

Original Article

Clinical and Classical Risk Factor Profiles of Coronary Artery Disease Patients Aged 40 Years or Less

Moeen Uddin Ahmed¹, Solaiman Hossain², Md. Shahimur Parvez³, Debashish Debnath⁴,

Anup Kumar Das⁵, Md. Mahidur Rahman Khan⁶

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Abstract

Background: Cardiovascular diseases (CVD) have increased greatly in the last 2 decades in low- and middle-income countries. Among the CVDs, atherosclerotic coronary artery disease is rare in young adults aged 40 years or less. However, South Asia is among the top 3 of the countries with highest proportion of cases of first acute coronary syndrome events occurring at age 40 years or less. Five classical risk factors account for 80% of population attributable risk in overall population and the impact of these risk factors are remarkable in young adults.

Objective: To explore the prevalence of the classical risk factors of coronary artery disease among patients of ischemic heart disease aged 40 years or less. **Materials and Methods:** This cross-sectional retrospective analysis included 140 patients who had coronary angiography for definite and probable ischemic heart disease at the department of Cardiology of Enam Medical College between July 2012 and December 2020. Clinical and classical risk factor profiles were recorded by recording height, weight and self-reported hypertension, diabetes mellitus, hyperlipidemia, tobacco smoking, family history of premature coronary artery disease, supplemented by testing for diabetes and hyperlipidemia as necessary. Coronary angiography was performed and analyzed in the same center as per standard protocol. **Results:** Of the 140 patients included in the study, 85% were males. The age range was 18–40 years, with a mean age 35.90 (SD 4.05) years, and 59.28% were in the 36–40 years age group. Indications for coronary angiography were: acute myocardial infarction in 69.28%, unstable angina in 3.57%, stable angina in 20% and other miscellaneous causes in 7.155 (e.g., heart failure, arrhythmia, prior PCI and positive exercise stress test). A prior history of myocardial infarction was present in 25.43%. Coronary angiogram revealed single vessel disease in 39.29%, double vessel disease in 25.72% and triple vessel disease in 23.57%. Normal Coronaries were found in 9.28% and myocardial infarction with non-obstructed coronary arteries (MINOCA) in 2.14%. Of the risk factors, hypertension was present in 38.57%, smoking in 34.91%, diabetes mellitus in 27.14%, a family history of coronary artery disease in 19.29% and dyslipidemia in only 15.71%. Obesity was present in 12.86%, while 37.86% were overweight. Altogether 57.72% had excess body weight, making it the most prevalent factor contributing to ischemic heart disease. Clustering of 2 or more risk factors was seen in 45% of patients, while

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1. Professor, Department of Cardiology, Enam Medical College & Hospital, Savar, Dhaka
 2. Professor, Department of Cardiology, Enam Medical College & Hospital, Savar, Dhaka
 3. Former-Assistant Professor, Department of Cardiology, Enam Medical College & Hospital, Savar, Dhaka
 4. Assistant Professor, Department of Cardiology, Enam Medical College & Hospital, Savar, Dhaka
 5. Junior Consultant, Department of Cardiology, Enam Medical College & Hospital, Savar, Dhaka
 6. Junior Consultant, Department of Cardiology, Enam Medical College & Hospital, Savar, Dhaka

Correspondence Moeen Uddin Ahmed, Email: moeen_64@live.com

45.71% had only one risk factor and 9.29% having none. A history of substance abuse was found in only 03 (2.14%) patients, 02 of them having additional traditional risk factors. **Conclusion:** In patients aged up to 40 years with ischemic heart disease, significant coronary artery disease burden was seen, including a significant proportion with multi-vessel disease. Traditional risk factors of coronary artery disease were found to play a significant role among them. Weight related problems (overweight and obesity) was seen to be significant. Further epidemiological studies with pooled data from all the tertiary care centers need to be carried out.

