

Complications And Clinical Outcomes Of Aneurysmal Subarachnoid Hemorrhage Following Endovascular Intervention: A Retrospective Tertiary Icu-Based Study From Nepal

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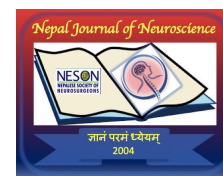
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Abstract

Introduction: Aneurysmal subarachnoid hemorrhage (aSAH) is a life-threatening neurological emergency associated with a significant global burden of morbidity and mortality. Although advances in endovascular intervention have improved survival and neurological outcomes, post-procedural complications continue to pose significant challenges, particularly in intensive care settings. Evidence regarding the clinical profile, complications, and outcomes of patients with aSAH undergoing endovascular treatment in Nepal remains limited. This study aimed to evaluate the demographic characteristics, aneurysm profile, post-procedural complications, and clinical outcomes of patients with aSAH managed with endovascular intervention in a tertiary care intensive care unit in Nepal.

Methods: This study was conducted in the Intensive Care Unit of Grande International Hospital, Kathmandu, Nepal. Patients with aSAH who underwent endovascular intervention between February 2023 and February 2026 were included. Demographic characteristics, aneurysm location, complications, and outcomes were analyzed. Categorical variables were expressed as frequency and percentage, while quantitative variables were expressed as mean $\pm$ standard deviation or median with interquartile range.

Results: A total of 50 patients were included. The mean age was 55.9 ± 10.8 years, with female predominance (56%). The anterior communicating artery was the most common aneurysm location (30%). The most frequent complications were infection (24%), vasospasm (22%), procedure-related intracranial hematoma (18%), EVD placement (12%), and hyponatremia (12%). The median ICU stay was 5.5 days, and mortality occurred in 4% of patients.

Conclusion: Endovascular management of aSAH showed favorable overall outcomes with low mortality; however, complications such as infection and vasospasm remained common. These findings provide important local data that may help optimize neurocritical care practices for aSAH in Nepal

Keywords: Aneurysmal subarachnoid hemorrhage; Endovascular coiling; Vasospasm; Retrospective study

INTRODUCTION

Aneurysmal subarachnoid hemorrhage (aSAH) is a serious neurological condition associated with high mortality

and long-term disability worldwide^{1,2}. The rupture of cerebral aneurysms is the hallmark of aneurysmal subarachnoid hemorrhage, a major neurological emergency that causes considerable morbidity and mortality worldwide. Despite making up just 5–10% of all strokes, it is disproportionately responsible for stroke-related deaths, highlighting its clinical significance.² Although endovascular interventions have improved outcomes, post-procedural complications remain a major challenge, particularly in intensive care settings³.

The demographic profile of aSAH reveals a higher incidence among middle-aged adults, particularly between the ages of 40 and 60, with a notable female predominance attributed to hormonal and vascular factors that predispose women to aneurysm formation⁴. Early treatment of ruptured intracranial aneurysms is essential to prevent rebleeding and improve outcomes⁵. Historically, surgical clipping was the primary modality; however, endovascular techniques have increasingly replaced surgical methods due to their minimally

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invasive nature⁶.

The International Subarachnoid Aneurysm Trial (ISAT) has highlighted the superior functional outcomes associated with endovascular coiling relative to surgical clipping, prompting a global shift towards these minimally invasive strategies⁷.

Patients with aSAH still experience a number of sequelae, such as vasospasm, hydrocephalus, and infections, which greatly increase long-term impairment and mortality despite improvements in treatment approaches. In the neurocritical care context, cerebral vasospasm, which occurs in 30–70% of cases, is still a major contributor to delayed neurological deterioration and requires close observation and treatment^{8,9}.

Neurocritical care management plays an essential role in improving outcomes following aneurysmal subarachnoid hemorrhage. Standardized protocols involving early aneurysm securing, hemodynamic stabilization, and prevention of secondary brain injury significantly influence survival rates¹⁰. Although endovascular therapy for aSAH has become more popular in Nepal in recent years, there is still a dearth of thorough information about the related comorbidities and clinical results. By assessing the complications and clinical results of patients with aSAH who received endovascular intervention at the intensive care unit of Grande International Hospital in Kathmandu, this study seeks to close this gap. By conducting this study, we hope to advance knowledge of the clinical implications of aSAH and direct future treatment strategies by offering insightful information about its care in a tertiary setting^{11,12}.

