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Research Article

CLINICAL AND CORONARY ANGIOGRAPHIC CHARACTERISTICS OF YOUNG PATIENTS WITH CORONARY ARTERY DISEASE; AN EXPERIENCE FROM CENTRAL SRI LANKA

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ABSTRACT

Introduction: The incidence of Coronary Artery Disease (CAD) in young is rapidly growing in number and it carries a significant health-economic weight to the community. Since it is more frequently seen in South Asia, it is essential to understand the patients' profile in our community aiming for a better preventive strategy.

Objectives: The objective of the study was to evaluate the clinical and coronary angiographic characteristics of young patients with Myocardial Infarctions who were presented to Cardiology Unit, Teaching Hospital Kandy.

Method: A descriptive cross sectional study was conducted at Cardiology Unit Kandy from 2015 September to 2017 September. All patients aged 45 years or less, having the history of angina, definite ECG changes and positive troponin values consistent with myocardial infarction were enrolled. Patients' demographic characteristics, risk factor profile, laboratory tests results and coronary angiography patterns were evaluated.

Results: A total of 212 patients (83.49% males) with a mean age of 39.54±6.48 years were reviewed. Dyslipidemia, diabetes mellitus and hypertension was seen in 34.91%, 16.98% and 22.64% respectively. There were 46.7% of smokers and among them, the mean exposure was 5.57±4.48 pack years. There were only 21.23% patients who had engaged in recreation related physical activity and among them 48.89% (only 10.38% of the total patients) had a recreation related physical activity level up to World Health Organization recommended activity standard. There were 2.36%, 61.32%, 16.98% and 19.34% with a body mass index of underweight, normal range, overweight and obese respectively. In the angiographic analysis, normal coronary arteries were found in 8.01% of patients. Significant atherosclerotic coronary lesions mainly found in the left anterior descending artery, which was 55.18% (n=117) followed by 34.90% (n=74) in the right coronary artery and 19.81% (n=42) in the left circumflex artery. There were 14.15% (n=30) had Chronic Total Occlusions (CTOs), 3.77% (n=8) with coronary artery ectasia and 2.83% (n=6) with coronary slow flow syndrome. There were 39.62% (n=84) had Single Vessel Disease (SVD), and the majority of SVD, the left anterior descending artery was the commonest (73.80%, n=62) territory involved.

Conclusion: Smoking, lack of exercise, obesity and dyslipidemia are the main risk factors observed among young patients with MIs. Interestingly, there is a nearly half of the patients had multi-vessel disease. This reflects that adjustment and promotion of healthy life style should be the primary goal in prevention of young myocardial infarction.

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INTRODUCTION

Ischemic Heart Disease (IHD) causes approximately 17 million deaths each year and accounts for 29% of all deaths in worldwide¹. However, it is believed that the occurrence of an acute Myocardial Infarction (MI) is relatively uncommon

among young individuals is based on the fact that it occurs in only 4 to 8% in this group². The Framingham study also supports this evidence reporting an overall incidence of 4% of patients with MI at the age of 40 years or less³. However, the prevalence of MI among young patients is in the rising trend,

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especially among Asians^{6, 7} and the exact reason for this need to be investigated.

The unique patterns of younger population with MIs have been observed in multiple studies conducted worldwide. Some of them have shown certain specific characteristics that may set them apart from their older counterparts. Most studies have evidence that smoking was the major risk factor for MI in these young patients^{3,4}. Dyslipidemia and obesity too are significantly present in this population⁴ and some studies show metabolic syndrome and insulin resistance to be more prevalent in them as well⁵. Importantly, young patients presenting with sudden cardiac death highlights that even atypical presentation is commoner when compared to older patients according to some observations⁷. It has also been found that there is a disproportionate increase in cardiac events among the Asian Indian ethnic group at an even younger age as well as they are found to have more complex coronary artery lesions.⁵

Interestingly, some studies³ have revealed that higher percentage of normal coronary arteries, non-obstructive coronary artery disease and single vessel disease in coronary angiography are characteristically seen among these younger patients when compared to the older population. Although studies have been carried out in the South Asian and South East Asian regions with regard to young patients with MI, little data can be found regarding Sri Lankan patients. Thus, identification of the pattern and behavior of Coronary Artery Disease (CAD) among these patients may help to understand the pathophysiology and to propose effective therapeutic strategies to achieve favorable outcomes for them in the long run⁶.

More importantly, the understanding of the patient presentation and complications may aid to improve early case detection and immediate medical care in these patients. Identification of the angiographic patterns also can give guidance on deciding the treatment methods and predicting the patients' response and their outcome.

