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Original article

ALARM! CORONARY ATHEROSCLEROSIS IN NON-CARDIAC DEATHS AN-AUTOPSY STUDY

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Abstract

Background: Coronary heart disease prevalence rates in India have been estimated over the past several decades and have ranged from 1.6% to 7.4% in rural populations and from 1% to 13.2% in urban populations.

Objective: To study the age and sex distribution and importance of early surveillance of atherosclerosis and also to assess the pattern of involvement of coronaries including grading of severity in atherosclerosis.

Methodology: This study was conducted from January2021 to December 2021 at Department of Pathology, Karnataka Institute of Medical Sciences, Hubballi, KARNATAKA. The hearts of 215 successive autopsies where deaths due to non-cardiac causes, received in the department.

Results: Age wise vessel involvement showed that out of 23 cases from 61-70 years, 13 had both vessel involvement, 7 had LCA and 3 had RCA. Out of 22 cases from 51-60 years, 16 had both vessel involvement, 4 had LCA and 2 had RCA. Out of 18 cases from 41-50 years, 13 had both vessel involvement, 3 had LCA and 2 had RCA. Severe degree of atherosclerosis was found in 2.94% RCA vs 3.93% LCA cases in our study. Moderate degree of atherosclerosis was found in 10.78% RCA vs 12.25% LCA cases in our study.

Conclusion: Our study involved few numbers of cases where it highlights the early on set and increase in prevalence and severity of atherosclerotic lesions in Indian population. It is an alarming situation where health institutions should screen, prevent and advice controlling measures against atherosclerosis from an early age.

Key words: Coronary atherosclerosis, non-cardiac deaths

Introduction

India has one of the highest burdens of cardiovascular disease (CVD) worldwide. The annual number of deaths from CVD in India is projected to rise from 2.26 million (1990) to 4.77 million (2025). Coronary heart disease prevalence rates in India have been estimated over the past several decades and have ranged from 1.6% to 7.4% in rural populations and from 1% to 13.2% in urban populations. Coronary artery disease due to atherosclerosis has emerged as a major social epidemic in India. The incidence of coronary artery disease has touched alarming proportions. It has almost doubled during past 3-4 decades. It will soon emerge as the single largest disease accounting for nearly one-third of all deaths in India.[1]

Coronary artery disease (CAD) is the leading cause of sudden cardiac death (SCD),[1] resulting from either acute coronary syndrome or fatal arrhythmias due to myocardial fibrosis and/or scarring. Among young, nonischaemic structural diseases and arrhythmia disorders are more prevalent. [2] While CAD is prevalent in older population, the magnitude of CAD as cause for SCD in younger subjects has also been acknowledged. Nevertheless, there are very little data on CAD in young populations since it is uncommon in these age groups. Compared with other causes of SCD in young population, CAD offers opportunities for effective prevention strategies. [3,4] Since the burden of CAD related SCDs among young adults has remained unchanged, more information is needed in order to develop effective risk prediction strategies and prevent unexpected CAD related SCD. [5]

Objective:

1. To study the age and sex distribution and importance of early surveillance of atherosclerosis.
2. To assess the pattern of involvement of coronaries including grading of severity in atherosclerosis.

Materials and methods

This study was conducted from January2021 to December 2021 at Department of Pathology, Karnataka Institute of Medical Sciences, Hubballi, KARNATAKA. The medico-legal death cases who underwent autopsy at our hospital and their hearts were sent to our department for histopathological analysis. The study was ethically approved by the institute's ethical committee. The hearts of 215 successive autopsies where deaths due to non-cardiac causes, received in the department. The hearts were dissected following standard autopsy protocol. The hearts were fixed in 10% formalin, weighed, measured, and the two main coronary arteries were dissected out. A section of the right coronary artery (RCA) in the atrio-ventricular groove from its origin, a segment of the left coronary artery (LCA) from its origin till the circumflex branch were excised and dissected out.

