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ORIGINAL RESEARCH

Clinical profile of coronary artery disease patients residing in urban and rural areas of Central India

[1]Dr. Varun Gupta, [2]Dr. Mohar Singh Uchariya, [3]Dr. Gagandeep Kaur, [4]Dr. Manju Pandey

[1,2]Assistant Professor, [4]Professor and Head, Department of General Medicine, K. D. Medical College and Research Center, Mathura, UP, India
[3]Associate Professor, Department of Community Medicine, K. D. Medical College and Research Center, Mathura, UP, India

Correspondence:
Dr. Manju Pandey
Professor and Head, Department of General Medicine, K. D. Medical College and Research Center, Mathura, UP, India

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Abstract

Background: The most common cause of mortality in all of India, including the poorer states and rural areas, is coronary artery disease (CAD), despite significant regional variation in the frequency of risk factors. There are several population studies highlighting demographic and socio-economic CAD risk factors. There is paucity of data on CAD especially, more so from rural background. Therefore, the present study was conducted with an aim to analyse the risk factors, clinical presentation and angiographic profile among CAD patients from rural and urban areas.

Methods: This Cross-Sectional Clinical Study was conducted among 124 patients with coronary artery disease attending the medicine and cardiology OPD and had admitted in medicine ICCU and wards in medical college and hospital during October 2014 to October 2015. A pretested questionnaire was used to collect the data. Patient found suitable for the study were subjected for clinical, haematological (including CPK‑MB), ECG, ECHO and coronary angiography investigations. The data were entered in Microsoft Excel sheet. The data was analysed using SPSS package and appropriate tests like chi-square, 't'-test and ANOVA were applied.

Results: Out of 124 patients, 44.4% (55/124) were from rural area and 55.6% (69/124) were from urban area.The mean age of urban subjects was 47.3±8.9 years and 48.4±7.8 years in rural subjects.Female from urban area (31.9%) were having more coronary artery disease when compared with female from rural area (27.3%).STEMI was the most common type of ACS observed among the admitted subjects with CAD from both urban (76.8%) and rural areas (72.7%). Time to onset of symptoms to presentation to hospital was 7-12 hours among 43.6% of subjects form rural area. The coronary angiogram showed obstructive coronary artery disease among 39.1% of subjects form urban area (n=46) and 43.6% of subjects from rural area (n=39). The death rate among rural subjects with CAD (5.5%) was higher than the subjects from urban area (1.4%).

Conclusion: In India, under diagnosis and underreporting of CAD is frequently seen among rural people. Economically underprivileged patients with CAD less often receive evidence-based treatments. The distribution of the healthcare workforce, between rural and urban India

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is not uniform. The earlier notion that the rural population is less prone to CAD is slowly dwindling due to rapid urbanisation of rural lifestyles.

Keywords: STEMI, Unstable angina, Coronary angiogram, Urban, Rural, Coronary artery disease

Introduction

Atherosclerosis is a chronic inflammatory disorder that begins in childhood and is caused by a variety of causes, the most important of which is abnormal lipid metabolism. According to studies, atherosclerotic plaques or their precursors can be found in kids as young as ten. Atherosclerotic disease is accelerated in later life by poor nutrition, smoking, drinking, obesity, sedentary lifestyles, and family history of cardiovascular disease [1,2].

The most common cause of mortality in all of India, including the poorer states and rural areas, is coronary artery disease (CAD), despite significant regional variation in the frequency of risk factors [3]. The fast epidemiological transition model is similar to how diseases have changed in India during the last 20 years. In urban India, the prevalence of ischemic heart disease grew from 2% in 1960 to about 14% in present [4,5]. In rural areas, it increased about fourfold, from 1.7% to 7.4%, between 1970 and the present [6,7]. According to Kumar et al., study, 1.7% of men and 1.5% of women in the communities had coronary heart disease [8].

Urban areas had much greater rates of hypertension, diabetes, obesity, and inactivity, while rural areas had significantly higher rates of smoking. The rates of alcohol consumption in urban and rural areas were identical [9]. In India, the prevalence of diabetes mellitus has nearly tripled from 2% to 9% in rural regions during the past 20 years while nearly doubling from 9% to 17% in urban areas [10].According to estimates, 30% of adult Indians have hypertension (34% in urban areas and 28% in rural regions) [11]. Almost 40% of ST-segment elevation MI patients, according to a large ACS registry, arrived at the hospital after 6 hours of symptom start, and optimal in-hospital and post-discharge medical care was less available in rural areas than in urban ones [12].

There are several population studies highlighting demographic and socio-economic CAD risk factors. There is paucity of data on CAD especially, more so from rural background. Therefore, the present study was conducted with an aim to analyse the risk factors, clinical presentation and angiographic profile among CAD patients from rural and urban areas.

