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CONVENTIONAL CARDIOVASCULAR RISK FACTOR PROFILING IN CORONARY ARTERY BYPASS (CABG) SURGERY PATIENTS IN INDIAN SETTING

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ABSTRACT

Background: Conventional cardiovascular risk factors (CVRFs) are known to influence short-term and long-term outcome following coronary artery bypass graft surgery (CABG), with recent increase in prevalence of CVRFs.

Methods: One thousand consecutive patients undergoing elective CABG were included and data on major CVRFs was obtained.

Results: Mean age was 59.73±9.5 years and 88.4% patients were males. 50.8% patients had BMI >25.0 kg/m2. Diabetes was present in 47.5%, hypertension in 70.9% and dyslipidemia in 85.6%. 19.9% patients had family history of premature CAD. 9.4% patients were current smokers. 95.9% of all the patients had at least one of the five major CVRFs and only 4.1% patients were free of all these risk factors.

Conclusions: The present study showed high prevalence of most of the conventional CVRFs, esp. diabetes, hypertension and dyslipidemia in Indian population undergoing CABG.

KEYWORDS : Cardiovascular risk factor, CABG

INTRODUCTION

India is in the middle of a coronary artery disease (CAD) epidemic.[1] Over past 30 years, the CAD rates have doubled in India. The prevalence of CAD in Indians aged >35 years revolves around ~10%.2 Increased genetic propensity to develop CVD and increasing prevalence of cardiovascular risk factors are the reasons being propagated.[3,4] In recent past, prevalence of most of the cardiovascular risk factors has increased markedly in India.[5-7]

Increased prevalence of CAD in India has led to an increase in number of coronary artery bypass grafting (CABG) being performed every year. CABG today accounts for >60% of all cardiac surgeries and every year 25000 coronary bypass operations are being carried out in India.[8] Several western studies have shown that presence of conventional cardiovascular risk factors (CVRFs) significantly affects both short-term and long-term outcome following CABG.[9-11] Diabetes & elevated blood lipid levels along with low HDL cholesterol levels are known to be associated with ongoing graft atherosclerosis following CABG.[9] Consequently, data from large studies has shown that modification of CVRFs is important not only in preventing progression of atherosclerosis following CABG, but also in improving survival in these patients.12 While there are several studies available from West regarding prevalence of conventional CVRFs in patients undergoing CABG,[13,14] scarce data is available from India. The present study was conducted to elucidate the same.

METHODS

Type of study: Cross-sectional study

Study Period: July 2004 to Oct 2014

Study Setting: Department of Cardiovascular & Thoracic Surgery, tertiary care government

hospital, Central India.

Operational Definitions:

- *Hypertension*- Systolic blood pressure >140 mm Hg, or diastolic blood pressure >90 mm Hg, or self-reported use of anti-hypertensive medications.
- *Diabetes mellitus*- Fasting blood glucose level of >126 mg/dl, or 2-hour post-prandial blood glucose level >200 mg/dl, or pharmacological treatment for diabetes.
- *Dyslipidemia*- LDL >100mg/dl, or HDL <40 mg/dl in men and <50 mg/dl in women, or TG >150 mg/dl. The cut-off value of 100 mg/dl was used to define high LDL since all the patients had proven CAD (as suggested by ATP III).15 However, the data was also analyzed using 130 mg/dl as the cut-off value for the same.
- *Family history of premature CAD*- 1^0 relative with coronary event before the age of 55 years in males and before the age of 65 years in females.
- *Current smoking*- History of smoking anytime during the past one month (as defined by ATPIII).[15]
- *Smoking in recent past*- History of smoking any time during the preceding one year.

Thousand consecutive patients undergoing elective CABG were included. Detailed information was obtained from all the subjects regarding presence or absence of conventional CVRFs namely hypertension, diabetes mellitus, dyslipidemia, smoking and family history of premature heart disease; duration of these CVRFs and any treatment if taken for the same (wherever applicable). Height, weight and BP were measured. Biochemical tests including fasting and 2 hour post-prandial blood sugar estimation and fasting lipid information was collected from the patients' case record sheets.

