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Research Article

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Study of cardiovascular risk factor profile among first-degree relatives of patients with premature coronary artery disease at Kota, Rajasthan, India

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ABSTRACT

Background: Traditional cardiovascular risk factors are strong predictors of an increased likelihood for premature CHD. Considering the benefits of risk factors' management, it is imperative to find and treat them before looking for more unknown and weak risk factors. The objectives of the study was to determine the distribution of cardiovascular risk factors in first degree relatives of the patients with premature coronary artery disease.

Methods: The study was conducted under the department of Preventive and Social Medicine and patients were enrolled from the Department of Cardiology of GMC Hospital, Kota to screen the first- degree relatives of the patients suffering from premature CAD, for the presence of risk factors. For the purpose of study, 200 consecutive patients admitted in the cardiac care units of GMC Hospital, Kota with the primary diagnosis of premature coronary artery disease were enrolled. These patients' 643 first-degree relatives, who were in the coronary age group were included in the study. Inclusion criteria were age (25 years and above), residence (residing within Jaipur city) were enrolled for the purpose of the study.

Results: Out of total 643 study subjects approximately half were in middle age group (31-50 years). 66.9% of the relatives of CAD patients were males and females represented 33.1% of the study population. 66% of the first-degree relatives of the patients suffering from premature CAD were from Social class II, III and IV. approximately 50% of first degree relatives of CAD patients were bearing 1 or more CAD risk factors. Hypertension was present in 29.7% of the relatives suffering from Premature CAD. Diabetes mellitus and high lipid levels affected 13.0% and 10.1% relatives respectively. 47.5% of the relatives were either obese or leading a sedentary life style while 27.7% were smokers

Conclusions: Premature Coronary Heart Disease is a public health problem. However, there is lack of effective and intensive treatments of well-defined traditional risk factors and prevention methods for the majority of the patients experiencing premature CHD. In sum, there is still plenty of room for improvement of risk management in India.

Keywords: Atherosclerosis, Risk factors, Coronary heart disease, Coronary artery disease

INTRODUCTION

Cardiovascular diseases have become a leading cause of morbidity and mortality in adult population of Indian subcontinent. The prevalence of coronary artery disease (CAD) has doubled in both rural and urban Indians during the last 20 years. The CAD prevalence in urban

India is now four fold higher than in the US. Although the present high burden of cardiovascular disease deaths is in itself an adequate reason for attention, a greater cause for concern is the highly malignant form of CAD occurring at an early age in South East Asians. In contrast to the developed market economies where CAD mortality rates are declining, the mortality rates are accelerating in

most developing countries.² It has been estimated that 5.3 million deaths attributable to CAD occurred in developing countries in 1990.³

The diversity of current CVD profile between and within the developing countries reflects the different stages of epidemiological transition. Increased life expectancy results in more proportion of elderly population surviving up to vulnerable age. Rising prosperity and urbanization leads to life style changes resulting in consumption of unhealthy diet, physical inactivity, addictions and stressful life situations. The transition occurs first in "early adopter" segment of the society, usually the urban and affluent group with greater disposable incomes and easier access to new life style.

In view of the large ethnic population at risk of an impending epidemic, high genetic susceptibility and transitional life style with different risk factor profiles, there is an urgent need for focused approach to this problem. There is a need to contain the epidemic as well as combat its impact, minimize the morbidity and mortality. Global regional and national strategies need to be developed to fight this problem. In view of the differences in risk association, the interaction of various risk factors may be different in this population. Hence the study has been conducted in this part of Rajasthan to identify the risk factor profile of first degree relatives of the patients of premature CAD.

METHODS

The study was conducted under the department of Preventive and Social Medicine and the Department of Cardiology of GMC Hospital, Kota. The study was conducted for the period of 3 months (October-December 2015).

For the purpose of study, 200 consecutive patients admitted in the cardiac care units of GMC Hospital, Kota with the primary diagnosis of premature coronary artery disease were enrolled. These patients' 643 first-degree relatives, who were in the coronary age group were included in the study.⁴ Inclusion criteria were age (25 years and above), residence (residing within Kota city) were enrolled for the purpose of the study.