Therefore, the aim of the study was focused to evaluate the clinical and angiographic characteristics of young patients (age < 45 years) with MI in our local setting to identify their unique characteristics.

METHODOLOGY

Study design and setting

A descriptive cross sectional study was conducted on those who were under the age of 45 years presented to the cardiology unit, teaching hospital Kandy with MI from 2015 September to 2017 September. Both group of patients who had Non ST Elevated Myocardial Infarction (NSTEMIs) and ST Elevated Myocardial Infarction (STEMIs) were recruited for the study. A detailed questionnaire was used to record the data including socio-demographic characteristics, physical activity, tobacco use, family history of heart disease, known history of thrombophilic disease, and regarding other vascular risk factors. Angiographic data was collected by analyzing the angiograms by two cardiologists individually.

Definitions

Definition of young MI

Since the interrelationship of both biological and chronological age definition are complex, an arbitrary age cut-off of less than 45 years was considered to define the patients with "young" MIs, regardless of the gender. This age definition was used by several studies conducted in similar manner^{8,9,10}.

Definition of standard physical activity

World Health Organization (WHO) recommended physical activity standard was defined as at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or performance of least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. Furthermore, muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week¹¹.

Statistical analysis

Data was analyzed using the Statistical Package for Social Science (SPSS) version 17. Continuous variables were presented as mean with Standard Deviation (SD) and categorical variables as percentages.

Ethical clearance

Ethical clearance was obtained from the ethical review committee of teaching hospital Kandy, Sri Lanka. Informed written consent was obtained from all patients while in the hospital stay.

RESULTS

Demographic characteristics and risk factors

A total of 212 patients with a mean age of 39.54±6.48 years were reviewed. There were 83.49% (n=177) of males. As the traditional vascular risk factors, there were 16.98% (n=36) of diabetics, 22.64% (n=44) of hypertensives, 34.91% (n=74) of dyslipidemics and 30.66% (n=65) had family history of significant CAD. There were only 8.02% (N=17) had positive thrombophilia tests (Table 01).

Table 1 Baseline characteristics of the study sample.

Variable	Results n (%)
Age (mean ± SD)	39.54±6.48 years
Gender	
Male	177 (83.49%)
Female	035 (16.51%)
Co-morbidities	
Diabetes	36 (16.98%)
Hypertension	44 (22.64%)
Dyslipidemia	74 (34.91%)
Family History of CAD	65 (30.66%)
Smoking history	99 (46.69%)

SD- Standard Deviation, CAD= Coronary Artery Disease

There were 8.96% (n=19) patients with age ≤20 years, 21.69% (n=46) with age between 20-30 years and 69.33% (n=147) with age between 30-40 years (Figure 01).

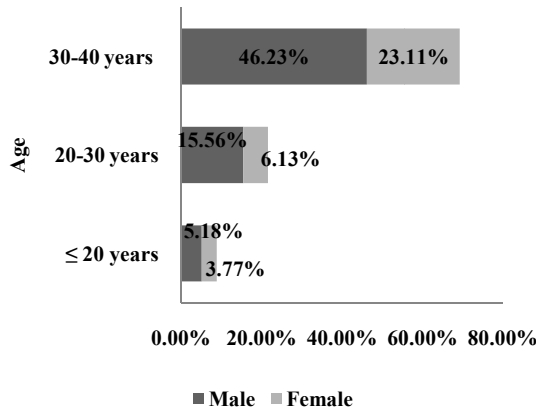


Figure 1 Deviation of age among the study sample

Smoking and alcohol consumption of the study sample

There were 53.30% (n=113) of non-smokers (someone who has not smoked greater than 100 cigarettes in their lifetime and does not currently smoke), 26.89% (n=57) of ex-smokers (someone who has smoked greater than 100 cigarettes in their lifetime but has not smoked in the last 28 days) and 19.81% (n=42) of current smokers (someone who has smoked greater than 100 cigarettes including hand rolled cigarettes, cigars, cigarillos etc. in their lifetime and has smoked in the last 28 days). Among the smokers, the mean exposure was 5.57±4.48 pack years¹².

There were 53.77% (n=114) of alcohol consumers, and out of them, 71.92% (n=82) consumed alcohol within the WHO recommended units per week (14 U)¹³ but only 28.08% (n=32) exceeded the recommend limits.

Obesity and overweight among the study sample

In the sample, 16.98% (n=36) were overweight (Body Mass Index (BMI) 23-24.9 kg/m²) and 19.34% (n=41) were obese (BMI ≥25kg/m²). There were 61.32% (n=130) had normal BMI (BMI 18.5-22.9 kg/m²) (Figure 02).

