Original Article

Retrospective Study of Sudden Death in Medico-Legal Autopsies

Bhavesh A. Surkar[1], Santosh Bhoi[2], Manu Yadav[3], Riwan Kamble[4], Naresh Zanjad[5]

[1,3]Junior Resident, [5]Professor and Head, [2]Associate Professor, Departmentof Forensic Medicine and Toxicology Dr.V.M.GMC, Solapur, [4]Associate Professor, Department of Forensic Medicine and Toxicology GMC, Miraj.

How to cite this article: Bhavesh A. Surkar, Santosh Bhoi, Manu Yadav et. al. Retrospective Study of Sudden Death in Medico-Legal Autopsies. Indian Journal of Forensic Medicine and Toxicology/Volume 20 No. 2, April-June 2026.

Abstract

Background: Death is considered sudden or unexpected when a person not known to be suffering from any dangerous disease, injury, or poisoning is found dead or dies within 24 hours after the onset of terminal illness, as per the WHO definition. In such cases, an autopsy plays a crucial role in determining the exact cause of death and helps the bereaved relatives rule out any suspicion of foul play. The present study aims to analyse the age, sex and system-wise distribution of causes of sudden death.

Methodology: This retrospective study was carried out at a tertiary care hospital, from 1st January 2023 to 31st December 2023. We reviewed autopsy reports and inquest papers and documented demographic details and cause of death. The data was analyzed statistically.

Observation: During the study period, a total of 556(24.7%) sudden death cases were recorded out of 2246 medico-legal autopsies. Most of the sudden deaths (82.7%) were observed in the 31- 60 years of age group with a male-to-female ratio of 3:2. The most common system involved in sudden death was the cardiovascular system (64%) followed by the respiratory system (23%), gastrointestinal system (10%) and CNS (3%). In the cardiovascular system, coronary artery disease (79.5%) was the leading cause of death.

Keywords: Medicolegal Autopsy, Sudden death and Natural death.

Introduction

Sudden death remains a significant public health concern due to its unexpected occurrence, often without prior symptoms or known chronic conditions. These events frequently take place outside clinical settings, with the premortem symptom and conditions surrounding death remaining unknown[1].

Medico-legal autopsies play a crucial role in identifying the underlying causes of sudden death, providing clarity for bereaved families and ruling out unnatural causes. These examinations yield valuable data on the physiological systems involved, contributing to a broader understanding of sudden mortality patterns[2]. Such insights are essential for developing effective public health strategies aimed at prevention and early intervention.

Corresponding Author: Bhavesh A. Surkar, Junior Resident, Department of Forensic Medicine and Toxicology Dr. VMGMC, Solapur.

E-mail: bhaveshsurkar@gmail.com

Submission date: November 20, 2025 **Acceptance date:** March 11, 2026 **Published date: April 23, 2026**

Although several studies have explored the causes of sudden natural deaths, limited region-specific data are available regarding the demographic distribution and system-wise causes of sudden death in medico-legal autopsy cases, particularly in tertiary care hospital settings. Variations in lifestyle, environmental factors, and healthcare accessibility may influence the patterns of sudden mortality across different populations. However, comprehensive analyses focusing on age, sex, and the physiological systems involved remain insufficiently documented in many regions.

Therefore, there is a need for systematic evaluation of medico-legal autopsy records to identify the patterns and determinants of sudden natural deaths. Understanding these patterns can help in recognizing vulnerable groups and the most commonly affected physiological systems, thereby aiding in early diagnosis, risk assessment, and preventive healthcare planning.

This study focuses on analysing the distribution of sudden natural deaths by age, sex and affected physiological systems, based on medico-legal autopsy records from a tertiary care hospital. By examining these patterns, the research aims to deepen the understanding of sudden death aetiologies and inform targeted preventive measures. The findings seek to enhance awareness of risk factors and support efforts to reduce the incidence of sudden mortality.

Material and Method

This retrospective study was conducted at a tertiary care hospital from January 1, 2023, to December 31, 2023, reviewing autopsy reports and inquest papers to document demographic details and causes of death, with data analysed statistically. The cases were selected as per WHO definition of sudden death which state that Death is considered sudden or unexpected when a person not known to be suffering from any dangerous disease, injury, or poisoning is found dead or dies within 24 hours after the onset of terminal illness[1]. The study included individuals of all age groups who were either brought dead (e.g., those who died at home) or were hospitalized patients who died within 24 hours of admission, excluding cases with a history of injury, poisoning, or terminal/chronic illness. As the study relied on existing medico-legal autopsy records, approval from the Institutional Ethics Committee was not obtained.

