Original Article

Proportion of Organ System Involved in Sudden Death: A Histopathological Autopsy Study at a Tertiary Care Hospital, Bhavnagar

Rutvi Prafulbhai Jotaniya[1,*], Pragnesh H. Shah[1], Chirangi Somabhai Ninama[1]

[1]Department of Pathology, Government Medical College, Bhavnagar, Gujarat, India

***Correspondence:** jotaniyarutvi2512@gmail.com

DOI
10.21276/apalm.3813

Article History
Received: 17-01-2026
Revised: 07-04-2026
Accepted: 13-04-2026
Published: 01-05-2026

How to cite this article
Jotaniya RP, Shah PH, Ninama CS. Proportion of Organ System Involved in Sudden Death: A Histopathological Autopsy Study at a Tertiary Care Hospital, Bhavnagar. Ann Pathol Lab Med. 2026;13(5):A261-A267.

Abstract

Background: According to the World Health Organization, sudden and unexpected death is defined as death occurring in an individual not known to have any serious disease, injury, or poisoning, within 24 hours of the onset of terminal illness. Such deaths are usually considered non-suspicious in older individuals but may raise medico legal concerns when occurring in younger persons.
Methods: A record-based observational study was conducted at Sir T Hospital, Bhavnagar, from 1 January 2020 to 31 July 2022. All cases labeled as sudden death and received in the autopsy section during the study period were included.
Results: A total of 62 sudden death cases were analyzed. Most deaths occurred in the 30–60-year age group (66.12%), with a marked male predominance (83.87%). Sudden unconsciousness was the most common presenting symptom (40.32%). The cardiovascular system was involved in (61.29%) of cases, and Coronary Arterial Heart Disease was the leading cause of death (45.16%).
Conclusion: Sudden deaths predominantly affected individuals over 30 years of age, representing a significant public health concern. Cardiac causes, particularly atherosclerosis related coronary artery disease, accounted for majority of cases. These findings emphasize the importance of regular health check-ups after 30 years of age to facilitate early detection of cardiovascular risk factors and reduce sudden mortality.

Keywords: sudden death; autopsy; cardiovascular system; coronary artery disease; myocardial infarction; atherosclerosis

Introduction

According to the World Health Organization, death is considered sudden and unexpected when a person not known to be suffering from any serious disease, injury or poisoning is found dead or dies within 24 hours after the onset of terminal illness. Some author further restrict the definition to deaths occurring instantaneously or within one hour of onset of symptoms. Natural death refers to death caused entirely by disease processes, without any contribution from trauma or poisoning.[1]

In many instances, the individual may not die immediately but may survive for a few hours after the onset of terminal symptoms. Sudden deaths in older individuals usually do not arouse suspicion; however similar deaths in younger individuals often raise medico-legal concerns. A medical officer should not issue a death certificate in cases of sudden death without a post-mortem examination, and such cases should be reported to legal authorities for appropriate investigation.[3]

Comparison of the incidence of sudden death across different regions is challenging due to variations in disease prevalence, environmental factors, socio economic status, genetic predisposition and differences in definitions and study methodologies.[2]

The age of the deceased, reliable information regarding past medical history and illness, and, most importantly, the presence of a witness at the onset of terminal symptoms are crucial in determining the necessity for conducting an autopsy. In most cases, essential emergency investigations such as electrocardiography (ECG), chest radiography, and other relevant tests were not performed. So, due to the absence of reliable witnesses or close relatives, detailed clinical histories could not be obtained in many cases.[3]

Materials and Methods

Study design: Record based observational study

Site of study: The study was conducted in autopsy section in Department of Pathology, Government Medical College, Bhavnagar after taking permission from SRC & ethical committee (EC Approval No-1378/2024).

Sample size: All cases labeled as "Sudden Death" received in the Department of Pathology, Government Medical College, Bhavnagar between 1st January 2020 to 31st July 2022 were included in study.

Data analysis: Details such as age, sex and presenting complaint were collected. Data were entered and analyzed using Microsoft Excel. Results were expressed as percentages and frequencies. Results were represented in tables for clarity.

