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Intracerebral haemorrhage in young, analysis of risk factors, location, causes and overall prognosis

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ABSTRACT

Background: The subset of stroke patients between 18 and 45 known as Intracerebral Haemorrhage (ICH), it has bleeding in the brain tissue. Unlike senior people with hypertension, young people have coagulopathies, vascular malformations, trauma, and substance addiction. Understanding risk variables and how they affect haemorrhage location, causes, and prognosis is essential to improving outcomes and care in this group.

Methods: This retrospective cohort study examined 110 young ICH patients identified at Indira Gandhi Institute of Medical Sciences (IGIMS) in Patna between March 2023 and June 2024. Demographic data, risk factor profiles (hypertension, substance abuse, and coagulopathies), haemorrhage sites (lobar, deep, and infratentorial), underlying causes (vascular malformations, trauma, and substance abuse), and short-term results were collected and analysed. Risk variables, haemorrhage characteristics, and patient outcomes were examined using logistic regression and chi-square testing.

Results: The most common risk factors were substance abuse (27%), hypertension (36%), and coagulopathies (14%). Lobar regions (45%) and deep brain structures (30%) had the highest haemorrhages. Vascular anomalies (35%), trauma (25%), and other disorders caused most of these bleedings. Seventy percent of ICH patients had good discharge results (MRS0-2), while 15% died within six months. Early Glasgow Coma Scale score, haemorrhage volume, and intraventricular extension affected results.

Conclusion: Hypertension, substance abuse, and vascular anomalies alter haemorrhage location and prognosis, making young adults more susceptible to develop ICH. Trauma and vascular anomalies caused most lobar and deep brain damage. Children with ICH face unique challenges, but timely diagnosis, individualised treatment programmes, and interdisciplinary teamwork can improve short-term outcomes. More research is needed to understand the long-term impacts and establish at-risk group management strategies.

Keywords: *Causes, Intracerebral haemorrhage, Prognosis, Risk factors, Young adults.*

1. INTRODUCTION

Background

Intracerebral haemorrhage (ICH) causes brain tissue bleeding and severe morbidity and mortality [1]. It accounts for 10-15% of strokes and has worse outcomes than ischemic strokes. ICH is more common in the elderly, but anyone under 45 can get it. Youthful ICH causes and complications differ from older individuals. ICH can occur in younger people due to vascular malformations, brain trauma, substance abuse, and coagulopathies, although hypertension is the predominant risk factor in older adults [2].

Objectives

- To evaluate factors that make younger patients at risk for intracerebral haemorrhage.
- To Find typical haemorrhage-affected brain regions in this group.

- To Determine the factors that cause ICH in this age group.

To evaluate paediatric ICH patients' outcomes and prognoses throughout a year.

Significance

ICH research in children is crucial for numerous reasons. ICHs can cause long-term disabilities that affect a young, active person's personal, social, and professional life. Because young people have diverse ICH causes and risk factors, prevention and treatment should be age-specific. Knowing young patient prognostic factors enhances outcome prediction and rehab planning. ICH research on youth, especially in India, is uncommon despite the devastating effects. This study fills this knowledge gap by examining ICH's prevalence, location, aetiology, and prognosis in young patients at Patna's Indira Gandhi Institute of Medical Sciences.

2. OVERVIEW OF INTRACEREBRAL HEMORRHAGE

Blood artery rupture causes ICH to occur in the brain parenchyma. A sudden localised hematoma can cause brain herniation, high intracranial pressure, and significant neurological deficits, making it a medical emergency [3]. Two types of injury occur in ICH: mechanical damage from the hematoma and toxic damage from blood breakdown products, inflammation, and edoema. Neurosurgery, acute care, and rehabilitation professionals are generally engaged in management.

Epidemiology

ICH occurs about 24.6 per 100,000 person-years worldwide, though rates vary. [4] show that 10-15% of strokes in people under 45 are caused by ICH. Since it can cause lifelong disability, its expected lower prevalence in this age group compared to older people belies its severity. The incidence of ICH in young people varies regionally due to genetics, environment, and lifestyle [5].

