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Original Article

Profile of coronary artery disease in indian rural youth (< 35 yrs)

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ABSTRACT

Aims: To study the risk factors, clinical and angiographic profile of Indian rural youth (under 35yrs) presenting with Premature Coronary Artery Disease (PCAD).
Subjects: and Methods: The PCAD registry had 1628 patients who were aged below 35 years, of which 681 patients satisfied the entry criteria. The data was analysed by statistical software R version 3.5.0.
Results: The study enrolled 681 patients after satisfying the entry criteria. The mean age of patients was 30.85 years. There were 405 (59.5%) aged between 30 and 35 yrs, 205 (30.1%) between 25 and 30 yrs, 64 (9.4%) between 20 and 25 yrs and 7 (1.0%) were aged less than 20 yrs. Majority of them were males, 617 (90.6%). Nearly 411 (60.4%) were smokers, 56patients (8.2%) were diabetics and 97 (14.2%) were hypertensives. Around 441 (64.8%) patients had low HDL cholesterol levels and 218 (32.0%) had elevated triglyceride levels. Abdominal obesity was seen in 443 (65.1%) patients. Most common clinical presentation was ST elevation myocardial infarction (STEMI) seen in 536 (78.7%) patients. Around 40% patients had recanalized/non obstructive/thrombotic/normal coronaries on coronary angiogram.
Conclusions: Conventional risk factors such as smoking, low HDL levels and abdominal obesity play a major role in the causation of premature coronary artery disease among the rural youth. Thrombotic milieu in the coronaries was commonly noted in coronary angiograms. Lack of awareness, combined with urbanisation of rural lifestyle could be responsible for increasing incidence of premature coronary artery disease in rural youth.

1. Introduction

Atherosclerosis is a chronic inflammatory condition which starts at young age and depends on many factors, mainly abnormal lipid metabolism.[1] Studies have shown that atherosclerotic plaques or their precursors can be seen even in children younger than 10 years.[2] In later life unhealthy nutrition, smoking, alcohol consumption, obesity, sedentary lifestyles and family history of cardiovascular disease accelerates atherosclerotic disease.[2]

Premature coronary artery disease by definition occurs at a younger age (before the age of 55 years in men and 65 years in women).[3] In its severe form, it occurs below the age of 40 years.[4] Indians are prone to CAD at a much younger age.[5] Approximately 50% of first heart attacks occur before 55 years and 25% occur before 40 years of age.[6]

Despite wide heterogeneity in the prevalence of risk factors across different regions, CVD is the leading cause of death in all parts of India, including the poorer states and rural areas.[7] The disease transition in India in the past 2 decades resembles the accelerated epidemiological transition model.

The prevalence of ischemic heart disease in 1960 in urban India was 2% and increased 7-fold to ≈ 14% by 2013.[8–16] Similarly, it more than quadrupled in rural areas, from 1.7% to 7.4% between 1970 and 2013.[14–16] Kumar et al showed the prevalence of coronary heart disease among males in the villages was 1.7% and among females 1.5%.[17] Hypertension, diabetes, obesity and physical inactivity were significantly more common in the urban areas, while the rate of tobacco smoking is significantly higher in the rural areas. The alcohol consumption rates for the urban and rural communities were comparable.[18] In the urban areas of India, the prevalence of diabetes mellitus has almost doubled in the past 20 years, from 9% to 17% and in rural areas it has nearly quadrupled, from 2% to 9%.[19] The prevalence of hypertension in adult Indians is estimated to be

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30% (34% in urban areas and 28% in rural areas).[20] The Prospective Urban and Rural Epidemiological (PURE) study had also noted low educational status in rural setup, which translates to lower rates of awareness, treatment and control of risk factors for cardiovascular disease (CVD).[21] Studies have shown that awareness and control of conventional risk factors are poor in rural regions in comparison with urban regions.[22] A large ACS registry from Kerala noted that nearly >40% of patients with ST-segment elevation MI reached the healthcare facility after 6 h of symptom onset, also the optimal in-hospital and at discharge medical care was worse in rural areas than in urban areas.[23]

There are several population studies highlighting demographic and socio-economic CV risk factors in the young. There is paucity of data on PCAD especially, in those aged below 35 yrs, more so from rural background. Therefore, we have analysed the other risk factors, clinical presentation and angiographic profile in Indian rural youth from the ongoing premature CAD registry at our institute.

2. Subjects and Methods

The PCAD registry is a prospective multisite descriptive observational study examining a cohort of young Indian adults aged ≤40 years with CAD from the point of index admission till a period of 5 years. This is registered under the Clinical Trials Registry of India (CTRI/2018/03/012,544).

Our study included all patients aged ≤35 years with index admission for ischemic heart disease, as proven by.

Inclusion criteria:

(1) Documented episode of acute coronary syndrome by history of typical chest pain, clinical examination, cardiac bio-markers, diagnostic ECG changes and coronary angiogram
(2) Chronic stable angina with evidence of CAD on coronary angiogram.