Observation

During the study period, a total of 556 (24%) sudden death cases were recorded out of 2246 medico-legal autopsies. In the study group, maximum cases of sudden death (34%) were observed in 31-40 years of age group followed by 41-50 years of age (28.6%). Over all 82.7% of participants were aged 31–60 years, showing majority of middle-aged individuals with fewer younger adults. The sample showed a higher predominance of males (male 71%and female 29%).

Table 1: Age and gender wise distribution of cases

Age Group (Years)	Male Cases	Male %	Female Cases	Female %	Total Cases	Percentage (%)
00–10	00	0.0%	00	0.0%	00	0.0%
11–20	00	0.0%	00	0.0%	00	0.0%
21–30	53	9.5%	21	3.7%	74	13.3%
31–40	134	24.1%	55	9.8%	189	34.0%
41–50	113	20.3%	46	8.2%	159	28.6%
51–60	45	8.0%	22	3.9%	67	11.9%
61–70	38	6.8%	15	2.6%	53	9.4%
71 & above	11	1.8%	03	0.5%	14	3%
Total	394	70.5%	162	29.5%	556	100.0%

Majority of deaths (64.0%) in this study was caused by involvement of the cardiovascular system. Additionally, 23.0% of deaths were caused by respiratory diseases, 10.0% by gastrointestinal diseases and 3.0% by central nervous system diseases.

Table 2: Distribution of Causes of Sudden Death

Sr. No.	Cause of Death	No. of Cases	Percentage (%)
1	Cardiovascular System	356	64.0%
2	Respiratory System	128	23.0%
3	Gastrointestinal System	56	10.0%
4	Central Nervous System	16	3.0%
Total		556	100%

Among cardiovascular system involvement, most frequently observed condition was coronary artery disease, present in 79.5% of the cases. This was followed by cardiomyopathy (9.8%), myocarditis (9.3%), and cardiac tamponade was noted in only five cases (1.4%).

Table 3: Cardiovascular System Findings

Sr no.	Condition	Count	Percentage
1	Coronary Artery Disease	283	79.5%
2	Cardiomyopathy	35	9.8%
3	Myocarditis	33	9.3%
4	Cardiac Tamponade	5	1.4%
Total		356	100.0%

Among respiratory system, pneumonia was the most prevalent condition, detected in 72.66% of the cases, indicating a high frequency. Pulmonary Koch's accounted for 18.8% of the cases, reflecting a notable burden of pulmonary Koch's. Additionally, interstitial pneumonitis was identified in 8.5% of the cases, contributing to the spectrum of respiratory diseases. These findings emphasize the importance of comprehensive respiratory evaluation in populations at risk for multiple pulmonary conditions.

Table 4: Respiratory System Findings

Sr. No.	Cause of Death	No. of Cases	Percentage
1	Pneumonia	93	72.66%
2	Pulmonary Koch's	24	18.8%
3	Interstitial Pneumonitis	11	8.5%
Total		128	100.0%

Findings of table no. 5 indicated that cirrhosis emerged as the most common cirrhosis condition, identified in 36 cases (64.3%). Hepatitis was documented in 10 cases (17.9%), highlighting its significant occurrence. Acute haemorrhagic pancreatitis was observed in 6 cases (10.7%), and intestinal perforation was reported in 4 cases, accounting for 7.1% of the total. These findings illustrate the diverse range of gastrointestinal and hepatobiliary disorders encountered

Table 5: Gastrointestinal System Findings

Sr. No.	Cause of Death	No. of Cases	Percentage (%)
1	Cirrhosis	36	64.3%
2	Hepatitis	10	17.9%
3	Acute Haemorrhagic Pancreatitis	6	10.7%
4	Intestinal Perforation	4	7.1%
Total		56	100%

Among the 16 cases observed due to CNS diseases, intracerebral haemorrhage was the leading cause of death, accounting for more than half of the cases (56.3%). Subarachnoid haemorrhage contributed to one-fourth of the cases (25%), while meningitis was the least common cause, observed in 18.8% of cases. This indicates a clear predominance of cerebrovascular causes (intracerebral and subarachnoid haemorrhage together making up over 80% of cases) compared to infective causes like meningitis.

