Original Article

Indian Journal of Forensic Medicine and Pathology
Volume 14 Number 2, April - June 2021
DOI: http://dx.doi.org/10.21088/ijfmp.0974.3383.14221.13

Study of Histopathological Findings in Sudden Unexpected Natural Deaths in a Tertiary Care Hospital

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How to cite this article:
Shailaja Kupati, Gayathri T, Shashikala V et al./Study of Histopathological Findings in Sudden Unexpected Natural Deaths in a Tertiary Care Hospital/Indian J. Forensic Med Pathol. 2021;14(2):103-107

Abstract

Introduction: Sudden death (SD) is defined by World Health Organization (WHO) as 'death within 24 hours from onset of the symptoms'.[1] It is by definition natural and it excludes all deaths due to poison and trauma. The incidence of sudden cardiac death has been steadily increasing all over the world. When SD occurs in adults and elderly persons, coronary atherosclerosis is the usual cause. These diseases are frequently concealed and discovered with surprise only at post mortem using macroscopic and microscopic examination of heart.

Methods: Present study is a retrospective study, conducted in the department of Pathology, Vydehi Institute of Medical Sciences and Research Centre Bengaluru from July 2016 to June 2020. Patients of all age groups who died within 24 hours from the onset of symptoms were included.

Results: A total of 483 autopsy cases were received for histopathological examination, among which there were 134 cases with history of sudden death during the study period. Age distribution ranged from 6 days to 86 years. In our study we observed male preponderance. Maximum number of cases was observed in 31 to 40 years of age. Major causes for sudden deaths observed were coronary artery diseases in 98 cases (73%) followed by pulmonary causes in 12 cases (8.96%).

Conclusion: Present study highlighted the presence of increasing cases of sudden deaths among young males compared to developed countries. This will emphasize the need for research studies to find out the cause and early interventional measures to prevent the same.

Keywords: Sudden death; Autopsy; Histopathological findings.

Introduction

The World Health Organization (WHO) definition of sudden death according to the International classification of diseases, version 10 (ICD-10) is death, non violent and not otherwise explained, occurring less than 24 hours from the onset of symptoms[1], but this time is too long for many clinicians and pathologists; some of them only accept death within one hour from the onset of illness. From a view point of forensic medicine, sudden death (SD) is mainly defined as rapid,unexpected and natural death.[2] The incidence of sudden cardiac death has been steadily increasing all over the world particularly in urban population.[3] When SD occurs in adults and elderly persons, coronary atherosclerosis is the usual cause. These diseases are frequently concealed and discovered with surprise only at post mortem using thorough macroscopic and microscopic examination.

Materials and Methods

Present study is a retrospective study, which was conducted in the department of Pathology, Vydehi

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Institute of Medical Sciences and Research Centre, Bengaluru from July 2016 to June 2020. Ethical committee clearance was obtained before starting the study. Patients of all age groups who died within 24 hours from the onset of symptoms whose organs have been sent to department of pathology for histopathological examination were analyzed. The organs commonly received in case of sudden deaths are heart, lung, liver, kidney, spleen and brain. Deaths after 24 hrs of onset, deaths due to RTA, homicides, suicides, electrocution injuries, pregnancy related deaths were excluded from the study.

Statistical Analysis

Master chart of collected data was prepared in Excel sheet. Descriptive statistical analysis is presented in the form of tables, figures,graphs and diagrams wherever necessary using SPSS software.

Objectives of this study

- To evaluate the role of histopathological findings in providing conclusive cause of death.
- To study age and sex distribution of sudden death cases and to compare data with other studies.

Results

A total of 483 autopsy cases were received in the department pathology for histopathological examination, of which there were 134 cases with history of sudden deaths during the study period. Age distribution of sudden death cases ranged from 6 days old baby to 86 years (Fig. 1).

