

NON-TRAUMATIC INTRACRANIAL HEMORRHAGE IN SUDDEN AND UNEXPECTED DEATHS: AN AUTOPSY-BASED STUDY

Forensic Medicine

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ABSTRACT

Background: Sudden and unexpected deaths in apparently healthy individuals pose a significant forensic challenge. Non-traumatic intracerebral haemorrhage (ICH) is an important cause and may be difficult to distinguish from traumatic hemorrhage. **Objective:** To study the pattern and associated risk factors of non-traumatic ICH in sudden deaths. **Materials and Methods:** A retrospective observational study was conducted on medico-legal autopsy cases at Maulana Azad Medical College, New Delhi, from January 2024 to August 2026. Demographic details, circumstances of death, haemorrhage characteristics, cardiovascular findings, and body mass index were assessed. **Results:** Cases were analyzed according to demographic characteristics, haemorrhage site and extent, cardiovascular changes, and BMI. Hypertensive changes were also evaluated. **Conclusion:** Detailed autopsy examination and clinicopathological correlation are essential for identifying non-traumatic ICH and distinguishing spontaneous from traumatic haemorrhage.

KEYWORDS

Intracerebral Haemorrhage; Sudden Death; Autopsy; Hypertension; Obesity.

INTRODUCTION

Sudden and unexpected death is an important medico-legal concern, especially in individuals without a known history of illness. Non-traumatic intracranial haemorrhage, particularly intracerebral haemorrhage (ICH), is an important cause of sudden death. Hypertension is the major risk factor for spontaneous ICH, while increasing age, diabetes mellitus, dyslipidemia, obesity, tobacco and alcohol use, and cardiovascular disease are other recognized risk factors¹.

From a forensic point of view, distinguishing traumatic from spontaneous intracerebral haemorrhage is important. A single, deep-seated haemorrhage usually suggests an underlying vascular disease. Hypertensive haemorrhages commonly occur in the putamen, basal ganglia, internal or external capsule, pons, and cerebellum, often due to rupture of lenticulostriate vessels². Traumatic haemorrhage may be associated with cerebral contusions, skull fractures, or scalp injuries, although it can occasionally occur without external injury. A history of hypertension, left ventricular hypertrophy, a typical site of haemorrhage, and a lesion disproportionate to the severity of trauma may support a natural cause.

The present study aimed to identify non-traumatic brain haemorrhage as a cause of sudden and unexpected death and to assess associated demographic and risk factors, particularly obesity^{3,6}.

Inclusion Criteria

- Sudden and unexpected deaths of any age or sex.
- Non-traumatic deaths subjected to medico-legal autopsy.
- Cases where non-traumatic intracranial haemorrhage was established as the primary cause of death.

Exclusion Criteria

- Deaths due to trauma or significant external injuries.
- Cases where poisoning or intoxication was established as the cause of death.
- Cases with inconclusive autopsy findings or an undetermined cause of death.
- Cases where intracranial haemorrhage was not established as the primary cause of death.
- Decomposed or severely decomposed bodies.
- Cases with unreliable height or weight measurements.

BMI Assessment

Height and weight were recorded during autopsy. BMI was calculated as weight (kg)/height² (m²). Cases were classified as underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), obesity Class I (30.0–34.9 kg/m²), Class II (35.0–39.9 kg/m²), and Class III (≥40 kg/m²)¹⁰.

Case Series

Case 1: History: A 65-year-old male with alleged self-fall from stairs was taken to hospital and referred to Lok Nayak Hospital, where he died during treatment. **BMI:** 24.0 kg/m² (154 cm, 72 kg). **Autopsy Findings:** Right parietal subdural haematoma, diffuse subarachnoid haemorrhage, right parietal intraparenchymal haemorrhage and bilateral intraventricular haemorrhage. Brain was congested and oedematous (Figure 1).

