those without the history of CAD using CIMT as a surrogate marker for atherosclerosis.

2.1. Exercise stress test

Due to limited funding, exercise tolerance test-ETT (also called stress test) was offered to only on diabetic participants without known history of CAD (n = 29) in order to determine the high possibility of CAD in this group. Standard Bruce protocol was followed for the ETT.[13,14] The exercise goal was to achieve at least a target heart rate of 85% of maximum predicted for age.[14] The test could also be terminated early at the discretion of supervising physician if a participant had any significant symptoms like chest pain, shortness of breath, sustained arrhythmias, or hemodynamic instability (based on BP control) or ST-segment changes.[14] ETT test was considered positive for ischemia (high possibility of CAD) in the presence of exercise induced 1 mm horizontal or down sloping ST-segment depression 80 ms from the J point. A blinded cardiologist interpreted ETT.

2.2. Carotid ultrasound doppler

Details on Carotid ultrasound Doppler procedure are provided elsewhere.[15] Briefly, IMT is defined by Pingoli and colleagues as the distance from the leading edge of the lumen-intima interface of the far wall to the leading edge of the media-adventitia interface of the far wall.[16] B-mode ultrasound scanning of bilateral common carotid arteries was performed by a trained non-invasive vascular ultrasound technician at study clinic at the Medical College of Georgia, using SonoCalc™ IMT machine (SonoSite, Inc Bothell, WA) with a 7.5 MHz linear array transducer. Both arteries were scanned in supine position. A total of eight images were obtained (four on each side), 1 cm proximal to the carotid bulb using an anterior approach. ECG leads were placed to obtain end-diastolic measurements. Images were recorded and stored on a disk. The CIMT approach for IMT measurements was preferred because the CIMT is reproducible and predictive of future cardiovascular events, and the data collection is more complete than other non-invasive markers.[17–19] Measurements of the internal carotid and bifurcation segments tend to have many more missing values.[18] The Mannheim Intima-Media Thickness Consensus suggested that measurement of the common carotid artery is ideal.[20]

Any focal thickening of the intima-media complex or carotid plaque though documented, but was not included in the analysis. A cardiologist, who was blinded to participants' identities and clinical information, analyzed stored images by using automated edge detection technology (SonoCalc™ IMT). Measurement of the far wall of the carotid artery was preferred, since studies comparing ultrasound measurements with histology suggest that far-wall CIMT measurements are more indicative of the true thickness of the arterial wall.[21] Near-wall CIMT measurements, in comparison, are limited by their dependence on the axial resolution, gain settings of the equipment used and show greater variation between repeated measurements.[22–24] Participants with values greater than 0.80 mm were considered to be IMT positive. Previous epidemiological studies suggest that a value of IMT at or above 0.80 mm is associated with a significantly increased absolute risk of CAD.[24] In this study CIMT values of 0.80 mm or more were considered abnormal. CIMT values were adjusted for age as age can influence IMT.[24] We did not include carotid plaque in this study.

2.3. Power calculation and statistical analysis

This was a pilot cross-sectional study on SAIs to determine the prevalence of CAD, diabetes and CAD risk factors in diabetic vs. non diabetic participants. Therefore a convenience sample of 213 SAIs was recruited without a specific sample size target. Results obtained from this study will help develop a powered prospective observational trial. The data management and statistical analysis was performed using Windows based SPSS software, version 9.1 of the SPSS system. A detailed statistical analysis was conducted to explore the socio demographic and clinical characteristics of the study participants. Baseline socio-demographic characteristics and laboratory measures were summarized by frequency distributions and percentages for qualitative measures and means and standard deviations for quantitative measures. Maximum likelihood estimates and asymptotic 95% confidence intervals were calculated for the prevalence of clinical parameters. Bivariate tests of association were performed using simple logistic regression. Multiple logistic regression models were used to assess the relative importance of variables found to be significantly associated with the outcome from the bivariate assessments. All statistical tests were two-sided and performed at the 0.05 level of significance.

3. Results

The total sample consisted of 213 participants who were categorized into two subgroups on the basis of the presence of diabetes: 35 diabetics and 178 non-diabetics. CIMT was performed on 46 participants who provided consent and had no known history of CAD; 19 diabetic and 27 non-diabetic participants. ETT was offered to 29 participants with diabetes and known CAD, however only 22 consented and completed ETT testing.

The mean age of participants was 51 ± 10.63 years with an almost equal number of males and females (Table 1). As per

Please cite this article in press as: S. Dodani, G.K. Sharma, Presence of coronary artery disease in diabetic and non diabetic South Asian immigrants, Indian Heart J (2017), http://dx.doi.org/10.1016/j.ihj.2017.07.009