Exclusion criteria:

(1) patients with myocarditis, cardiomyopathies, and pulmonary embolism
(2) patients with previous history of ischemic heart disease or on medications such as antiplatelets and statins
(3) patients with chronic kidney disease or liver failure
(4) patients with history of use of oral contraceptives and or steroids.

For all patients detailed demographic data, history of various risk factors, clinical presentation, primary method of management, course in hospital and echo on admission were documented. Coronary angiographic profile and mode of intervention (if any) were all documented.] Diabetes was diagnosed by ADA 2020 definition.[24]

Body mass index was calculated as body weight (kg) divided by height squared (m) by IDF criteria.[25]

2.1. Statistical methods

The qualitative data were summarized by count and percentage, while quantitative data were tabulated by descriptive statistics such as mean, median and standard deviation (SD). The data were analysed by R statistical analysis and computing language version 3.5.1 (R core team, 2018) which is released under the GNU General Public License (GPL), version 2, published by the Free Software Foundation.

3. Results

A total of 3450 patients (<40 yrs) were registered under the PCAD registry during the 3yrs (2017–2020), of this 1628 patients were aged 35 yrs or younger.

3.1. Demographic characteristics

Of the registry, 681 patients (41.8%) satisfied the entry criteria. The mean age of patients was 30.85 years. There were 405 (59.5%) aged between 30 and 35 yrs, 205 (30.1%) between 25 and 30 yrs, 64 (9.4%) between 20 and 25 yrs and 7 (1.0%) were aged less than 20 yrs. Majority of patients were inhabitants/migrants from villages of districts of surrounding districts. Around 145 (21.3%) from Tumkur, 114 (16.7%) from Chikkaballapur, 66 (9.7%) from Bangalore rural and Ramanagar and 61 (8.9%) from Bellary district. Around 193 (28.3%) of them were farmers, 160 (23.5%) were drivers, 78 (11.5%) were manual labourers and 52 (7.7%) were home makers. There were 156 (22.9%) graduates, 166 (24.4%) were educated till 12th standard and 247 (36.3%) till 10th standardand 112 patients (16.4%) had no formal education.494 patients (72.5%) were covered under the government social security schemes and belonged to below poverty line category. The group had 63 (9.3%) vegetarians.

3.2. Risk factor characteristics

Majority of them were males, 617 (90.6%). Nearly 411 (60.4%) were smokers, 209 (30.7%) gave history of alcohol consumption, 56 patients (8.2%) were diabetics and 97 (14.2%) were hypertensives. Physical parameters showed that 286 patients (41.9%) had normal BMI, while 220 patients (32.3%) had high BMI (159 overweight, 61 obese), 166 patients (24.4%) had BMI which according to the revised BMI classification for south Asian Indians comes under the category of overweight. Therefore, abnormal BMI was noted in 58% patients. Going by waist-hip ratio definition, 443 patients (65.1%) had abdominal obesity.

Mean total cholesterol of entire study population was 185.967 ± 47.11, LDL was 115.913 ± 84.81 mg/dl, HDL was 32.943 ± 9.64, TG was 168.475 ± 87.11. Around 441 patients (64.8%) had low HDL cholesterol levels, 218 (32.0%) had elevated triglyceride levels, 92 (13.5%) had elevated LDL cholesterol and68 patients (9.9%) had elevated total cholesterol levels. The predominant form of dyslipidaemia was low HDL cholesterol with high triglycerides.

3.3. Clinical and angiographic characteristics

Most common clinical presentation was ST elevation myocardial infarction (STEMI) seen in 536 (78.7%) patients (445(83.1%) patients presented with anterior wall MI and 91 (16.9%) presented with inferior wall MI), followed by unstable angina/Non-ST elevation MI in 108 (15.9%) patients. In patients presenting with STEMI, 14 patients (2%) underwent primary PCI, 92% were thrombolysed with streptokinase, while 6% were thrombolysed with Tenecteplase. The time from onset of symptoms to presentation to hospital was within 3 h in 64 patients (9.4%), between 3 and 6 h in 174 patients (25.5%), between 6 and 12 h in 297 patients (43.6%) and more than 12 h in 146 patients (21.3%).

Around 481 patients (71%) underwent coronary angiogram. Of which 211 (31%) had obstructive coronary artery disease, 27 patients (4%) had normal coronaries, 183 (27%) had recanalized coronaries, 40 (6%) had mild non flow limiting atherosclerotic plaques and 20 (3%) had only thrombus. Of 481 patients, 377 (78.4%) had LAD lesions, 54 (11.2%) had RCA lesions, 23 (4.8%) had LCX lesions and 27 patients had normal coronaries.

Of the group 449 (65.9%) were continued on optimal medical therapy and follow-up, whereas 211 patients (31%) had significant CAD requiring PCI (201) or CABG (10), 18 patients (2.6%) were discharged on triple antithrombotics in view of high thrombus burden and advised check angiograms on follow up. There were 3 deaths in the group, due to refractory cardiogenic shock. The left ventricular (LV)ejection fraction recorded, showed adequate systolic function (>55%) in 200 (29.4%) patients, mild LV systolic dysfunction (45–54%) in 295 (43.3%), moderate LV systolic dysfunction (30–44%)in122 (17.9%), while it was severe LV dysfunction (<30%) in 64 (9.4%) patients.

