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Original Article

Study of Coronary Arteries' Atherosclerosis in Autopsies Conducted at BPS GMC (W), Khanpur Kalan, Sonipat

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ABSTRACT

Background: Atherosclerosis is a leading cause of vascular disease worldwide. Its major clinical manifestations include ischemic heart disease, ischemic stroke, and peripheral arterial disease. In view of the above-mentioned disease load, this study was carried out at tertiary care hospital in north India (Haryana region) from year 2021 to 2022. A total of 80 cases were included in this study which was brought for postmortem examination. **Material and Methods:** In the present study, 80 patients were studied who came for postmortem at tertiary care hospital in north India from year 2021 to 2022. In these 80 cases, along with gross examination of hearts, 240 main coronary arteries, that is, left coronary artery (LCA), left anterior descending artery (LAD) and right coronary artery (RCA), were studied both grossly and microscopically, using conventional staining methods and light microscopy. Grading of coronary arteries' atherosclerosis was given according to the Modified American Heart Association Classification. **Result:** Among 80 postmortem cases, 63cases were males and 17 were females. Peak occurrence of Coronary arteries' atherosclerosis was noted in the age groups of 30–39 and 40–49 years as the number of study cases were most in these age groups. Number of coronaries involved and severity of lesions increased with increasing age. Percentage of lesions in males was significantly more as compared with females. LAD and LCA involvement was almost similar but more than RCA.

Keywords: Atherosclerosis, MAHA, Coronary arteries, lifestyle, LAD, RCA, LCA

INTRODUCTION

Atherosclerosis is a leading cause of vascular disease worldwide. Its major clinical manifestations include ischemic heart disease, ischemic stroke, and peripheral arterial disease [1]. The existence of atherosclerosis has been recognized for 500 years; as a pathological condition, it has been recognized for 150 years. Understanding of atherosclerotic vascular disease has evolved most dramatically over the past 25 years with the growth of the field of vascular biology [2]. Atherosclerosis is an inflammatory disease, because of high plasma concentrations of cholesterol, in particular those of low-density lipoprotein cholesterol. The process of atherogenesis has been considered by many to consist largely of the accumulation of lipids within the artery wall; however, it is much more than that [1].

Over 300 risk factors have been associated with atherosclerosis and its major complications, coronary heart disease and stroke. However, between 70% and 90% of the risk of atherosclerotic disease can be explained by different associations between conventional risk factors, such as smoking, abnormal lipids, hypertension, diabetes, obesity, psychosocial factors, unhealthy diet, and lack of physical activity [3]. Keeping in view the diversity of race, geographical and cultural diversification present in India, studying the prevalence and other aspects of this disease in a specific population is of great importance specially for the targeted population. Not many studies have been carried out in Haryana region. Hence, this study is being undertaken to collect and analyze information about prevalence and other aspects of coronary arteries' atherosclerosis.

MATERIALS AND METHODS

Data regarding age, sex, locality, weight of heart, gross heart examination, Modified American Heart Association (MAHA) grading on coronary artery atherosclerosis, lumen obstruction, major artery involvement, number of vessel involvement and age- and gender-wise coronary artery involvement were recorded and analyzed by descriptive method.

In the present study, 80 patients were studied who came for postmortem at tertiary care hospital in north India from year 2021 to 2022. All the cases of known age were included, coming for postmortem examination. Transgender, mutilated bodies, unknown bodies and decomposed bodies were excluded from this study. The specimen of heart fixed in 10% buffered formalin solution was further processed for histopathology. Specimen was weighted and thoroughly examined grossly. Grossing was done by inflow–outflow method along the direction of blood flow. The sections were processed, stained and examined as per standard protocol. For coronary arteries, malleable probe 2–3 mm in diameter was inserted through coronary ostia to check their position and serial sections across coronary arteries were taken. Gross examination of left anterior descending artery (LAD), right coronary artery (RCA) and left coronary artery (LCA)was done for the presence of any atherosclerotic plaques, thrombus and calcification with associated lumen reduction. Multiple sections were taken as per need. Hematoxylin and Eosin (H & E)-stained slides were visualized under light microscopy. Sections were studied and classified as per MAHA Classification of Atherosclerosis.