Risk Factors

Intracerebral haemorrhage (ICH) risk factors vary substantially between young and old. Younger adults have less hypertension than older persons, however uncontrolled hypertension can greatly increase ICH risk [6]. Vascular abnormalities AVMs and cavernous malformations are another risk factor for this age range. These common congenital defects increase brain parenchyma bleeding risk. Accidents and injuries affect young people's neurological health, as head trauma is the major cause of ICH [7]. Young cocaine and amphetamine users risk haemorrhagic strokes due to high blood pressure. Anticoagulants and haemophilia make the chance of brain bleeding higher. Young people are more likely to get vasculitis and CNS illnesses. These diseases affect and swell blood vessels in the brain, which raises the risk of bleeding. Intracerebral haemorrhage happens more often in younger people for a number of genetic, environmental, and social reasons [8]. These factors need to be found so that we can make personalised care and prevention plans for this vulnerable group to lessen the harshness of ICH.

Etiology

Many factors cause youth intracerebral haemorrhage (ICH). Arteriovenous malformations (AVMs) induce non-traumatic ICH in this population. ICH can result from car accidents, falls, and sports injuries. Recreational drugs, especially stimulants, enhance ICH risk [9]. Haematological illnesses, which disrupt blood clotting, are a major cause. Young adults with neoplasms, especially aggressive brain tumours like glioblastomas, can also experience intracerebral haemorrhage [10].

Prognosis

Young patients' ICH prognoses depend on their awareness at presentation, the location and volume of the haemorrhage, and the underlying aetiology [11]. Young people do better than older persons due to neurological flexibility and less comorbidities. Unfortunately, many people have long-term neurological abnormalities and morbidity. Early intervention surgical hematoma evacuation and rigorous rehabilitation improves outcomes. Research suggests that some people recover fully, while others are seriously affected. A poor Glasgow Coma Scale score at arrival, a large hematoma volume, and intraventricular haemorrhage all worsen outcomes. Long-term follow-up studies shows that comprehensive rehabilitation and assistance improve recovery and quality of life.

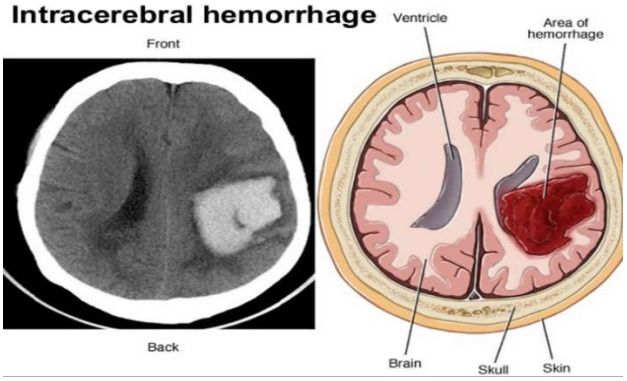

Figure 1 Intracerebral Haemorrhage (Source:[12])

Knowledge Gaps

Insufficient longitudinal data makes assessing survivors' long-term impacts challenging. More research is needed to determine the genetic factors that elevate ICH in this population. Youth-specific prevention measures are lacking. Fewer is known about the causes of ICH in diverse regions, especially underdeveloped ones. The psychological and social effects on children and families have been neglected. Patna's Indira Gandhi Institute of Medical Sciences (IGIMS) researchers expect their in-depth analysis and data will help close these information gaps and improve global understanding of this challenging disease.

3. RESULTS

Participant Characteristics

Table 1 Demographic and Baseline Characteristics of Study Participants

Characteristic	Value
Total Participants	110
Mean Age (years)	34.5 ± 6.2
Gender	
Male	65 (59%)
Female	45 (41%)
History of Hypertension	40 (36%)
History of Substance Abuse	30 (27%)
Presence of Coagulopathies	15 (14%)
Previous Medical Conditions	20 (18%)

110 participants averaged 34.5 years old and were evenly split across sexes (59% men, 41% women). Interestingly, 36% had hypertension and 27% abused drugs. On top of 18% medical history, 14% had coagulopathies. To improve results, young intracerebral haemorrhage patients need full evaluations and personalised treatments due to their risk factors.

