

## SUDDEN NATURAL DEATH: AUTOPSY-BASED CROSS-SECTIONAL STUDY AT SCB MEDICAL COLLEGE, CUTTACK, ODISHA.

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### ABSTRACT.

#### Background:

Sudden natural death represents a critical area of medical and forensic investigation, encompassing instances where death occurs suddenly without preceding symptoms. Despite advancements in diagnostic techniques, sudden natural deaths continue to pose significant challenges, particularly in understanding their underlying causes and associated risk factors. The study aimed to determine the causes of sudden natural death and assess the epidemiological and sociodemographic parameters linked to it.

#### Methods:

A cross-sectional study was conducted. Data were collected from various sources including inquest reports, autopsy records, and histopathological examinations.

#### Results:

Among the 250 cases (35.87%) identified as sudden deaths, with males constituting 86% of the cases compared to females at 14%. The demographic distribution showed a predominance of Hindus (60%), followed by Muslims (30%) and Christians (10%). Geographically, approximately two-thirds of cases originated from rural areas. Cardiovascular disease emerged as the leading cause (40%), with myocardial infarction being the most prevalent subtype. Other significant causes included cerebrovascular accidents, pulmonary embolism, respiratory, gastrointestinal, and central nervous system causes.

#### Conclusion:

This study provides valuable insights into the demographics, place of occurrence, and causes of sudden natural deaths. Understanding these factors is crucial for implementing effective preventive strategies and improving access to timely medical care, particularly in rural and residential settings.

#### Recommendations:

Based on the findings, recommendations include the implementation of targeted preventive measures to address modifiable risk factors for cardiovascular disease, enhancing access to healthcare facilities in rural areas, and promoting awareness about the signs and symptoms of sudden natural death among the general population.

**Keywords:** Sudden Natural Death, Cardiovascular Disease, Autopsy, Epidemiology, Risk Factors

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### INTRODUCTION.

Sudden natural death encompasses instances where death occurs suddenly without preceding symptoms, as well as unexpected death following a brief period of non-threatening complaints. These cases can initially suggest trauma or even a crime, but typically, the definitive cause and manner of death are determined through autopsy, with the heart being the most commonly involved organ [1]. Sudden cardiac death, specifically, refers to the unexpected natural death from a cardiac cause within a

short period, usually within 1 hour from symptom onset, in individuals without any previously known fatal condition. This type of death is often attributed to cardiac arrhythmia, and despite advancements in monitoring, about 40% of such deaths remain unwitnessed [2]. Sudden natural death also significantly affects children, with various cardiovascular diseases being major causes among non-hospitalized, ambulatory children aged 1 to 21 years. A cooperative international study involving ten countries reported 254 cases of sudden unexpected death

from cardiovascular disease in children, highlighting the acute, often instantaneous nature of these incidents [3]. Sudden natural death, particularly sudden cardiac death, represents a critical area of medical and forensic investigation, significantly impacting individuals across all age groups. The determination of the specific causes and mechanisms often requires thorough autopsy examinations, highlighting the importance of advanced diagnostic approaches in understanding and potentially mitigating these abrupt and unexpected fatalities. The study aims to determine the causes of sudden natural death and assess the epidemiology and sociodemographic parameters linked to it.

## METHODOLOGY.

### Study Design.

The study adopted a cross-sectional design.

### Study Setting.

The study was carried out at the Department of Forensic Medicine and Toxicology (FMT), Srirama Chandra Bhanja (SCB) Medical College, Cuttack, Odisha, spanning from January 1, 2021, to December 31, 2023.

### Participants.

A total of 250 participants were enrolled in the study.

### Inclusion and Exclusion Criteria.

Included were all cases of sudden natural death occurring within 24 hours of terminal illness onset, across all age groups and genders. Excluded were unnatural deaths from accidents, suicides, and homicides, as well as cases involving decomposed or putrefied bodies, poisoning, and hospitalizations exceeding 24 hours.

