

ORIGINAL ARTICLE

BURDEN OF ATHEROSCLEROSIS RISK AMONG DIFFERENT ETHNICITY: A HIDDEN HEALTH CHALLENGE

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Background: Atherosclerosis risk and incidence of developing chronic cardiovascular conditions vary greatly between ethnic groups in South Asian population. To evaluate different ethnic groups in Pakistan, population based study was conducted at Karachi, the largest metropolitan city of Pakistan; to assess ten years and lifetime estimated cardiovascular disease risks without preexisting cardiovascular disease in Pakistani subjects by using Pooled Cohort Risk equation (calculator) as per American College of Cardiology (ACC) and the American Heart Association (AHA) 2013 guidelines. **Methods:** For the study, consecutive subjects (n=437) with multi-ethnic background, aged 20–79 years and having non-atherosclerotic disease were enrolled at site of National Institute of Cardio-Vascular Diseases (NICVD), Karachi, Pakistan. **Results:** Within each ethnic group and overall, the risk of developing atherosclerosis was common in all ethnic groups especially Urdu speaking are mostly at the high with all the factors above the borderline values, followed by Punjabis and Pathans that may point toward associated higher risk for prevalence of cardiovascular disease. These ethnic groups showed increased prevalence of dyslipidemia, obesity, and much greater abnormalities as unique risk. Although there are differences in these altered factors but the changes in lifestyle, urbanization, genetic profile and physiological makeup are the main reasons that could be a trigger to increase cardiovascular events. **Conclusion:** The present study provides the first evidence and may serve as useful guidance to calculate the estimated risk both 10 years and lifetime in the non-atherosclerotic Pakistani population with different ethnic background.

Keywords: Cardiovascular Disease; Atherosclerotic Cardio-Vascular disease (ASCVD); Pakistani Ethnic Groups; Pooled Cohort Risk Equation

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INTRODUCTION

The increasing burden of cardiovascular disorders (CVD) in the developing countries is associated to the aggregating incidence of atherosclerotic diseases, perhaps due to modernization in lifestyle and comorbidities like diabetes, obesity, dyslipidemia, hypertension, etc, the age of manifestation.^{1,2} A large body of epidemiologic studies has clearly demonstrated a link between certain risk indicators and incidence of developing CVD(3). These include contributing risk factors, and secondly established risk indicators. The prevalence of modifiable and non-modifiable risk factors for atherosclerosis are alarmingly high in the Pakistani population as the rates of other related cardiovascular disorders vary greatly between groups of population. To know whether this variation can be explained by differences in disease risk factors and subclinical atherosclerosis, many researches and epidemiological surveys were conducted globally on south Asian populace^{4,5} and other population-based studies including ethnic groups from South Asia, China, and Europe^{6,7} Although there are physiological as well as genetic differences in predictable and novel risk factors between various ethnic groups, this variation

and the degree of atherosclerosis only partly explains the higher rates of cardiovascular disease among different ethnic backgrounds of South Asians.^{2,8} The increased risk of cardiovascular events could be due to factors affecting plaque rupture, the interaction between prothrombotic factors and atherosclerosis, or as yet undiscovered risk factors.⁹ The burden of atherosclerotic disease varies among races and ethnic groups. These differences in the incidence, severity, and distribution of atherosclerotic disease may be partially explained by disparities in the race and ethnic distribution of vascular risk factors.^{5,6} Asian populations in the West women are reported to be more predisposed to central obesity and metabolic syndromes.^{10,11} However, the burden of coexistence of clinical risk factors for cardiovascular disease (CVD) and associated gender disparities in native population of South Asia are not known.³ Whether differences remain after controlling for risk factors, socioeconomic status, and access to medical care remains controversial. In addition to study populations differing by age and race/ethnicity, there are variation in pathophysiological concerns and progression regarding plaque formation and its potential triggers. Various studies differ in

measurement methodologies as well as geographical regions and related factors like lifestyle.^{7,12} Ethnicity unlike race is a makeup that comprises both genetic and cultural differences, as individuals from diverse ethnic backgrounds incline to live in distinctive regions and societies, variations in disease rates by ethnicity are also entwined with geographical differences.^{2,12} Furthermore, particular ethnic groups from the same location adopt certain lifestyles, whereas other ethnic groups from other locations may live with substantially different lifestyles.