Comparisons between the groups were done using Student's unpaired t test and Chi-square test wherever appropriate. Statistical analysis was done using SPSS version 18.0.

Informed consent were obtained from the participants. The study was approved by the institutional ethics committee.

RESULTS

Mean age of the patients was 59.73±9.5 years. 884/1000 (88.4%) were men and 116/1000 (11.6%) were women. Majority of the patients were overweight with 505/994 (50.8%) having BMI >25.0 kg/m^2 and 747/994 (75.2%) having BMI >23.0 kg/m^2 (cut-off suggested for definition of overweight in Indian population).[16] Almost half (475/1000, 47.5%) of all the patients were diabetics. Dyslipidemia was present in 781/913 (85.6%) patients. Even when 130 mg/dl was used as cut-off to define high LDL; 743/913 (81.4%) patients were found to be dyslipidemic. Every fifth individual (199/1000, 19.9%) had family history of premature CAD and more than half of the patients (545/1000, 54.5%) had at least one family member having CAD. History of smoking was present in 396/1000 (39.6%) patients, with 94/1000 (9.4%) patients still continuing to smoke. 876/913 (95.9%) of all the patients had at least one of the five major CVRFs (viz. diabetes, hypertension, smoking, dyslipidemia and family history of premature CAD) and only 37/913 (4.1%) patients were free of all these risk factors. Even with higher LDL value (>130 mg/dl) being used as cutoff, only 39/913 (4.3%) patients were found to be free of all the five major CVRFs (15.4%, 31.8%, 34.3%, 12.6% and 1.8% with 1, 2, 3, 4 and 5 risk factors respectively).

As compared to men; women were more obese, had greater prevalence

of dyslipidemia, had higher total cholesterol, LDL cholesterol and triglycerides and lower HDL cholesterol. Family history of premature CAD was more common in women. Fasting blood sugar was also higher in women but prevalence of diabetes mellitus wasn't significantly different between men and women. (Table 1).

Table 1: Clinical characteristics of the entire study group and according to the gender

	Entire group	Males	Females	P-value
N	1000	884 (88.4%)	116 (11.6%)	—
Mean age (years)	59.73±9.5	59.59±9.59	60.81±8.86	0.195
Body mass index (kg/m2)	25.77±4.1	25.55±3.95	27.37±4.96	<0.001
Hypertension	709/1000 (70.9%)	626/884 (70.8%)	83/116 (71.6%)	0.869
Diabetes mellitus	475/1000 (47.5%)	411/884 (46.5%)	64/116 (55.2%)	0.078
Dyslipidemia*	781/913 (85.6%)	684/810 (84.5%)	97/103 (93.9%)	0.023
High LDL cholesterol	213/913 (23.3%)	185/810 (22.8%)	28/103 (26.8%)	0.326
Low HDL cholesterol	662/913 (72.5%)	581/810 (71.7%)	81/103 (78.6%)	0.139
High triglycerides	338/913 (37.0%)	292/810 (36.0%)	46/103 (44.6%)	0.088
Family history of premature CAD	199/1000 (19.9%)	165/884 (18.7%)	34/116 (29.3%)	0.007
Family history of CAD at any age	545/1000 (54.5%)	472/884 (53.4%)	73/116 (62.9%)	0.052
Smoking	396/1000 (39.6%)	390/884 (44.1%)	6/ 116 (5.2%)	<0.001
Current	9.4%	10.4%	1.7%	
Smoking in recent past	30.2%	33.7%	3.4%	
Fasting blood sugar (mg/dl)	137.56±45.7	136.18±44.7	148.75±51.5	0.014
Total cholesterol (mg/dl)	142.05±40.0	140.0±39.5	158.24±40.5	<0.001
LDL cholesterol (mg/dl)	80.66±30.8	79.81±30.8	87.43±29.61	0.035
HDL cholesterol (mg/dl)	36.2±8.8	35.56±8.41	41.25±10.2	<0.001
Triglycerides (mg/dl)	145.34±65.3	143.28±65.3	161.71±63.5	0.015
Risk factor count				
No risk factor	37/913 (4.1%)	33/810 (4.1%)	4/103 (4.3%)	0.474
1 risk factor	141/913 (15.4%)	124/810 (15.3%)	17/103 (16.4%)	
2 risk factors	290/913 (31.8%)	250/810 (30.9%)	40/103 (38.8%)	
3 risk factors	313/913 (34.3%)	287/810 (35.4%)	27/103 (25.9%)	
4 risk factors	115/913 (12.6%)	100/810 (12.4%)	14/103 (13.8%)	
5 risk factors	16/913 (1.8%)	49/810 (1.9%)	1/103 (0.9%)	