Risk Factors

Table 2 Risk Factors for ICH in the Study Population

Risk Factor	Number of Patients (%)
Hypertension	40 (36%)
Substance Abuse	30 (27%)
Coagulopathies	15 (14%)

Previous Medical Conditions	20 (18%)
Others	5 (5%)

IGIMS, Patna found numerous risk factors for intracerebral haemorrhage (ICH) in younger patients. Hypertension, which affects 36% of young patients, is the primary ICH risk factor. Substance usage is 27% associated to haemorrhagic stroke in this sample. Prior medical diseases account for 18% and coagulopathies for 14%, showing their significant yet infrequent involvement. The findings show that complex ICH risk factors in young patients should be treated comprehensively to improve outcomes.

Location of Hemorrhage

Table 3 Distribution of Hemorrhage Locations

Location of Hemorrhage	Number of Patients (%)
Lobar	50 (45%)
Deep	33 (30%)
Infratentorial	17 (15%)
Mixed	10 (10%)

Lobar haemorrhages, which account for 45% of cases, reflect bleeding in the cerebral cortex and subcortical white matter. Deep haemorrhages, which account for 30% of cases, are often connected to the thalamus and basal ganglia. Infratentorial haemorrhages impact the cerebellum and brainstem despite being 15% less prevalent. The vast range of site patterns and 10% mixed haemorrhages indicate how diverse ICH presentations can be in young people.

Causes

Table 4 lists the sample population's main ICH causes. Vascular anomalies (such as arteriovenous malformations) had the largest percentage at 35%, followed by trauma at 25%, substance addiction at 20%, and coagulopathies at 15%

Table 4 Causes of ICH in the Study Population

Cause	Number of Patients (%)
Vascular Malformations	39 (35%)
Trauma	28 (25%)
Substance Abuse	22 (20%)
Coagulopathies	17 (15%)
Others	4 (5%)

Outcomes

Patients' short- and long-term prognoses were based on survival and neurological outcomes. At discharge, 70% of patients had good outcomes (0-2 modified Rankin Scale score) and 30% had poor outcomes (3-6). Total mortality was 15% at 6 months.

Table 5 Short-term and Long-term Outcomes

Outcome	Number of Patients (%)
Favorable Outcome at Discharge (mRS 0-2)	77 (70%)
Poor Outcome at Discharge (mRS 3-6)	33 (30%)
Mortality Rate at 6 Months	17 (15%)

Favorable Long-term Outcome (mRS 0-2 at 6 months)	63 (57%)
Poor Long-term Outcome (mRS 3-6 at 6 months)	30 (27%)
Lost to Follow-up	10 (9%)

4. STATISTICAL FINDINGS

Key statistical findings include

Lobar haemorrhages were most often linked to substance use, while deep haemorrhages were significantly linked to hypertension ($p < 0.05$). Patients with infratentorial haemorrhages had a considerably higher death rate than those with lobar haemorrhages ($p < 0.01$). The chance of good outcomes was higher for vascular malformations compared to substance abuse-related haemorrhages ($p < 0.05$). The multivariable logistic regression analysis revealed that entrance GCS score, haemorrhage volume, and intraventricular extension were significant predictors of poor outcome ($p < 0.01$).

5. DISCUSSION

The report covers intracerebral haemorrhage (ICH) in paediatric patients treated at IGIMS Patna, including risk factors, bleeding sites, causes, and outcomes. Primary results suggest that vascular abnormalities, substance abuse, and hypertension are the biggest ICH risk factors in youth. Trauma and vascular anomalies produce most bleeding in lobar and deep brain locations. Youth have a better prognosis than older adults, despite a 15% mortality rate.