Key words: Coronary artery disease; Ischemic heart disease; Young adults; Risk factors

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Introduction

Cardiovascular diseases (CVD), the leading cause of death and loss of disability adjusted life years, have increased greatly in low- and middle-income countries in the last two decades compared with a decline in several developed countries, with incidence rates of 29–30 and a mortality rate of 9.5–14 per 1000 person years in Bangladesh.¹ They account for about 80% of the burden of diseases now occurring in these countries, with median age of presentation of cases about 9 years lower (53 vs. 60–63 years of age) than in the Western European, North American and other developed nations. In addition, South Asia figured 3rd (after Middle East and Africa) among the countries with the highest proportion of cases of first ACS event occurring at age 40 years or below.²

Among the CVDs, atherosclerotic or non-atherosclerotic Coronary Artery Disease (CAD) is the leading cause of death among men and women worldwide. Atherosclerosis is the predominant cause of CAD, and although it starts to develop at a very early age, symptomatic atherosclerotic CAD and acute coronary syndromes (ACS) are rarely seen in adults less than 40 years of age, accounting for 8.9% of them (in South Asia geographical region) and 10.6% (among ethnic South Asians irrespective of geographical location).^{2,3} CAD occurring in adults at or below 40 years of age is variously termed CAD in the young, premature CAD etc.,⁴ and accounts for 0.4–19% of all ACS cases.⁵ Premature CAD is a growing problem, occurring in even younger adults and although the prognosis is not as adverse as in the older adults, premature CAD has profound lifelong consequences on their active lifestyle, including

effects on psychosomatic well-being as well as grave socio-economic impacts.

Although only five risk factors (e.g., Smoking, lipids, hypertension, diabetes mellitus, and obesity) accounted for about 80% of the Population Attributable Risks (PAR) in the overall population, the effects of these risk factors are more remarkable in young people (PAR around 93% in men and 96% in women).² Most of the studies on which our current epidemiological knowledge is derived from were based on predominantly Western populations and are therefore of limited value for application worldwide. There are some data suggesting that the risk factors for CAD varies between populations, and even that risks factors with proven associations with CAD differ in prevalence among differing ethnic groups and populations.^{6,7} Although the Framingham Study has established the presence and impact of classical risk factors on the development of IHD/CAD in young adults,⁵ there is a growing body of evidence to suggest that CAD in young adults might be altogether a “different beast”⁸, differing in risk factor profiles and therefore need a different set of guiding principles in addition to the classical approach for its clinical and epidemiological assessment and management strategy.

There have been some studies exploring the risk factor profile and extent of coronary artery involvement in these young adults in Bangladesh. But the topic needs further study, because of its emergence as a growing problem. The present study explores the prevalence of the classical risk factors of CAD in young adults presenting with Ischemic heart disease and having CAD at a tertiary care hospital in a sub-urban setting.

Materials and Methods

This is retrospective cross-sectional observational analysis of patients treated between July 2012 and June 2020 at the Cardiology Department of Enam Medical College Hospital, Savar, Dhaka. 140 patients admitted into the CCU and Cardiology facility of the hospital with the diagnosis of definite or probable stable ischemic heart disease and or Acute Coronary Syndromes (ACS) and had Coronary Angiograms (CAG) to document their coronary artery disease were included in the final analysis. Patients who were treated but did not undergo CAG were excluded. Recorded detailed clinical history and findings and pre-angiogram data sheets were consulted and used to record diagnosis, past medical history (prior history of stable IHD, ACS and/or Coronary interventions) and risk factor profile (self reported presence of hypertension, diabetes mellitus, dyslipidemia on treatment, smoking, addictions/substance abuse, and family history of premature CAD). A history of drug addiction/substance abuse was actively sought out from patients and their close family and social circles and recorded.