### Bias.

Efforts were undertaken to mitigate bias through strict adherence to inclusion and exclusion criteria.

### Variables.

Variable encompassed socio-demographic characteristics, epidemiological factors, and pathological observations.

### Sample size.

Patients who enrolled after filling the inclusion criteria. For calculating sample size the following formula was used:

$$N\Delta = \frac{2(Z_{\alpha} + Z_{1-\beta})^2 \sigma^2}{2}$$

Where, N= sample size, Z is a constant

Z<sub>α</sub> is set by convention according to an accepted error of 5% as 1.649 Z<sub>1-β</sub> is set by convention according to accepted 1-β or power of study of 80% as 0.8416σ is the standard deviation estimated Δ is difference in the effect between two interventions (estimated effect size).

### Data Collection.

Data were sourced from inquest reports, autopsy records, histopathological examinations, and relevant departmental documents.

### Study Procedure.

Organs or segments displaying gross pathological changes were preserved for histopathological assessment.

### Statistical Analysis.

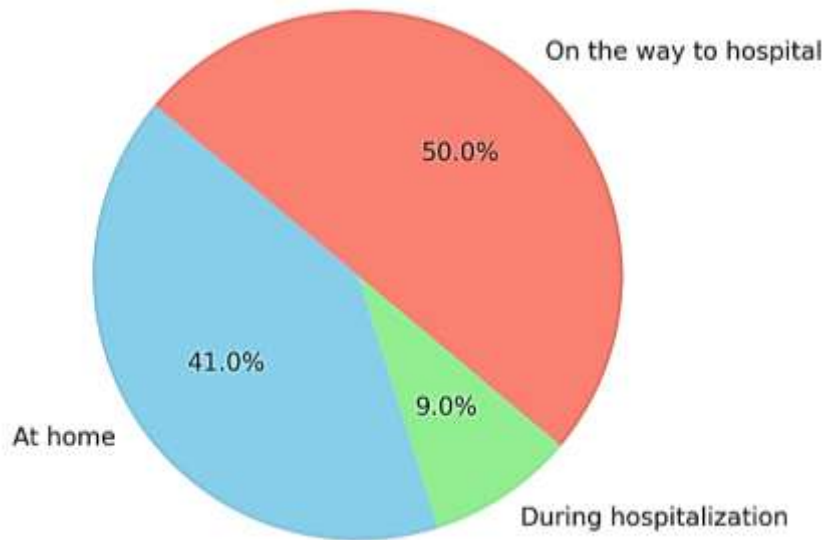
The collected data underwent statistical analysis using Microsoft Excel version 2021.

## RESULTS.

During the study period, a total of 697 medico-legal autopsies were conducted at the Department of Forensic Medicine and Toxicology. Among these autopsies, 250 cases (35.87%) were identified as sudden deaths. Male individuals were predominant, constituting 86% of the cases compared to females at 14%. The demographic distribution revealed that approximately 60% of the study population were Hindus, 30% were Muslims, and 10% were Christians, reflecting the predominant Hindu population.

**Table 1: Demographic profile.**

Characteristic	Percentage
Age Distribution	
0-30 years	15%
31-40 years	25%
41-50 years	30%
51-60 years	20%
61+ years	10%
Religion	
Hindu	60%
Muslim	30%
Christian	10%
Gender	
Male	86%
Female	14%
Geographic	
Urban	40%
Rural	60%



**Figure 1: Place of occurrence.**

Despite an age range spanning from infancy to elderly ages, the highest number of deaths occurred in the 40 to 50-year age group, comprising around 30% of cases,

followed by the 30 to 40-year age group with slightly over 20%. Geographically, approximately two-thirds of cases originated from rural areas.