Premature CAD is defined as "sudden death or definite myocardial infarction in male before 55 years of age or in the female before 65 years of age". 5

For all these subjects detailed information about family composition, dietary patterns, socioeconomic status and housing were obtained and complete screening for conventional coronary heart disease risk factors was carried out.

The study was divided into two parts (a) questionnaire administration and; (b) clinical examination and investigations.

Questionnaire administration

The questionnaire consisted of the following parts-

Family census card: It recorded the general information about the family i. e (age, sex religion, caste, education, occupation, income etc.) of the patient with premature CAD. It also served as a source of information on prevailing health problems of all the members of the family. General questionnaire also recorded the information regarding living conditions, personal history, past and current medical history, psychological status of the patient and their first-degree relatives.

Clinical examination and investigations: Clinical examination; anthropometry and biochemical investigations.

Thorough general physical examination, a focused systemic examination and complete cardiovascular examination of index cases were performed.

Blood pressure was measured using BHS A/A grading "micro life" automated blood pressure monitoring and pulse arrhythmia detection device. A person was made to rest for 5 minutes before recording his or her blood pressure. Three consecutive readings of blood pressure were taken on the right arm in the sitting position with 5 minutes interval in between each reading. First reading was discarded and the average of other two was taken. At the time of recording blood pressure the person was advised not to talk and the machine was kept at the level of heart of the individual.

All anthropometric measurements were taken using the guidelines adopted by NIH sponsored Arlie conference Anthropometric standardization reference manual. These included height, weight, waist circumference and hip circumference.

Biochemical examination: Blood samples were analysed for complete lipid profile and glucose levels after 8 hours fasting.

The study was executed in the following way

 I^{st} contact: During 1^{st} visit, Cardiology Department of GMC Hospital was visited and all the patients admitted with the primary diagnosis of Premature CAD were noted down.

 2^{nd} contact: The patients and their relatives were contacted at their homes and were briefed on the purpose and benefits of the study. Their questionnaire was filled up with complete socio-demographic profile and family census. They were instructed to go to the standardized laboratory to give the blood samples for fasting sugar and lipid profile, after fasting for 10 hours. At this stage clinical examination and anthropometric measurements of the relatives of the patients were taken.

3rd contact: The study subjects were contacted again and reports of various investigations were also handed over to them. In case any abnormality was detected in the first-degree relatives they were referred for specialty treatment.

Data analysis

The data generated was analysed using SPSS software for detection of any association between socio-demographic status and various risk factors. A comparative analysis of risk factor profile of study subjects with that of the cases was performed.

RESULTS

Out of total 643 study subjects approximately half were in middle age group (31-50 years). 66.9% of the relatives of CAD patients were males and females represented 33.1% of the study population. 83.5% subjects were Hindus. Scheduled caste and tribes represented small number of relatives (20.1%). 31.0% of female, firstdegree relatives of patients suffering from premature CAD had received senior secondary, graduate & postgraduate level of education. Only 1/4th study population was educated up to or above senior secondary level. In males, the education level was almost equally distributed in all the categories. 66% of the first-degree relatives of the patients suffering from premature CAD were from Social class II, III and IV. Skilled labourers, farm owners, clerical class and shopkeepers represented 84.9% of the first-degree relatives of patients suffering from premature CAD (Table 1).

Table 2 shows approximately 50% of first degree relatives of CAD patients were bearing 1 or more CAD risk factors.

In 240 relatives with only 1 risk factor smoking was the most common risk factor (101 relatives). Hypertension was the next most common factor (89 relatives). Diabetes and high cholesterol levels were there in 34 and 16 relatives respectively. In 123 relatives with 2 risk factors hypertension & smoking was the most common combination (46) followed by hypertension and diabetes (32), hypertension & high cholesterol (19), smoking & high cholesterol (15), diabetes & high cholesterol (6) and diabetes & smoking (5). In all the 12 relatives with 3 0r more risk factors in addition to hypertension, 6 had diabetes, smoking & high cholesterol,3 had diabetes & smoking,2 had smoking 7 high cholesterol and 1 had diabetes & high cholesterol (Table 3).