RESULTS AND DISCUSSION

A cross-sectional study was conducted in the Department of Forensic Medicine at tertiary care hospital, Sonepat, Haryana, for the duration of 1year. The autopsy study gives an understanding the basic process which sets the stage for clinically significant atherosclerotic coronary artery disease. There is no method to validate the coronary atherosclerosis in a living patient. The autopsy study provides a better representation and layout of the prevalence of coronary atherosclerosis in living population. Maximum cases seen in the age group of 30–39 years, i.e., 21 (26.2%) cases followed by 20 cases (25%) in the age group of 40–49 years then 19 cases (23.7%) in 20–29 years of age group. Two cases were observed each in 60–69 and 70–79 years age groups. Youngest case found in this study was 11 years old and eldest case seen was in 77 years old (Table 1). Out of 80 cases, 63 cases

Table 1: Distribution of cases according to age

Age group (years)	No. of cases (n)	Percentage (%)
10–19	09	11.3
20–29	19	23.7
30–39	21	26.2
40–49	20	25
50–59	07	8.8
60–69	02	2.5
70–79	02	2.5
Total	80	100

were male (78.8%), whereas only 17 cases were females (21.2%) with male : female ratio of 3.7:1 (Table 2), which were similar with other studies [5-8]. On the basis of weight of heart, we found that average weight of heart is more in males as compared with females (Table 3). These results are comparable to the similar findings of previous studies [8-9] but does not tally with the ratio given in KV Krishna Das [10]. In our study, LCA and RCA were equally involved but more than RCA (Figure 1), with LCA and LAD being involved in 61 cases out of 80 cases that had some lesions according to MAHA grading system, whereas RCA was involved in 58 cases out of 80 cases that had some lesions according to MAHA grading system (Table 4). In our study, the prevalence of coronary atherosclerosis in 3rd and 4th decade of life, gives 95.23% and 100%, respectively (Table 6) which were similar with other studies [7,11-12]. We also observed that both severity and age group-wise ratio of atherosclerosis increases as the age increases (Table 6). These findings are in agreement with other studies [4,8,9,11,13,14]. This is because in this modern globalized era, where human life style has become more and more complex and challenging. Various life stressors (anxiety, depression, etc.) along with a sedentary lifestyle and lack of exercise coupled up with smoking and excessive alcohol intake and poor dietary habits like intake of junk food and increased use of refined and processed food items in place of whole grains and fresh fruits and vegetables can be

Table 2: Distribution of cases according to gender

Gender	No. of cases (n)	Percentage (%)
Male	63	78.8
Female	17	21.2
Total	80	100

Table 3: Distribution of cases according to weight of heart

Weight of heart (g)	Male		Female		Total	
	n	%	n	%	n	%
<300	27	42.9	16	94.1	43	53.8
300–350	15	23.8	00	00	15	18.7
351–500	19	30.2	01	5.9	20	25
>500	2	3.1	00	00	02	2.5
Total	63	100	17	100	80	100

Table 4: Distribution of atherosclerosis in three major coronary arteries out of total 240 coronary arteries in 80 cases

	Right Coronary Artery		Left Coronary Artery		Left Anterior Descending Artery	
	n	%	n	%	n	%
Coronary atherosclerosis	58	72.5	61	76.25	61	76.25

Table 5: Distribution of coronary artery atherosclerosis based on percentage of lumen obstruction

Percentage of lumen obstruction (%)	Right Coronary Artery (n)	Left Coronary Artery (n)	Left Anterior Descending Artery (n)
<40%	10	16	12
40%–75%	11	11	09
>75%	02	06	01
Total	23	33	22

Table 6: Age-wise distribution of coronary artery atherosclerotic lesions

Age group (years)	No. of cases (n)	Affected individuals	Percentage (%)
10–19	09	02	22.22
20–29	19	11	57.89
30–39	21	20	95.23
40–49	20	20	100
50–59	07	07	100
60–69	02	02	100
70–79	02	02	100
Total	80	64	80