Further investigation reports obtained as per our departmental standard protocol were also consulted. Namely, incidentally detected hyperglycemia at hospital admission were further investigated with relevant investigations (HbA1c, FBS and OGTT) to confirm or refute a diagnosis of DM. A pre-discharge fasting lipid profile is routinely done at our centre for all ACS patients. Wherever present, all relevant pertinent previous personal records and documents were analyzed. Self-reported age in completed years were recorded and verified by NID cards. Angiograms were performed using the standard protocol by two of the authors and analyzed individually followed by collation between the two performing cardiologists, using the on-board Quantitative Coronary-angiographic Analysis softwares of the two angiogram machines (Infinix 8000V, Toshiba Corporation, Tokyo, Japan; and Bransist AlexaC12, Shimadzu Corporation, Kyoto, Japan). In cases doubt, the two performing cardiologists reviewed the CAG jointly and reports were finalized based on consensus.

Data were recorded and analyzed using the IBM SPSS Statistics 2020 (IBM Corp., Armonk, NY,

USA). Discrete variables were reported as numbers and percentages, whereas continuous variables were reported as mean, median and standard deviations.

Results

Of the 140 patients included in this study 119 (85%) were male and 21 (15%) were female. Just over 59% (89 patients) were in the 36–40 years age group while slightly over 39% were in the 26–35 years age range, with only 2 patients (1.43%) below 25 years of age. The youngest patient was aged 18 years. Mean age of the cohort was just below 36 years (Mean 35.90, SD 4.05 years) (Table I).

Table I: Distribution of patients by age (N=140)

Age (years)	Number	Percentage
20 –25	2	1.43
26 –30	16	11.43
31 –35	39	27.86
36 –40	83	59.28

Table II: Reason for admission in coronary care unit and/or subsequent coronary angiogram (N=140)

Diagnosis	Number	Percentage
<i>Acute Myocardial Infarction</i>	97	69.28
STEMI	80	57.14
With prior MI	04	4.86
NSTEMI	17	12.14
With prior SA	02	1.43
<i>Stable Angina</i>	28	20.00
With prior STEMI	13	12.14
NSTEMI	04	04.86
<i>Unstable Angina</i>	05	3.57
With prior MI	02	1.43
<i>Others</i>	10	7.15
Heart Failure	03	2.14
With prior MI	02	1.43
Arrhythmia	02	1.43
With Prior MI	01	0.71
Prior PCI	01	0.71
Elective	05	3.57

STEMI = ST segment elevation myocardial infarction; NSTEMI = Non-ST segment elevation myocardial

infarction; MI= Myocardial infarction; PCI= Percutaneous coronary intervention

Indications for CAG were a mix of ACS, Stable ischemic heart disease and screening for possible causes of other symptoms (Table II). A total of 130 (92.85%) had CAG consequent to an ACS – 80 (57.14%) with ST segment elevation MI (STEMI), 17 (12.14%) with Non-ST segment elevation (NSTEMI) and 05(3.57%) with Unstable angina (UA) – while 28(20%) had Stable Angina Pectoris. Overall, 90.56% of patients had a history of MI, acute or prior. Rest of the patients (10, 7.15%) had CAG as screening for other presentations of suspected ischemic origin, e.g., arrhythmia (2 patients, 1.43%), heart failure (3 patients, 2.14%), non-specific chest pain with or without positive exercise tolerance test (5 patients, 3.57%). One patient had recurrent ischemic symptoms with prior history of percutaneous coronary intervention (PCI). Thirty-three (23.57%) of the patients also had a prior history of old or recent (< 4 weeks old) myocardial infarction (Table II).

Coronary angiography revealed significant CAD in 124 (88.58%) and insignificant or no CAD in 16 (11.42%) patients, with 03 (2.14%) of them found to have MINOCA (myocardial infarction with no obstruction on coronary angiography). Fifty-five (39.29%) had single vessel CAD, 36 (25.72%) had double vessel CAD and 33 (23.57%) had triple vessel CAD (Table III).