Material and Methods

This retrospective observational study was conducted in the Intensive Care Unit of Grande International Hospital, Kathmandu, Nepal, over a three-year period from February 2023 to February 2026. All patients diagnosed with aneurysmal subarachnoid hemorrhage (aSAH) who underwent endovascular intervention and required ICU admission following the procedure were included. Patients with non-aneurysmal subarachnoid hemorrhage, those managed with surgical clipping without endovascular intervention, and cases with incomplete medical records were excluded.

Data were retrieved from ICU discharge summaries. Collected variables included demographic characteristics (age and sex), comorbidities, aneurysm location, type and timing of endovascular intervention, use of antiplatelet therapy, ICU complications, length of ICU stay, and clinical outcomes. Early intervention was defined as aneurysm securing within 24 hours of presentation/admission.

The primary outcome measures were post-procedural complications, duration of ICU stay, and in-hospital mortality. Complications assessed included vasospasm, rebleeding, procedure-related hematoma or infarction, requirement for external ventricular drain (EVD) placement, seizure episodes, decompressive craniectomy, tracheostomy, infections, dyselectrolytemia, and other systemic complications. Procedure-related intracranial hematoma referred to intracranial hemorrhagic complications detected after endovascular intervention, whereas femoral hematoma referred specifically to vascular access-site complications.

Categorical variables were expressed as frequency

and percentage, while quantitative variables with non-normal distribution were presented as median with interquartile range (IQR). Normality was assessed using the Shapiro–Wilk test. Quantitative variables were compared using the Kruskal–Wallis test where appropriate. Categorical variables were summarized descriptively because subgroup sizes were small. A p-value of <0.05 was considered statistically significant¹³.

This retrospective study was reviewed by the Institutional Review Committee (IRC) of Grande International Hospital.

Results

Baseline Characteristics

A total of 50 patients with aneurysmal subarachnoid hemorrhage who underwent endovascular intervention were included in the study. The mean age was 55.9 ± 10.8 years (range: 32–82 years). Females constituted 28 (56.0%) patients, while 22 (44.0%) were males. The most common aneurysm location was the anterior communicating artery (ACOM) in 15 (30.0%) patients, followed by middle cerebral artery (MCA) in 11 (22.0%), posterior communicating artery (PCOM) in 9 (18.0%), internal carotid artery (ICA) in 8 (16.0%), basilar artery in 3 (6.0%), posterior cerebral artery (PCA) in 2 (4.0%), and vertebral artery (VA) in 2 (4.0%) patients.

Regarding comorbidities, 22 (44.0%) patients had no documented comorbid conditions. Hypertension was the most common comorbidity, present in 25 (50.0%) patients, followed by diabetes mellitus in 5 (10.0%), hypothyroidism in 5 (10.0%), chronic obstructive pulmonary disease (COPD) in 1 (2.0%), and hyperuricemia in 1 (2.0%) patient. Early intervention (within 24 hours) was performed in 12 (24%) patients, whereas delayed intervention was noted in 38 (76.0%) patients.

Endovascular coiling was the predominant treatment modality, performed in 45 (90.0%) patients. Flow diverter placement was performed in 3 (6.0%) patients, while stent-assisted coiling was used in 2 (4.0%) patients. Antiplatelet therapy was not administered in 29 (58.0%) patients; single antiplatelet therapy (SAPT) was used in 15 (30.0%), and dual antiplatelet therapy (DAPT) in 6 (12.0%) patients.

Post-procedural complications were common. Infection was the most frequent complication, occurring in 12 (24.0%) patients, followed by vasospasm in 11 (22.0%) and procedure-related intracranial hematoma in 9 (18.0%) patients. External ventricular drain (EVD) placement and hyponatremia were each observed in 6 (12.0%) patients, while procedure-related infarction occurred in 4 (8.0%). Decompressive craniectomy, tracheostomy, diabetic ketoacidosis (DKA), rebleeding, third nerve palsy, and femoral hematoma were each reported in 2 (4.0%) patients. Less frequent complications included arrhythmia, bedsore, absence seizure, generalized tonic-clonic seizure, malignant cerebral edema, cardiomyopathy, and hypernatremia, each occurring in 1 (2.0%) patient.

Among infectious complications, urinary tract infection (UTI) was the most common, seen in 6 (12.0%) patients, followed by ventilator-associated pneumonia (VAP) in 5 (10.0%), hospital-acquired pneumonia (HAP) in 3 (6.0%), and bacteremia in 2 (4.0%) patients.