In all cases, mostly the organs received were the Heart, Lungs, Liver, Kidneys, Spleen, and Brain, with detailed information during the autopsy from the Department of Forensic Medicine. All organs were grossly examined and then fixed in 10% neutral buffered Formalin for at least 24 hours. Multiple tissue sections of 4–5 mm thickness were taken, processed in tissue processor, embedded in paraffin, sectioned at 4 μm thickness, and then stained with routine hematoxylin and eosin stains. All slides were examined histopathologically, and the cause of death was determined. Atherosclerotic lesions were classified according to the Modified American Heart Association criteria.[12]

Inclusion criteria: All specimen of sudden death cases received in autopsy section of the department of pathology, Government Medical College, Bhavnagar.

Exclusion criteria: Unnatural deaths due to accidents, suicides and homicide. Poisoning cases. Animal strike/sting cases. Autolysed specimens.

Statistical analysis: Chi-square goodness-of-fit test was applied to assess whether observed category-wise distributions differed significantly from equal expected distribution. Proportions were expressed with 95% confidence intervals. A p-value <0.05 was considered statistically significant.

Results

In the present study, a total of 62 cases of sudden death were analyzed. Out of this maximum number of deaths (66.13%) occurred in the age group of >30–60 Years with a marked male (83.87%) predominance. The most common clinical presentation was sudden unconsciousness (40.32%), followed by chest pain (22.58%), and breathlessness (12.90%). The cardiovascular system was most frequently (61.29%) affected, while other systems were involved less often. Coronary artery disease (45.16%) was identified as the leading cause of death, followed by myocardial infarction (16.13%). A few cases (4.84%) remained inconclusive despite detailed autopsy examination.

Table 1: Age wise distribution of sudden death cases.

Age group (years)	Cases	%	95% CI
0–30	13	20.97	10.83 – 31.10
31–60	41	66.13	54.35 – 77.91
61–90	8	12.90	4.56 – 21.25
>90	0	0	—
Total	62	100	
p-value*		<0.001	

Discussion

Of the total 563 autopsies conducted during the study period, 62 cases were classified as sudden deaths. The present study analyzed these cases with respect to age, sex, presenting complaint and histopathological findings.

In the present study, the maximum number of deaths, i.e., 41 cases (66.12%), were observed in the >30–60 years age group, followed by the 0–30 years age group 13 cases (20.97%). This suggests that middle-aged individuals form the most

Table 2: Sex wise distribution of sudden death cases.

Sex	Cases	%	95% CI
Male	52	83.87	74.70 – 93.04
Female	10	16.13	6.96 – 25.30
Total	62	100	
p-value*		<0.001	

Table 3: Distribution of sudden death cases according to presenting complaints.

Presenting complaint	Cases	%	95% CI
Sudden unconsciousness	25	40.32	28.11 – 52.53
Chest pain	14	22.58	12.17 – 32.99
Breathlessness	8	12.90	4.56 – 21.25
Convulsions	2	3.22	0 – 7.61
Vomiting	5	8.06	1.29 – 14.83
Not known	8	12.90	4.56 – 21.25
Total	62	100	
p-value*		<0.001	

Table 4: Distribution of sudden death cases according to predominantly involved body system.

Body system	Cases	%	95% CI
Cardiovascular	38	61.29	49.16 – 73.42
Respiratory	11	17.74	8.25 – 27.23
CNS	3	4.84	0 – 10.18
Hepatobiliary	7	11.29	3.41 – 19.17
Gastrointestinal	0	0	—
Genitourinary	0	0	—
Others	0	0	—
Not known	3	4.84	0 – 10.18
Total	62	100	
p-value*		<0.001	

Table 5: Cause wise distribution of sudden death cases.