Materials and methods

This Cross-Sectional Clinical Study was conducted among all patients with coronary artery disease (defined as per WHO cardiovascular survey methods criteria)attending the medicine and cardiology OPD orwere admitted in medicine ICCU and wards in NSCB medical college and hospital Jabalpur, during October 2014 to October 2015. So, during that defined duration a total of patients 124 subjects were included in the study using convenient sampling technique.

A pretested questionnaire was used to collect the data. Patient found suitable for the study were subjected for clinical, haematological (including CPK‑MB),ECG, ECHO and coronary angiography investigations.Urban and Rural population were defined according to census of India data. Rural Patients: Patients belong from a cluster, which have population of <2500, according to the Census2011 and patients from places which were included as “Villages” in villages list of Jabalpur district, persons born in these villages and still living there.Patients not satisfying above criteria were considered to urban patients.

Blood pressure (BP) measurement was done after 10 minutes rest in supine position, with no tight clothes, mean of two measurements was registered and hypertension defined as perInternational Society of Hypertension Global Hypertension Practice Guidelines. Blood

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sugar was measured by glucose oxidase peroxidase method and diabetes defined according toClassification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes.Anthropometric evaluation was carried out including height, weight, and Body mass index (BMI) was calculated by formula: body weight (in kilogram)/ height^2 (in meter)and overweight and obesity defined as BMI ≥25kg/m^2.

Serum cholesterol was measured by cholesterol oxidase peroxidase method.Serum triglycerides (TGs) was measured by glycerol phosphate oxidase peroxidase method.Serum high-density lipoprotein (HDL) was measured by cholesterol oxidase per oxidase method after precipitation.Serum low-density lipoprotein (LDL) was measured by Friedwald's equation derangement in lipid profile defined by adult treatment panel (ATP) III guideline.

Physical inactivity was defined among adults (≥18 years) as not achieving 150 min of moderate-to-vigorous-intensity physical activity per week or 75 min of vigorous-intensity physical activity per week or an equivalent combination of moderate and vigorous-intensity activity. Users of all types of tobacco products and present and past smokers have been included in smoker category. The diagnostic criteria for tobacco use as well as other coronary risk factors adopted were in accordance with American College of Cardiology clinical data standards.Socioeconomic status was defined on basis of Revised BG Prasad Scale, where the updated and modified value for BG Prasad socioeconomic classification calculated as per the new income value for May 2014.

Statistical analysis

The data were entered in Microsoft Excel sheet. The data was analysed using SPSS package and appropriate tests like chi-square, 't'-test and ANOVA were applied.In all the above test P value less than 0.05 were taken to be statistically significant.

Results

In our study, a total of 124 patients with CAD were enrolled. Out of 124 patients,44.4% (55/124) were from ruralarea and 55.6% (69/124) were from urban area.The mean age of urbansubjects was 47.3±8.9 years and 48.4±7.8 years in rural subjects.Female from urban area (31.9%) were havingmore coronary artery disease when compared with female from rural area (27.3%). In our study, both in urban and rural subjects, most ofCAD patients were having their education up to secondary school (47.8% and54.5% respectively). The "high" physical activity seen in urban patients was 58.0% whereas it was much higher among patients from rural area (81.8%) (Table 1).

Table 1: Baseline characteristics of the CAD subjects (Rural vs Urban) (N=124).

Variables	Number (%)		P value
	Urban (N=69)	Rural (N=55)	
Age group			
Age (in years)	47.3±8.9	48.4±7.8	0.471
Gender			
Male	47 (68.1)	40 (72.7)	0.577
Female	22 (31.9)	15 (27.3)	
Education			
Up to primary school	17 (24.6)	21 (38.2)	0.011
Secondary school	33 (47.8)	30 (54.5)	
Graduation and above	19 (27.6)	4 (7.3)	
Socioeconomic status*#			
Upper class	24 (34.8)	3 (5.5)	<0.001
Upper middle and Middle class	11 (15.9)	11 (20.0)	

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Lower middle and Lower Class	34 (49.3)	41 (74.5)	
Current Smoker#	27 (39.1)	35 (63.6)	0.006
Tobacco chewing	15 (21.7)	20 (36.4)	0.072
Alcohol intake	18 (26.1)	8 (14.5)	0.116
Fruits and vegetable consumption			
5 or more servings	8 (11.6)	2 (3.7)	0.066
2-4 servings	36 (52.2)	23 (41.8)	
<2 servings	25 (36.2)	30 (55.5)	
Physical activity			
High	40 (58.0)	45 (81.8)	0.017
Moderate	18 (26.1)	6 (10.9)	
Low	11 (15.9)	4 (7.3)	

*Revised BG Prasad SESClassification, #Statistically significant

The BMI was abnormal among 62.3% of urban patients and 58.2% of rural patients. The abdominal obesity on the basis of waist to hip ratio was seen among 69.9% of urban patients and 65.5% of rural patients. The elevated cholesterol was seen in 13.0% of urban patients and 9.1% of rural patients. Low HDL was seen in 62.3% of urban subjects and 65.5% of rural subjects. Elevated LDL was seen in 15.9% of urban subjects and 12.7% of rural subjects. Elevated triglycerideswere seen in 39.1% of subjects from urban and 32.7% subjects from rural area (Table 2).