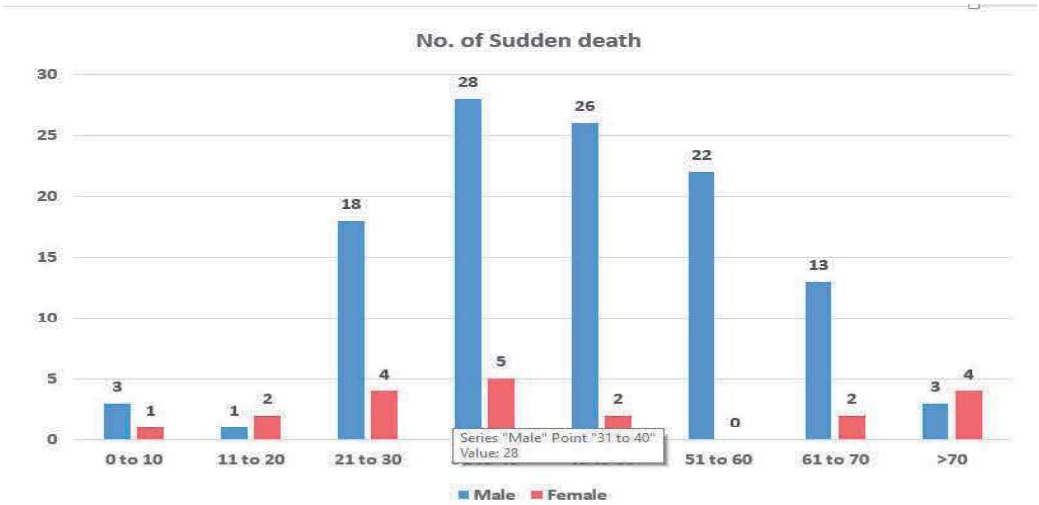

Fig. 1: Age distribution among sudden death cases (134 cases).

Male preponderance was observed with 114 (85%) of cases with the male: female ratio of 5.7:1 (Fig. 2). Maximum number of cases was observed in 31 to 40 years of age group.

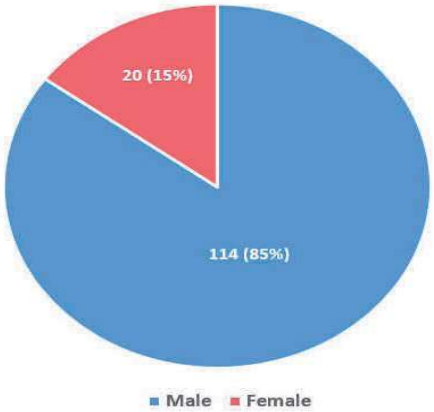

Fig. 2: Sex distribution of sudden death cases.

Table 1: Shows cardiac causes of sudden death.

Diagnosis	No of cases (Total- 103)	Percentage
Coronary artery disease	98	73.13%
Hypertrophic cardiomyopathy	2	1.49%
Aortic rupture	2	1.49%
Pericarditis	1	0.75%

Table 2: Shows Non cardiac causes of sudden death.

Diagnosis	No of cases (Total -31)	Percentage
Pulmonary embolism	12	8.96%
Cerebral stroke	6	4.48%
Aspiration	4	2.99%
Acute necrotizing pancreatitis	3	2.24%
SIDS	2	1.49%
Acute pyelonephritis with DIC	1	0.75%
No Conclusion	3	2.24%

The most frequent prodromal symptoms in our study were acute chest pain, circulatory collapse and dyspnoea and less common were fever, cough and epilepsy. We also observed that majority of our cases occurred in young adult males who were laborers and working in hot weather which may precipitate cardiovascular and respiratory diseases.

Distribution of causes of sudden deaths, cardiac and non-cardiac causes are mentioned in Table no. 1 and Table no. 2 respectively. The most common cause for sudden deaths were coronary artery diseases (Fig. 3) leading to myocardial infarction and its complications accounting for about 73.13% of total cases.