The main objective of our study was to estimate 10 years and lifetime risk in a population without preexisting cardiovascular diseases i.e. Pakistanis with diverse ethnic backgrounds residing in Karachi, the largest metropolitan city of Pakistan. As Pakistan is a developing nation and to an extent is ill-equipped to grip this burden that result in poorer disease outcomes. Moreover, multiple ethnic groups were included for determination of risk of CVD that may have a likely role in escalation of the CVD epidemic marked in Pakistan.^{8,13}

MATERIAL AND METHODS

A cross sectional study was carried out in Pakistani population visiting NICVD that is a hub of cardiac patients in metropolitan city of Karachi. The ethnic groups were identified as Karachi is considered mini Pakistan representing all ethnic groups of the country.

The study was conducted in accordance with ICH-GCP guideline from July 2014 to March 2015, enrolling 437 individuals at high risk of atherosclerosis from both genders. The participants of both genders with the age range from 20–79 years were recruited through consecutive sampling along with presence or absence of diabetes, with or without hypertension (if hypertensive whether on treatment or not), systolic blood pressure and presence or absence of smoking. Participants were excluded on the basis of clinically evident CVD and atherosclerosis, pregnancy and lactation. The study was approved by the IRB of NICVD. Demographic, clinical and para clinical data were recorded and completed by the trained cardiologist residents.

The risk factors used for screening and traditional risk factors were defined as:²⁰

- Obesity: body mass index(BMI) > 30
- Overweight: 25<BMI<30
- Abdominal obesity: Waist to hip ratio (w/h) >1 in male and >0.8 in female.
- Dyslipidemia: triglycerides >150 and / or cholesterol>200 and/ or low density lipoprotein (LDL) >160 and/ or high density lipoprotein (HDL) <40 for male and <50 for female and/or history of taking anti-hyperlipidemia drugs.

- Hypertension: Currently taking antihypertensive medications and/ or systolic blood pressure (SBP) >140 and/or diastolic blood pressure (DBP) >90, by taking the average of 3 measurements.
- Diabetes mellitus: history of using hypoglycemic agents and/or fasting blood sugar (FBS) >126 and glucose tolerance test (GTT) >200.
- Smoking: consumption of 10 cigarettes per day, at least for 3 months
- Working Class: People are currently involved in any sort of job or business.
- Non-working Class: People either retired or housewives

The ethnic groups of Pakistan population are defined as: Punjabi, , Sindhis, Baluchi, Urdu speaking and many other small groups.¹⁴

For estimated the 10-year predicted risk for ASCVD events in Pakistani ethnic groups by Pooled Cohort Equations. The study samples assess into 2 groups: those with low predicted 10-year risk (10-year risk <7.5%) and those with high predicted 10-year risk (10-year risk ≥7.5% or diabetes mellitus).

For the lifetime predicted risk for ASCVD, estimated using a previously published algorithm based on the aggregate risk factor burden. The life time predicted risk for ASCVD again divided into two lifetime risk groups, i.e., <39% (life expectancy were 10 years as per pooled cohort so only life time risk was calculated) and >39% (ten year risk was calculated due to the factor of age by equation).²¹ Statistical analysis was done with SPSS version 22.

RESULTS

The mean age of recruited males in the study was 43±11.26 and of females was 42±0.01. The demographics of the participants is shown in table-1.

The data suggested (Table-2) that in the time span of 10 years 82.15% of the target population had a low risk of atherosclerosis while 17.85% had a high risk. The table shows that the ethnic group who was found to be most at high risk is Urdu speaking with population of 44.87%.

The data suggested (Table-3) that in the lifetime 78.03% of the target population had high risk of atherosclerosis while 21.97% had low risk that indicated higher risk in our population while in comparison of ethnic groups who was found to be most at high risk is Urdu Speaking group 35.48% population. The data suggests (Table-4) that the target population had lower cholesterol level, i.e., below 200 mg/dl with 57.44% while 31.12% had the average range, i.e., between 200–238 mg/dl and 11.44% had the high cholesterol level, i.e., above 240 mg/dl. The table shows that in comparison with other ethnic groups the Urdu speaking possesses more ratios of having high levels of cholesterol.