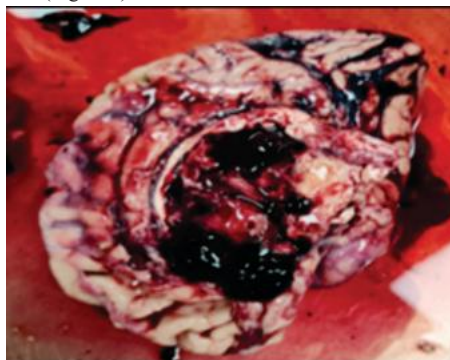


Figure 1

Case 2: History: A 55-year-old female was found unconscious at a public toilet and died after two days of treatment. She was on medication for hypertension. **BMI:** 21.9 kg/m² (154 cm, 52 kg). **Autopsy:** Subarachnoid haemorrhage over the frontal and occipital lobes, frontal intraparenchymal haemorrhage and bilateral intraventricular haemorrhage. Brain was congested and oedematous (Figure 2).

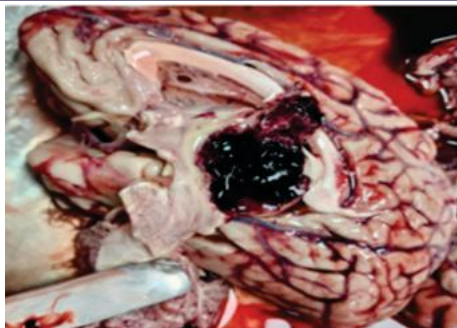


Figure 2

Case 3: History: A 60-year-old male presented with sudden loss of consciousness and vomiting and died during treatment. He had a history of hypertension and chronic alcoholism. **BMI:** 19.6 kg/m² (166 cm, 70 kg). **Autopsy:** Right temporal subdural haemorrhage, patchy subarachnoid haemorrhage and approximately 100 g of intraventricular clotted blood. Brain was congested and oedematous (Figure 3).



Figure 3

Case 4: History: A 78-year-old male with alleged self-fall followed by vomiting was referred to Lok Nayak Hospital, where he died during treatment. **BMI:** 19.8 kg/m² (165 cm, 82 kg). **Autopsy:** Patchy subarachnoid haemorrhage over the left frontal and temporal lobes and approximately 80 g of intraventricular clotted blood. Brain was congested with flattened gyri and obliterated sulci (Figure 4).

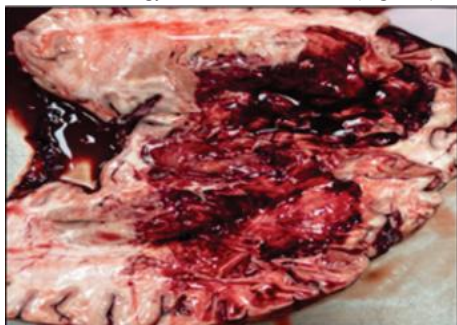


Figure 4

Case 5: History: A 55-year-old male was found unconscious and subsequently referred to Lok Nayak Hospital, where he died during treatment. **BMI:** 15.9 kg/m² (170 cm, 46 kg). **Autopsy:** Soft, brownish and oedematous brain with bilateral intraventricular haemorrhage containing approximately 100 g of dark-red clotted blood, with features suggestive of decomposition (Figure 5).

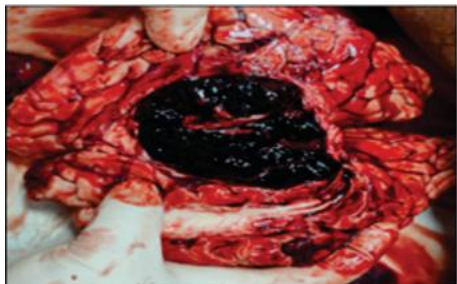


Figure 5

Case 6: History: A 61-year-old male with alleged fall in the bathroom at home was referred to Lok Nayak Hospital, where he died during treatment. He had hypertension, Type 2 diabetes mellitus and left-sided hemiparesis for 4 years. **BMI:** 23.9 kg/m² (161 cm, 70 kg). **Autopsy:** Bilateral intraventricular haemorrhage with clotted blood and multiple petechial haemorrhages over both cerebral hemispheres. Brain was oedematous and congested (Figure 6).