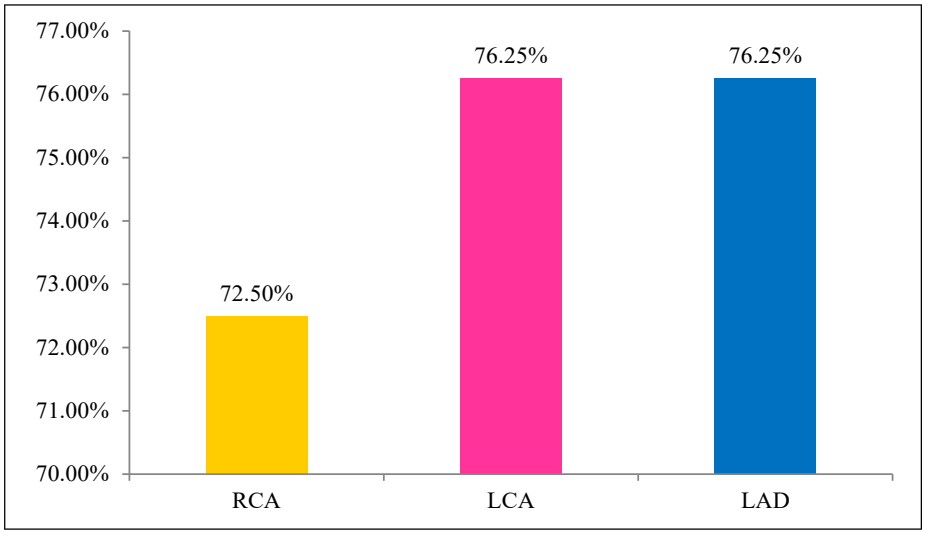


Figure 1: Distribution of coronary artery atherosclerosis in three major coronaries
Abbreviations: LCA, left coronary artery; LAD, left anterior descending artery; RCA, right coronary artery.

Table 7: Distribution of Grades of Coronary Artery Atherosclerosis in total 240 coronary arteries in total 80 cases, according to Modified American Heart Association (MAHA) classification

Morphological description	Right Coronary Artery		Left Coronary Artery		Left Anterior Descending Artery		Total	
	n	%	n	%	n	%	N	%
Unremarkable	22	27.50	19	23.75	19	23.75	60	25.00
Grade I	10	12.50	13	16.25	12	15.00	35	14.58
Grade II	16	20.00	21	26.25	22	27.50	59	24.58
Grade III	13	16.25	17	21.25	14	17.50	44	18.33
Grade IV	09	11.25	04	5.00	04	5.00	17	7.08
Grade V	07	8.75	05	6.25	06	7.50	18	7.50
Grade VI	01	1.25	01	1.25	02	2.50	04	1.60
Grade VII	01	1.25	00	00	00	00	01	0.41
Grade VIII	01	1.25	00	00	01	1.25	02	0.83
Total	80	100	80	100	80	100	240	100