The most common non cardiac causes were due to pulmonary disease (Fig. 4) in 16 cases (51.6%), amongst which pulmonary embolism formed the majority in 12 cases (8.96%) followed by 4 (2.99%) cases of pulmonary aspiration. Other non cardiac causes for sudden deaths were cerebral stroke in 6 cases (4.48%), acute necrotizing pancreatitis in 3 (2.24%) cases and 1 case of DIC with acute pyelonephritis. Youngest case of our study was of 6day old female baby, in which we observed that lungs were showing bronchioles filled with homogenous eosinophilic material, with lipid droplets suggestive of milk. We also found 2 (1.49%) cases of SIDS (Sudden Infant Death Syndrome). In 3 cases even after detailed pathological examination cause of death could not be concluded.

Discussion

One of the challenges faced by pathologist is to determine the exact cause of death in a previously healthy appearing person.[2] Sequential examination of autopsy case which is suggested by Sheppard et al is to consider natural death first and then to consider non cardiac causes like cerebral stroke.[4] Majority of literature shows coronary artery diseases leading to myocardial infarction as the major cause for sudden deaths.[4-9] Our study shows 98 cases of coronary artery diseases including frank evidence of myocardial infarction which correlates with study conducted by Pandian et al[5] and Shanti et al.[6]

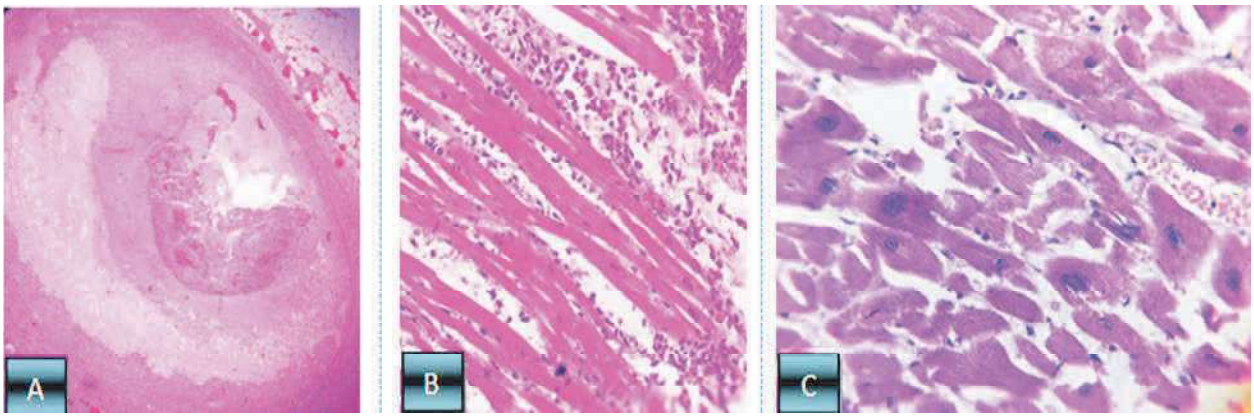

Fig. 3: Cardiovascular disease **A.** Complete blockage of coronary artery (H&E 10X), **B.** Early changes of myocardial infarction showing neutrophilic infiltration (H&E 10X), **C.** Hypertrophic cardiomyopathy showing muscle disarray and nucleomegaly (H&E 40X).