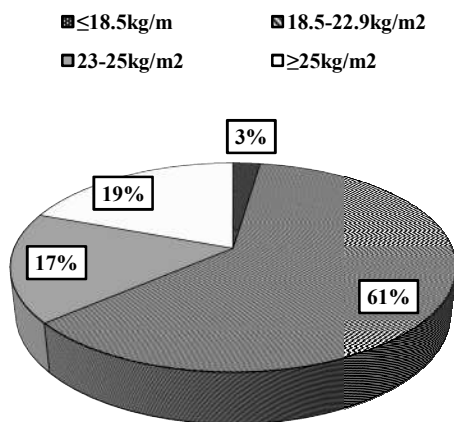


Figure 2 Deviation of BMI among the study sample

Physical activity among the study ample

There were only 21.23% (n=45) patients who had engaged in recreation related physical activity and among them 48.89% (n=22) had recreational related physical activity level up to WHO recommended activity standard. In other words, only 10.38% (n=22) of the total patients had physical activity level up to WHO recommended activity standard.

Post MI complications

As the post MI complications, there were 8.07% (n=17), 9.90% (n=21) and 11.79% (n=25) who had cardiogenic shock, heart failure and ischemic arrhythmia as complications encountered within the first week following the event. However, there were no mechanical complications such as acute mitral regurgitation, acquired ventricular septal defect or myocardial ruptures noted within the first three month following MI of these patients. Interestingly, at the end of the 90 day follow up, there was only one MI related death noted in the sample.

Coronary angiographic pattern

Significant atherosclerotic coronary lesions mainly found in the left anterior descending artery (LAD), which was 55.18% (n=117) followed by 34.90% (n=74) in the right coronary artery (RCA) and 19.81% (n=42) in the left circumflex artery (LCX) (Figure 03)

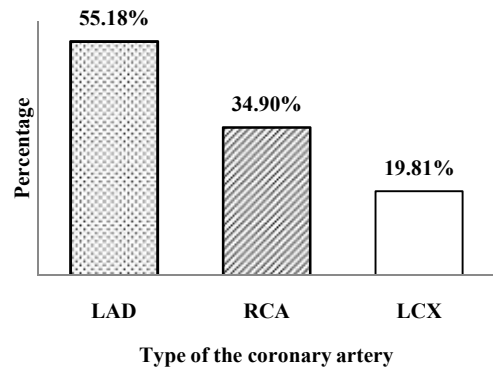


Figure 3 Location of the coronary artery lesions in the study sample

There were 14.15% (n=30) had Chronic Total Occlusions (CTOs), 3.77% (n=8) with coronary artery ectasia and 2.83% (n=6) with coronary slow flow syndrome. Angiographically normal coronary arteries were found in 8.01% (n=17) of patients. Only 2.35% (n=5) had significant left main stem stenosis, which is more than 50% of the left main involvement.

There were 39.62% (n=84) had Single Vessel Disease (SVD), and the majority of SVD, the LAD artery was the commonest (73.80%, n=62) territory involved.

Out of the all, 63.20% (n=134) had per-cutaneous intervention therapies, 14.62% (n=31) underwent CABG and 22.17% (n=47) had medical management following their MIs.

DISCUSSION

Though the incident of MIs in young adults is a relatively an uncommon entity, it constitutes an important problem to the patient as well as for the treating physician in many aspects.

Importantly, the rising trend of the incident of young MIs in recent past may have created an adverse effect to the entire health economy of the country in a complex manner. Addition to that, having MIs at a young age will invariably affect the patient physically and psychologically as an individual manner as well as involving their families which results in several social and financial hardships. As most of these patients are active members of the working force of the country, it will also lead to an increase burden to the entire economy, indicating that this population requires special attention.

Interestingly, these young patients also have diverse clinical presentations, various risk factor profile, and may have a different prognosis in comparison with their older counterparts, which need to be taken into consideration while treating them. One of an important fact to be considered is that the increasing prevalence of vascular risk factors for CAD as a result of life style changes may set up an alarming trend to increase the prevalence of young MIs in current modern society.

