A Study of Autopsy Findings in Cases of Sudden Cardiac Death at Kakatiya Medical College and Hospital Warangal

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Abstract

Background and Objectives: The incidence of sudden cardiac death is increasing in developing countries due to changes in lifestyle and food habits. We in the present study tried to evaluate the autopsy findings of cases of sudden cardiac death reported to Kakatiya Medical College and MGM Hospital Warangal.

Methods: The present study was carried in the Department of Forensic Medicine and Toxicology, Kakatiya Medical College and MGM Hospital Warangal from January 2019 to Jan 2020. All the cases including both sexes those who died suddenly and unexpectedly brought to the institute for post-mortem examination were studied.

Results: In 10% of cases major blockage was noted in both right and left main coronary arteries. Left main trunk blockage was noted in 31% of cases 5% of cases the blockage was seen in only right coronary arteries. In 32% of cases, the blockage was severe >90%. The highest incidence of major blocks was seen in the age group 60-70 years. The younger age group showed the tendency of blockage of the left coronary arteries. The less commonly affected was the circumflex branch and right coronary arteries. MI was the cause of death in 44% of cases and 5% of cases there was evidence of old and fresh infarcts.

Conclusion: Within the limitations of the current study it can be concluded that most of the cases of sudden cardiac death in this study were from 51-70 years. The most commonly affected victims were males by a ratio of 17:3. Autopsy plays an important role in the accurate diagnosis of sudden cardiac death. Therefore meticulous postmortem examination and histopathological examination are needed to minimize the risk of negative reporting.

***Keywords**: Sudden Cardiac Death (SCD), Autopsy Findings, Myocardial Infarction (MI), Coronary Artery Disease (CAD).*

Introduction

Sudden cardiac death as per WHO includes the death of a person usually seen within 24 hours of the onset of symptoms [1]. The widely accepted definition of sudden death is a death that is not caused due to trauma, poisoning, violent asphyxia which occurs within twenty-four hours of the onset of symptoms [2]. There is a rising trend in cases of sudden cardiac death across the world particularly in the urban population during the last five decades [3,4]. The majority of cases of sudden cardiac death in the older population are attributed to atherosclerotic coronary artery diseases whereas cardiomyopathies are the cause of death in younger (<35 years) age [5]. Studies in India have shown the incidence of ischemic heart disease has increased to 10% [6]. The most common cause of death recorded in autopsy in cases of sudden cardiac death is myocardial infarction due to coronary insufficiency [7]. In some of the cases of SCDs, the cardiac abnormality cannot be identified despite histopathologic

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examination and toxicology screening in such cases they will be classified as sudden arrhythmic death syndrome [SADS] [5]. The incident is associated with the development of ventricular tachycardia progressing to ventricular fibrillation and at lastly Asystole. Identifying patients at risk of developing sudden cardiac death is an important challenge for clinicians but unfortunately, the majority of sudden cardiac death victims who suffer from cardiac diseases are discovered through the postmortem examination. We in the present study tried to evaluate the causes of sudden cardiac death in cases reported to Kakatiya Medical College and MGM Hospital Warangal.

Material and Methods

The present study was carried in the Department of Forensic Medicine and Toxicology, Kakatiya Medical College and MGM Hospital Warangal from January 2019 to Jan 2020. All the cases including both sexes those who died suddenly and unexpectedly brought to the institute for post-mortem examination were studied based on the inclusion and exclusion criteria

Inclusion criteria

1. Cases in which autopsy results showed deaths due to cardiovascular system involvement.

2. Cases where the autopsy was done within the 24 hours of the death of the subject.

3. Cases that were brought in an unconscious state to casualty and subsequently died due to cardiovascular causes.

Exclusion criteria

1. Cases of unnatural deaths were not included in the study.

2. Cases where the cause of death remained obscure despite detailed post-mortem examination including histopathological, toxicological and microbiological examinations.

3. Cases of death which reported after 24 hours for post mortem examination

4. Deaths due to non-cardiac origin.

The dissection of the heart was done from the subjects as per the description by Davidson's technique [8]. The ventricles were cut transversely to view the endocardium including its colors, scars, and fibrosis if present. The autopsy findings were focused on details of the gross appearance of heart its surfaces, walls, coronary arteries, valves, great vessels, the weight of heart was measured and recorded in all cases, condition of papillary muscles was noted. The myocardial infarction was considered recent if hemorrhage paleness and softening found in the myocardium. The specimens were preserved in 10% formol saline [is prepared by dissolving 8.5 g of sodium chloride in 900 ml of distilled water and mixing with 100 ml of 40 percent formaldehyde] and Hematoxylin and Eosin staining for microscopic examination. The microscopic examinations in such cases revealed cytoplasmic hypereosinophilia, granularity, edema, and hemorrhages. The signs of old infarct were the presence of triangular-shaped scars of 0.5cms or more and directed towards the apex. All the data was recorded in MS Excel Spreadsheet and statistical analysis was done using SPSS version 17 on windows format.