Table III: Extent of coronary artery involvement (N=140)

Extent	Number	Percentage
Single Vessel Disease	55	39.29
Double Vessel Disease	36	25.72
Triple Vessel Disease	33	23.57
Normal or Near Normal	13	9.28
MINOCA	03	2.14

MINOCA = Myocardial Infarction with Nonobstructive Coronary Arteries

Distribution of traditional risk factors for CAD: The risks factors explored were smoking, hypertension, diabetes mellitus, dyslipidemia and obesity. In

addition, a history of substance abuse/drug addictions was also looked for.

BMI: Table IV gives the data on BMI of the patients. Just below half of the patients (69, 49.28%) had a BMI over the traditional cut-off value for normal healthy value of <25 Kg/M² and only 18 (12.86%) had class I to class III Obesity. Four patients (2.84%) had class III or severe/morbid obesity (Losing Weight, Body Mass Index (nih.gov)).⁹ The Mean and Median values were 25.31 and 25.15 kg/square meter of body surface area.

Table IV: Distribution of BMI in patients aged less than 40 years with IHD (N=140)

BMI (Kg/square meter)	Number	Percentage
< 21	21	15.00
21 – 25	48	34.28
>25 – 30	53	37.86
>30 – 35	14	10.00
>35 – 40	02	01.43
>40 – 45	02	01.43

BMI = Body Mass Index; Kg= Kilograms

Hypertension was the most predominant RF, followed by smoking, diabetes mellitus (DM), dyslipidemia, family history of CAD. Surprisingly, dyslipidemia was the least prevalent RF in this cohort of patients.

Hypertension: Of the 140 patients, 54 (38.57%) suffered from hypertension. Of them 17 had hypertension alone, while 37 had at least one more associated factors 16 DM, 12 were smokers also, 07 dyslipidemic, 07 were obese, and 03 had a family history of premature CAD.

Smoking: Although the second commonest of the RFs, only 49 (34.91%) patients had a history of smoking. Only 20 were smoker without any further associated RF. Twelve (12) also had hypertension, 11 had family history of CAD, 05 had dyslipidemia, 03 had obesity and 01 had DM.

Diabetes mellitus: A total of 39 (27.86%) patients had diabetes mellitus, of whom 13 had diabetes alone, while 25 had one or more other associated RF. Of them, 16 also had hypertension, 06 had dyslipidemia,

05 had obesity, 01 was smoker also and 01 had family history of CAD.

Family History: Twenty-seven (19.29%) of the patients had a family history of premature CAD; of them 08 had it without other associated RF. Other associated RF were 11 along with smoking, 03 along with dyslipidemia, 03 with hypertension, 02 with obesity and 01 with diabetes mellitus.

Dyslipidemia: Twenty-two (15.71%) of the patients suffered from dyslipidemia, 04 without any other associated risk factor. Associated risk factors among the others were 07 with hypertension, 06 with diabetes, 05 with a history of smoking and 03 with family history of CAD.

Table V: Distribution of traditional risk factors (RF) among coronary artery disease (CAD). Patients aged less than 40 years (M= 140)

Risk Factor	Number	Percentage
Hypertension	54	38.57
Smoking	49	34.91
Diabetes mellitus	39	27.86
Family history of CAD	27	19.29
Dyslipidemia	22	15.71
Obesity	18	12.86
Number of RF per patient		
No RF	13	09.29
01 RF	64	45.71
02 RF	53	37.86
03 RF	10	07.14

Among 140 patients, 13 (09.29%) had no traditional risk factors for CAD, 64(45.71%) had a single risk factors, 53 (37.86%) had two and 10 (07.14%) patients had three risk factors. A history of substance abuse was found in three patients, of whom two also had additional risk factors.