In our study, the mean age of the patients with acute MIs was 39.54±6.48 years. Similarly, studies conducted by Varsha et al.¹⁴ and Alappatt et al.¹⁵ found that their average age of the samples was around 35 years. In this study, the majority of the patients (83.49 %) were male. A similar study results were observed by Alappatt et al.¹⁵, reporting that 74% of patients were male in their study. This type of male preponderance may be as a result of protective hormonal profile in menstrual women who are belonged to this age category. The prevalence of smoking is about 46.7% in the present study which correlate with some of the Indian studies i.e. 48% in H.S Wasir et al.¹⁶, 63.3% in K.C Garg et al.¹⁷ and 60% in study conducted by Dani et al.¹⁸ However, a western study performed by Donald. A Underwood et al.¹⁹ showed much higher prevalence such as 83.9% of their smoking prevalence. Importantly, several studies have highlighted the elevated rates of tobacco use among very young patients who present with acute MIs, with percentages ranging from 62% to 90%²⁰.

The prevalence of obesity was 19% in the present study and this is slightly higher than reported by Siwach et al.²¹ (13.8%) and P. Jit Singh et al.²² (16%). Addition to that the combined value of the proportion of patients who were overweight and obese found to be 36% in our study. This may be as a result of multifactorial causes such as modernization of the lifestyle, change in the feeding habits and importantly, the physical inactivity that is going to be observed among our patients. Therefore, these facts to be considered in planning the primary preventive strategies of these patients aiming for a lower burden of CAD.

About 74% of patients were found to have dyslipidemia in the present study. However, some of the other studies have shown a relatively low incidence such as 47.3% (Moccetti and Malacrida et al.²³), 41.66% (Dwiwedi et al.²⁴) and 42% (Dani et al.¹⁸). The incident of hypertension and diabetes was 22.64% and 16.98% in our study and the diabetes incident was relatively similar to the observation made by Akram et al.²⁵. The relatively low prevalence of diabetes in this cohort may be as a result of the fewer epidemiological prevalence of diabetes among young population compared to elderly patients. Regular physical exercise has been shown to reduce the risk of ischemic cardiac events in a number of observational and

epidemiological studies²⁶. However, in our study indicates that only 10.38% patients had physical activity level up to WHO recommended activity standards. Therefore, the lack of physical activity should be addressed as one an important contributory factor in these subset of MI patients aiming for a sustainable future preventive strategies.

It had been recognized that multi-vessel disease is less common among young²⁷ patients with MIs contrast to older patients who are usually having multi-vessel disease^{28,29,30,31,32,33,34}. However, in our series there were only 39.62% had single vessel disease. Therefore, this multi-vessel trend that was observed in our study need to be further elaborated in future large-scale studies. The most critical point is that the Long-term prognosis of these patients depends upon the number of vessels affected, and the degree of Left Ventricular (LV) dysfunction^{35,36,37}. Our study was in line, showing the majority having multi-vessel disease though they have less number of patients with impaired LV dysfunctions. Therefore, this highlights the aggressive need of primary preventative measures in this category of patients to have a long term better prognosis in their future.

As for an etiology, various investigators have studied several pathological mechanisms such as rupture of a vulnerable plaque or endothelial erosions, hypercoagulability, coronary spasms, vasculitis affecting coronary arteries, substance abuse etc. with atherosclerosis remaining the dominant cause³⁸ and most of them are having high burden of vascular risk factors. Interestingly, coronary angiography has demonstrated, in fact, normal coronary arteries in 8% in our sample of the patients with the presence of all other evidence of MI. Therefore, further elaboration should be made on this sub-group of patients to explore the non atherosclerotic mechanism of the ischemia as a causative factor for their MIs.

The occurrence of MI in young age is increasing nowadays as a result of the alteration of demographic characteristics as well as the other factors which contributes to increase the prevalence of non-communicable disease. Therefore, more practical and sustainable primary preventive strategy should be implemented to prevent long term health burden of these patients.

Limitation

Though this study was able to highlight the clinical profile and angiographic characteristics of young MI patients, there were few limitations that we would like to highlight. The range of the study was limited by its cross-sectional nature of patients attending to a single center and its outcomes may not be generalizable to the whole population. However, the institute where the study was carried out had a wide range of population drainage from various parts of the country as the center is one of a main interventional cardiology center in Sri Lanka. Therefore, expanding the study into multicenter level would make more representative value of the whole population.

CONCLUSION

Smoking, lack of exercise, obesity and dyslipidemia are the main risk factors observed among young patients with MIs. Interestingly, there is a nearly half of the patients had multi-vessel involvement contrast to previous studies. Therefore, the authors strongly emphasize the importance of primary preventive measures by the adjustment and promotion of

healthy life style as primary goal in prevention of MI even at the younger age.

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Conflict of interest

The authors declare that they have no conflict of interest.

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