**Table 2: Causes of Sudden Natural Death.**

Cause	Percentage
Cardiovascular Disease (CVS)	40%
Myocardial Infarction	42.6%
Cerebrovascular Accidents	18.9%
Pulmonary Embolism	8.3%
Respiratory Causes	25%
Chronic Parenchymal Lung Disease	12%
Gastrointestinal Causes	15%
Chronic Liver Disease	8%
Central Nervous System Causes	10%
Intracerebral Hemorrhage	6%

Among the sudden death cases, half of the victims died on the way to the hospital, 41% were found dead at home, and only 9% died during hospitalization. Regarding the causes of sudden death, nearly 40% were attributed to cardiovascular causes (CVS), with myocardial infarction being the most prevalent, constituting 42.6% of cardiovascular-related deaths. Other significant causes included cerebrovascular accidents (18.9%), pulmonary embolism (8.3%), chronic parenchymal lung disease, and chronic liver disease. The central nervous system causes accounted for a smaller proportion of cases, primarily due to intracerebral hemorrhage.

## DISCUSSION.

The results of the study provide valuable insights into the demographic characteristics, place of occurrence of death, and causes of sudden natural death within the study population.

The study population consisted of predominantly male individuals, comprising 86% of the cases, while females constituted 14%. This gender distribution highlights a significant disparity in the occurrence of sudden natural deaths between males and females.

The demographic distribution based on religion revealed that approximately 60% of the study population were Hindus, 30% were Muslims, and 10% were Christians. This distribution likely mirrors the religious composition of the region under study.

Age distribution indicated that the highest number of deaths occurred in the 40 to 50-year age group, comprising around 30% of cases. Subsequently, the 31 to 40-year age group accounted for slightly over 20% of cases, followed by other age groups with decreasing percentages. Despite the wide age range spanning from infancy to elderly ages, these middle-aged groups exhibited a disproportionately higher incidence of sudden natural deaths. Geographically, the study highlighted the rural-urban divide, with around two-thirds of cases originating from rural areas, indicating potential disparities in access to healthcare resources and infrastructure between urban and rural regions.

Furthermore, an examination of the place of occurrence of death provided critical insights into the circumstances surrounding sudden natural deaths. Alarmingly, half of the victims died on the way to the hospital, suggesting significant challenges in providing timely medical intervention outside healthcare facilities. Additionally, around 41% of deaths occurred at home, emphasizing the importance of understanding and addressing factors contributing to sudden natural deaths in residential settings. Conversely, only 9% of deaths occurred during hospitalization, underscoring the relatively smaller proportion of deaths within medical facilities compared to deaths outside healthcare settings.

The study also shed light on the diverse spectrum of causes underlying sudden natural deaths. Cardiovascular disease emerged as the predominant cause, accounting for nearly 40% of cases, with myocardial infarction constituting the most prevalent subtype. Other significant

contributors included cerebrovascular accidents, pulmonary embolism, respiratory, gastrointestinal, and central nervous system causes. These findings underscore the multifactorial nature of sudden natural deaths and highlight the need for comprehensive preventive strategies targeting modifiable risk factors and enhancing access to timely medical care, particularly in rural and residential settings.

The phenomenon of sudden natural deaths, particularly those occurring unexpectedly in apparently healthy individuals, has been a subject of extensive study and concern in India. Several autopsy-based studies across different regions of the country have provided valuable insights into the prevalence, causes, and demographic profiles associated with these deaths, highlighting the significant role of cardiovascular and respiratory pathologies.

One notable study reviewed sudden and unexpected deaths over four years. The findings indicated that sudden and unexplained deaths accounted for 8.67% of all medico-legal autopsies, with a pronounced male-to-female ratio of 5.8:1. The study identified that a substantial 66.67% of these cases were attributed to cardiovascular pathology, and 27.45% to pulmonary pathology, underscoring the predominance of cardiac and respiratory conditions in sudden natural deaths [4].

Another significant autopsy-based retrospective research in Mangalore, South India, contributed to the literature. The study spanned over four years and concluded that out of 271 cases classified as sudden deaths, 35.4% were sudden cardiac deaths. The demographic profile revealed a male predominance (92.7%) and an average victim age of 49.84 years. The researchers highlighted ischemic heart diseases as the leading cause of sudden cardiac deaths, constituting 81.3% of cases, and observed a seasonal pattern with over 50% of the deaths reported during February and May [5].