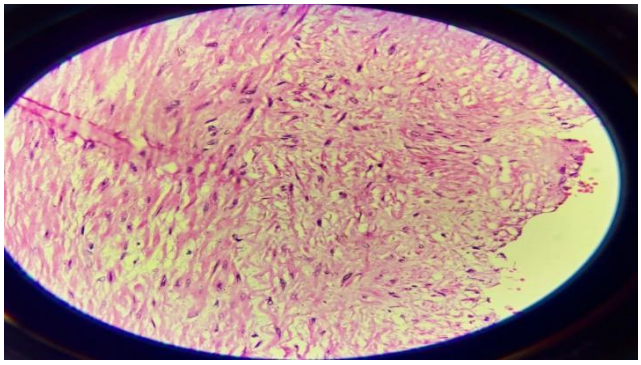
Each coronary artery was then sectioned. The exposed artery was carefully examined for any thickening, yellow streaks, frank plaque, or calcification. Multiple sections were taken from

areas thus found and proper identification number was given. After routine processing and paraffin embedding, 4 µm sections were taken and stained with hematoxylin and eosin (H and E).

All the histological sections were examined microscopically for the presence of atheromas.

American Heart Association typing of atherosclerotic plaque was done.

Fig 1: Grade 1-Presence of isolated macrophages and foam cells Grade 2- Mainly intracellular lipid accumulation



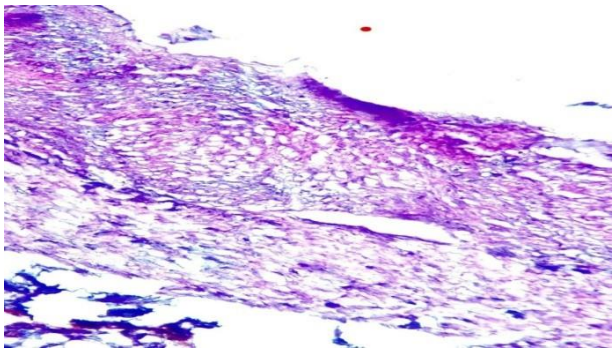


Fig 2: Grade 3- Grade 2 lesions along with small extracellular lipid pools. Grade 4- Grade 2 changes along with a core of extracellular lipid

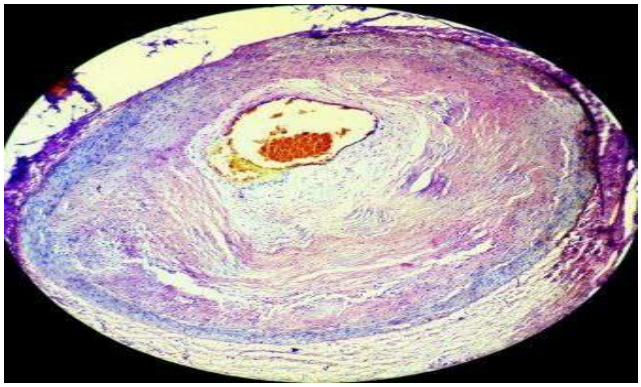


Fig 3: Grade 5- Lipid core and fibrotic layer or multiple lipid cores and fibrotic lipid layers; mainly calcific or fibrotic

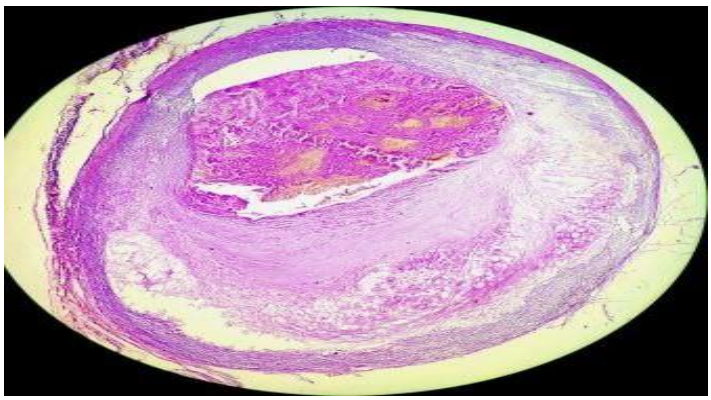


Fig 4: Grade 6 Surface defect, hematoma, hemorrhages, or thrombus formation

The degree of atherosclerosis was classified as-

- Unremarkable - Grade 0
- Mild -Grade 1-2
- Moderate -Grade 3-4
- Severe -Grade 5-6

Results

During the study period from January 2021 to December 2021, 215 consecutive autopsied hearts were submitted to the Department of Pathology, of which subjects had a history of non-cardiac cause of death. The age group ranged from birth to above 70 years.