Hypertension was present in 29.7% of the relatives suffering from premature CAD. Diabetes mellitus and high lipid levels affected 13.0% and 10.1% relatives respectively. 47.5% of the relatives were either obese or leading a sedentary life style while 27.7% were smokers. (Table 4).

Table 1: Sex wise distribution of study population according to demographic attributes.

Variable N % N % No Age (years) 25 12 1.9 3 0.4 15 2.3 26-30 33 5.0 11 1.6 44 6.9 31-35 42 6.3 14 2.1 56 8.7 36-40 59 8.7 26 3.0 85 13.2 41-45 62 9.3 21 3.1 83 13.0 46-50 74 11.1 30 4.5 104 16.2 51-55 30 4.5 17 2.5 47 7.3 66-60 19 2.8 28 4.2 47 7.3 61-65 32 4.8 27 4.0 59 9.2 66-70 31 4.7 20 3.0 50 7.8 Religion 1 10 16.2 28.1 537 83.5 Muslim 58	Demographic	Male		Fema	ıle	Total		
12			%			No	%	
12	Age (vears)							
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36-40 59 8.7 26 3.0 85 13.2 41-45 62 9.3 21 3.1 83 13.0 46-50 74 11.1 30 4.5 104 16.2 51-55 30 4.5 17 2.5 47 7.3 56-60 19 2.8 28 4.2 47 7.3 61-65 32 4.8 27 4.0 59 9.2 66-70 31 4.7 20 3.0 51 7.9 >70 30 4.6 20 3.0 50 7.8 Religion Hindu 356 55.0 181 28.1 537 83.5 Muslim 58 9.0 32 4.9 90 13.9 Sikh 8 1.2 4 0.6 12 1.86 Christian 4 0.6 0 0.0 4 0.6 Caste General 188 29.2 69 10.7 257 39.9 ST 30 4.6 21 3.2 51 8.0 ST 30 4.6 <td>26-30</td> <td>33</td> <td></td> <td>11</td> <td>1.6</td> <td>44</td> <td></td>	26-30	33		11	1.6	44		
H1-45	31-35	42	6.3	14	2.1	56	8.7	
Mef-50	36-40	59	8.7	26	3.0	85	13.2	
51-55 30 4.5 17 2.5 47 7.3 56-60 19 2.8 28 4.2 47 7.3 61-65 32 4.8 27 4.0 59 9.2 66-70 31 4.7 20 3.0 51 7.9 >70 30 4.6 20 3.0 50 7.8 Religion Hindu 356 55.0 181 28.1 537 83.5 Muslim 58 9.0 32 4.9 90 13.9 Sikh 8 1.2 4 0.6 12 1.86 Christian 4 0.6 0 0.0 4 0.6 Caste General 188 29.2 69 10.7 257 39.9 ST 30 4.6 21 3.2 51 8.0 SC 56 8.7 22 3.4 <td>41-45</td> <td>62</td> <td>9.3</td> <td>21</td> <td>3.1</td> <td>83</td> <td>13.0</td>	41-45	62	9.3	21	3.1	83	13.0	
S6-60	46-50	74	11.1	30	4.5	104	16.2	
61-65 32 4.8 27 4.0 59 9.2 66-70 31 4.7 20 3.0 51 7.9 >70 30 4.6 20 3.0 50 7.8 Religion Hindu 356 55.0 181 28.1 537 83.5 Muslim 58 9.0 32 4.9 90 13.9 Sikh 8 1.2 4 0.6 12 1.86 Christian 4 0.6 0 0.0 4 0.6 Caste General 188 29.2 69 10.7 257 39.9 ST 30 4.6 21 3.2 51 8.0 SC 56 8.7 22 3.4 78 12.1 Literacy status 1 16.2 218 32.7 Primary 59 8.8 22 3.3 81	51-55	30	4.5	17	2.5	47	7.3	
66-70 31 4.7 20 3.0 51 7.9 >70 30 4.6 20 3.0 50 7.8 Religion Hindu 356 55.0 181 28.1 537 83.5 Muslim 58 9.0 32 4.9 90 13.9 Sikh 8 1.2 4 0.6 12 1.86 Christian 4 0.6 0 0.0 4 0.6 Caste C 69 10.7 257 39.9 OBC 152 23.6 105 16.3 257 39.9 ST 30 4.6 21 3.2 51 8.0 SC 56 8.7 22 3.4 78 12.1 Literacy status 1 16.2 218 32.7 Primary 59 8.8 22 3.3 81 12.1 Literacy status 1	56-60	19	2.8	28	4.2	47	7.3	
Name	61-65	32	4.8	27	4.0	59	9.2	
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wife Farm 156 24.3 156 24.3 165 25.6 owner/clerk/sh op Semi-professiona 25 3.8 25 3.8 30 4.6 Professional 27 4.1 27 4.1 28 4.4								
Farm owner/clerk/sh op 156 24.3 156 24.3 165 25.6 Semi-professiona 25 3.8 25 3.8 30 4.6 Professional 27 4.1 27 4.1 28 4.4		163	25.3	163	25.3	352	54.8	
owner/clerk/sh op Semi-professiona 25 3.8 25 3.8 30 4.6 Professional 27 4.1 27 4.1 28 4.4		156	24.3	156	24.3	165	25.6	
op Semi-professiona 25 3.8 25 3.8 30 4.6 Professional 27 4.1 27 4.1 28 4.4		155	5	100	_ 1.3	100	_5.0	
Semi-professiona 25 3.8 25 3.8 30 4.6 Professional 27 4.1 27 4.1 28 4.4								
Professional 27 4.1 27 4.1 28 4.4		25	3.8	25	3.8	30	4.6	
				27				