Figure 6

Case 7: History: A 45-year-old male with alleged self-fall in the washroom following dizziness was referred to Lok Nayak Hospital, where he died during treatment. **BMI:** 24.4 kg/m² (167 cm, 68 kg). **Autopsy:** Diffuse subarachnoid haemorrhage, bilateral intraventricular haemorrhage and basal brain haematoma. Thinning of vessels was noted at the anterior cerebral artery–anterior communicating artery junction, with adherent blood clots (Figure 7).



Figure 7

Case 8: History: A 34-year-old male was found unconscious with abnormal movements of the right limb and subsequently referred to Lok Nayak Hospital, where he died during treatment. **BMI:** 24.3 kg/m² (178 cm, 95 kg). **Autopsy:** Diffuse right-sided subdural haemorrhage with haematoma over the frontal and parietal lobes and intraparenchymal haemorrhage in the right temporal lobe. Brain was oedematous and congested (Figure 8).



Figure 8

Case 9: History: A 39-year-old male developed sudden-onset headache followed by loss of consciousness and was taken to Lok Nayak Hospital, where he died during treatment. **BMI:** 24.4 kg/m² (167 cm, 68 kg). **Autopsy:** Diffuse subdural and subarachnoid haemorrhages involving the cerebral hemispheres and base of the brain, with right frontal and temporal haematomas. Brain was oedematous and congested (Figure 9).

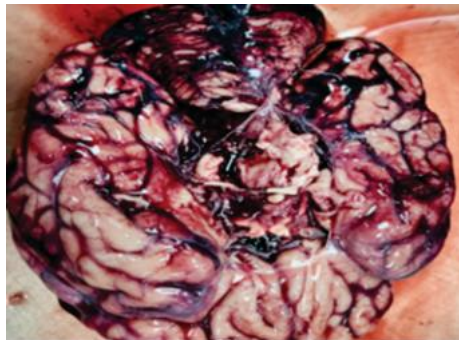


Figure 9

Case 10: History: A 54-year-old male developed sudden-onset headache followed by loss of consciousness and was brought to Lok Nayak Hospital, where he was declared brought dead. **BMI:** 23.7 kg/m² (172 cm, 70 kg). **Autopsy:** Subdural haemorrhage over multiple cerebral lobes and diffuse subarachnoid haemorrhage over both cerebral and cerebellar hemispheres. Brain was oedematous and congested (Figure 10).



Figure 10

Table Summarizing Case Details

Observation

- 9/10 cases were males, aged 34–78 years.
- Intracranial haemorrhage was the predominant finding.
- SAH and IVH were common findings.
- SDH and intraparenchymal haemorrhage were seen in some cases.
- Hypertension/diabetes were present in some cases.
- BMI ranged from 15.9–24.4 kg/m².
- Most deaths were sudden and unexpected.
- Significant traumatic findings were absent in most cases.

DISCUSSION

Non-traumatic intracranial haemorrhage is an important cause of sudden death. In this series of 10 cases, ages ranged from 34–78 years, with male predominance (9/10). Common presentations included sudden unconsciousness, headache, vomiting, dizziness, and abnormal limb movements.

Autopsy revealed SAH and IVH as the predominant findings, with SDH and intraparenchymal haemorrhage in some cases. Brain oedema and congestion were frequent. Although some cases had a history of falls, significant traumatic injuries were absent, highlighting the importance of distinguishing spontaneous haemorrhage from trauma. Hypertension and other vascular risk factors were present in some cases. One case showed a vascular abnormality at the ACA–ACom junction, emphasizing the need for careful examination of cerebral vessels.

BMI ranged from 15.9–24.4 kg/m², with no clear association between

BMI and intracranial haemorrhage. Detailed brain and vascular examination, along with clinical and circumstantial correlation, is essential in sudden deaths.

CONCLUSION

Non-traumatic intracranial haemorrhage is an important cause of sudden and unexpected death. SAH and IVH were the predominant findings. The history of falls in some cases highlights the need to differentiate spontaneous haemorrhage from traumatic injury. Larger studies are needed to further evaluate these findings.

Authors' Contributions

All authors contributed to data collection, analysis, manuscript preparation, editing, and final approval.

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Conflict of Interest

The authors declare no conflict of interest.

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