Results

A total of n=100 patients were autopsied and studied during the study period from Jan 2019 to Jan 2020. The ratio of male to female was 17: 3 for sudden cardiac death (85% male and 15% female). Table 1 shows the demographic profile of the subjects included in the study. It is evident from the study that most of the patients were belonging to 51 to 70 age groups with a total of 58% of subjects.

The 20% of cases were found dead without any complaints of illness before admission in casualty and 21% of cases the history of illness was unknown. 39% of patients had a history of ischemic heart disease and were on various medications during the time of incidence. In 6% of patients, the existence of cardiac disease was not known by the subjects. 59% of patients were showing signs and symptoms of illness and 20% had ignored the signs and symptoms and 39% were in casualty before the event. Most of the patients died within 24 to 48 hours of the appearance of symptoms. Most of the signs and symptoms by the patients in the study were sweating in 30% followed by dyspnea in 59% cases, pericardial pain in 50% of cases other symptoms were vomiting and cyanosis in 30% cases.

The Middle-income group was mostly involved in sudden cardiac death 41% of cases followed by the higher income group in 30%. The most common cardiac pathology in these cases was coronary artery disease [CAD]. The majority of cases 57% of deaths were reported outside the hospital. The anatomical location of block and percentage of atherosclerotic lesions was studied in the autopsy.

In 10% of cases, a major blockage was noted in both right and left main coronary arteries. Left main trunk blockage was noted in 31% of cases 5% of cases the blockage was seen in only right coronary arteries. In 32% of cases, the blockage was severe >90%. In most of the cases, the type of occlusion observed was in the form of concentric central pinhole type to crescentic with the lumen of the vessel pushed to one side. The highest incidence of major blocks was seen in the age group 60-70 years. The younger age group showed a tendency of blockage of the left coronary arteries. The less commonly affected was the circumflex branch and right coronary arteries. MI was the cause of death in 44% of cases and 5% of cases there was evidence of old and fresh infarcts.

Statistical analysis was done by the following method: All of the available data was entered in MS Excel spreadsheet and analyzed by SPSS version 17 on windows format

Table 1: Showing the demographic profile of cases included in the study

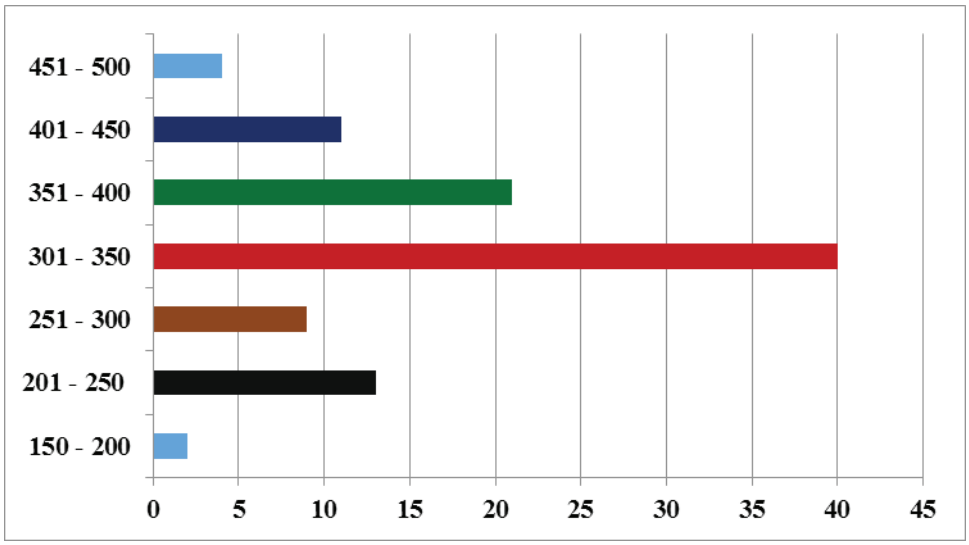
Age group	Male	Female	Total (%)
21 – 30	04	00	04
31 – 40	09	01	10
41 – 50	10	03	13
51 – 60	15	07	22
61 – 70	34	02	36
> 70	13	02	15
Total	85	15	100

