Original Research Article

Profile of Cases of Death Due to Coronary Artery Disease: An Autopsy Based Descriptive Study

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Abstract

Background: Most common cause of sudden cardiac death is coronary artery disease, which contributes to 75 to 90%. The present study is undertaken to describe the profile of autopsy cases of coronary artery disease.

Methods: Descriptive cross-sectional study was conducted in all cases of sudden and unexpected death brought for autopsy a tertiary level centre in southern Kerala during a period of one year. Gross and microscopical examination of heart and coronary arteries were studied and in cases with coronary artery disease, associated factors like previous history of illness, personal habits, family history of illness, body mass index, abdominal circumference, horizontal earlobe crease were described in detail. Categorical variables were represented as frequency and percentage, continuous variables as mean and standard deviation and association was tested using Chi square test.

Conclusions: Statistically significant association (*p value = 0.001)* was observed between the horizontal earlobe crease and occlusive coronary artery disease. No significant association was obtained between the obesity parameters like body mass index, waist to hip ratio and occlusive coronary artery disease. Majority of the cases with significant occlusion was observed in the left anterior descending artery. The most common site of thrombus was in the proximal third of left anterior descending artery.

Key words: Sudden cardiac death, coronary artery disease, coronary thrombosis, coronary atherosclerosis, horizontal earlobe crease.

Introduction

Sudden cardiac death is unexpected natural death of a person due to cardiac cause, within 24 hours of onset of symptoms without any prior fatal disease[1]. Cardiac disorders constitute the most common causes of sudden and unexpected deaths. Among the sudden cardiac deaths, the most common cause

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is coronary artery disease (CAD) and it contributes 75 to 90% of sudden cardiac deaths in the world [2,3,4].

Objectives:

1. To analyze the profile of autopsy cases of death due to coronary artery disease
2. To find out the proportion of coronary artery disease among autopsy cases of sudden cardiac deaths

Materials and Methods

Descriptive cross-sectional study was conducted in all cases of sudden and unexpected death brought for autopsy a tertiary level centre in southern Kerala during a period of one year. The study was conducted after getting Institutional Ethics Committee and instituitional research committee approval. Cases selected after obtaining the informed consent from the accompanying near relative. Personal details of the deceased like occupation, income, previous history of the illness (CAD, Hypertension, Diabetic Mellitus), personal habits (smoking and alcoholism), family history of CAD were collected from the police and the available near relative. During autopsy examination height, weight, waist circumference (midway between the lower rib margin and the iliac crest), hip circumference (at the level of widest circumference over the greater trochanters), abdominal subcutaneous fat thickness (midway between the umbilicus and pubic symphysis) were taken. Gross details of aorta and heart including examination of coronary arteries were recorded and bits from relevant areas subjected to microscopic examination and findings noted.

Body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meter. Base on BMI subjects were classified into four categories: < 20-lean, 20 to 24.9 (normal), 25 to 29.9 (overweight) and > 30kg/m^2 (obese). Waist hip ratio was calculated by dividing waist circumference with hip circumference. Data was collected using intake proforma, entered in Microsoft Excel spread sheet and analyzed using SPSS software version 16.0. Categorical variables were represented as frequency and percentage, continuous variables as mean and standard deviation and association was tested using Chi square test.

Results and Discussion

During the study period total 120 cases of sudden cardiac death were autopsied. Among that 92(76.7 %) cases were coronary artery disease, which included cases of Occlusive coronary artery disease and Coronary artery thrombosis.

The demographic characteristics of the cases are as follows,

Table. 1 Age and Sex Distribution of the study population

Age group (in years)	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
20-30	4	4.8	0	0	4	4.3
30-40	6	7.1	2	25	8	8.7
40-50	27	32.2	2	25	27	29.3
50-60	25	29.8	2	25	29	31.6
60-70	19	22.6	2	25	21	22.8
70-80	3	3.5	0	0	3	3.3
Total	84	100	8	100	92	100

x^2= 34.360 df = 6 p = .001

A significant (*p value = 0.001)* relation was present between the age of the persons and sudden death due to occlusive coronary artery disease. The peak age of incidence was found to be 41 to 50 years, followed by 51 to 60 years. Higher occurrence of atherosclerosis was noted in 4th decade in a study conducted in Trivandrum medical college (Sasikala K; Occlusive coronary artery disease – a histomorphological study of 100 medico-legal cases , Unpublished thesis.1996)

Males predominated in the study population (91%) which tallies with the observations of the

previous studies[3,4]. This huge preponderance is due to the higher incidence of coronary atherosclerosis in males, which forms the major part of the sudden death due to cardiac causes. Use of alcohol and cigarette smoking may be the predisposing factors. Premenopausal females are well protected from the risk of atherosclerosis due to the presence of oestrogen.