Table 2: Risk factors characteristics of CAD subjects (Rural vs Urban) (N=124).

Variables	Mean±SD		P value
	Urban (N=69)	Rural (N=55)	
Abnormal BMI	43 (62.3)	32 (58.2)	0.639
Abdominal obesity (W/H ratio)	48 (69.9)	36 (65.5)	0.626
Body Mass Index (kg/m^2)*	24.9±2.7	23.2±1.8	<0.001
Hypertensives	21 (30.4)	21 (38.2)	0.365
Systolic blood pressure (mmHg)	118±34	116±38	0.758
Diastolic blood pressure (mmHg)	78±13	76±16	0.443
Type II Diabetes	18 (26.1)	8 (14.5)	0.116
Random blood glucose	97.5±42.6	93.2±35.7	0.550
HbA1c	5.9±2.6	5.5±2.3	0.372
Total cholesterol(mg/dL)	155.1±35.6	149.3±36.0	0.371
HDL(mg/dL)*	39.9±6.9	36.7±9.2	0.028
LDL(mg/dL)	107.4±29.4	102.9±34.5	0.434
Triglycerides(mg/dL)	124.5±47.7	116.8±32.5	0.308
VLDL(mg/dL)	23.6±9.2	23.3±7.8	0.847
Elevated cholesterol	9 (13.0)	5 (9.1)	0.489
Low HDL	43 (62.3)	36 (65.5)	0.718
Elevated LDL	11 (15.9)	7 (12.7)	0.613
Elevated Triglycerides	27 (39.1)	18 (32.7)	0.461

*Statistically significant

STEMI was the most common type of ACS observed among the admitted subjects with CAD from both urban (76.8%) and rural areas (72.7%). The unstable angina was observed among 21.8% of subjects from rural area and 15.9% subjects of urban area. Time to onset of symptoms to presentation to hospitalwas 7-12 hours among 43.6% of subjects form rural area. CPK-MB level (IU) on admission for subjects from urban and rural area with STEMI was 32.9±9.8 IU and 31.7±9.7 IU respectively. CPK-MB level (IU) after 24 hours of admission for subjects from urban and rural area with STEMI was 42.3±9.9 IU and

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41.8±8.6IU respectively.66.7% of subjects from urban area and 70.9% of subjects consented for coronary angiogram. The coronary angiogram showed obstructive coronary artery disease among 39.1% of subjects form urban area (n=46) and 43.6% of subjects from rural area (n=39). The coronary angiogram showedrecanalized coronary artery47.8% of subjects from urban area (n=46) and 38.5% of subjects from rural area (n=39). The death rate among rural subjects with CAD (5.5%) was higher than the subjects from urban area (1.4%) (Table 3).

Table 3: Clinical and angiographic characteristics of CAD subjects (Rural vs Urban) (N=124).

Variables	Number (%)		P value
	Urban (N=69)	Rural (N=55)	
Type of ACS			
STEMI	53 (76.8)	40 (72.7)	0.673
Non-STEMI	5 (7.3)	3 (5.5)	
Unstable Angina	11 (15.9)	12 (21.8)	
Time to onset of symptoms to presentation to hospital*			
<3 hours	17 (24.6)	5 (9.1)	0.011
3-6 hours	26 (37.7)	14 (25.5)	
7-12 hours	20 (29.0)	24 (43.6)	
>12 hours	6 (8.7)	12 (21.8)	
CPK-MB level (IU) on admission			
STEMI	32.9±9.8	31.7±9.7	0.372
Non-STEMI	92.4±42.1	89.3±39.2	0.675
Unstable Angina	112.3±101.2	109.9±97.6	0.894
CPK-MB level (IU) after 24 hours of admission			
STEMI	42.3±9.9	41.8±8.6	0.767
Non-STEMI	67.3±27.1	66.7±29.3	0.906
Unstable Angina	112.3±82.3	108.3±74.2	0.779
Coronary angiogram done	46 (66.7)	39 (70.9)	0.613
Coronary angiogram findings			
Obstructive coronary artery disease	18 (39.1)	17 (43.6)	0.891
Normal coronary artery	2 (4.3)	2 (5.1)	
Recanalized coronary artery	22 (47.8)	15 (38.5)	
Mild non flow limiting AP#	3 (6.6)	3 (7.7)	
Only thrombus	1 (2.2)	2 (5.1)	
Coronary artery involved			
LAD lesions	40 (87.0)	31 (79.5)	0.789
RCA lesions	3 (6.5)	4 (10.3)	
LCX lesions	1 (2.2)	2 (5.1)	
Normal	2 (4.3)	2 (5.1)	
Left ventricular ejection fraction			
Adequate systolic function	10 (21.7)	11 (28.2)	0.764
Mild LV systolic dysfunction	22 (47.8)	17 (43.6)	
Moderate LV systolic dysfunction	11 (23.9)	7 (17.9)	
Severe LV systolic dysfunction	3 (6.6)	4 (10.3)	
Death	1 (1.4)	3 (5.5)	0.209