Discussion

In this study we have shown the prevalence and distribution of traditional risk factors of coronary artery disease (obesity, hypertension, diabetes mellitus, family history of premature CAD and smoking) among patients presenting with ischemic

heart disease (over 90% with a history of MI) with (88.58%) or without significant angiographic CAD. A history of substance abuse was also recorded in a very minor number of patients. All the patients had ischemic heart disease with or without complications, and almost 89% had significant coronary artery disease, while about 9% had insignificant or no CAD.

Gender: Males represented 85% of this cohort. This is consistent with the INTERHEART study, which showed that the proportion of male cases were highest in regions with younger age of presentation of first ACS: 85% of them in South Asia and 86% in the Middle East, compared to 68–74% in Western regions including Europe, and 70% in China. In Bangladesh, the rates previously found were similar (80%, and 78.30%).^{4,10} The proportions of males in similar studies in the subcontinent showed 87.5 and 85.3% males in India,^{11,12} and 84% males in Pakistan³. Studies that involved a slightly higher age group (up to 45 years of age) showed slightly lower male representations 61%.¹³ Studies on patients of similar age to the current study in more developed countries show values of 89.8% of males in a Taiwanese study⁵ and 86.2% in Poland¹⁴. All these data uphold the INTERHEART observation, namely that CAD presenting in young adults is more common among males compared to older patient populations.

CAD Patterns: Analysis of the extent coronary artery disease on CAG (Table III) revealed that the majority had single vessel (SVD) involvement (39.29 %); double vessel involvement (DVD) was found in 25.72% patients, while triple vessel involvement (TVD) was seen in a surprisingly high proportion of patients (23.57%). Only 11.42% of our cohort had normal or near normal findings on CAG. These values differ significantly from previous reports from Bangladesh in two respects, namely normal coronary arteries were found in 18 to 25% of patients in the age category of the current study, while triple vessel disease was found in 8.3 and 18% of the patients^{4,10}, values noticeably lower from the current study. The finding of single and double vessel disease in the present study was comparable to previous reports (42–48.3% and 18.3–22% respectively). Recent studies from the subcontinent show that, in Pakistan

the results are comparable – 39, 22, 12 and 28%,³ and 50, 20.8, 18 and 11.2%¹⁵ respectively for SVD, DVD, TVD and normal, while in India, the corresponding figures were 66, 22.32 and 11.61% for SVD, DVD and TVD respectively¹¹. In a study from Nepal, the corresponding figures were 30.27, 13.76, 11.92 and 11.92 % for SVD, DVD, TVD and Normal Coronaries, respectively.¹⁶ In a recent study from Taiwan, the frequencies were 37.1, 17.6 and 16.7% respectively for SVD, DVD and TVD leaving 28.6% as normal.⁵ A similar study from Korea showed 48.4% having SVD, 11.4% having DVD and less than 5% as having TVD, leaving around 36% as normal.¹⁷ A study from Poland revealed 61.9% as having SVD and 34.7% having multi vessel (DVD and TVD) disease, with 37.1% of the possible CAD patients turning out to have normal CAG, and 16.9% of ACS patients having normal CAG findings.¹⁴ In our study involving almost entirely of a high-risk group of patients with definite IHD, there was a comparatively higher number of TVD patients and a low number of Normal CAG findings. A recent review, however, reported that in young adults, normal CAGs are found in 10–21% of patients,¹⁸ which matches the findings of normal or near normal CAG in our study (11.42%).

Hypertension: Of the five traditional risks factors for coronary artery disease, hypertension was the most prevalent in 38.57 % of patients in the current study, which compares well with previous reports from Bangladesh (38 and 41.70%).^{4,10} While WHO country status report (2018) gives 21% as the prevalence rate of hypertension among the general population based on 2015 data,¹⁹ the prevalence of hypertension among patients with cardiovascular diseases irrespective of age was found to be 47.7% in middle income countries and 40.0% in low-income countries, compared to 49.8% in High-income countries,¹ whereas in the INTERHEART study² it was found to be 39.02% in a world-wide population that included over 1700 south Asians. In a recent review article,¹⁸ hypertension was found in 38.1% of young MI patients. In the studies on young CAD patients from Pakistan, the prevalences were 42 and 36.7%^{3,13} while in India, a registry on ACS patients in Kerala aged 40 years or less reported hypertension in 48.4% of patients²⁰ and another one

