

Outcome of Primary Intracerebral Hemorrhage: Study in a Tertiary Care Center in Western Nepal

Subodh Gautam¹, Niraj Prasad Sah², Ashmita Nepal³, Sumi Jha⁴, Saharaj Siddiqui⁵, Jonesh Tiwari⁶

¹.Department of surgery, Nepalgunj medical college, Banke, Nepal

².Nepalgunj medical college, Banke, Nepal

³.Department of Anesthesiology, Nepalgunj medical college, Banke, Nepal

⁴.Nepalgunj Medical college, Banke, Nepal

⁵.Medical officer, Bhaktapur Hospital

⁶.Department of Urology, Seti Provincial Hospital, Dhangadhi, Nepal

Date of Submission: 27th January 2026

Date of Acceptance: 1st March 2026

Date of Publication: 15th March 2026

Abstract

Introduction: Primary intracerebral hemorrhage (ICH) is a leading cause of stroke-related mortality in South Asia, yet data from western Nepal remain limited. This study describes the clinical profile, radiological characteristics, management strategies, and three-month outcomes of primary ICH patients at a tertiary care center in western Nepal.

Material & Methods: This prospective analytical study was conducted at the Department of Neurosurgery, Nepalgunj Medical College and Teaching Hospital (NGMCTH), Kohalpur, Nepal. Sixty-three adult patients with confirmed primary ICH on non-contrast CT head were enrolled over three months using consecutive sampling and followed up for an additional three months. Clinical, demographic, and radiological data were collected at the time of admission. Neurological status was assessed using the Glasgow Coma Scale (GCS) at admission and at three months.

Results: The median patient age was 62 ± 12.8 years, with male predominance (65.1%). Hypertension was the most common comorbidity (74.6%). Approximately 74.6% presented with moderate-to-severe neurological compromise. Admission GCS was significantly associated with three-month neurological outcome. Conservative management was employed in 63.5% of patients, and 17.5% underwent surgical intervention. A notable 25.4% left against medical advice (LAMA).

Conclusion: Primary ICH in western Nepal predominantly affects middle-aged hypertensive males. Admission GCS is the strongest predictor of short-term neurological outcome. The high LAMA rate reflects critical socioeconomic barriers that likely underestimate true ICH mortality. Strengthening community-level hypertension control, expanding financial protection for neurosurgical emergencies, and improving patient retention seem essential to improving outcomes in this region.

Keywords: Glasgow Coma Scale, Hypertension, Intracerebral Hemorrhage, Outcome.

Introduction

The Primary ICH accounts for approximately 10-15% of all stroke patients. Rupture of Charcot- Bouchard aneurysms

or chronic hypertension is the major factor.¹ Despite advances in neurosurgery and intensive care, prognosis remains poor, with high mortality in the first month of admission.² Primary ICH is a major public health concern, especially in regions with high hypertension; in Nepal, it accounts for half of all strokes.³ Primary ICH results from rupture of small arteries weakened by hypertension or small vessel disease, causing blood accumulation, raised intracranial pressure, edema, and neuronal injury, leading to high fatality and poor outcomes.⁴

The tertiary care center shows the number of incidence, prevalence, or number of Admissions/outdoor attendance of patients with an increase in the annual number of ICH patients, reflecting the burden of stroke in this region.^{5,6} The studies in the past have recognized key variables influencing the outcome of ICH, including age, score of GCS, and systolic blood pressure.⁷ However, most of these studies were conducted within affluent healthcare systems, and their relevance to resource-limited environments remains uncertain.⁸ The research aims to fill these gaps by offering an evidence-based perspective into the local epidemiological and outcome predictors of primary ICH.