Cause of death	Cases	%	95% CI
Coronary arterial heart disease	28	45.16	32.76 – 57.56
Myocardial infarction	10	16.13	6.96 – 25.30
Pneumonia	4	6.45	0.33 – 12.57
Diffuse alveolar damage	1	1.61	0 – 4.76
Pulmonary edema	2	3.23	0 – 7.61
Tuberculosis	4	6.45	0.33 – 12.57
Cirrhosis of liver	5	8.06	1.29 – 14.83
Infection	1	1.61	0 – 4.76
Chronic liver cell injury	1	1.61	0 – 4.76
Meningitis	1	1.61	0 – 4.76
Venous sinus thrombosis	1	1.61	0 – 4.76
Subarachnoid haemorrhage	1	1.61	0 – 4.76
Inconclusive	3	4.84	0 – 10.18
Total	62	100	
p-value*		<0.001	

vulnerable group for sudden deaths in this study population.

These findings are in concordance with the study conducted by Mohan et al.[4] where the maximum number of sudden deaths was reported in the 40–50 years age group. Similarly, Pandey et al.[5] documented the highest incidence of sudden deaths in the 40–59 years age group, while Kumar A, et al.[6] reported the 51–60 years age group as being most affected.

This variation in age distribution across different studies may be attributed to differences in demographic profiles, genetic predispositions, prevalence of risk factors (such as hypertension, coronary artery disease, diabetes, and alcohol abuse),

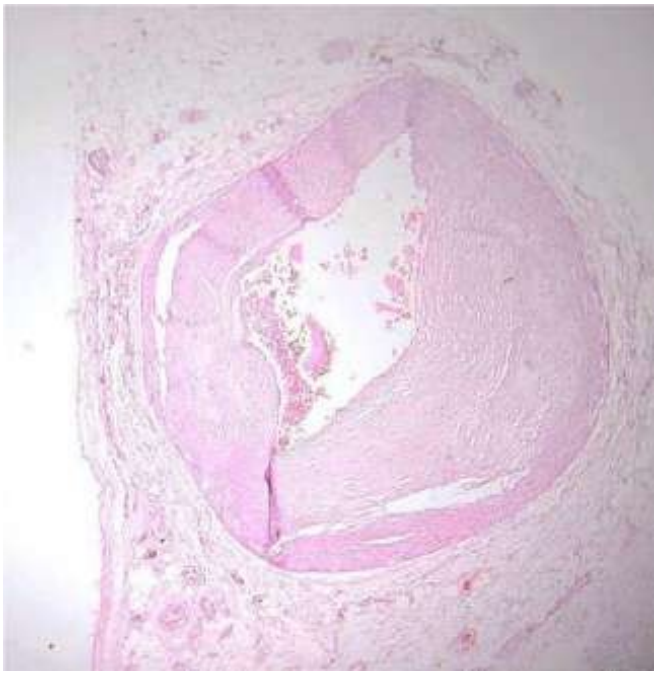

Figure 1: Section of coronary artery showing lipid core with fibrous cap (AHA grade V) (H&E 100x).

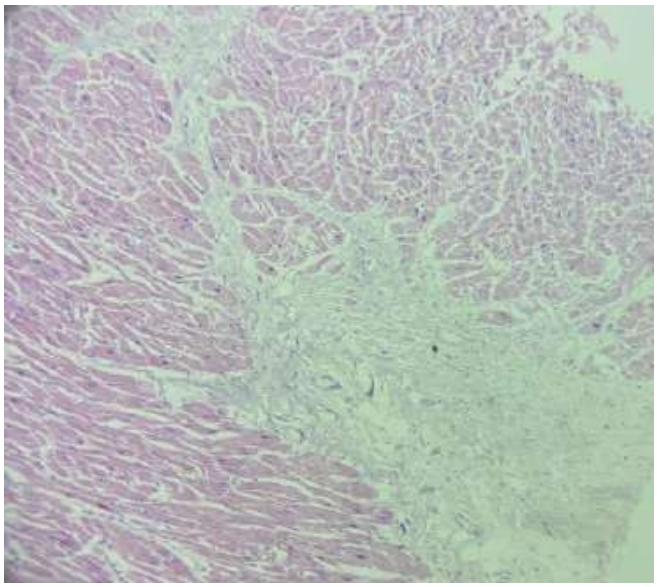

Figure 2: Healed infarct (H&E 100x).

lifestyle patterns, and healthcare access across different populations and regions.