from Odisha reported a prevalence of 26.7%¹². In a Nepalese study the reported prevalence was 14.6%.¹⁶ Reports from more advanced Asian countries found similar prevalence among young CAD patients – 30.6% in Korea¹⁷ and 29.8% in Taiwan⁵. Taken together, all these data support the Framingham theory of the role and validity of traditional risk factors in young patients with ischemic and coronary artery disease.

Smoking was the next commonest risk factor in the current study, being present in 34.91% of cases. In Bangladesh, as per the latest WHO country status report 2018, the prevalence of smoking was 23% overall and 44% among males as per 2016 data, with a decreasing trend and a projected prevalence of between 35 and 40% by the year 2020.¹⁹ Importantly, prevalence of smoking was found to vary from 18.7 to 23.4% depending on social and educational background with a population average of 21% in middle income countries, the corresponding figures being 11.3 to 27.8% and 22.8% for low-income countries.¹ The INTERHEART Study reported a rate of 65.19% irrespective of age.² However, previous reports from Bangladesh give higher rates (63.3% and 70%) in 2015 and 2010, respectively.^{4,10} Data from other sub continental countries give figures of 60% in a study from 2008³ and 41% in a more recent one from Pakistan¹⁵, and 34.4% in Kerala and 65.3% in Odisha, India^{12,20}. In the Nepalese study the prevalence was 29.3%.¹⁶ Taken together, these data would indicate that there is a growing trend of cessation of smoking and consequently, smoking as a risk factor for CAD is declining in importance among young patients. In this connection, it may be mentioned that a report in 2019 found that the history of smoking cessation among patients with cardiovascular diseases was found among 48.1% of subjects in middle income countries and 32% among low-income countries.¹

A diagnosis of diabetes mellitus was found in 27.86% of our patients, which is considerably higher than the general population prevalence of 8% reported in the WHO country status report for Bangladesh,¹⁹ the 7.52% reported in control group of the INTERHEART study,² and the rates of 8.0% in middle income countries vs 9.4% in low-income countries among

CVD patients reported in the PURE Study,¹ it was also slightly higher than the 18.45% reported among the cases of MI irrespective of age in the INTERHEART study². Previous studies in Bangladesh reported prevalence widely varying from only 4% to 18.30%.^{4,10} Figures from sub continental young CAD patients reported previously were - 15.3% in Odisha and 37.6% in Kerala, India^{12,20} while it was reported in 36 and 18.3% in Pakistan^{3,13} and 5.5% in a Nepalese study¹⁶. Prevalence data among more developed Asian countries among young adult CAD patients also show widely varying figures of 7.5% in Korea and 14.3% in Taiwan.^{5,17} While the Polish report gives a value of 6.3%,¹⁴ a review of worldwide data shows a more consistent figure of 14.7%¹⁸.

A family history of premature CAD was found in 19.29% of our patients, compared to the rates in the previous studies in Bangladesh (36.0 and 21.70%).^{4,10} In both of the above studies, there's a consistent finding of more than double the rates compared to older patients (> 40 years of age). Findings from other Sub continental studies show widely varying rates, e.g., 8.7% in Odisha¹² and 26 to 43% in Pakistan^{3,12}. In Nepalese young CAD patients, reported prevalence was 7.5%.¹⁶ Studies in more developed Asian countries show a variable prevalence of 9.0% in Koreans¹⁹ to 15.1% among young Taiwanese patients,⁵ while a worldwide literature review found widely varying rates from 41–71% among young patients depending on the definition of young (age less than or equal to 40–55 in different studies)¹⁸.