Sixty-one of the 1000 patients (6.1%) were younger than 45.0 years of age (range 26-44 years, mean 40.57±3.7 years, and median 41.0 years). These patients had higher prevalence of dyslipidemia and family history of premature CAD as compared to the older patients. Smoking was commoner in younger patients but the difference was of borderline statistical significance only. Diabetes mellitus and hypertension, on the other hand, were commoner in older patients (Table 2).

Table 2: Clinical characteristics of the patients as per age

	Age >45 years	Age <45 years	P-value
N	939	61	—
Mean age (years)	60.98 ± 8.4	40.57 ± 3.7	<0.001
Male gender	828/939 (88.2%)	56/61 (91.8%)	0.392
Body mass index (kg/m2)	25.77 ± 4.1	25.74 ± 4.2	0.96
Hypertension	673/939 (71.7%)	36/61 (59.0%)	0.035
Diabetes mellitus	457/939 (48.7%)	18/61 (29.5%)	0.004
Dyslipidemia	727/859 (84.6%)	54/54 (100.0%)	0.004
Family history of premature CAD	176/939 (18.7%)	23/61 (37.7%)	<0.001
Family history of CAD at any age	504/939 (53.7%)	41/61 (67.2%)	0.04
Smoking	363/939 (38.7%)	33/61 (54.1%)	0.053
Current	9.3%	11.5%	
Smoking in recent past	29.4%	42.6%	
Fasting blood sugar (mg/dl)	137.51 ± 45.4	138.28 ± 50.2	0.908
Total cholesterol (mg/dl)	140.80 ± 39.0	160.87 ± 50.5	0.001
LDL cholesterol (mg/dl)	79.31 ± 29.3	101.51 ± 43.9	<0.001
HDL cholesterol (mg/dl)	36.47 ± 8.8	32.04 ± 7.4	0.001
Triglycerides (mg/dl)	144.19 ± 65.4	162.80 ± 62.0	0.061

DISCUSSION

The present study reveals a high prevalence of various cardiovascular risk factors in Indian patients who are undergoing CABG. Prevalence of most of the CVRFs in our patients was higher than reported in studies involving patients of different ethnic origin.[10,13,14,17] This indicates recent increase in prevalence of these CVRFs in general population in India. Only 4.1% patients in our study were found to be free of all the five major CVRFs. Even when the criteria for diagnosis of dyslipidemia and smoking were relaxed, only 6.1% patients were found to be free of all the risk factors. Comparable figures have not been reported in most of the studies. However, in a study by Chiam et al on patients in Malaysia who were undergoing CABG, 298 of 302 patients (98.7%) were found to be having at least one of the three CVRFs namely diabetes, hypertension and dyslipidemia. The figure was even higher (100%) for 35 Indians included in the study, all of whom had at least one of these three CVRFs.[17] Our study being much larger, confirms the same.

Diabetes mellitus was present in 47.5% of our patients. In the study by Chiam et al also, equally high prevalence (45.7%) of diabetes was noted. Once again the figure was higher (57.1%) for the Indian subjects.[17] In contrast, most other studies involving western population have reported much lower prevalence of diabetes.[13,14] Nashef et al reported 20.3% prevalence of diabetes in 11731 European patients in EuroSCORE trial[13] and Waly et al showed 23.7% prevalence of diabetes in 1180 American patients and 32.4% prevalence in 290 Egyptian patients.[14] Our study and the study by Chiam et al thus demonstrate increased prevalence of diabetes in South-Asian population and in particular Indians. Significantly high prevalence of diabetes in Indian population is hypothesized to be due to their genetic propensity to have abnormalities in glucose homeostasis.3 The same pathological phenomenon is also reflected in rapidly increasing prevalence of diabetes and metabolic syndrome in India.