Access this article online	
Website: https://www.nepjol.info/index.php/NJN	
DOI: https://doi.org/10.3126/njn.v23i1.90067	
HOW TO CITE	
Gautam, S., Sah, N. P., Nepal, A., Jha, S., Siddiqui, S., & Tiwari, J. Outcome of Primary Intracerebral Hemorrhage: Study in a Tertiary Care Center in Western Nepal. NJNS. 2026;23(1):11-16	

Address for correspondence:

Dr. Subodh Gautam
Department of surgery, Nepalgunj medical college, Banke, Nepal
Email: Subodhgautam1771@gmail.com

Copyright © 2023 Nepalese Society of Neurosurgeons (NESON)
ISSN: 1813-1948 (Print), 1813-1956 (Online)



This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

METHODS AND MATERIALS

Study Design and Setting

This was a prospective analytical study conducted in the Department of Neurosurgery, Nepalgunj Medical College and Teaching Hospital (NGMCTH), Kohalpur, Banke, Nepal, a tertiary care center serving the population of western Nepal. The study was approved by the Institutional Review Committee of Nepalgunj Medical College (IRC-NGMC) before enrollment. Written informed consent was obtained from each patient or, in cases of altered consciousness, from the primary caregiver before inclusion in the study.

Study Duration and Participants

Patient enrollment commenced on the date of ethical approval and continued for three consecutive months, following a sequential (consecutive) sampling strategy. All adult patients (aged 18 years and above) presenting to the Department of Neurosurgery with a confirmed diagnosis of primary intracerebral hemorrhage (ICH) were considered for inclusion. Diagnosis was established on the basis of clinical history, neurological examination, and non-contrast computed tomography (NCCT) of the head. Patients with secondary causes of hemorrhage, including hemorrhagic transformation of ischemic stroke, underlying tumors, arteriovenous malformations, or anticoagulant-related bleeding, were excluded. Following the three-month enrollment period, all included patients were followed up for an additional three months, resulting in a total study duration of six months.

Sample Size Calculation

The minimum required sample size was calculated using the single-population proportion formula: $n = Z^2 \times p \times (1 - p) / e^2$, based on a previously reported ICH mortality rate of 15.5% from a comparable regional study. Using a 95% confidence interval ($Z = 1.96$) and a margin of error of 10%, the minimum required sample size was calculated to be 47 patients. A total of 63 patients were ultimately enrolled, exceeding this threshold and improving the statistical power of the study.

Data Collection

Clinical and demographic information was collected prospectively using a pre-designed, structured data collection form at the time of hospital admission. The variables recorded included patient demographics (age and sex), presenting neurological status, comorbid conditions (particularly hypertension), and radiological characteristics on NCCT of the head. Radiological parameters assessed included the site of hemorrhage (basal ganglia, thalamus, cerebellum, brainstem, or lobar regions), laterality (left vs. right), presence of intraventricular extension (IVH), hematoma volume, and degree of midline shift. Neurological status at admission was graded using the Glasgow Coma Scale (GCS) and categorized into mild (GCS 13–15), moderate (GCS 9–12), and severe (GCS ≤ 8 or intubated). Management strategy, conservative or surgical, was documented along with the type of surgical intervention, where applicable.

Follow-Up and Outcome Assessment

All patients were reassessed at three months following their index admission. For patients who were discharged, follow-up was conducted during outpatient visits. Patients who left against

medical advice (LAMA) were contacted by telephone at three months after discharge; verbal consent was obtained from the patient or primary caregiver before conducting the telephonic interview. Neurological outcome was assessed using the GCS at 3 months, with neurological status categorized as mild impairment (GCS 13–15), moderate impairment (GCS 9–12), severe impairment or intubated (GCS ≤ 8), or death.

Statistical Analysis

All data were entered and analyzed using IBM SPSS Statistics, version 26. Continuous variables are expressed as median \pm standard deviation. Categorical variables are presented as frequencies and percentages. The association between categorical variables was assessed using the Chi-square test, and Fisher's exact test was applied where cell counts were small. A two-tailed p-value of less than 0.05 was considered statistically significant.

RESULT

A total of 63 cases were included in the study conducted in the Department of Neurosurgery, Nepalgunj Medical College and Teaching Hospital, Kohalpur, Banke. The study population comprised patients aged 18 years and above who were diagnosed with primary intracerebral hemorrhage.