Dyslipidemia was present in 15.71% of our patients. Reported prevalence of dyslipidemia from previous study in Bangladesh was 85%,^{4,10} while it was 9.3% among young patients in Odisha¹². In Pakistan, reported prevalence was 51%³ and although not of similar age group: another study in Pakistan found a prevalence of 30.3% among patients 45 years or younger with CAD¹³. A prevalence of 29% was found among young CAD patients in Taiwan,⁵ while it was found to be 85.6% in a Polish cohort of young CAD patients¹⁴.

Obesity (BMI \geq 30 Kg/square meter body surface area) was detected in 12.86% of our patients, while

37.86% were overweight (i.e., having a BMI value of >25–30 kg/square meter). Altogether 57.72% were overweight and obese, which is considerably higher than the previously reported value of 30% from Bangladesh.⁴ The other study from Bangladesh reported values comparable to our data, a mean value of 24.30 and standard deviation of 7.30 kg/square meter, which on extrapolation would mean that slightly less than 15% were obese and just over 68% were overweight (assuming minimal skewness of data).¹⁰ In other sub continental studies, the reported figures were 18% obese and 51% overweight from Pakistan,³ 5.3% obese in Odisha, India (no reported value for overweight patients)¹². One Nepalese study reported mean and standard deviations of 27.36 and 2.31 kg/square meter, which on extrapolation would indicate a value of just over 15% obese and somewhat over 68% were overweight.²¹ In the Polish study, the rates for obese and overweight were 35.6 and 15.9% respectively.¹⁴ In the more advanced Asian population of Taiwan, the mean BMI was 26.7 kg/square meter with a standard deviation of 4.2 kg/square meter, indicating that a majority were overweight and roughly over 15% obesity.⁵ The WHO country status report on Bangladesh 2018 gives the prevalence of obesity at 3% among adult aged 18+.¹⁹ Taken together, it is evident that excess body weight played a significant role in these young patients of CAD.

Clustering of more than one risk factors were seen in 63 (45%) of our young CAD patients, while only 13 (9.29%) had no traditional risk factors. In the Pakistani patients, the corresponding figures were 49% and 21% respectively, while 30% had only one risk factor, compared to 45.71% in our study. Data regarding clustering of traditional risk factors in the subcontinent were hard to find, but our study results indicate that currently the traditional Framingham risk factors of CAD are quite prevalent in the young ischemic heart disease patients and might play as important a role as in the older population, while novel risk factors like hyper-homocysteinemia, lipoprotein a, anti-phospholipid syndromes, hypercoagulable states and substance abuse may also play a role. Further epidemiological studies are needed to corroborate the role of traditional risk factors in the emerging threat of

burgeoning young CAD/IHD patients.

Ischemic heart disease due to coronary artery disease is a growing problem world-wide, and is becoming so in the subcontinent too. More patients in the younger age groups are presenting with ischemic heart disease and are discovered to have significant coronary artery disease. Contrary to expectations, traditional risk factors appear to play a greater role in this surge and needs to be addressed for formulation of a proper management strategy. Further epidemiological studies in this field are required for that.

Limitations of the study: Our study included only 140 patients, but for a study on the epidemiological factors behind a disease, larger studies are need. Pooled data from the different tertiary centers caring for young CAD patients are needed. We collected information on patients self-reported history of known hypertension, diabetes, and dyslipidemia mostly, detailed diagnostic tests were not done. For example, it is known that measures of the ratio of Apolipoprotein B to Apolipoprotein A1 is a better predictor of CAD, which was not studied in this case. Furthermore, abdominal obesity in terms of the ratio of waist to hip circumference is a better indicator of obesity or increased body fat mass and is more prevalent and important co-morbidity in Asians in general and South Asians in particular, leading to premature CAD. We did not test for the non-traditional factors for CAD in the 9.29% of our patients who did not have any traditional risk factors.

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