The study group had seven patients who were aged under 20 yrs. All were males, three of them were smokers, two had family h/o CAD and one of them was a diabetic. All of them presented with STEMI, four with anterior wall and three with inferior wall MI. All received thrombolysis with streptokinase on admission. Only six underwent CAG and all had recanalized culprit vessel indicating presence of predominant thrombus in the coronaries.

4. Discussion

In Global Registry of Acute Coronary Events study, the prevalence of young ACS was 6.3%; in Thai ACS registry, it was 5.8%; in Spain registry, it was 7%.[26–28] In a study in south Indians by Iragavarapu et al it was 10.4%.[29] Our PCAD registry shows a higher prevalence of 16%. Of this 41.8% of the registry population belonged to rural PCAD group.

4.1. Demographic and risk factor characteristics

The population under study had predominantly males (90.6%) with average age of 30.85 years. Majority of patients (91.8%) were non vegetarians. Among traditional cardiovascular risk factors, most common risk factor was smoking present in 60.4% of patients, similar to observations in INTERHEART study, more so in rural Indians as noted by several studies.[18,30–32] It was noted that 58% had an abnormal BMI of which only 9% were obese. There were 8.2% diabetics and 14.2% hypertensives. Our findings were similar to previous studies which showed that prevalence's of hypertension, obesity and diabetes mellitus were lower in the rural population whereas smoking was common.[18] Abdominal obesity was seen in 65.1% patients, similar to other studies noted in rural population.[32]

The rural group had a low educational status with only 22.9% graduates and 16.4% had no formal education. The PURE study had also noted low educational status in rural setup which translates to lower rates of awareness, treatment and control of risk factors for CVD.[21]

Lipid abnormalities are well known to increase the risk of CAD. The predominant form of dyslipidemia found in the young rural population was low HDL cholesterol in 64.8% and high triglycerides in 32.0%. Only 13.5% had elevated LDL cholesterol and 9.9% had elevated total cholesterol levels.

Our findings were similar with those of Pais et al, and others who reported high triglycerides and low HDLcholesterol with normal LDL cholesterol in their cases.[18,32,33] The lower HDL-C and higher triglyceride levels were found prominently in young Indians.[29,34] Low levels of HDL cholesterol have been shown to be a powerful risk factor for CAD.[18,32] Alcohol consumption was noted in 30.7% cases, similarly the consumption of alcohol by rural men was lower compared to urban men.[18]

4.2. Clinical and angiographic characteristics

The most common acute coronary presentation was STEMI (78.7%), also noted in other studies.[29,35] Only 34.9% presented within 6 h to hospital with majority presenting late to hospital indicating lack of awareness and delayed referral.[23]

In patients presenting with STEMI, 98% were thrombolysed. Around 29% did not consent for coronary angiograms, 31% had obstructive coronary artery disease and remaining 40% had either normal coronaries (4%)/recanalized coronaries (27%)/mild non flow limiting plaques (6%)/only thrombus (3%). The presence of obstructive coronary artery disease was lesser indicating a predominantly thrombotic milieu commonly seen among smokers. Cigarette smoke exposure creates an imbalance of antithrombotic/prothrombotic factors and profibrinolytic/antifibrinolytic factors that support the initiation and propagation of thrombosis.[36]

Nearly 72.7% patients had an LV ejection fraction (LVEF) of greater than 45% of which 29.4% had normal LV function. Remaining 27.3% patients had moderate to severe LV dysfunction. Young CAD patients are noted more often to have normal to mild LV dysfunction.[35,37] Conventional risk factors such as smoking, abdominal obesity and low HDL levels need to be recognized as important risk factors in young rural PCAD patients.

In India, underdiagnosis and underreporting of CVD is frequently seen among rural people.[38] Economically underprivileged patients with CVD 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 CVD is slowly dwindling due to rapid urbanisation of rural lifestyles.

Studies have shown that awareness and control of conventional risk factors are poor in rural regions in comparison with urban regions.[22] Improving the human resource capacity for the prevention and control of CVD should be a national priority, and efforts should be made to ensure equitable distribution of available resources in both rural and urban settings.[39]

5. Conclusion

Conventional risk factors such as smoking, low HDL levels and abdominal obesity play a major role in the causation of premature coronary artery disease among the rural youth. Lack of awareness, combined with urbanisation of rural lifestyle could be responsible for increasing incidence of premature coronary artery disease in them. A multifaceted strategy is the need of the hour. Various awareness programmes highlighting the CV risk factors with focus on primary prevention are required. Aiming at bridging the urban-rural health services gap, by incorporating telemedicine services for immediate diagnosis and treatment are needed. It will also ensure early stabilisation of patients and urgent referral of high-riskcases. Such services will play a key role in assisting the rural primary healthcare doctors and other frontline health workers in CVD risk management.

6. Limitations of the study

The detailed dietary patterns in this rural subgroup were not analysed.

Declaration of competing interest

All authors have none to declare.

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