However, despite these regional variations, a common observation across these studies, including the present one, is that individuals between the third and fifth decades of life (30–50 years) consistently represent a high-risk group for sudden death. This age group typically represents the active and productive segment of the population, often exposed to various occupational and lifestyle stresses that may predispose them to cardiovascular and other fatal medical conditions.

The identification of this vulnerable age group emphasizes the need for early screening, preventive healthcare measures, and awareness programs targeting modifiable risk factors, particularly in middle-aged individuals, to reduce the incidence of sudden deaths.

In the present study, out of a total of 62 cases of sudden deaths, males contributed to 52 cases (83.87%), whereas females contributed to 10 cases (16.13%), showing a clear male predominance. This observation is in concordance with various national and international studies. A similar male predominance was observed in the study conducted by Mohan et al.[4], where males accounted for 86% of sudden death cases. Pandey et al.[5] also reported a higher incidence among males (85.7%) in their retrospective study on sudden cardiac death. Likewise, Kumar A et al.[6] found that males constituted 80.5% of the cases, further supporting the trend of male predominance.

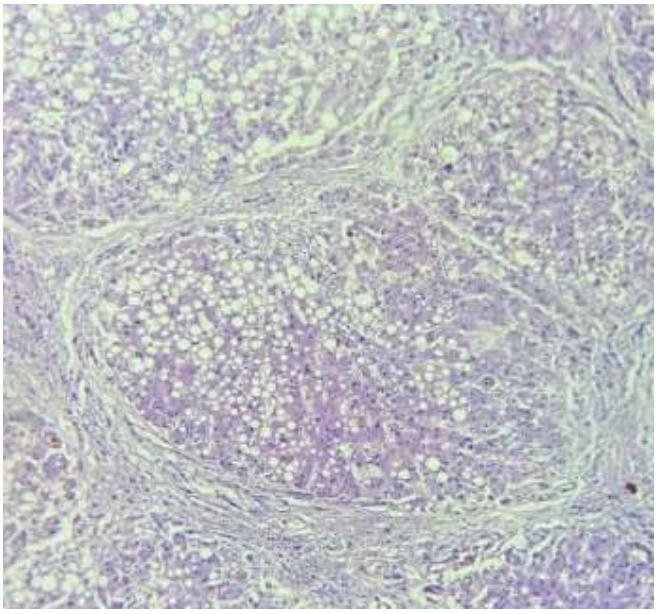

Figure 3: Cirrhosis of liver (H&E 100x).

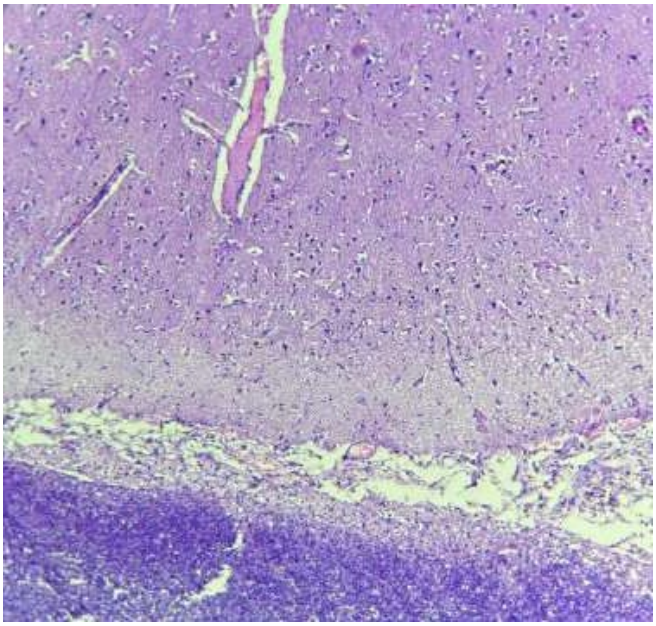

Figure 4: Meningitis (H&E 100x).