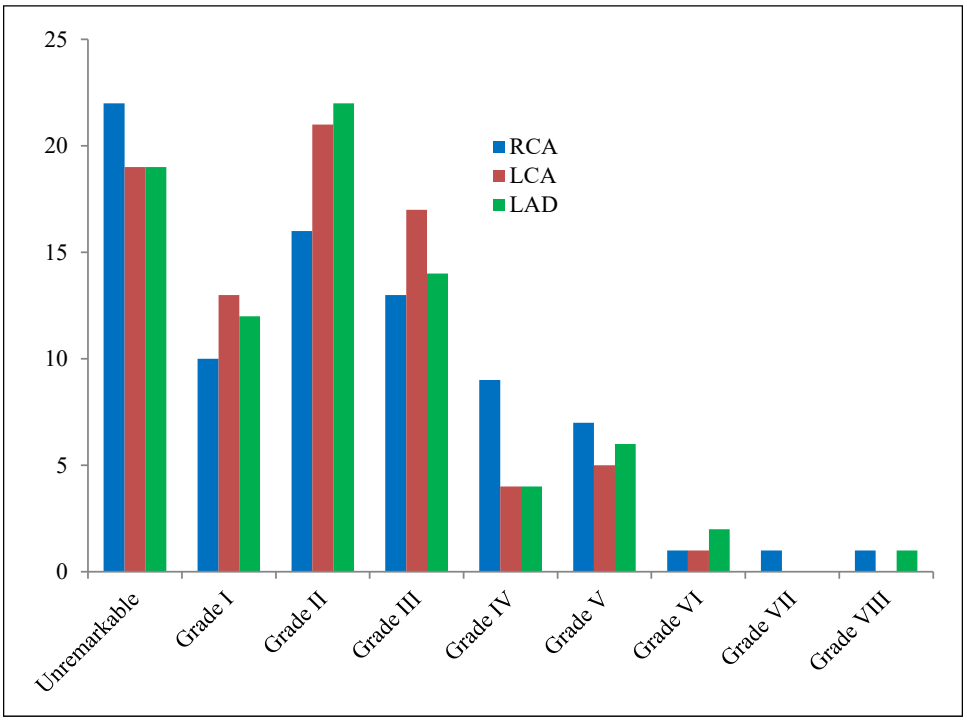


Figure 2: Distribution of grades of coronary artery atherosclerosis in total 240 coronary arteries in total 80 cases, according to modified American heart association classification
Abbreviations: LCA, left coronary artery; LAD, left anterior descending artery; RCA, right coronary artery.

Table 8: Distribution of cases according to age, sex and coronary artery lesions

Age in years	Male		Female		Total		
	UR	Lesions	UR	Lesions	UR	Lesions	%
10–19	04	02	03	00	07	02	3.1
20–29	05	07	03	04	08	11	17.1
30–39	00	18	01	02	01	20	31.25
40–49	00	18	00	02	00	20	31.25
50–59	00	05	00	02	00	07	10.9
60–69	00	02	00	00	00	02	3.1
70–79	00	02	00	00	00	02	3.1
Total	09	54	07	10	16	64	100

important factors for earlier initiation of development and progressive increase in atherosclerotic lesions in this young Indian population. This clearly indicates that atherosclerosis in coronary arteries is significantly higher in younger age group and demands the need for early screening to detect or treat the patient so as to avoid deadly consequences of coronary atherosclerosis.

In our study, all three major coronary arteries (80 cases x 3 = 240 arteries) were examined microscopically and categorized into eight grades (Figure 2). In our study, 60 arteries out of 240 (25%) were found to be unremarkable with maximum cases in RCA. Grade II lesions were the overall most common finding observed in 59 arteries (24.58%) with maximum cases observed in LAD, i.e., 22 cases followed by 21 cases in LCA and 16 cases in RCA (Table 7). Grade III lesions were the overall second most common finding observed in 44 arteries (18.33%) with maximum cases observed in

Figure 3 (A) and 3 (B): Show distribution of cases according to age, and coronary artery lesions in males and females, respectively