Table No.6 Central Nervous System

Sr no.	Cause of Death	No. of Cases	Percentage (%)
1	Intracerebral Haemorrhage	9	56.3%
2	Subarachnoid Haemorrhage	4	25.0%
3	Meningitis	3	18.8%
total		16	100%

Discussion

In the present study, majority of sudden natural deaths was observed in the 31–40 years age group (34.0%) fallowed by 41-50 year of age group (28.6%).

The similar findings were observed in study reported by Zanjad N.P. and Nanadkar S.D.[3] (28.56). However, other studies had documented lower incidences, such as Sapate A. et al[4] (23%), Ugiagbe E.E. and Ugiagbe R.A.[5] (16.8%), Azmak A.D.[6] (15.47%), and Bhoi S.B. and Tumram N.K.[7] (14.37%). The variation may be due to differences in demographic patterns and lifestyle risk factors. Although there is a difference, most studies highlight that the middle-aged group remain vulnerable**.** This predominance can be explained by the fact that conditions such as hypertension, ischemic heart disease and diabetes commonly manifest in this age group, making them highly susceptible to fatal cardiovascular events.

In terms of sex distribution, the present study showed male predominance (71%). Similar findings were observed by Zanjad NP and Nanadkar SD[3] (84.8%), Rathva VK and Bhoot RR [8] (80%), Azmak A.D. [6](76%), Kumar T. et al[9] (75.45%) and Bhoi SB and Tumram NK[7] (67.5%). These consistent results across different regions suggest that sudden natural deaths occur more commonly in males because of the higher prevalence of modifiable cardiovascular risk factors such as smoking, alcohol consumption, stress and occupational hazards.

In the present study, majority of sudden death cases was observed related to cardiovascular system (64%). This finding is consistent with the observations made by Sapate A. et al[4] (55%), Kumar T. et al[9] (72%) and Azmak A.D.[6] (55%), who also reported cardiovascular causes as the leading contributors to sudden natural deaths. The finding of the death due to respiratory causes (23%) in the present study was comparable to those reported by Zanjad N.P. and Nanadkar S.D.[3] (27.23%), Sapate A. et al[4] (26%), Kumar T. et al[9] (22%), Azmak A.D.[6] (19.1%) and Bhoi S.B. and Tumram N.K.[7] (27.20%) but, was not consistent with study finding by Ugiagbe E.E. and Ugiagbe R.A.[5](12.5%) which showed lower incidence. The present study and finding of other studies indicated that death due to cardiovascular causes had maximum fatality in young age due to change in lifestyle and it's a worrisome issue.

Coronary artery disease (CAD) emerged as the most common cause of sudden cardiac death, accounting for 79.5% of cardiovascular cases, followed by cardiomyopathy (9.8%), myocarditis (9.3%). This result aligns with global trends, as highlighted in the WHO reports on cardiovascular disease (2023) as a major global health burden.[10] Similar patterns were reported by Zanjad NP and Nanadkar SD[3] (86.47%), Bhoi SB and Tumram NK[7] (72.5%),Chaudhari S.H. et al[11] (71.83), who also reported CAD as the leading cardiovascular cause. However, Sapate A. et al[3] documented a significantly lower proportion of CAD-related deaths (41%), which is in contrast with the present study. The predominance of CAD can be attributed to the high prevalence of lifestyle-related risk factors (hypertension, diabetes, smoking, obesity, stress), making it the major contributor to sudden cardiac deaths across regions.

The present study observed pneumonia in 73% of respiratory system causes. A comparable finding was reported by Azmak A.D.[6](69.8%), showing similarity with our results. However, studies conducted by Zanjad N.P. and Nanadkar S.D.[3] (27.3%), Bhoi S.B. and Tumram N.K.[7] (27.2%), Choudhary S.H. et al[11] (25.7%) and Sapate A. et al[4] (23%) documented lower incidence of death due to pneumonia. The higher proportion of pneumonia cases in the current study may be attributed to an increased prevalence of infectious diseases such as community-acquired pneumonia and tuberculosis in the region, coupled with delayed diagnosis and treatment.

In the present study, cirrhosis was observed in 64.3% of the gastrointestinal causes of sudden death, whereas study conducted by Zanjad N.P. and Nanadkar S.D.[3] observed cases of cirrhosis in 44.4% of cases. However other studies observed different causes like hepatitis, Acute Pancreatitis. This difference may be due to variations in alcohol consumption, occurrence of liver disease, food habits, and availability of medical care which affect how often cirrhosis and pancreatitis occur in different regions.