In the present study, the cardiovascular system was found to be the most commonly involved system in sudden deaths, accounting for 38 cases (61.29%). This was followed by the respiratory system 11 cases (18.33%).

The predominance of cardiovascular causes is consistent with several studies conducted across different geographical regions. Mohan et al.[4] reported that cardiovascular diseases were the leading cause of sudden deaths, followed by respiratory causes. Similarly, Gurusamy et al.[8] and Pandey et al.[5] also observed a high frequency of sudden deaths due to cardiac pathology.

Globally, cardiovascular disease remains the leading cause of sudden natural deaths, as highlighted by R.D. Bagnall et al.[7] in their prospective study. The findings emphasize the need for early identification of cardiovascular risk factors and strengthening of preventive healthcare to reduce mortality from sudden unexpected deaths.

In the present study, sudden unconsciousness was the most commonly observed presenting symptom, recorded in 25 cases (40.32%), followed by chest pain in 14 cases (22.58%). These findings are consistent with those reported in previous studies. Arava S, et al.[9], where sudden collapse was also identified as the predominant presenting complaint in cases of sudden death, followed by chest pain. Similarly, Bagnall et al.[7] also reported that sudden unconsciousness and chest pain were among the most frequent prodromal symptoms observed before sudden deaths.

In the present study, the leading cause of sudden death was cardiovascular causes in which Coronary Arterial Heart Disease

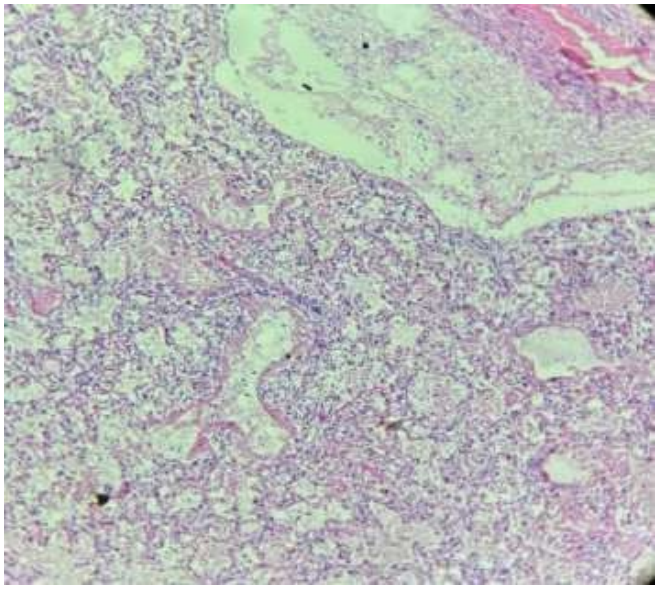

Figure 5: Section of lung with changes of diffuse alveolar damage (H&E 100x).

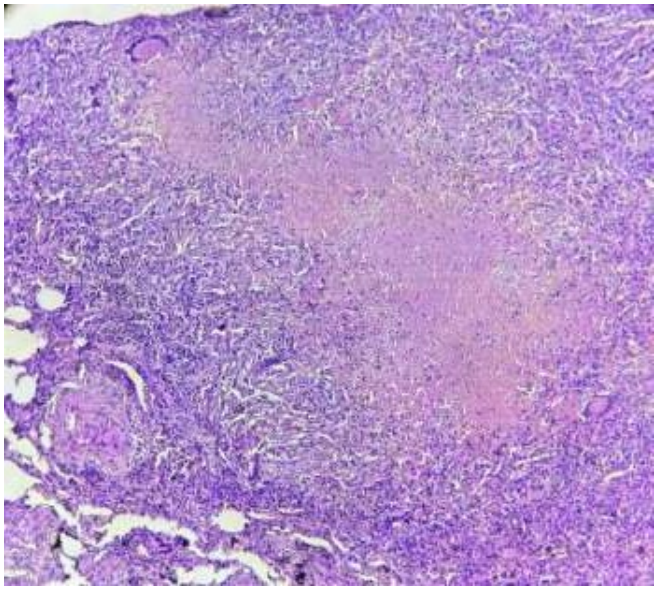

Figure 6: Section of lung with tuberculosis (H&E 100x).

