Biochemical assessment of risk factors in coronary artery disease patients: An observational study in suburban hospital of Hapur, Uttar Pradesh

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ABSTRACT

Background: Coronary risk factors such as hypertension, diabetes and coronary artery disease (CAD) have become major health problem in Indian subcontinent, despite low fat intake and low rates of obesity. It is a paradox that the increased risk of people of Indian origin to diabetes and CAD is not explained by conventional risk factors. It is possible that the presence of new risk factors may explain this paradox. **Aims and Objective:** The present study was undertaken to estimate the prevalence of coronary artery disease and identify & compare some socio-demographic and lifestyle risk factors associated with coronary artery disease in urban and rural populations of Hapur. **Materials and Methods:** It's a community based study in which 350 adults each were randomly selected from urban and rural populations of Hapur using modified cluster sampling method. Selected individuals were examined. Data entry and analysis was done using SPSSversion16 for windows version 8.1. Several published epidemiological and case-controlled studies are reviewed. The prevalence of hypertension (3.2%), diabetes (2.6%) and CAD (3.2%) is very low in the rural population of India. However, in urban and immigrant populations, the prevalence of hypertension ($\geq$160/95, 12–20%), diabetes (6–8%) and CAD (7–14%) is significantly higher than in the developed countries. **Result:** Out of 350 patients of CAD included in study, 133(38%) were females and 217(62%) were males. Among those 54(15.4%) were below 45 years of age and 296(84.6%) were equal to and above 45 years of age. Risk factors like gender prevalence, family history of IHD, lifestyle, triglycerides level, HDL level, BMI and smoking were not significantly associated with different age groups(p-value >0.05). While HTN, DM, stress, LDL level and cholesterol were found to be significantly associated with age $\geq$45 years. **Conclusions:** These studies support the consensus that people of urban origin wherever they are settled should have lower desirable limits of serum cholesterol, body mass index and dietary fat intake and should also decrease new risk factors for prevention of CAD. This finding may require modification of the existing guidelines of the International Task Force for Prevention of CAD.

Key words: Hypertension; Diabetes; Ethnicity; Prevalence; Angiotensin-converting enzyme

INTRODUCTION

CAD has become a major health problem in India. In developing countries we find nearly one-fourth of the total world population which is in the process of nutritional transition from poverty to middle class owing to rapid economic development.[1,2] Reliable population-based data on coronary mortality are not available from South Asia; however, current epidemiological evidence from India and Sri Lanka indicates that CAD has become a public

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health problem in these countries.[3] In the Indian urban population, there has been a ten-fold increase in CAD prevalence in the last three decades.[4] A similar situation appears to exist in Pakistan, Sri Lanka, Bangladesh and Nepal, as revealed by the World Health Organization estimates.[1,2] In urban areas, CAD is as common as in developed countries and the prevalence varies between 7–14%.[4-6] Studies from rural areas have shown a three-fold lower prevalence as compared to cities; however, a rising trend has been observed in both rural and urban areas.[7]

The prevalence of CAD is higher in the south India as compared to North India in both rural and urban areas.[3,6] The risk of CAD in South India is higher among higher social classes.[7] CAD incidence, case fatality and mortality have been reported[8-15] to be unusually high among people of Indian origin living in industrialized countries. In England and Wales in 1979-1983, coronary mortality was 36% higher in men and 46% higher in women born in South Asia than in the general population.[9] In South Africa, in 1985, the relative risk of coronary death in Indians compared with Europeans was 1.3 in men and 1.7 in women.[10] The relative risk of CAD in men of Indian origin aged less than 40 years was more than twice the national average.[9] High coronary mortality is common in Gujarati Hindus, Punjabi Sikhs and Muslims from Pakistan and Bangladesh.[11] The increased susceptibility of Indians to CAD has been hard to explain by conventional coronary risk factors and diet and lifestyle factors.[12-14] However, most experts have compared Indians with indigenous white populations to reach these conclusions. This is of course open to bias.[15] There is higher risk of CAD in persons having central obesity, diabetes and insulin resistance[12], although even insulin sensitivity cannot fully account for the increased coronary mortality in Indians.[16] Accumulation of cholesterol and calcium is damaging to endothelial cells and can, in conjunction with higher Lp(a), insulin, angiotensin II and other risk factors and antioxidant deficiency, enhance the process of atherosclerosis.[17-19]