Regarding clinical outcomes, the majority of patients were shifted to the ward in stable condition 33 (66.0%), followed by discharge on patient request (DOPR) in 11 (22.0%). Ward

transfer in high-risk condition, DOPR while intubated, and mortality were each observed in 2 (4.0%) patients. The median ICU stay was 5.5 days (interquartile range: 4–8 days) (Table 1 and 2).

Table 1: Patient characteristics distribution.

Patient characteristics	n (%) / Mean $\pm$ SD (Range) / Median (25th-75th percentile)
Age (years)	55.9 $\pm$ 10.8 (32-82)
Gender	
Female	28 (56.00%)
Male	22 (44.00%)
Aneurysm Location	
Anterior Communicating Artery (ACOM)	15 (30.00%)
Basilar Artery	3 (6.00%)
Internal Carotid Artery (ICA)	8 (16.00%)
Middle Cerebral Artery (MCA)	11 (22.00%)
Posterior Cerebral Artery (PCA)	2 (4.00%)
Posterior Communicating Artery (PCOM)	9 (18.00%)
Vertebral Artery (VA)	2 (4.00%)
Comorbidities	
No comorbidities	22 (44.00%)
Hypertension	25 (50.00%)
Diabetes	5 (10.00%)
Hypothyroidism	5 (10.00%)
Chronic Obstructive Pulmonary Disease (COPD)	1 (2.00%)
Hyperuricemia	1 (2.00%)
Early vs delayed intervention	
Early (within 24 Hours)	12 (24.00%)
Delayed	38 (76.00%)
Procedure	
Coiling	45 (90.00%)
Flow diverter	3 (6.00%)
Stent assisted coiling	2 (4.00%)
Antiplatelet	
Nil	29 (58.00%)
Single Antiplatelet Therapy (SAPT)	15 (30.00%)
Dual Antiplatelet Therapy (DAPT)	6 (12.00%)

Table 2: Complications and Outcomes

Decompressive craniectomy	2 (4.00%)
Tracheostomy	2 (4.00%)
External Ventricular Drainage (EVD) placement for Hydrocephalus (HCP)	6 (12.00%)
Vasospasm	11 (22.00%)
Procedure-related intracranial hematoma	9 (18.00%)
Hyponatremia	6 (12.00%)
Procedure-related infarction	4 (8.00%)
Diabetic Ketoacidosis (DKA)	2 (4.00%)
Rebleeding	2 (4.00%)
3rd nerve palsy	2 (4.00%)
Femoral hematoma	2 (4.00%)
Arrhythmia	1 (2.00%)
Bedsore	1 (2.00%)
Absence seizure	1 (2.00%)
Generalized tonic-clonic seizure	1 (2.00%)
Malignant cerebral edema	1 (2.00%)
Cardiomyopathy	1 (2.00%)
Hypernatremia	1 (2.00%)
Infection	
Urinary Tract Infection (UTI)	6 (12.00%)
Ventilator-Associated Pneumonia (VAP)	5 (10.00%)
Hospital-Acquired Pneumonia (HAP)	3 (6.00%)
Bacteremia	2 (4.00%)
Outcome	
Ward	33 (66.00%)
High-risk ward	2 (4.00%)
Discharged on Patient Request (DOPR)	11 (22.00%)
DOPR (Intubated)	2 (4.00%)
Death	2 (4.00%)
Total stay (days)	5.5 (4-8)

Percentages may exceed 100% as multiple comorbidities were present in some patients

The distribution of complications showed that infection was the most frequent complication, occurring in 24% of patients, followed by vasospasm (22%) and procedure-related intracranial hematoma (18%). Hyponatremia-related complications and procedure-related infarction were also relatively common, reported in 12% and 8% of patients, respectively. External ventricular drain (EVD) placement for hydrocephalus was required in 12% of patients. Less frequent complications included Decompressive craniectomy (4%), requirement of tracheostomy (4%), and

Metabolic, neurological and procedure related complications such as diabetic ketoacidosis (DKA), rebleeding, third nerve palsy, and femoral hematoma were each observed in about 4% of cases.

Other complications—including arrhythmia, bedsores, absence seizures, generalized tonic-clonic seizures, malignant cerebral edema, cardiomyopathy, and hypernatremia—were relatively uncommon, each occurring in approximately 2% of patients.