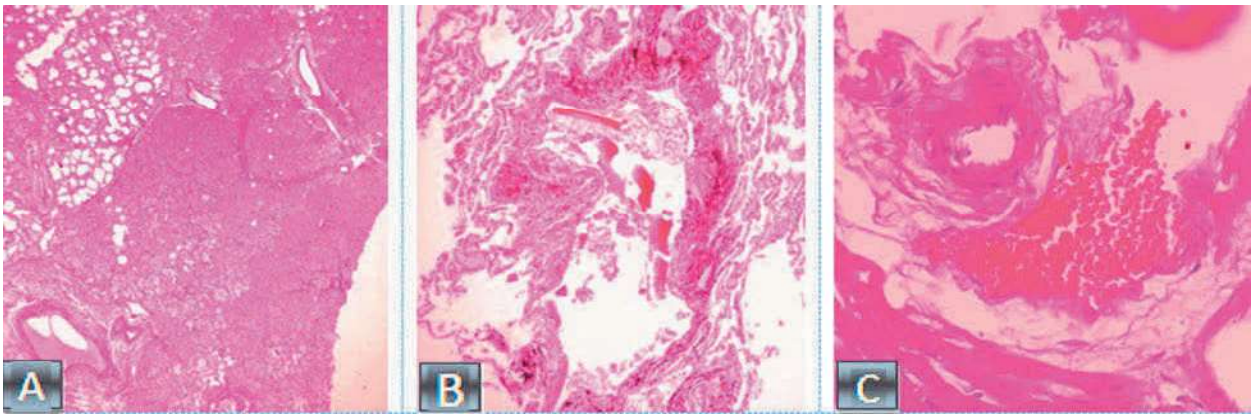

Fig. 4: Pulmonary causes for sudden death, **A.** Diffuse alveolar damage showing alveoli filled with fluid (H&E 10X), **B.** Pulmonary Aspiration showing food particles in bronchus (H&E 40X), **C.** Pulmonary embolism showing collapsed artery with adjacent congested vein (H&E 40X).

Majority of the studies have male preponderance of SD such as studies by Pandian J et al who had a male to female ratio of 6.5:1, and Hajra K Mehdi et al[13] with male to female ratio of 10:1.The present study also showed similar male to female ratio of 5.7:1. Sudden death incidence is more in males because of increased rate of cardiovascular diseases.

Coronary artery pathology in sudden death cases consists of single, double or triple vessel atherosclerotic disease and usually leads to thrombotic complete or near complete obstruction of coronary vessels which accounts for sharp interruption of regional blood flow.[5,6] In the young it is usually due to a single subobstructive plaque, located at the first segment of the anterior descending coronary artery, mostly fibro cellular, devoid of atheroma, fissuring or thrombosis. In the setting of acute thrombosis, superficial erosion seems to be a peculiar mechanism precipitating plaque instability, unlike in adults where it is mainly due to rupture of the thin fibrous cap of an atheromatous plaque.

Endothelial erosion may be the consequence of either plaque inflammation or intimal smooth muscle cell proliferation. The inflammatory nature of atherosclerotic plaque components prompted the postulation that either infection and/or autoimmune phenomena are involved in the onset and progression of the disease.[7]

We found 2 cases of hypertrophic cardio-myopathy. Grossly the weight of heart was increased to more than 500 gms, and microscopically it showed myocyte disarray, increase in myocyte nuclear size. Rhythm disturbances may lead to sudden death in these cases.[4]

Current definitions of SIDS are generally of exclusion, which means that the term "SIDS" can only be used for an infant death once other causes of sudden death have been excluded. These are diagnosed after taking consideration of scene of death. But still few microscopic findings like sections from the thymus and lungs show areas of interstitial hemorrhage corresponding to the macroscopically noted petechiae. The lungs are congested and edematous, sometimes with foci of incidental submucosal chronic inflammatory cells.[11]

The gross appearance of acute pancreatitis can vary greatly from mild hyperemia to frank hemorrhagic necrosis that extends to the adjacent tissue and beyond. It is necessary to distinguish postmortem autolysis and actual pancreatitis, the only way to definitively confirm the presence of pancreatitis is to examine the tissue microscopically and identify the acute inflammatory cell infiltrate.[12]

Conclusion

Present study highlighted the presence of increasing cases of sudden deaths among young males compared to developed countries.This will emphasize the need for research studies to find out the cause and early interventional measures to prevent the same. Histopathological findings in various organs will help to identify probable cause of sudden unexpected natural deaths.

Acknowledgement

We would like to thank Dr Shivarudrappa AS, former professor and HOD, Department of Pathology, VIMS and RC Bengaluru.

Conflict of Interest: None

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