Further insights are provided by retrospectively analyzed studies of sudden natural death cases at Assam. The study found an incidence rate of 15.95% for sudden natural deaths with a striking male-to-female ratio of 10.2:1. Most victims were in the age groups of 51-60 and 31-40 years, with the cardiovascular system being the most commonly affected (43.56%). Coronary artery disease emerged as the main cause of cardiovascular deaths, further emphasizing the critical impact of cardiac conditions on sudden natural deaths [6].

A study explored the role of respiratory diseases in sudden deaths through a three-year prospective autopsy study in Bangalore, India. The findings revealed that 23.8% of 176 sudden deaths were due to respiratory causes, with bronchopneumonia being the most frequent culprit (71.4%). This study points to the significant, though less recognized, role of respiratory diseases in causing sudden natural deaths, particularly noting the rapid progression of fatal respiratory conditions leading to death within less than an hour in some cases [7].

## CONCLUSION.

The study provides valuable insights into the demographic characteristics, place of occurrence, and causes of sudden natural deaths within the study population. The findings highlight the disproportionate burden of sudden natural deaths among middle-aged individuals and the predominance of cardiovascular disease as the leading cause. Additionally, the study underscores the critical need for targeted interventions to address modifiable risk factors and improve access to timely medical care, particularly in rural and residential settings. By understanding the complex interplay of factors contributing to sudden natural deaths, healthcare systems can develop more effective strategies for prevention and intervention, ultimately reducing the incidence and impact of these fatalities on communities.

## LIMITATIONS.

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of a comparison group also poses a limitation for this study's findings.

## RECOMMENDATION.

Based on the findings, recommendations include the implementation of targeted preventive measures to address modifiable risk factors for cardiovascular disease, enhancing access to healthcare facilities in rural areas, and promoting awareness about the signs and symptoms of sudden natural death among the general population.

## ACKNOWLEDGMENT.

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## LIST OF ABBREVIATIONS.

FMT - Forensic Medicine and Toxicology  
CVS - Cardiovascular Disease  
MI - Myocardial Infarction  
CVA - Cerebrovascular Accident

PE - Pulmonary Embolism  
CNS - Central Nervous System

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No funding was received.

## CONFLICT OF INTEREST.

The authors have no competing interests to declare.

## REFERENCES.

1. Blokker BM, Wagenveld IM, Weustink AC, Oosterhuis JW, Hunink MM. Non-invasive or minimally invasive autopsy compared to conventional autopsy of suspected natural deaths in adults: a systematic review. *European radiology*. 2016 Apr;26:1159-79.
2. Yekben MG, Erbaş O. Sudden death: Causes, epidemiology, and associations in cardiology.
3. Maury P, Sacher F, Rollin A, Mondoly P, Duparc A, Zeppenfeld K, Hascoet S. Ventricular arrhythmias and sudden death in tetralogy of Fallot. *Archives of cardiovascular diseases*. 2017 May 1;110(5):354-62.
4. S Rao D. Sudden and unexpected natural deaths-a four-year autopsy review.
5. Kanchan T, Rastogi P, Kumar N, Singh M, Ansari SN. Sudden cardiac deaths autopsy analysis from a tertiary care center in coastal South India. *International Journal of Medical Toxicology & Legal Medicine*. 2013;16(1and2):1-7.
6. S V, Kakati N, Thakuria D. A retrospective study of sudden natural death cases brought for autopsy at Jorhat Medical College and Hospital, Jorhat, Assam. *Indian J Appl Res*. 2022. Available from: <https://doi.org/10.36106/ijar/3502917>.
7. Viswakanth B, Shreedhar NC, Roopak SN, Venkatesha VT. Sudden deaths due to respiratory diseases in a metropolitan city of south India: A three-year prospective autopsy study. *Journal of Indian Academy of Forensic Medicine*. 2016;38(2):156-9.

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