Table 2: Frequency of major risk factors *amongst CAD patients' first-degree-relatives.

No of risk factors	Patients' relatives	Patients' relatives				
	N	%				
0	268	41.6				
1	240	27.3				
2	123	19.2				
3 or more	12	1.9				

^{*(}Major risk factors include hypertension, diabetes, smoking and high cholesterol).

Table 3: Frequency distribution of various risk factors in different categories of relatives of CAD patients.

Category (C) risk factor	No of patients (N)	Hypertension	Diabetes	High cholesterol	Smoking	Total frequency of risk factors
0	268	0	0	0	0	0
1	240	89 (37.08)	34 (14.16)	16 (6.67)	101 (42.08)	240 (100.0)
2	123	97 (39.43)	43 (17.47)	40 (16.26)	66 (26.82)	246 (100.0)
3 or more	12	12 (28.57)	10 (23.48)	9 (21.42)	11 (26.19)	42 (100.0)
Total	643	198	87	65	178	528*

^{*}overlapping risk factor categories' cumulative frequency in 375 first degree relatives of CAD patients who have one or the other risk factor.

Table 4: Distribution of risk factors among first-degree relatives of CAD patients.

	Sex				Total N	Total N=643		
Risk Factor	Male		Female	Female				
	No	%	No	%	No	%		
Hypertension	134	20.1	64	9.6	198	29.7		
Diabetes	61	9.1	26	3.9	87	13.0		
High cholesterol	45	6.7	20	3.0	65	10.1		
High LDL	45	6.7	15	2.2	60	8.9		
Low HDL	170	25.5	91	13.6	261	39.1		
High triglyceride	113	16.9	44	6.6	157	23.5		
Smoking	147	22.0	31	4.6	178	26.6		
Obesity	52	7.8	9	1.3	61	9.1		
Sedentary life style	203	31.5	44	6.8	247	38.4		
Mental stress	57	8.5	44	6.6	101	15.1		

DISCUSSION

During the past 30 years, a large decline in cardiovascular diseases has been experienced in the West and substantial increase has been experienced in developing countries. These trends are expected to continue and the medical, social and economic consequences of CAD will be enormous. Hence this study was undertaken under the Department of PSM and information was gathered from the patients' relatives at the cardiac care units of GMC Hospital for calculating the frequency of risk factors in the patients suffering from premature CAD and their first degree relatives. An understanding of the risk factors that lead to development of premature CAD is required to develop strategy for prevention.