Table 2. Baseline characteristics of study population (N= 92)

	Characteristics	Frequency	Percentage
Personal details	Dietary habits - Non veg	91	97.8
	Hypertension	22	23.9
	Diabetes mellitus	1	1.1
	Smoking	28	30.4
	Alcoholism	7	7.6
	Past H/o Heart disease	6	6.5
	Horizontal ear lobe crease	61	66.3
Family history	Hyperlipidaemia	4	4.2
	Diabetes mellitus	7	7.6
	Hypertension	14	15.2

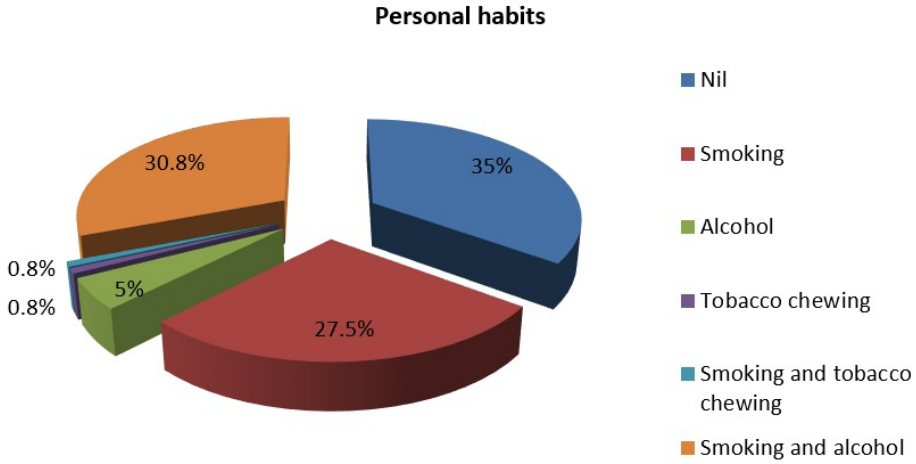

Figure 1 Personal Habits

A highly significant association (*p value=0.008)* was found between smoking and coronary artery disease of the study sample.

Family history of hypertension was present in 15% cases. No significant family history was obtained in 75.8% of cases. Family history of the diseases like hypertension, diabetes and hyperlipidaemia have a contributory role in the development of coronary atherosclerosis. In the present series, relevant family history was obtained only in 24.2% of cases. This may be due to the inadequacy of the history obtained from the relatives available at autopsy.

Statistically significant association (*p value = 0.001)* was observed between the horizontal earlobe crease and occlusive coronary artery disease. This agrees with the findings of Moraes et al[5] and Toyosak et al[6]which may be considered as a prediction for the presence of coronary artery disease.

General physical details

Table 3. Body mass index (N= 92)

Body mass index	Number	Percentage
Under weight	6	6.5
Normal	31	33.6
Overweight or obese	55	59.8
Total	92	100

As per waist to hip ratio, 63% of the victims of coronary artery disease were normal and the rest were obese. The mean value for the waist circumference in victims with occlusive coronary artery disease was 88.2cm with standard deviation of 11.8cm.

Table 4. Waist to hip ratio and occlusive coronary artery disease (N=92)

Waist to hip ratio	Occlusive coronary artery disease	
	Number	Percentage
Normal	58	63.0
Obese	34	37.0
Total	92	100

Table 5. Abdominal fat thickness and extent of coronary artery occlusion (N=92)

Thickness of abdominal fat	Percentage of Coronary artery occlusion								Total	
	<25		25-50		50-75		>75			
	No.	%	No.	%	No.	%	No.	%	No.	%
<2cm	9	50	7	50	8	57.1	24	32.4	48	40.0
2-4cm	8	44.4	6	42.9	4	28.6	44	59.5	62	51.7
>4cm	1	5.6	1	7.1	2	14.3	6	8.1	10	8.3
TOTAL	18	100	14	100	14	100	74	100	120	100

The mean of the abdominal fat thickness of the persons died of coronary artery disease was 2.8cm and the standard deviation is 1.1cm. In 59.5% of the cases of occlusive coronary artery disease with severe stenosis (more than 75% narrowing of the lumen) of coronary arteries, had abdominal fat thickness between 2 to 4 cm. This finding is in accordance with the observations by Korteleinen[7] that abdominal subcutaneous fat thickness had a significantly negative association with severity of coronary atherosclerosis.

In the present study, the presence of occlusive coronary artery disease is almost similar in overweight or obese cases and in normal people. This finding is contradictory to Framingham heart study[8-10], which may be due to the presence of increased proportion of manual labourers (39.5%) in the present study.

Findings in the Heart

In the present study, the mean weight of heart in males and females were 298.2gm and 282.5gm respectively. Mean thickness of the left ventricle was 2cm and the standard deviation 0.3cm. Prolonged undiagnosed hypertension could be the reason for increased left ventricular thickness.

Among 92 cases, 90.2% showed microscopic changes of ischaemia in the myocardium. In the remaining cases, positive findings are occlusion of the coronary arteries by subintimal haemorrhage and thrombus.