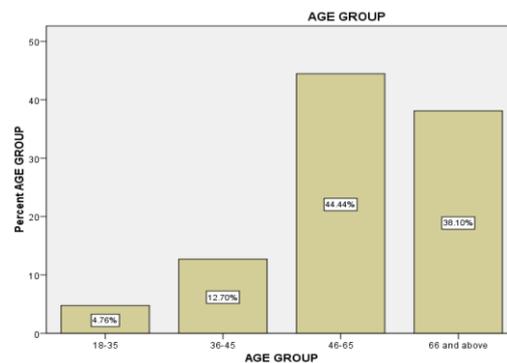


Figure 1- Bar diagram showing age group of study population.

Patient ages ranged from 31 to 90 years, with a median age of 62 ± 12.8 years. Of the 63 patients, 11 (17.5%) were classified as having “Stroke in Young” (age below 45 years), while the remaining 52 patients (82.5%) were 45 years or older (Figure 1), underscoring that ICH in this region disproportionately affects working-age adults.

Table 1: Gender distribution of the study population

Gender	Number of individuals	Percentage
Male	41	65.1%
Female	22	34.9%
Total	63	100%

As shown in Table 1, males constituted the majority of the study cohort, accounting for 41 patients (65.1%), while 22 patients (34.9%) were female, yielding a male-to-female ratio of approximately 1.9:1.

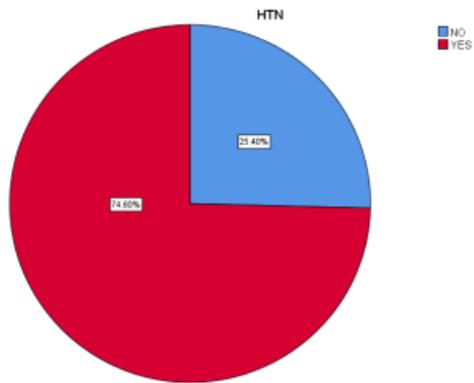


Figure 2- Pie Chart showing hypertension status among patients with primary ICH

Among comorbid conditions, hypertension was by far the most prevalent, present in 47 patients (74.6%) (Figure 2).

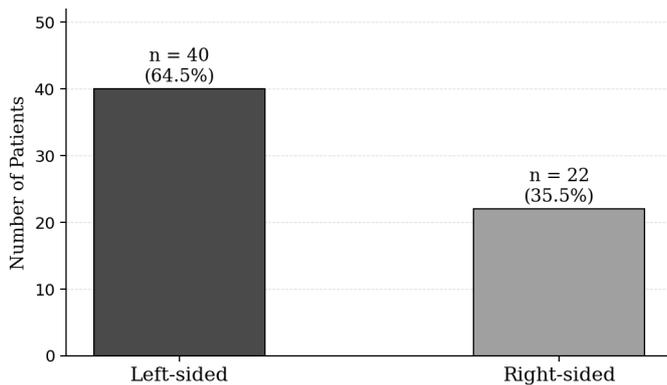


Figure 3- Bar diagram showing laterality of hemorrhage (Basal ganglia and cerebellar)

FFigure 3 illustrates the laterality of the Basal Ganglia (BG) and cerebellar bleed. Left-sided bleed was more common, occurring in 40 patients (64.5%), while right-sided bleed was observed in 22 patients (35.5%).

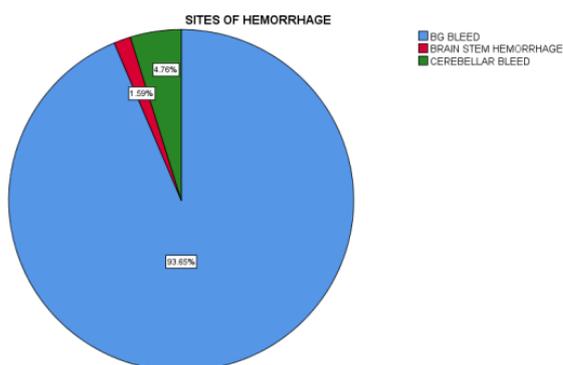


Figure 4- Pie chart showing sites of ICH

Intraventricular extension of hemorrhage (IVH) was observed among 8 patients (12.7%) of BG bleed, 1.58% had brainstem hemorrhage (pontine), and 3 patients (4.8%) had cerebellar hemorrhage.