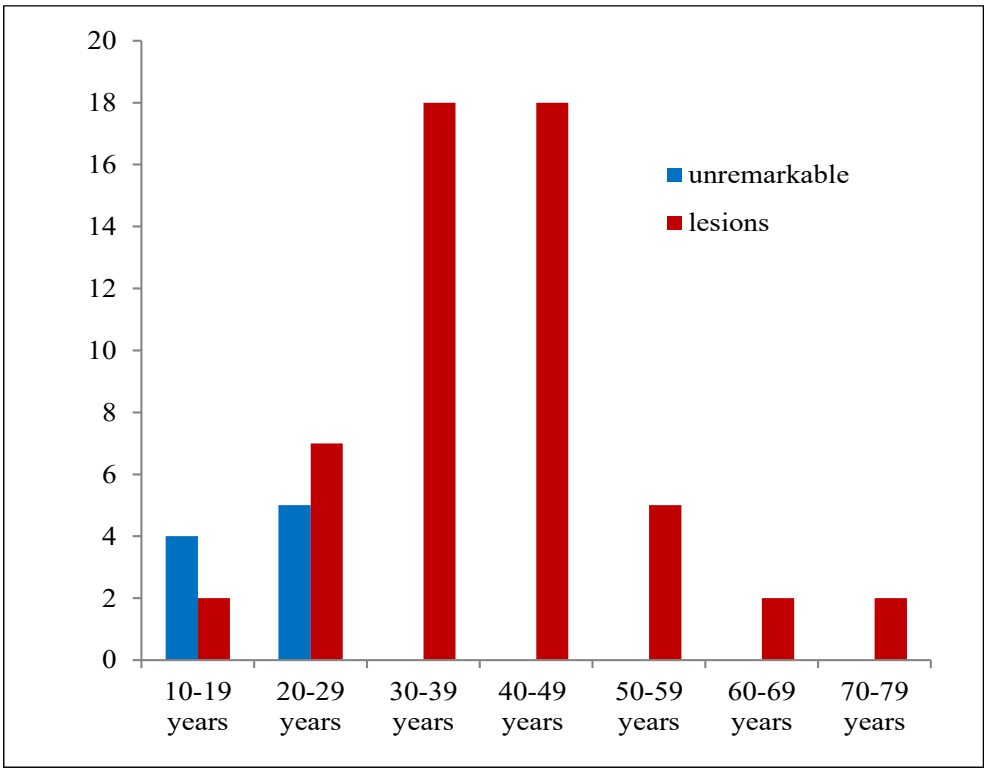
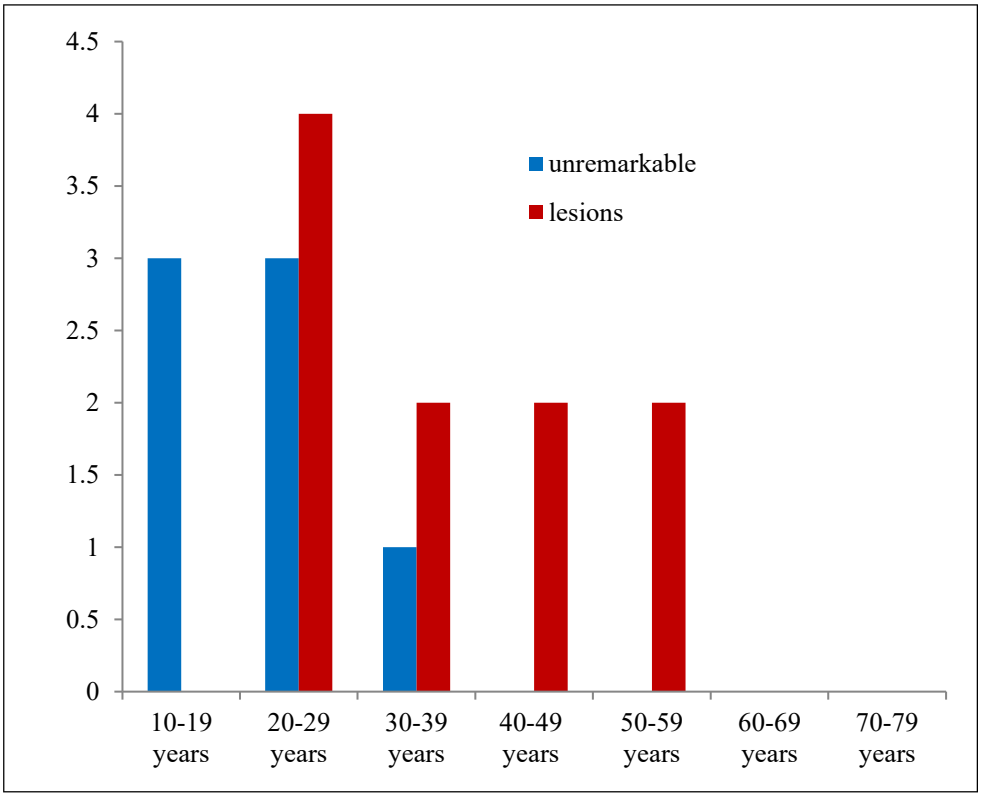


Figure 3 (B):



LCA, i.e., 17 cases followed by 14 cases in LAD and 13 cases in RCA. Advanced atherosclerotic lesions, i.e., grade V, VI, VII, VIII were observed in 25 arteries (10.33%). Maximum cases of advanced lesions were observed in RCA, i.e., 10 cases followed by LAD, i.e., 9 cases followed by LCA in which 6 cases were reported (Table 7). This was in concordance with the data given by other researchers [8,14,15]. In the present study, we found a male (84.37%) preponderance of coronary atherosclerosis as compared with 58.82% in females (Table 8), which is similar with the past researcher studies [4-7] in which males were affected most compared with the females.