Out of these 204 subjects (174males and 30females), 77(37.74%) subjects had some histopathological evidence of coronary atherosclerosis. In that 68(39.08%) were males out of 174 total male case and 09 (30%) were females out of 30 total female case. The average heart weight for all subjects in males and females was found to be 276.19 gm and 235.20 gm respectively.

Table 1: Age distribution of Atherosclerosis cases

Age	Atherosclerosis		Normal		Total
	Number	Percent	Number	Percent	
<21	1	5.26	18	94.74	19
21-30	4	11.76	30	88.24	34
31-40	6	19.35	25	80.65	31
41-50	18	36.00	32	64.00	50
51-60	22	66.67	11	33.33	33
61-70	23	69.70	10	30.30	33
>70	3	75.00	1	25.00	4
Total	77	37.75	127	62.25	204

Age wise prevalence of atherosclerosis was high in above 70 years i.e. 75% followed by 61-70 years i.e. 69.7%, 51-60 years-66.67% and 41-50 years-36%.

Table 2: Age and Sex Distribution of atherosclerosis cases

Age	Male		Female		Total
	Number	Percent	Number	Percent	
<21	0	0.00	1	100.00	1
21-30	3	75.00	1	25.00	4
31-40	6	100.00	0	0.00	6
41-50	17	94.44	1	5.56	18
51-60	18	81.82	4	18.18	22
61-70	21	91.30	2	8.70	23
>70	3	100.00	0	0.00	3
Total	68	88.31	9	11.69	77

Table 3: Age distribution – vessel involvement

Age	Vessels involved			Total
	RCA	LCA	BOTH	
<21	0	0	1	1
21-30	0	2	2	4
31-40	1	1	4	6
41-50	2	3	13	18
51-60	2	4	16	22
61-70	3	7	13	23
>70	0	0	3	3
Total	08(11%)	17(22%)	52(67%)	77

Age wise vessel involvement showed that out of 23 cases from 61-70 years, 13 had both vessel involvement, 7 had LCA and 3 had RCA. Out of 22 cases from 51-60 years, 16 had both vessel involvement, 4 had LCA and 2 had RCA. Out of 18 cases from 41-50 years, 13 had both vessel involvement, 3 had LCA and 2 had RCA.

Table 4: Degree / severity of atherosclerosis in the coronary vessels

SEVERITY	VESSELS	
	RCA (%)	LCA (%)
Normal	143(70%)	133(65.20%)
Mild	33(16.18%)	38(18.62%)
Moderate	22(10.78%)	25(12.25%)
Severe	06(2.94%)	08 (3.93%)
Total	204	204

Severe degree of atherosclerosis was found in 2.94% RCA vs 3.93% LCA cases in our study. Moderate degree of atherosclerosis was found in 10.78% RCA vs 12.25% LCA cases in our study.

Discussion

Atherosclerosis is a multi-factorial disease affected by various factors. Morbidity and mortality due to coronary atherosclerosis in India has reached alarming proportions and these numbers are expected to maintain the upward trend in the next decade. Atherosclerosis is a commonly observed pathological finding in almost all ethnicities and societies worldwide, but with variable prevalence in different races. The onset of atherosclerosis starts early in life from childhood and gradually progresses through young adulthood to form the lesions that causes coronary heart disease later in life.

In the present study, the overall incidence of atherosclerosis was found to be 37.74 %, which is similar to earlier studies by Dhruva et al[6], (23.3%); Golshahi et al[7], (28.9%); Garg et al[8], (46.4%); and Yazdi et al[9]. The frequencies of these lesions were reported between 16-74%.

Conclusion

- The study showed unexpectedly high prevalence of atherosclerosis in India, especially in the relatively young population and males are affected more than females, with no prior history of cardio vascular diseases.
- In this modern globalized era where human life style has become more and more complex, and challenging, various life stressors (anxiety, depression) along with a sedentary lifestyle and lack of exercise and poor dietary habits, can be important factors for earlier lesions in young population.
- Our study involved few numbers of cases where it highlights the early on set and increase in prevalence and severity of atherosclerotic lesions in Indian population.
- It is an alarming situation where health institutions should screen, prevent and advice controlling measures against atherosclerosis from an early age.

Conflict of interest- None

Source of funding- self-funded

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