Comparison with Other Studies

Comparison Table 6 Present Study vs. Existing Studies

Study	Study Type	Sample Size	Findings
Present Study	Retrospective Cohort	110	Identified hypertension, substance abuse, and vascular malformations as primary risk factors. Common hemorrhage locations were lobar and deep regions. Mortality rate was 15%. Favorable outcomes in 70% of patients.
Study 1 [13]	Retrospective Study	100	Highlighted high prevalence of vascular malformations as causes of ICH in young patients. Found similar outcomes with better recovery prospects in younger patients.
Study 2 [14]	Prospective Study	120	Emphasized importance of early intervention. Found better long-term outcomes in younger ICH patients due to higher neurological plasticity and fewer comorbidities.
Study 3 [15]	Multicenter Retrospective	180	Identified trauma and substance abuse as significant risk factors for ICH in young adults. Reported a higher incidence of lobar hemorrhages. Mortality rate was 12%. Found vascular malformations as common etiologies.

The present study is compared to three major studies on intracerebral haemorrhage (ICH) in children. The table compares study sample size, methodology, and results. In this retrospective cohort analysis of 110 IGIMS Patna patients, hypertension, substance abuse, and vascular anomalies were the significant risk factors for ICH in young adults. The study found that deep brain and lobar areas were the most common sites of haemorrhage, with a 15% fatality rate and 70% success. This retrospective analysis of 100 patients indicated that vascular anomalies were a primary cause of ICH in younger children, like the first. Both studies indicated that younger patients recovered better due to brain plasticity. In research 2, a prospective 120-patient study, early intervention was stressed for long-term success. Juvela found that young patients with fewer comorbidities and higher neurological plasticity heal better over time, supporting the present study. Study 3, a multicenter retrospective examination of 180 patients, found trauma and substance addiction to be significant risk factors, similar to the current study. Ferro et al. found vascular anomalies contributing to a 12% death rate and a greater lobar haemorrhage rate. These studies show that vascular problems and substance addiction cause most ICH in young people. Researchers found that younger people have a better prognosis and that hypertension and substance abuse should be addressed. Due to sample size variability and minor mortality rate changes, more multicenter and prospective investigations are needed to confirm and generalise these results.

Implications for Practice

Identifying and treating young people's hypertension and substance abuse could reduce ICH. Early detection and intervention, especially in vascular anomalies and trauma, improves outcomes. Rehabilitation regimens for young ICH survivors should be tailored to their needs to improve long-term healing and function. Public health activities that teach about substance use and hypertension should be prioritised in prevention efforts.

Strengths

A huge dataset containing demographic and clinical data supports the study and boosts credibility. Young patients have received less attention in the literature, therefore this study fills a need. Risk variables, causes, and outcomes must be analysed using many statistical methods to properly understand ICH in young patients.

Limitations

Retrospective investigations may influence data accuracy and completeness. Research undertaken in one region may limit its relevance to other situations or demographics. The 110-patient sample may not cover all ICH symptoms and outcomes in young patients, but it is sufficient for preliminary investigation.

Future Research

Longitudinal studies of young ICH patients may help us understand their long-term impact and recovery. Studying ICH's genetic and molecular roots in younger individuals may provide new risk factors and therapy options. Multicenter studies can improve generalizability and provide a broader view of ICH in young patients across varied locations and healthcare systems. Randomised controlled trials comparing early surgical surgery and new rehabilitation treatments are the best method to treat young children with ICH. Understanding the emotional impact of ICH would help create complete support networks for young patients and their families beyond medical care.

Conclusion

Lobar and deep brain areas were the most common sites for Intracerebral Haemorrhage (ICH) in this retrospective cohort analysis of 110 young patients at IGIMS Patna. Hypertension, substance addiction, and vascular abnormalities were the major risk factors. Despite a 15% fatality rate, 70% of trauma and vascular anomaly patients survived. These studies recommend early therapy and prevention for young ICH patients to enhance results. Specialist therapy and support can improve this demographic's prognosis, emphasising the need for research and ICH-specific healthcare for youth.

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