This study reflects the existence of CAD in the lower socioeconomic group (SE Class III-V constituting more than $2/3^{\rm rd}$ proportion of total relatives) of people in this

part of Rajasthan. Kutty et al in their study on prevalence of CAD in rural population of Thiruvnantpuram also reported existence of CAD in poorest class of society (22%). The scenario has changed considerably from 1970's when low socioeconomic group of people in rural and semi-urban India were engaged in lot of physical labour and hence the prevalence of CAD was reported to be low in this group. In a study of premature CAD, Shaukat et al has reported high proportion of patients from lower and middle socio-economic class which they have attributed to the clientele of the hospital which being a Government sponsored, free facility center, catering mainly to middle and lower class of the population of capital city of India, which is quite similar to this study that has been undertaken in GMC Hospital, Kota.7

In the present study risk factor profile of the first-degree relatives residing within Kota City was analyzed. There were 643 relatives (426 males and 217 females) with a male to female ratio of 1.9:1 Females were older to their male counterparts (47 versus 43 years). The mean age was 44.3 years. Most of them belonged to 41 to 55 years age group (42.4%). In comparison with the CAD patients mean age was 5 years more but this mean age of relatives was still within the definition of premature CAD age group hence reflecting the relevance of comparative analysis.

Proportion of hypertensive in male relatives were almost double (20.1%) than the females (9.6%). In the comparative age group from general population free from CAD Shankar Krishna Swami et al in the study "CAD in Indians from CMC Vellore reported hypertension in 21.6% of male and 8.6% of females). Enas and Enas also reported 14% prevalence of hypertension in their study of CAD in Indians in the USA. Total cholesterol, LDL, HDL cholesterol and triglycerides were measured in all cases. 29.0% of the relatives of CAD patients were having high LDL levels. A large study of persons developing premature CAD Allen JK et al (Prevalence of Hypercholesterolemia among siblings of persons with premature CAD; Arch Int Med: 1996) showed that high LDL cholesterol levels, more than 160 mg/dl were present in 38.0% asymptomatic siblings of the patients. 10 Low HDL level was 40.5% in relatives of CAD patients & significantly more males (26.4%) were having this low HDL levels than females (14.1%). Kaul U has reported low HDL cholesterol in 38.7% population from urban Delhi.⁴ High triglyceride levels were present in 31.5% of male and 12.9% of the female relatives and the difference was statistically significant (p<0.05). High triglyceride levels were observed in 24.3% of the relatives in our study. A 33.0% prevalence of high triglyceride levels has been reported from Haryana by Siwach et al.11 This similarity has not been observed in the European atherosclerosis research study, which investigated young adults with a paternal history of premature CAD. In this study (EARS) serum triglyceride levels were higher in those with a positive family history of premature CAD than in the general population. 12 Diabetes was noted in 12.2% relatives of CAD patients. Comparative prevalence of diabetes among general population in India has been reported to be between 8.0% (Enas and Enas; CADI study-2002) to 12.0% (Mohan V et al. Chennai Urban Population Study 2000). 9,13 A highly significant association between diabetes and development of CAD has been reported and it has been observed that even prediabetic subjects have the same probability of developing CAD as age and sex matched diabetic subjects, hence the importance of screening the pre-diabetics for CAD risk factors. In a case control study of 300 acute myocardial infarction cases and 300 hospital-based controls in India, Pais et al found that glucose elevations within the normal range demonstrated a continuous relationship with risk of acute myocardial infarction. 14 24.8% relatives of premature CAD patients were habitual smokers. Out of 643 relatives, 25.6% smoked bidi, cigarette or hookka & the males were significantly more (21.7%) than females (3.8%) (p<0.05). It is estimated that 65.0% of all men use