CAD is three times more common in the urban north (9.0%), four times more common in urban south Indians (13.9%) and Mumbai (11.6%), and significantly higher in Nagpur (10.0%) and Calcutta (8.2%) than in the rural (3.2%) population.[7,15] Increased susceptibility to CAD in Indians may be due to decreased beta-cell functions, insulin resistance and CAD hyperinsulinemia, increased prevalence of type II diabetes, increased Lp(a), increased plasminogen activator inhibitor-1 and Apo-B and decreased tissue plasminogen activator and low HDL-cholesterol.[17] Recently inflammatory markers and infections, heart rate and blood pressure variability as well as increased angiotensin-converting enzyme activity in urban compared to rural subjects (39.5 vs. 65.5 IU) have been demonstrated to be important risk factors of CAD.[18-19] The HOPE study has reported that treatment with angiotensin-converting enzyme inhibitors can cause significant reduction in cardiovascular and all-cause mortality in the intervention group compared to the control group.[20]

Aims and objective

The present study was undertaken to estimate the prevalence of coronary artery disease and identify & compare some socio-demographic and lifestyle risk factors associated with coronary artery disease in urban and rural populations of Hapur.
- To identify risk factors for coronary artery disease.
- Effect of biochemical profile such as Lipid Profile.

MATERIALS AND METHODS

Study design
The present study is a Randomized, Prospective and Comparative study in Saraswati Institute of Medical Sciences and Hospital, Hapur (UP).

Study area
The study was conducted in District Hapur (UP), India.

Study period
The study was conducted from October 2017 to February 2018.

Study setting
The study was carried out from the patients being referred to the Department of General Medicine, Saraswati Institute of Medical Sciences and Hospital, Hapur (Uttar Pradesh).

Study population
A total of 350 individuals were recruited in the study. In the present series, the subjects were diagnosed with hypertension with no further immediate medical complications. Approval from a research ethical committee of SIMS, Hapur was taken. Written consent from patients was obtained. Cross sectional study design was used. All the male and females patients of different age groups admitted with IHD were subjects of the study. Semi-structured questionnaire having both open ended and closed ended questions were used to collect the data.

Statistically analysis
Data was analyzed by using computer software SPSS version 16. Descriptive statistics were used to describe data. Chi square test was applied to check the significance between groups. P-value less than 0.05 was considered significant.

Ethical approval
Ethical Approval was taken from the Institutional Ethical Committee after explaining the aim and objectives of the Study.

Detailed procedure

All patients underwent a clinical and laboratory evaluation.

RESULTS

Out of 350 patients of CAD included in study, 133(38%) were females and 217(62%) were males. Among those 54(15.4%) were below 45 years of age and 296(84.6%) were equal to and above 45 years of age. Risk factors like gender prevalence, family history of IHD, lifestyle, triglycerides level, HDL level, BMI and smoking were not significantly associated with different age groups (p-value >0.05). While HTN, DM, Stress, LDL level and Cholesterol level were found to be significantly associated with age ≥ 45 years. Comparison of gender with frequency of risk factors did not show any significant difference with a family history of IHD, Cholesterol level, triglycerides level, BMI (p-value >0.05). HTN, stress & HDL showed highly significant differences with male gender.

Table 1 shows the Distribution of various risk factors among Coronary Artery Disease. Among those 54(15.4%) were below 45 years of age and 296(84.6%) were equal to and above 45 years of age. Risk factors like gender prevalence, family history of IHD, lifestyle, triglycerides level, HDL level, BMI and smoking were not significantly associated with different age groups. While HTN, DM, Stress, LDL level and Cholesterol level were found to be significantly associated with age ≥ 45 years.

DISCUSSION

We found in our study that there is a predisposition of male gender among patients of CAD (Male 62% & female 38%). Our study shows that 15% of CAD patients are in the 45 ≤ years of age group. Results are different in different study because of variation in our dietary habits, sedentary lifestyle and stress level. In our study results, 57% patients have the family history of CAD. 30.3% of CAD Patients were suffering from Diabetics in our study. If we compare the rural population of India to other population groups, it is clear that the prevalence of CAD is still very low. This may be acceptable. The risk of CAD shows a gradient with increase in affluence in urban and immigrant

Risk factors	Age of patient group					
	<45	≥45	Total	Chi square value	p value	significance
Gender of pts						
Female	17	116	133	1.152	0.283	Insignificant
Male	37	180	217			
Family h/o IHD						
No	19	131	150	1.535	0.215	Iinsignificant
Yes	35	165	200			
Having HTN						
No	25	95	120	4.088	0.043	Significant
Yes	29	201	230			
Having DM						
No	44	200	244	4.188	0.041	Significant
Yes	10	96	106			
Life style a/c activity level						
Sedentary	26	182	208	3.370	0.066	Insignificant
Active	28	114	142			
Stress						
No	25	69	94	12.283	<0.001	Significant
Assessment						
Yes	29	227	256			
Cholesterol level						
Normal	35	232	267	4.644	0.031	Significant
High	19	64	83			
TG level						
Normal	101	151	252	1.652	0.199	Insignificant
High	32	66	98			
LDL level						
Normal	97	151	248	0.447	0.504	Insignificant
High	36	66	102			
HDL level						
Below normal	27	79	106	10.130	<0.001	Significant
Normal	106	138	244			
BMI						
Normal	85	128	213	0.839	0.360	Insignificant
High	77	60	137			