Central nervous system (CNS) causes accounted for 3% of sudden deaths, with intracerebral haemorrhage being the leading cause (56.3%). These findings are similar to those of Azmak A.D.[6] (45%), who also reported intracerebral haemorrhage as a major CNS cause of sudden death. This may be attributed to long-standing hypertension, which predisposes to rupture of cerebral vessels, resulting in intracerebral bleeding and sudden death.

Conclusion

In conclusion, this study highlights the critical importance of implementing preventive measures to manage cardiovascular diseases, respiratory conditions, gastrointestinal diseases and neurological health effectively. By prioritizing public health initiatives such as regular screenings, lifestyle modifications and timely medical interventions, the incidence of sudden deaths can be significantly reduced. Furthermore, advancing research and raising awareness about the early signs and risk factors associated with these conditions are essential steps toward enhancing patient outcomes and preventing sudden mortality.

The findings of this study also have important implications for forensic professionals, as medico-legal autopsies remain a vital tool in determining the precise cause of sudden and unexpected deaths. A systematic evaluation of sudden death cases can assist forensic experts in identifying common pathological patterns, improving the accuracy of cause-of-death certification, and contributing valuable data for epidemiological surveillance and public health planning.

However, certain limitations must be acknowledged. The study is based on medico-legal autopsy records from a single tertiary care hospital, which may limit the generalizability of the findings to the broader population. Additionally, the retrospective nature of the study and reliance on available autopsy records may restrict the availability of complete clinical histories and risk factor information.

Future research should focus on multicentre studies with larger sample sizes to better understand regional and population-based variations in sudden natural deaths. Prospective studies integrating clinical history, toxicological findings, and advanced diagnostic techniques such as molecular autopsy may further enhance the understanding of the underlying mechanisms of sudden death and aid in developing more effective preventive strategies.

Authorship declaration: All authors contributed equally.

Sources of Funding: Nil

Conflict of interest: Nil

Acknowledgement: All faculty of the Department of Forensic Medicine, Dr V.M.GMC, Solapur

Reference

1. Reddy KSN, Murty OP. The Essentials of Forensic Medicine And Toxicology. 35th Ed. New Delhi: Jaypee Brothers Medical Publishers; 2022:110.
2. Guharaj PV. Forensic Medicine. 2nd Ed. Hyderabad: Universities Press (India) Pvt Ltd; 2009: 74.
3. Zanjad NP, Nanadkar SD. Study of sudden unexpected deaths in medico-legal autopsies. J Indian Acad Forensic Med. 2006;28(1):27-30.
4. Sapate A, Petkar M, Ghangale A, Arora P, Datir S. Autopsy profile of natural causes of sudden deaths and survival time. Int J Healthc Biomed Res. 2015 Jul;3(4):126-134.
5. Ugiagbe EE, Ugiagbe RA. Causes of sudden natural death: a medico-legal autopsy study of medical cases in an African referral centre. East African Medical Journal. 2012;89(10):332-338.
6. Azmak AD. Sudden natural deaths in Edirne, Turkey, from 1984 to 2005. *Medicine, Science and the Law.* 2007;47(2):147–155.
7. Bhoi SB, Tumram NK. Sudden cardiac deaths: a critical analysis after death. J Forensic ToxicolPharmacol. 2018;7(1):7–9.
8. Rathva VK, Bhoot RR. Assessment of sudden natural deaths in medico-legal autopsies at tertiary care teaching hospital. Indian J Forensic Med Toxicol. 2023;17(4):25-29.
9. Kumar T, Sarala M, Kumar S, Rathee A, Radhakrishna KV. Current trends in sudden natural deaths in South-Western Maharashtra: a six-year retrospective study. Indian J Forensic Med Toxicol. 2021 Apr-Jun;15(2):865-870.
10. Chaudhari SH, Ingale R, Sane M, Zine KU and others. Study of Sudden Natural Deaths in MedicoLegal Autopsies with Special Reference to Cardiac Causes. International Journal of Current Research Review, 2013;5(3):37-42.
11. Di Cesare M, Perel P, Taylor S, Kabudula C, Bixby H, Gaziano TA, McGhie DV, Mwangi J, Pervan B, Narula J, Pineiro D, Pinto FJ. The Heart of the World. Glob Heart. 2024;19(1):11.