Table 2: duration of onset of symptoms and death

Duration of symptoms	Male	Female	Total (%)
< 30 minutes	08	07	15
1 – 2 hours	04	03	07
12 – 24 hours	33	04	37
unknown	40	01	41

Table 3: showing the socioeconomic status of the cases in the study

Socioeconomic status	Male	Female	Total (%)
Low Income Group	07	05	12
Middle Income Group	39	02	41
High Income Group	29	01	30
Unspecified	10	07	17



Graph 1: Showing the Weight of the heart in grams after an autopsy

Table 4: Types of cardiac pathology found in the present study

Pathology	Male	Female	Frequency (%)
Myocardial Infarction	35	09	44
Coronary Artery Disease	26	03	29
Rheumatic Heart Disease	05	02	07
Hypertrophic cardiomyopathy	03	00	03
Hypertensive heart disease	07	01	08
Alcoholic cardiomyopathy	06	00	06
Aneurysm of Heart	03	00	03
Total	85	15	100

Table 5: Showing the involved artery with the percentage of blockage in cases of the study

Involved artery	Frequency	Blockage percentage		
		70 – 100%	40 – 70%	< 30 %
Left Main trunk	41	29	10	2
Left Anterior Descending branch	44	35	5	4
Left circumflex artery	20	8	4	8
Right coronary artery	15	10	2	3

tes)

Discussion

The postmortem examination of the case of SCD includes macroscopic and histological studies of the heart apart from the heart, examinations of other organs is done to rule out possible non-cardiac causes

of death [9]. The macroscopic examinations include the abnormalities of pulmonary arteries for embolus and patterns and origins of coronary arteries and distributions and examination of luminal obstruction. The size of chambers of heart, conditions of valves, the thickness of walls and presence of zones of old or new infarcts [10]. The intactness of papillary muscles and chordae tendineae should be done [11]. In the present study, we found Myocardial infarction as the major contributory cause of sudden cardiac death in 44% of patients. The overall male to female ratio in the study was 17:3. Framingham's study has found the cases of SCD are 10 times more common in males as compared to females [12]. Other similar studies have reported the male to female ratio of coronary heart disease from 3:2 to 8:1 [13-15]. The highest number of cases of sudden cardiac death was between 60 - 70 years of age group. Chugh SS has found a higher prevalence of SCD in the geriatric age group 75-85 years [13]. It has been found that the age-related trends of SCD increase with age with no predilection to race or sex [16]. Derya AA et al; have shown that a large number of sudden natural death was in the age group 50-59 years [17]. DS Rao et al; [18] found the largest number of cases of sudden natural deaths were between age group 45 - 65 years. Although cases of sudden death in this study were aged above 60 years we also found 22% of cases in the age of 51-60 years. The incidence of SCD is increasing due to changes in lifestyles, use of refined carbohydrates, stress and strain in life and lack of regular medical check-ups. Kuller et al; have shown that cases of sudden non-traumatic death are due to arteriosclerotic diseases [19]. In the present study, the timing of death was in early morning hours from 5 AM to 12 PM in 47% of cases. According to Chaudhari VA et al; higher frequency in the morning may be related to the stress of life which includes the fulfillment of duties, transportation and other work-related activities [20]. The hemodynamic stress to CVS appears to be greater in the morning and any vulnerable atherosclerotic plaque causes sudden cardiac death. The situation appears to be compounded by higher levels of catecholamines in the morning hours. Studies have also found that there is a greater tendency of platelet agreeability in morning hours [21, 22]. In this study, we found the left anterior descending branch involvement in 40% of cases. Most of the coronary arteries were blocked within 2cms of origin of the artery and in 32% of cases, the blockage was severe >90%. The left anterior descending branch supplies over half of the heart muscle hence most of the time blockage is found at the beginning of the artery. In most of the cases, the type of occlusion observed was in the form of concentric central pinhole type to crescentic with the lumen of the vessel pushed to one side. The involvement of the left anterior descending artery was higher with severe narrowing as compared to cases where the right coronary artery is involved. Bohrod MG has found the ranges of the left anterior descending branch were 45-64% while the right coronary artery was involved in 24-46% and the left circumflex artery is involved in 3 -10% of cases [23].

Conclusions

Within the limitations of the current study, it can be concluded that most of the cases of sudden cardiac death in this study were from 51-70 years. The most commonly affected victims were males by a ratio of 17:3. Autopsy plays an important role in the accurate diagnosis of sudden cardiac death. Therefore meticulous postmortem examination and histopathological examination are needed to minimize the risk of negative reporting. The use of newer and more sophisticated techniques like 3T-MRI, S100 Calcium Binding Protein A1 (S100A1), and quantitative myoglobin essay may be done wherever feasible.

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