CONCLUSION

Coronary artery disease has been expanding at alarming pace and causing significant morbidity and mortality globally. Coronary atherosclerosis and myocardial infarction are one of the most common fatal cardiac diseases discovered in autopsies. The study of human atherosclerotic lesion is an extremely difficult task in a living subject and, hence, an autopsy study is the best possible and cost-effective procedure. This study was conducted using MAHA classification, which describes eight grade lesions, helping in estimating the exact disease burden in the population. The fact is that progression of these lesions are preventable through health-care programs, necessitates collecting baseline information on the prevalence of such lesions. Thus, our study will help in providing valuable data to the literature regarding the morphology of atherosclerotic lesions and its relation to the significant cardiac morbidity.

Conflict of interest: No.

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Ethical approval: Taken via letter no BPSGMCW/RC641/IEC/2021, dated 26.02.2021.

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REFERENCES

[1] Herrington W, Lacey B, Sherliker P, Armitage J, Lewington S. Epidemiology of Atherosclerosis and the Potential to Reduce the Global Burden of Atherothrombotic Disease. Circulation Research 2016; 118(4):535–46.

[2] Faxon DP, Fuster V, Libby P, Beckman JA, Hiatt WR. Atherosclerotic vascular disease conference. Circulation 2004; 109(21):2617–25.

[3] Kumar V, Abbas AK, Fausto N, Robbins SL, Cotran RS. In: Robbins and Cotran pathologic basis of diseases. 7th ed. Philadelphia, PA: Elsevier Saunders 2005; pp. 516,520,571–2.

[4] Singh H, Oberoi SS, Gorea RK, Bal MS. Atherosclerosis in coronaries in malwa region of Punjab. Journal of Indian Academy of Forensic Medicine 2005; 27:32–5.

[5] Murthy MS, Dutta BN, Ramalingaswami V. Coronary atherosclerosis in North India (Delhi Area). The Journal of Pathology and Bacteriology 1963; 85:93–101.

[6] Bhargava MK, Bhargava SK. Coronary atherosclerosis in North Karnataka. Indian Journal of Pathology and Microbiology 1975; 18:65–79.

[7] Padmavati S. Epidemiology of cardiovascular disease in India. II. Ischemic heart disease. Circulation 1962; 25:711–17.

[8] Garg M, Agarwal AD, Kataria SP. Coronary atherosclerosis and myocardial infarction: An autopsy study. Journal of Indian Academy of Forensic Medicine 2011; 33:39–42.

[9] Dhruva GA, Agravat AH, Sanghvi HK. Atherosclerosis of coronary arteries as predisposing factor in myocardial infarction: An autopsy study. Online Journal of Health and Allied Sciences 2012; 11:1.

[10] Krishna DKV. Cardiology. In: Textbook of medicine. New Delhi: Jaypee, the Health Sciences Publisher 2017; pp. 742–883.

[11] Wig KL, Malhotra RP, Chitkara NL, Gupta SP. Prevalence of coronary atherosclerosis in northern India. BMJ 1962; 1(5277):510–13.

[12] McGill HC Jr, McMahan CA, Herderick EE, Zieske AW, Malcom GT, Tracy RE et al. Pathobiological Determinants

of Atherosclerosis in Youth (PDAY) Research Group. Obesity accelerates the progression of coronary atherosclerosis in young men. Circulation 2002; 105(23):27121–8.

[13] Tandon OP, Aggarwal VC, Katiyar BC. Coronary and aortic atherosclerosis (A study on 300 medicolegal postmortems). Indian Heart Journal 1969; 21:5–10.

[14] Yazdi SA, Rezaei A, Azari JB, Shakeri MT. Prevalence of atherosclerotic plaques in autopsy cases with noncardiac death. Iranian Journal of Pathology 2009; 4:101–14.

[15] Sudha ML, Sundaram S, Purushothaman KR, Kumar PS, Prathiba D. Coronary atherosclerosis in sudden cardiac death: An autopsy study. Indian Journal of Pathology and Microbiology 2009; 52:486–89.

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