Infectious complications were notable, with urinary tract infection (UTI) in 12%, ventilator-associated pneumonia (VAP) occurring in 10% of patients, Hospital-acquired pneumonia (HAP) in 6% and Bacteremia in 4%. Overall, procedure-related and infectious complications constituted the majority of adverse events observed in this cohort. (Fig 1)

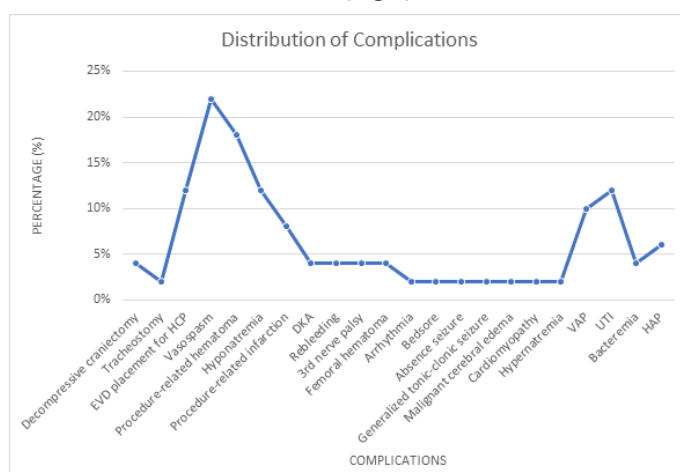


Figure 1: Distribution of complications among patients with aneurysmal subarachnoid hemorrhage following endovascular intervention.

The graph illustrates the frequency of neurological, procedure-related, and systemic complications observed during ICU stay. Infection, vasospasm, and procedure-related intracranial hematoma were among the most frequently observed complications.

ICU length of stay varied across aneurysm locations, with overall comparable distributions among most groups. ACOM, PCOM, PCA, MCA, VA, and basilar artery aneurysms demonstrated relatively similar ICU stays, generally ranging

between 4–8 days with limited variability. In contrast, internal carotid artery (ICA) aneurysms showed greater heterogeneity in ICU duration, with a higher median stay and notable outliers, including a prolonged admission extending up to 55 days. A single prolonged ICU stay was also observed in the MCA group. Overall, while ICU stay was largely consistent across aneurysm locations, ICA aneurysms were associated with increased variability and longer hospitalization in selected cases. (Fig 2)

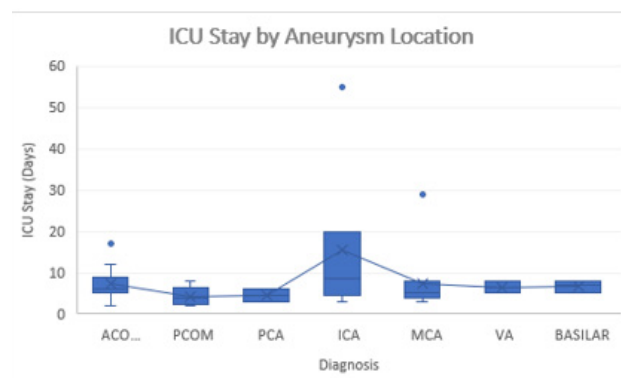


Figure 2: ICU stay according to aneurysm location.

Box-and-whisker plot showing the distribution of ICU length of stay across different aneurysm locations. Internal carotid artery (ICA) aneurysms demonstrated the greatest variability and longest ICU stay.

The total hospital stay did not differ significantly according to aneurysm location ($p = 0.134$). The median (25th–75th percentile) duration of hospital stay was 6 (5–8.5) days for anterior communicating artery (ACOM) aneurysms, 7 (6–7.5) days for basilar artery aneurysms, 8.5 (5.5–20) days for internal carotid artery (ICA) aneurysms, 5 (4–7) days for middle cerebral artery (MCA) aneurysms, 4.5 (3.75–5.25) days for posterior cerebral artery (PCA) aneurysms, 4 (3–5) days for posterior communicating artery (PCOM) aneurysms, and 6.5 (5.75–7.25) days for vertebral artery (VA) aneurysms (Table 3).

Table 3: -Association of total stay with diagnosis.