Hypertension was present in 70.9% of our patients. In EuroSCORE trial, prevalence of hypertension was much lower in patients from almost all centers.[13] In the data by Waly et al on American patients, hypertension was seen in 62.8% patients.[14] Another study on patients in USA revealed the prevalence of hypertension to be 55.9%.[10] In the study by Chiam et al on South-Asians, hypertension was seen in 78.8% patients.[17] Thus, similar to diabetes, hypertension is also found to be common in South-Asians as compared to Western population. The difference can be attributed to the epidemiological shift the South-Asian nations are undergoing at present.

Direct comparison of prevalence of dyslipidemia reported in various studies is not possible since varying definitions of dyslipidemia have been used. However, similar to our study, dyslipidemia was the commonest risk factor seen in the study by Chiam et al also.[17]

We have found a much lower prevalence of smoking in our patients as compared to other studies. 66.6% patients in the study by Koch et al were smokers.[10] Waly et al saw exactly similar prevalence of smoking in Egyptian patients. In the same study, prevalence of smoking was found to be much lower (47.5%) in American patients but it was still higher than that seen in our study.[14]

Data regarding family history of premature CAD in patients undergoing CABG is relatively less forthcoming. 19.9% of our patients had family history of premature CAD whereas 54.5% patients had at least one first degree relative who had had CAD at any age. Whether such high occurrence of CAD in first-degree relatives suggests clustering of risk factors in the families or influence of genes or both needs to be determined. Waly et al reported a 28.5% prevalence of family history of CAD in American patients.[14] However, age of onset of disease in the family members was not specified.

Another important finding of our study was high prevalence of obesity. 50.8% patients were overweight by WHO criteria for BMI and 75.2% patients by the modified criteria suggested for Indian population.[16]

CABG in young patients

In India, CAD has not only become exceedingly common, it tends to occur at a younger age. During the past 3 decades, the average age of a first heart attack has increased by 10 years in the U.S., but has decreased by 10 years in India. About 50% of all heart attacks among Asian Indian men occur under the age of 55 and 25% under the age of 40, something that is very uncommon in any other populations. However, contrary to our expectation, only 6.1% patients in our study were <45 years of age. The likely reasons for this difference would be relatively less extensive disease in younger individuals rendering them suitable for angioplasty and also the tendency to prefer angioplasty over CABG at younger age.

Several previous studies have consistently shown the younger patients to have, as compared to older individuals, a lower prevalence of diabetes and hypertension and a higher prevalence of dyslipidemia, family history of premature CAD and smoking.18-20 Exactly similar findings were obtained in the present study also. Prevalence of obesity was not different in the two groups. It indicates early introduction of adverse influences of faulty life-style at a younger age.

Limitations

Since we included only those patients who were undergoing CABG, the present study does not provide information about prevalence of CVRFs in Indian patients with CAD as a whole. Also, causal association of these risk factors with development of CAD or requirement of CABG cannot be assessed from the present study. In addition since the present study was a cross-sectional study, we cannot determine influence of CVRFs on outcome following CABG.

In the present study, influence of the treatment on the prevalence of risk factors could not be studied due to the lack of the information regarding the treatment status of the patients. For example, majority of the patients included in the study were already on statins. Hence it is likely that the true prevalence of dyslipidemia was underestimated. However, as 85.6% patients still had abnormal lipid profile, the figure could not have been much different even in absence of statins. Similarly for other risk factors as well treatment would have, if at all, resulted in underestimation of prevalence only.