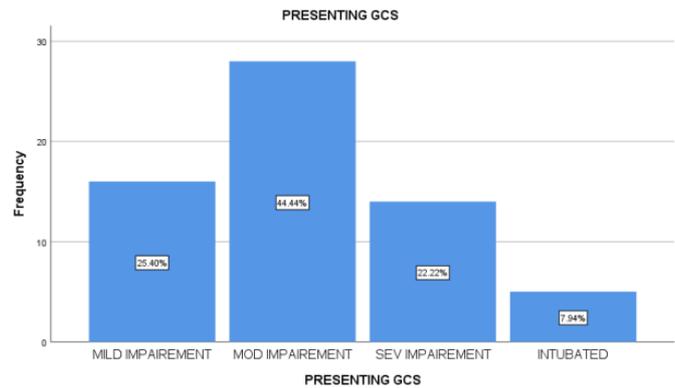


Figure 5- Bar diagram showing GCS/neurological impairment at the time of presentation

Neurological status at admission was assessed using the Glasgow Coma Scale (GCS) in all 63 patients, as shown in Figure 5. At the time of presentation, 16 patients (25.4%) had mild neurological impairment (GCS 13–15), 28 patients (44.4%) had moderate impairment (GCS 9–12), and 14 patients (22.2%) had severe impairment (GCS ≤8). An additional 5 patients (7.9%) were intubated at presentation. Taken together, approximately three-quarters of patients (74.6%) presented with moderate-to-severe neurological compromise

Table 2- Crosstab showing the relationship between GCS at 3 months follow-up and side of hemorrhage

Side of Hemorrhage	Mild Impairment	Moderate Impairment	Severe/Intubated	Death	LA MA	Total	p-value
Right (n = 22)	10	3	1	1	7	22	
Left (n = 40)	20	6	5	1	8	40	0.734
Total	30	9	6	2	15	62	

As presented in Table 2, the distribution of three-month outcomes was analyzed by side of hemorrhage: among patients with right-sided hemorrhage (n = 22), 10 had mild impairment, 3 had moderate impairment, 1 had severe/intubated status, 1 died, and 7 left against medical advice. Among patients with left-sided hemorrhage (n = 40), 20 had mild impairment, 6 had moderate impairment, 5 had severe/intubated status, 1 died, and 8 left against medical advice. Chi-square analysis revealed no statistically significant association between hemorrhage laterality and three-month neurological outcome (p = 0.734), indicating that the side of hemorrhage is not an independent predictor of recovery in this cohort.

Table 3- Crosstab showing relationship between GCS at 3 months follow up and presenting GCS.

GCS at 3 months follow up					
Baseline GCS at admission	Mild (13-15)	Moderate (9-12)	Severe (≤ 8 /intubated)	Total	p-value
Mild (n=16)	14	0	0	14	
Moderate (n=28)	15	8	2(death)	25	0.001
Severe (n=14)	1	1	4	6	
Total	30	9	6	45	

As shown in Table 3, a statistically significant association was found between admission GCS and three-month neurological outcome using Fisher's exact test ($p = 0.001$). Among the 16 patients who presented with mild impairment, none deteriorated. Among the 28 patients who presented with moderate impairment (GCS 9-12), 15 had recovered to mild impairment at three months, 8 had moderate impairment, and 2 had died. Among the 14 patients who presented with severe impairment (GCS ≤ 8 or intubated), 1 had attained mild impairment, 1 had moderate at three months, reflecting meaningful neurological recovery in this subgroup.