*Statistically significant, #AP: atherosclerotic plaques

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Discussion

In our study, STEMI was the most common type of ACS observed among the admitted subjects with CAD from both urban (76.8%) and rural areas (72.7%). The unstable angina was observed among 21.8% of subjects from rural area and 15.9% subjects of urban area, and similar pattern also noted in other studies [13,14]. Akram et al., found that the most common anatomical location of the MI was the anterior wall and 92.3% of the cases were MIs with ST segment elevation [15].

In our study, the time to onset of symptoms to presentation to hospital was 7-12 hours among 43.6% of subjects form rural area. In a study done by Sricharan et al., the mean time of presentation after the onset of the symptoms was 14.73 hrs [16]. In a study, only 34.9% presented within 6 h to hospital with majority presenting late to hospital indicating lack of awareness and delayed referral [12].However, this is a phenomenon that warrants further exploration [17].

In our study, the adequate systolic functionwas noted in 21.7% of urban and 28.2% of rural patients. Also, mild LV systolic dysfunction was noted in 47.8% of urban and 43.6% of rural, which was similar to other studies which CAD patients more often to have normal to mild LV dysfunction [14,18].

In our study, the coronary angiogram showed obstructive coronary artery disease among 39.1% of subjects form urban area (n=46) and 43.6% of subjects from rural area (n=39). The coronary angiogram showed recanalized coronary artery 47.8% of subjects from urban area (n=46) and 38.5% of subjects from rural area (n=39). In a study done by Gotman et al., on angiography identified higher incidence of no‐vessel or one‐vessel disease in 43.8% of patients [19].

Hospital based studies are useful to monitor trends of non-communicable diseases and there is an ongoing need for periodic surveys to document trends of CAD, in order to assess interventions and plan prevention. In present study,the prevalence of CAD was higher in males as females whether it urban (male: 68.1% and female: 31.9%) or rural area (male: 72.7% and female: 27.3%). This pattern was similar to other hospital-based studies worldwide [17]. A systematic review of studies from India also showed little increase in prevalence rates CAD among men [20].Possible explanations for the higher prevalence of angina in females may include gender differences in health perceptions or differential health-seeking behavior or that these symptoms in females may not always indicate severe disease.

In our study, the BMI was abnormal among 62.3% of urban patients and 58.2% of rural patients. The abdominal obesity on the basis of waist to hip ratio was seen among 69.9% of urban patients and 65.5% of rural patients. Our study results were consistent with Venkatramana et al., and Gupta et al., studies, in which prevalence of obesity were significantly greater in the urban patients [21,22]. Studies have shown thatincrease in BMI results in significant dyslipidemia and insulin resistance and a 3-fold increase in diabetes [23,24].

In our study, the elevated cholesterol was seen in 13.0% of urban patients and 9.1% of rural patients. Low HDL was seen in 62.3% of urban subjects and 65.5% of rural subjects. Elevated LDL was seen in 15.9% of urban subjects and 12.7% of rural subjects. Elevated triglycerides were seen in 39.1% of subjects from urban and 32.7% subjects from rural area. Our findings were similar with those of Pais et al, and others who reported high triglycerides and low HDL cholesterol with normal LDL cholesterol in their cases [9,25,26]. The lower HDL-C and higher triglyceride levels were found prominently in Indians [27,28]. Low levels of HDL cholesterol have been shown to be a powerful risk factor for CAD [9,25].Serum LDL concentration was significantly ($p<0.001$) elevated in urban population in comparison with rural population[29].

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Conclusion

In India, underdiagnosis and underreporting of CAD is frequently seen among rural people. Economically underprivileged patients with CAD less often receive evidence-based treatments. The distribution of the healthcare workforce, between rural and urban India is not uniform. The earlier notion that the rural population is less prone to CAD is slowly dwindling due to rapid urbanisation of rural lifestyles. Improving the human resource capacity for the prevention and control of CAD should be a national priority, and efforts should be made to ensure equitable distribution of available resources in both rural and urban settings.Higher rates of cardiovascular disease in urban India compared to rural India suggest important roles for nutritional and environmental factors, or nature.

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