Conclusion

The present study reveals high prevalence of most of the cardiov ascular risk factors esp. diabetes, hypertension and dyslipidemia in Indian patients undergoing CABG. This implies greater risk of short-term and long-term complications in these patients. These findings mandate strategies to increase emphasis on aggressive risk factor modification in patients undergoing CABG as well as general population in our country.

REFERENCES

1. Reddy KS. Cardiovascular disease in non-Western countries. N Engl J Med 2004;350:2438-40.
2. World Health Organization. Health situation in the South-East Asia region 1998-2000. New Delhi: WHO, 2002.
3. McKeigue PM, Ferrie JE, Pierpont T, Marmot MG. Association of early-onset coronary heart disease in South Asian men with glucose intolerance and hyperinsulinemia. Circulation 1993;87:152-61.
4. Enas EA, Garg A, Davidson MA et al. Coronary heart disease and its risk factors in the fi rst generation immigrant Asian Indians to the United States of America. Indian Heart J 1996;48:343-54.
5. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27:1047-53.
6. Gupta R. Meta-analysis of hypertension in India. Indian Heart J 1997;49:43–8.
7. Ramachandran A, Snehalatha C, Satyavani K, Sivasankari S,Vijay V. Metabolic syndrome in urban Asian Indian adults—a population study using modified ATP III criteria. Diabetes Res Clin Pract 2003;60:199-204.
8. Girinath MR. The future of cardiothoracic surgery in India. JIMA 2001;99:497–9.
9. Campeau L, Enjalbert M, Lesperance J, et al. The relation of risk factors to the development of atherosclerosis in saphenousvein bypass grafts and the progression of disease in the native circulation. A study 10 years after aortocoronary bypass surgery. N Engl J Med 1984;311:1329-32.
10. Koch CG, Weng YS, Zhou SX, et al. Ischemia Research and Education Foundation; Multicenter Study of Perioperative Ischemia Research Group. Prevalence of risk factors, and not gender per se, determines short- and long-term survival after coronary artery bypass surgery. J Cardiothorac Vasc Anesth 2003;17:585-93.
11. Seven-year outcome in the Bypass Angioplasty Revascularization Investigation (BARI) by treatment and diabetic status; The BARI Investigators. J Am Coll Cardiol 2000;35:1122-9.
12. Knatterud GL, Rosenberg Y, Campeau L, et al. Long-term effects on clinical outcomes of aggressive lowering of low-density lipoprotein cholesterol levels and low-dose anticoagulation in the post coronary artery bypass graft trial. Post CABG Investigators. Circulation 2000;102:157-65.
13. Nashef SA, Roques F, Michel P, et al. Coronary surgery in Europe: comparison of the national subsets of the European system for cardiac operative risk evaluation database. Eur J Cardiothorac Surg 2000;17:396-9.
14. Waly HM, Elayda MA, Lee VV, el-Said G, Reul GJ, Hall RJ. Risk factor analysis among Egyptian patients who underwent coronary artery bypass surgery. Tex Heart Inst J 1997;24:204-8.
15. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III). JAMA 2001;285:2486-97.
16. Obesity: Preventing and managing the global epidemic: Report in WHO Consultation. WHO Tech Rep Ser 2000;894: 1-253.
17. Chiam P, Abdullah F, Chow HK, Adeeb SM, Yousafzai MS. The ethnic characteristics and prevalence of diabetes mellitus, hypertension and hyperlipidaemia in patients who underwent coronary artery bypass grafting in Hospital Universiti Kebangsaan Malaysia. Med J Malaysia 2002;57:460-6.
18. Graziosi GC, Wolterbeek DW, Kappetein AP, Huysmans HA. Risk factors in coronary artery bypass surgery for patients 40 years of age and younger. Thorac Cardiovasc Surg 1994;42:259-63.
19. Nguyen TD, de Virgilio C, Kakuda J, et al. Characteristics of patients less than 45 years of age compared with older patients undergoing coronary artery bypass grafting. Clin Cardiol. 1998;21:913-6.
20. Kelly ME, DeLaria GA, Najafi H. Coronary artery bypass surgery in patients less than 40 years of age. Chest 1988;94:1138-41.