Table 4: Treatment Profile and 3-Month Functional Outcomes

Primary Intracerebral Hemorrhage Cohort, Western Nepal (n=63)

Part A: Management Strategy

Management Approach	n	%
Conservative management	40	63.5
Surgical intervention		
– Decompressive hemicraniectomy with hematoma evacuation (n=7)		
– Endoscopic hematoma evacuation (n=2)	11	17.5
– External ventricular drain (EVD) placement (n=2)		
Left against medical advice (LAMA)	16	25.4
Total	63	—

Part B: 3-Month Outcomes in LAMA Patients

3-Month Outcome in LAMA Patients (n=13 contacted)	n	%
Functionally independent	1	6.25
Ambulatory with residual disability	3	
Dependent on caregiver (ADLs)	6	37.5
Died after discharge	3	
Lost to follow-up	3	
Total LAMA patients	16	100

Of the 63 patients, 40 (63.5%) were managed conservatively, and 11 (17.5%) underwent surgical intervention. Sixteen patients (25.4%) left against medical

advice, primarily due to financial constraints; of the 13 successfully followed up at three months, 9 (69.2%) had either died or remained fully dependent on caregivers, reflecting the disproportionately poor outcomes associated with premature hospital departure.

DISCUSSION

Primary intracerebral hemorrhage (ICH) remains a devastating neurological emergency with high mortality and morbidity, particularly in resource-limited settings. Li et al. reported a pooled global ICH incidence of 26.47 per 100,000 person-years, with the highest burden in lower-middle-income countries, and a 1-year survival rate of only approximately 50% worldwide.¹ The present prospective study examined the clinical profile, radiological characteristics, management strategies, and three-month outcomes of 63 patients with primary ICH at a tertiary care center in western Nepal. The median age in this study was 62 ± 12.8 years, where 17.5% of patients were under 45 years (stroke-in-young), underscoring likely premature vascular aging driven by uncontrolled hypertension in this region. Bhandari et al., in a comparable neurosurgical cohort from western Nepal, similarly documented a younger age distribution with hypertension as the predominant risk factor.³ Male predominance (65.1%) is consistent with the systematic review and meta-analysis by Paudel et al., which identified a higher stroke burden among the male population.⁹

Hypertension was documented in 74.6% of patients, serving as the dominant comorbidity. Chronic hypertension induces lipohyalinosis and Charcot-Bouchard microaneurysm formation in small penetrating arteries, predisposing to deep-seated hemorrhages in the basal ganglia and thalamus, the most common sites in this series. Bhandari et al. similarly reported hypertension as the most prevalent comorbidity in their western Nepali ICH cohort.³ The high prevalence reflects deficiencies in community-level blood pressure screening, medication adherence, and long-term follow-up, emphasizing the preventive potential of structured antihypertensive programs.

Baseline GCS was the strongest predictor of three-month neurological outcome in this study ($p = 0.001$; Table 3). Of patients presenting with mild impairment (GCS 13–15), 60% maintained mild status at three months; in contrast, the majority of those presenting with severe impairment had persistent disability or died. Hegde et al. in a prospective tertiary care study from South India, similarly identified admission GCS as the most significant predictor of in-hospital mortality and discharge outcome.² Bhatia et al. in a prospective cohort of spontaneous ICH patients in northern India, reported an in-hospital case fatality rate of approximately 32%, with severe neurological compromise at admission as the principal driver of poor outcome.¹¹ Additionally, Shrestha et al. demonstrated in a prospective Nepali cohort of 89 ICH patients that 37.08% had poor 30-day outcomes.¹⁰

The Basal ganglia was the most common hemorrhage site consistent with hypertensive small-vessel disease. Godoy et al., in a systematic review and meta-analysis, found that intracranial hypertension following spontaneous ICH was prevalent and independently associated with increased mortality, underscoring the importance of aggressive ICP management.¹² Intraventricular extension (IVH) was observed in 12.7% of

patients; while lower than some large urban series, IVH carries recognized prognostic significance due to its association with hydrocephalus and raised intracranial pressure. Cerebellar (4.8%) and brainstem (1.58%) hemorrhages were infrequent but clinically significant, as posterior fossa hemorrhages are prone to rapid deterioration and may require urgent surgical decompression. Hemorrhage laterality did not significantly influence three-month outcomes ($p = 0.734$; Table 2), indicating that recovery is primarily determined by hemorrhage volume, depth, and degree of consciousness rather than side of involvement.