Table 6: Percentage distribution of causes of sudden death in the present study in comparison with other studies.

Cause of Death	Present Study (%)	Mohan et al.	Patel et al.	Jain et al.
Cardiovascular causes	61.29%	39%	62.10%	40%
Respiratory causes	17.74%	29.7%	18.37%	21.3%
Hepatobiliary causes	11.28%	23.4%	1.62%	6.4%
Neurological causes	3.23%	6%	0.56%	3.2%
Inconclusive	4.84%	0%	10%	21.3%

(CAHD), accounting for 28 cases (45.16%), followed by myocardial infarction 10 cases; (16.13%). These findings are in concordance with previous studies such as Mohan et al.[4], Patel et al.[11] and in Jain et al.[10].

Limitations

In the present study, only 62 cases were included, despite considering all cases that met the inclusion criteria over a period of 31 months. This relatively small sample size is mainly due to the lower number of autopsies performed at our hospital.

Conclusion

The present study demonstrates that sudden deaths predominantly occur in individuals over 30 years of age, highlighting an important public health concern. Cardiac causes, particularly atherosclerosis leading to coronary artery disease (CAD) were the most common contributors. This trend presents a major challenge to healthcare providers and underscores the urgent need to increase awareness among at-risk populations. From a healthcare policy perspective, implementation of routine cardiovascular risk screening programs at the primary care level, especially for individuals above 30 years, is essential. Early identification and management of modifiable risk factors such as hypertension, diabetes, dyslipidemia, and lifestyle-related factors should be prioritized through national health programs and workplace-based screening initiatives. Strengthening health education and awareness strategies is equally important to promote prevention of serious health problems.

Acknowledgements: None

Funding: None

Competing Interests: None

References

1. Modi JP. Modi's Medical Jurisprudence and Toxicology. 25th ed. New Delhi: LexisNexis; 2016. p. 538–540.
2. Saukko P, Knight B. Knight's Forensic Pathology. 4th ed. Boca Raton: CRC Press; 2016. p. 564–565.
3. Reddy KSN. The Essentials of Forensic Medicine and Toxicology. 34th ed. Hyderabad: K Suguna Devi; 2017. p. 156–158.
4. Mohan AP, Choudhury NM, Singha YN, Sharma P, Koiri B, Devi RP. Study of sudden natural death: An autopsy-based cross-sectional study in a tertiary care medical college and hospital of Assam. Indian J Forensic Med Toxicol. 2024;18(1):9–14.
5. Pandey V, Kulkarni V, Bhaskar V, Mire V. Spectrum of histopathological lesions in sudden death: An autopsy-based study. J Clin Diagn Res. 2024;18(2):EC01–EC05.
6. Kumar A, et al. Profile of sudden cardiac deaths: a retrospective autopsy-based study. 2025.
7. Bagnall RD, Weintraub RG, Ingles J, Duflou J, Yeates L, Lam L, et al. A prospective study of sudden cardiac death among children and young adults. N Engl J Med. 2016;374(25):2441–52.
8. Gurusamy DS, et al. Insights into sudden cardiac deaths: an autopsy-based study. 2025.
9. Arava S, et al. Sudden cardiac death in young. Indian Heart J. 2025.
10. Jain A, Patel S, Sharma R, Gupta N, Mehta K, Singh V, et al. Clinicopathological profile of sudden natural deaths in a tertiary care centre. J Clin Diagn Res. 2024;18(3):EC12–EC16.
11. Patel J, Patel S, Bansal A. An autopsy study of sudden natural deaths at a tertiary care centre in Gujarat, India. J Clin Diagn Res. 2023;17(10):FE01–FE05.
12. Patel P, Jhaveri S, Patel P. Histological and morphometric analysis with grading of atherosclerosis-associated myocardial changes in sudden death. National Journal of Medical Research. 2025.