Table-1: Demographic characteristics of ethnicities as per occupation and age groups (n=437)

Ethnicity	Punjabi	Sindhi	Balochi	Urdu Speaking	Pathan	Miscellaneous
Occupation (n=437)						
Working Group (n=135)	49.63% (n=67)	5.19% (n=7)	2.96% (n=4)	22.22% (n=30)	2.96% (n=4)	17.03% (n=23)
Non-Working Group (n=302)	14.57% (n=44)	4.64% (n=14)	4.30% (n=13)	42.38% (n=128)	24.50% (n=74)	9.69% (n=29)
Age Group (n=437)						
20-50 years (n=258)	23.64% (n=61)	6.59% (n=17)	4.65% (n=12)	27.52% (n=71)	20.93% (n=54)	16.67% (n=43)
≥51 years (n=179)	15.08% (n=27)	4.47% (n=8)	5.03% (n=9)	51.40% (n=92)	16.20% (n=29)	7.82% (n=14)

Table-2: Ten year risk of first atherosclerotic CVDs in different ethnic groups of Pakistan

Ethnicity	Ten Year Risk (Binned)		Total
	< 7.5	7.5+	
	Low	High	
Punjabi	26.74% (n=96)	19.23% (n=15)	111
Sindhi	5.29% (n=19)	2.56% (n=2)	21
Balochi	3.89% (n=14)	3.85% (n=3)	17
Urdu Speaking	34.26% (n=123)	44.87% (n=35)	158
Pathan	18.11% (n=65)	16.67% (n=13)	78
Miscellaneous	11.69% (n=42)	12.82% (n=10)	52
Total	359	78	437

Table-3: Lifetime risk of first atherosclerotic CVDs in different ethnic groups of Pakistan

Ethnicity	Lifetime Risk (Binned)		Total
	< 39.0	39.0+	
	Low	High	
Punjabi	29.17% (n=28)	24.34% (n=83)	111
Sindhi	2.08% (n=2)	5.57% (n=19)	21
Balochi	3.13% (n=3)	4.11% (n=14)	17
Urdu Speaking	38.54% (n=37)	35.48% (n=121)	158
Pathan	15.63% (n=15)	18.48% (n=63)	78
Miscellaneous	11.46% (n=11)	12.02% (n=41)	52
Total	96	341	437

Table-4: Total blood cholesterol level in different ethnic groups of Pakistan

Ethnicity	Total Cholesterol			Total
	Below 200 mg/dl	200-238 mg/dl	240mg/dl and above	
	Below 200 mg/dl	200-238 mg/dl	240mg/dl and above	
Punjabi	25.89% (n=65)	26.47% (n=36)	20% (n=10)	111
Sindhi	4.78% (n=12)	5.88% (n=8)	2% (n=1)	21
Balochi	2.79% (n=7)	5.15% (n=7)	6% (n=3)	17
Urdu Speaking	35.06% (n=88)	33.83% (n=46)	48% (n=24)	158
Pathan	17.53% (n=44)	19.12% (n=26)	18% (n=8)	78
Miscellaneous	13.94% (n=35)	9.56% (n=13)	8% (n=4)	52
Total	251	136	50	437

DISCUSSION

Our results showed alarming figures indicating raised burden of high risk scores for having a first atherosclerotic cardiovascular diseases in the Urdu speaking community belonging to the urban Pakistani population. Our findings portrayed the reported prevalence of cardiovascular disorders and their risk factors in Pakistan as Karachi is a densely multicultural and multi-ethnic metropolitan city.⁴ It has been suggested that predictable risk factors clearly confer risk in South Asians but do not adequately explain their excess risk compared with other populations and also the minor groups exist in the country though many studies confer the susceptibility of Asian Indians.^{13,15} CVD in longitudinal studies and in present study is indicted by Urdu speaking that are migrants from South Asia before partition. Rates of smoking, hypertension and dyslipidemia tend to be lower in South Asians, although diabetes is more prevalent.²