Table 4 presents the complete treatment profile and three-month neurological outcomes of the cohort. The majority of patients (63.5%) were managed conservatively in keeping with current AHA/ASA guidelines that do not recommend routine surgical evacuation for supratentorial ICH in unselected patients.¹³ Surgical intervention was performed in 11 patients (17.5%): seven underwent decompressive hemicraniectomy with hematoma evacuation, two had endoscopic hematoma evacuation, and two required external ventricular drain (EVD) placement for hydrocephalus from intraventricular extension. Al-Salihi et al. in an updated systematic review and meta-analysis of randomized and propensity-matched studies, demonstrated that minimally invasive surgery (MIS) was associated with reduced mortality compared to medical management in selected supratentorial ICH, though improvement in functional independence remained modest and uncertain.¹⁵ The two endoscopic cases in this series reflect an emerging shift toward less invasive surgical techniques at this center, though the numbers preclude independent outcome analysis.

The most concerning finding in Table 4 is the high LAMA rate of 25.4% ($n = 16$). Among 13 patients who were successfully contacted at three months, 6 (37.5%) were fully caregiver-dependent for activities of daily living, 3 (18.75%) were ambulatory with residual disability, 3 (18.75%) had died after discharge, and 1 (6.25%) achieved functional independence, meaning 9 out of 16 (56.25%) of followed-up LAMA patients had either died or remained completely dependent. Sapkota et al., in a prospective observational study from a Nepali neurosurgical unit, identified financial constraints, absence of health insurance, and perception of poor prognosis as the principal drivers of LAMA, factors that are particularly prevalent among patients requiring ICU admission or surgical intervention.¹⁶ Consequently, true ICH mortality in this cohort is substantially underestimated, as critically ill patients discharged at family request are excluded from in-hospital mortality counts. Addressing this systemic failure requires policy-level intervention, including subsidized neurosurgical care, integration of financial counseling within inpatient teams, and expansion of government health insurance coverage for stroke and neurosurgical emergencies.

The findings of this study highlight the urgent need for a multidimensional approach to ICH management extending beyond hospital walls. Community-level hypertension screening and treatment programs remain the most impactful preventive intervention. Strengthening pre-hospital emergency systems and organized stroke referral networks can reduce delays that translate into preventable neurological deterioration at admission. Simultaneously, expansion of government health insurance schemes to cover acute neurosurgical care is critical to reducing LAMA rates and improving survival in this vulnerable

population.

CONCLUSION

Primary ICH in western Nepal predominantly affects middle-aged hypertensive males presenting with moderate-to-severe neurological compromise. Admission GCS is the strongest short-term prognostic factor, while hemorrhage laterality does not independently influence recovery. Conservative management was the mainstay of treatment, with surgery reserved for selected cases including, decompressive hemicraniectomy, endoscopic evacuation, and EVD placement. The high LAMA rate (25.4%), with 56.25% of patients either deceased or fully caregiver-dependent at three months, reflects critical socioeconomic barriers that obscure true mortality. Strengthening community hypertension programs, establishing structured neurosurgical financial support, and improving patient retention through social work integration are essential to reducing ICH-related mortality and disability in this region.

ACKNOWLEDGEMENT

We are thankful to the participants of the study

FUNDING: No funding was obtained for the study

DISCLOSURES: Authors have nothing to disclose.

CONFLICT OF INTEREST: None.

REFERENCES

1. Li X, Zhang L, Wolfe CDA, Wang Y. Incidence and Long-Term Survival of Spontaneous Intracerebral Hemorrhage Over Time: A Systematic Review and Meta-Analysis. *Frontiers in neurology*. doi: 10.3389/fneur.2022.819737
2. Hegde A, Menon G, Kumar V, Prasad GL, Kongwad LI, Nair R, et al. Clinical Profile and Predictors of Outcome in Spontaneous Intracerebral Hemorrhage from a Tertiary Care Centre in South India. 2020;2020. doi: 10.1155/2020/2192709
3. Bhandari P, Adhikari S, Bhattarai A, Yogi N, Karmacharya B, Karki B, et al. Demographics, Clinical profile, Causes and Outcome of Intracerebral Hemorrhage in Neurosurgical Unit in Manipal Teaching Hospital of Western Nepal. *Eastern Green Neurosurg*. 2021 Aug 8;3(01):8–14. Doi: <https://doi.org/10.3126/egn.v3i01.38963>
4. Liu T, Jiang W, Zhang M, Xiong S, Chen L, Chen X, et al. Intracerebral Hemorrhage: Advances, Knowledge Gaps, and Future Directions. *MedComm*. 2025 Nov;6(11):e70436. doi: 10.1002/mco2.70436
5. Feigin VL, Stark BA, Johnson CO, Roth GA, Bisignano C, Abady GG, et al. Global, regional, and national burden of stroke and its risk factors, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Neurology*. 2021 Oct;20(10):795–820. doi: 10.1016/S1474-