In 14.1% of cases calcification of atheromatous plaque of the intima of any of the coronary arteries seen and showed ischaemic changes.

Atheromatous plaques around coronary ostia

In 55.8% of cases, crowding of atheromatous plaques were present around both coronary ostia. In 19.2% of cases, it was present only around right coronary ostia and in 7.5% of cases, only around the left coronary ostia.

Atheromatous thickening of the coronary arteries

In the right coronary artery, more than 75% narrowing of the lumen was present in 30% of cases. Left main trunk showed more than 75% narrowing in 6 cases (5%). More than 75% narrowing of the left anterior descending artery was present in 54.2% of cases. In the left circumflex artery, significant narrowing was present only in 5% of cases.

Table 6. Atheromatous thickening of the Coronary arteries

Artery	Less than / = 25%		26-50%		51-75%		More than75%	
	No	%	No	%	No	%	No	%
Right coronary artery	32	34.7	24	26	9	9.7	27	29.3
left main coronary artery	30	33	36	39	20	22	6	6
left anterior descending artery	16	17.4	14	15.2	7	7.6	55	59.8
left circumflex artery	64	70	21	23	4	4	3	3

Thrombus in the coronary arteries

In the present study, out of the 92 cases, 16.7% of cases showed occlusion of coronary arteries by a thrombus. Most common site of thrombus was in the upper third of left anterior descending artery in 50% of cases. Next common site is the right coronary artery (35%), in its upper half, in 20% of cases and in the lower half, in 15%.

Gross changes in the myocardium

Myocardium was pale in 62.5% and granular in 53.3% of the cases. Among the 92 cases, gross fibrosis of the myocardium was present in 38.7% and haemorrhage in 27.5% of cases. Aneurysm of left ventricle was present in 7 cases and mural thrombus in 5 cases.

Microscopic ischaemic changes in the myocardium

Out of the 85 cases with microscopic ischaemic changes in the myocardium, 82.3% of the cases showed more than 75% narrowing of the lumen of any one of the coronary arteries. The microscopic changes in the myocardium in cases where the cause of death was occlusive coronary artery disease were, waviness of fibres (31.5%), hypereosinophilia of fibres(22.9%), inflammatory cell infiltration (75%), congestion (77.2%), interstitial oedema (47.3%), necrosis of myocardial fibres (48.9%), and haemorrhage (44.6%).

Table 7. Percentage of occlusion of coronary artery and presence of any of the microscopic ischaemic change in myocardium

Percentage of coronary occlusion	Cases with any of the microscopic ischaemic change in myocardium	
	Total	Percentage
<25	1	1.2
25-50	5	5.9
50-75	9	10.6
>75	70	82.3
Total	85	100

Apart from CAD, there were cases of Coronary Artery thrombosis and cardiac tamponade due to rupture of left ventricle. Both cases were males, aged 48years.The left anterior descending artery was completely blocked by a fresh thrombus in one case and more than 75% narrowing of the right and the left coronary arteries were present in the other case. Grossly left ventricle showed extensive fibrosis in one case. In both cases, tear was in the left ventricle near the apex. Microscopically, myocardial necrosis, inflammatory cell infiltration with neutrophils and haemorrhages were seen in both cases.

Conclusions

- A highly significant association (*p value=0.008)* was found between smoking and coronary artery disease of the study sample.
- Statistically significant association (*p value = 0.001)* was observed between the horizontal earlobe crease and occlusive coronary artery disease. Horizontal ear lobe crease can be considered as a prediction for the presence of coronary artery disease.

- In 59.5% of the cases with severe stenosis (more than 75% narrowing of the lumen) of coronary arteries had abdominal fat thickness between 2 to 4 cm.
- No significant association was obtained between the obesity parameters like body mass index and waist to hip ratio, and occlusive coronary artery disease.
- Mean thickness of the left ventricle in deaths due to occlusive coronary artery disease was 2cm and the standard deviation was 0.3cm.
- Majority of the cases with significant occlusion (>75%) was observed in the left anterior descending artery (54.2%) , followed by right coronary artery (30%), left main coronary artery (5%) and left circumflex artery (5%).
- The most common site of thrombus was in the proximal third of left anterior descending artery (50%) followed by, right coronary artery (35%), in its upper half in 20% of cases and 15% in the lower half.
- In 90.2% of cases, any one microscopic change of coronary ischemia was seen in the myocardium.
- Left ventricle of the heart showed rupture following ischaemic changes of the myocardium in two cases.

Policy implications and limitations of the study

Further elaborative studies are required in the field of sudden cardiac death to take necessary actions to prevent or modify the associated factors. Proper history is not available in many of the cases because of the absence of near relative who has knowledge regarding the health condition of the person died.

Ethical clearance: Taken from Human Ethics committee, Govt. Medical College, Thiruvananthapuram (Reference no. IEC 04/04/2009 Dated 05/08/2009)

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