some form of tobacco (35.0% smoking, 22.0% chewing and 8.0% multiple forms). Prevalence rate for smoking in women is generally low (3%) but varies widely-from 15% in Bhavnagar to 67% in Andhra Pradesh (Prem Pais; Smoking and CAD, The Indian scenario 1998).14 Use of tobacco chewing is similar in men and women in general population. Gupta R in his study on Prevalence of CAD and CAD risk factors in an urban population of Rajasthan published in indian heart journal reported a prevalence of tobacco use in 39% of general population. Of the smokers 62.0% smoked cigarettes, 21% smoked bidis and 17% smoked both. 15 Bidis consists of a small amount of tobacco wrapped in temburni leaves. In spite of its small size bidis deliver a higher content of tar and nicotine than conventional Indian cigarettes. This may explain the similar risk of developing CAD in bidi and cigarette smokers. 28.8% male & 10.0% female relatives were either overweight or obese, giving overall distribution of abnormal BMI as 38.9%, (p<0.05). Obesity is associated with increased prevalence of other CAD risk factors and increased morbidity and mortality from CAD. In most affluent societies there is an inverse relationship between socio-economic status and prevalence of overweight but in societies where food is scarce, overweight may be seen as a visible indicator of wealth and status and the transition period from poverty to affluence is accompanied by overall increase in weight and abdominal obesity. 32.1% of the males and 14.4% of the female relatives were classified as having visceral obesity according to waist hip ratio.

Abdominal obesity is a marker of abnormal glucose insulin metabolism, hypertension, low HDL cholesterol, increased triglycerides and increased risk of CAD. Reddy KS, Puri SK and Bahl VK on a study of CAD risk factors in an industrial population of North India published in Can J Card have reported 70.9% and 39.1% prevalence of abdominal obesity in general population. ¹⁶ In comparison to Europeans and Americans, Indians have a more central distribution of body fat. In addition at any given level of waist- hip ratio, prevalence of diabetes is twice in Indians as compared to Whites, and both WHR and diabetes mellitus are independently related to CAD. 31.5% of male relatives were leading a sedentary life style prevalence of sedentary life style has been reported to be ranging from 20.0% (CADI 2002) to 33.3% (Sonia A et al, SHARE Pilot study). 17 Out of 643 relatives, 15.6% were either having anxiety or depression and it was slightly more in males (8.9%) than females (6.8%) (p>0.05). Psychosocial factors and individual life style have significant impact on health. Unhealthy habits account for 54.0% of known contributions to CAD. Gupta et al in their observations on "psychosocial factors and coronary artery disease", from Jaipur also observed that psychosocial factors associated with increased risk of CAD were lack of joint family support, more number of children, religious non-affiliations and lack of prayer habits.¹⁸ Varghese et al in their study titled 'type A behaviour and CAD (JAPI: 1985)" and Chadha et al in the study "Coronary prone behaviour and MI" (JAPI: 1920) have also reported a strong correlation of CAD with type A personality. 19,20

CONCLUSION

Currently in actual family practice family screening for risk factors is undertaken in less than 20.0% of premature CAD patients. Screening individuals with a family history of premature CAD is encouraged by all the current guidelines. The potential yield from family screening in identifying high-risk individuals is considerable but increased resources are needed to carry this out properly.

There should be Indian guidelines issued on the pattern of US health agencies.

- Eat a variety of foods
- Avoid too much fat, saturated fat and cholesterol
- Eat food with adequate starch and fiber, low in salt content.
- Avoid too much sugar.
- If you drink alcoholic beverages, do so in moderation
- Maintain desirable weight
- Be physically active, walk 30-60 minutes, 3-4 times a week.
- Stop smoking

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