Table 1: Distribution of various risk factors among coronary artery disease

populations and from lower social classes to higher social classes.[5-7] This is against the results in, developed countries where lower social classes have a greater risk of CAD than higher social classes.[1,2,19]

Comparison of the lifestyles of rural and urban subjects and of lower and higher social classes shows that the most striking difference is that the rural and lower social classes have higher occupational physical activities.[5-7,21,22] Rural and lower social classes also consume low fat, cereal-based diets, have low mental stress, lower serum cholesterol, lower triglycerides and lower body mass index which indicate a graded increase in these risk factors in urban and immigrant populations.[7,22] Low levels of risk factors and higher physical activity lead to a low risk of CAD despite higher levels of smoking and a lower intake of protective fruit and vegetables.[22,23] It is possible that cessation of tobacco intake and an increase in fruit and vegetable intake can further decrease the risk of CAD in the rural population and in lower social classes.[23] Cessation of smoking may also be important for the prevention of CAD in Indians where 30–45% of men smoke. A recent study among people of Indian and Pakistani origin living in the USA showed a higher risk of CAD among them than Americans.[24] It is paradoxical that people of Indian origin have a higher risk of CAD despite a low fat intake, lower serum cholesterol and lower body mass index.[24] Physical inactivity and an increase in dietary fat intake (although still within desirable limits) in conjunction with psychosocial stress appear to be the most important determinant lifestyle factors in the increased susceptibility to CAD in urban and immigrant populations. Therefore, moderate physical activity, such as brisk walking (30 min/day) and jogging (3 km/day), may be important for the prevention of CAD.[23]

Increased consumption of milk (calcium, lactose and saturated fat) and an inverse association of cereal intake with CAD risk[7] indicate that Indians should continue to eat low fat foods and more cereals, which may be protective. Increased physical activity and a decrease in trans fatty acids and more ω-3 fatty acids (mustard and soyabean oils) may decrease insulin resistance and dyslipidemia. South Asians also have higher triglycerides, Lp(a) and low high-density lipoprotein cholesterol (HDL-C) levels as well as a high total cholesterol: HDL-ratio.[12-15,17] Nicotinic acid is known to decrease Lp(a) and triglycerides and increase HDL-C which may be useful for the prevention of CAD in Indians, if diet and lifestyle changes show no response in dyslipidemia tests within six months of trial.[25] However, for secondary prevention, statins should be administered with nicotinic acid in conjunction with diet and lifestyle changes to achieve normal serum cholesterol, triglycerides and HDL-C levels similar to low-risk rural populations.[26] It is unlikely that statins are the answer for new risk factors

common in Indians.[27] It seems that simply reducing the conventional risk factors to below those of the general population may not be the answer.

There is a need to find out the role of trace elements chromium, copper, zinc, magnesium and ACE-inhibitors in the prevention of CAD and diabetes in Indians in view of the extraordinary results of the HOPE study.[20] CAD in people of Indian origin is due to the interaction of genetic and environmental risk factors. However, "genetic" does not mean non-nutritional or non-environmental. The efficacy of weight loss, physical activity and a decrease in central obesity in reversing insulin resistance, resulting in a significant reduction in cardiac events in patients with CAD, has also been observed in Indians.[23] Association of low maternal body weight and small size at birth with the risk of CAD and higher postprandial plasma insulin responses in low birth weight children in Indians indicates that improving the nutrition of pregnant mothers and infants appears to be important for the prevention of CAD It may be necessary to control the lipid tetrad index: (total cholesterol 3 triglycerides 3 lipoprotein(a)/HDL) in Indians with due consideration to hyperinsulinemia, ACE activity and homocysteinemia especially for secondary prevention of CAD.[28-31] Since the main victims of CAD are higher social class urban and rural populations, it may be prudent simply to stop tobacco consumption, and increase seasonal fruit and vegetable intake in lower social classes for the prevention of CAD.

CONCLUSION

This study showed the increased frequency of stress followed by hypertension, sedentary life style, family history, smoking, diabetes, obesity and dyslipidemia. Frequency of acute CAD cases is more than chronic CAD cases. Stress & hypertension are more common in males while sedentary lifestyle and diabetes mellitus are in females and in age group equal to and more than 45 years.

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