6. Xu L, Wang Z, Wu W, Li M, Li Q. Global, regional, and national burden of intracerebral hemorrhage and its attributable risk factors from 1990 to 2021: results from the 2021 Global Burden of Disease Study. *BMC Public Health.* 2024 Sep 6;24(1):2426. doi: 10.1111/enc.70031
7. Wang Z wei, Wan M ping, Tai J hui, Wang Y, Yin M yi. Global regional and national burden of intracerebral hemorrhage between 1990 and 2021. *Sci Rep.* 2025 Jan 29;15(1):3624. doi: 10.1038/s41598-025-88017-0
8. Rajbanshi JN, Nepal PR. Outcome of Primary Intracerebral Hemorrhage: A Study in Tertiary Care Center. *Eastern Green Neurosurg.* 2020 Jun 3;2(2):35–40. doi: <https://doi.org/10.3126/egn.v2i2.29246>
9. Paudel R, Tunkl C, Shrestha S, Subedi RC, Adhikari A, Thapa L, et al. Stroke epidemiology and outcomes of stroke patients in Nepal: a systematic review and meta-analysis. *BMC Neurol.* 2023 Sep 25;23(1):337. doi: 10.1186/s12883-023-03382-5
10. Shrestha G, Gurung A, Sedhain G, Bajpai S, Hamal A, Verma R, et al. Prediction of the outcome of intracerebral hemorrhage by blood neutrophil to lymphocyte ratio: a prospective observational study. *Ann Med Surg (Lond).* 2024 Nov;86(11):6472–6. doi: 10.1097/MS9.0000000000002554
11. Bhatia R, Singh H, Singh S, Padma M, Prasad K, Tripathi M, et al. A prospective study of in-hospital mortality and discharge outcome in spontaneous intracerebral hemorrhage. *Neurol India.* 2013;61(3):244. doi: 10.4103/0028-3886.115062
12. Godoy DA, Núñez-Patiño RA, Zorrilla-Vaca A, Ziai WC, Hemphill JC. Intracranial Hypertension After Spontaneous Intracerebral Hemorrhage: A Systematic Review and Meta-analysis of Prevalence and Mortality Rate. *Neurocrit Care.* 2019 Aug;31(1):176–87. doi: 10.1007/s12028-018-0658-x
13. Price EF Courtney. Spontaneous Intracerebral Hemorrhage - 2022 AHA/ASA Guidelines [Internet]. *EMottawa Blog.* 2023 [cited 2026 Feb 11]. Available from: <https://emottawablog.com/2023/01/spontaneous-intracerebral-hemorrhage-2022-aha-asa-guidelines/>
14. Stroke Policies and Clinical Practice Guidelines [Internet]. [cited 2026 Feb 11]. Available from: <https://www.fmolhs.org/-/media/files/careers/stroke-policies-and-cpgs-combined-ppt-for-healthstream-2024.pdf;%20z=z>
15. Al-Salihi MM, Al-Jebur MS, Saha R, Saleh A, Abd Elazim A, Siddiq F, et al. Minimally Invasive Surgery Versus Medical Management for Spontaneous Supratentorial Intracerebral Hemorrhage: An Updated Systematic Review and Meta-Analysis of Randomized and Propensity Score-Matched Studies. *Medicina.* 2025 Dec 16;61(12):2216. doi: 10.3390/medicina61122216
16. Sapkota S, Karn M, Neupane BR, Gurung B, Pandit C, Upadhyay T, et al. Factors predicting leaving against medical advice in Neurosurgery: A prospective observational study