Recent studies have suggested that the metabolic syndrome and abdominal obesity may play a causative role in both the prevalence of diabetes and the premature atherosclerosis as noted in South Asians.^{4,17} It is possible that genetically susceptible individuals develop abdominal obesity and insulin resistance when exposed to a toxic environment of reduced energy expenditure and increased caloric consumption.^{16,17} This pattern is increasingly noted in parallel with urbanization, suggesting that the increased cardiovascular risk in South Asians may be preventable through lifestyle interventions and the judicious use of medicines to attain optimal levels of blood pressure, lipids and glucose.¹⁸ The association of Urdu speaking might be a direct correlation with local chewable tobacco, gutka, beatlenuts, supari

etc.that needs further investigations. Though the risks are uniformly high in the young and in women, whereas other studies emphasized it to be more common in older adults and males too.¹¹ Rigorous efforts are needed to prevent the epidemic of atherosclerosis in Pakistan, focusing on dyslipidemia as well as hypertension, diabetes and smoking. Several factors may contribute to these observed intergroup differences in the CVD profile.^{1,16} First, the epidemiologic evolution, with dissimilar demographic profiles, diverse life expectancy, and divergent contributions from challenging causes of death. Therefore, the CVD spectrum, can vary according to the subtleties of health evolution. Secondly, environmental factors linked to CVD risk differ widely across ethnic groups and may be partly related to cultural as well as state of intrauterine, infant, and early childhood nutrition.^{3,8} Third important reason is genetic factors that explain variance in the risk of incident by providing the root for variances in individual susceptibility in a communal and relatively identical environment², due to mutable frequencies of one or more genetic determinants of hazard in different ethnic groups. Genetic influences to obesity, lipid disorders, salt sensitivity, coagulation derangements, insulin resistance and endothelial dysfunction are being discovered. The current and prompt changes in environment escorted by higher life expectancies might result in a metabolic incongruity. Thus the salt-sensitive individuals with genetic background can react to a salt-enriched diet with elevated blood pressure. Likewise, an insulin-resistant individual with ancestral background can respond to a high-calorie diet and an inactive lifestyle with unpredictable degrees of glucose intolerance and hyperinsulinemia¹⁸ Therefore, variances in demographic profiles, environmental factors, early childhood influences as well as changes in gene incidence or expression can all contribute to variations in CVD between different groups. These disparities are possibly demonstrated by the information from studies in refugee groups, where environmental changes due to changed lifestyles are overlaid by genetic influences. Hence, anywhere the environment remains common but gene pools vary, the nonconventional hazards to health may be illuminating of risk variance; while the similar gene pool is when challenged with dissimilar environments, the predictable risk factors play a major role. The challenge of preventing CVD lies in recognizing and addressing the aspects pertinent to any community at their current and projected levels of the epidemiologic transition.¹⁹ In addition to augmented relocation of individuals from rural to urban areas, the areas are themselves also being

transformed which is more like global influences on lifestyles apparent to be desired or the changes in the types of food consumed by the urban populace.¹⁹

It is the first ever study to report the cardiovascular risk calculated by pooled cohort equations in different ethnic groups who do not have any known cardiac event.

As the site of the study was located in an urban area of Pakistan therefore the results of this study may not be generalizable in the rural areas of the country where the prevalence may be lower as "demographic evolution" may not have occurred. However, they may be applied in similar socioeconomic strata in Pakistan.

CONCLUSION

The present study was designed to estimate 10 years and lifetime risk of first atherosclerotic cardiovascular disease in without preexisting cardiovascular disease Pakistani with diverse ethnic backgrounds residing in Karachi, the largest metropolitan city of Pakistan and by far explored the independent association of ethnicity with progression of these conditions however the prevalence was much higher in one ethnic class, i.e., Urdu speaking community. It was also observed that Punjabis and Pathans are also at risk with considerable ratios. As there is low community awareness about these risk factors and its modifiable risk factors, individual and public health interventions are warranted. This unique study pointed out the risk both 10 year and life time in Pakistani population, but more work is required in Pakistani population to socket the reasons of whys.

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AUTHORS' CONTRIBUTION

TA Principal investigator & developed the protocols and made discussion, KFA, ASA and NM contributed for data collection, manuscript writing, references. MTK for data analysis and formulation of results.

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