Total stay (days)	ACOM (n=15)	Basilar (n=3)	ICA (n=8)	MCA (n=11)	PCA (n=2)	PCOM (n=9)	VA (n=2)	Total	P value
Median (25th-75th percentile)	6 (5-8.5)	7 (6-7.5)	8.5 (5.5-20)	5 (4-7)	4.5 (3.75-5.25)	4 (3-5)	6.5 (5.75-7.25)	5.5 (4-8)	0.134†

Table 4 summarizes the distribution of complications according to aneurysm location. Infection (24%), vasospasm (22%), and procedure-related intracranial hematoma (18%) were the most common complications observed across aneurysm subgroups. Less frequent complications included hyponatremia (12%), infarction (8%), rebleeding (4%), seizures (4%), cardiomyopathy (2%), hypernatremia (2%), and mortality (4%). Owing to the small number of patients in several aneurysm location categories, these data are presented descriptively and should not be interpreted as evidence of differences between aneurysm locations.

Table 4: Distribution of complications according to aneurysm location (descriptive analysis)

Complications	ACOM(n=15)	Basilar(n=3)	ICA(n=8)	MCA(n=11)	PCA(n=2)	PCOM(n=9)	VA(n=2)	Total
Decompressive craniectomy	0 (0%)	0 (0%)	1 (12.50%)	1 (9.09%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)
Tracheostomy	0 (0%)	0 (0%)	1 (12.50%)	1 (9.09%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)
Infection	2 (13.33%)	0 (0%)	4 (50%)	3 (27.27%)	0 (0%)	2 (22.22%)	1 (50%)	12 (24%)
EVD placement	2 (13.33%)	1 (33.33%)	2 (25%)	1 (9.09%)	0 (0%)	0 (0%)	0 (0%)	6 (12%)
Vasospasm	4 (26.67%)	0 (0%)	2 (25%)	4 (36.36%)	0 (0%)	1 (11.11%)	0 (0%)	11 (22%)
Procedure related intracranial Hematoma	4 (26.67%)	0 (0%)	2 (25%)	1 (9.09%)	1 (50%)	1 (11.11%)	0 (0%)	9 (18%)
Hyponatremia	2 (13.33%)	0 (0%)	0 (0%)	3 (27.27%)	0 (0%)	1 (11.11%)	0 (0%)	6 (12%)
Procedure related Infarction	1 (6.67%)	0 (0%)	1 (12.50%)	0 (0%)	0 (0%)	1 (11.11%)	1 (50%)	4 (8%)
DKA	1 (6.67%)	0 (0%)	0 (0%)	1 (9.09%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)
Rebleeding	0 (0%)	0 (0%)	1 (12.50%)	0 (0%)	0 (0%)	1 (11.11%)	0 (0%)	2 (4%)
3rd nerve palsy	1 (6.67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (50%)	2 (4%)
Femoral hematoma	0 (0%)	0 (0%)	1 (12.50%)	1 (9.09%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)
Arrhythmia	0 (0%)	0 (0%)	0 (0%)	1 (9.09%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)
Bedsore	0 (0%)	0 (0%)	0 (0%)	1 (9.09%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)
Absence seizure	1 (6.67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)
Generalized tonic-clonic seizure	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (11.11%)	0 (0%)	1 (2%)
Malignant cerebral edema	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (11.11%)	0 (0%)	1 (2%)
Cardiomyopathy	1 (6.67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)
Hypernatremia	1 (6.67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)
Death	1 (6.67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (11.11%)	0 (0%)	2 (4%)

Percentages are calculated within each aneurysm location subgroup. Owing to small subgroup sizes, no inferential statistical comparisons were performed.

The majority of patients (66%) were managed in the ward following intervention, indicating favorable clinical recovery. Around 22% discharged on patients request while a small proportion were shifted to ward in high-risk and few patients were also discharged on request while they were intubated due to financial issues (4% each). Overall mortality was 4%. (Fig 3)

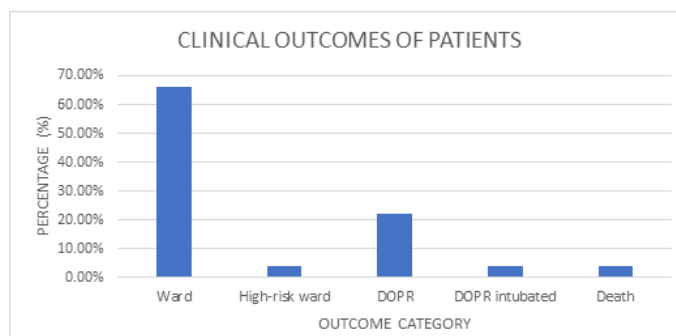


Figure 3: Clinical outcomes of patients after endovascular intervention for aneurysmal subarachnoid hemorrhage.

Bar chart demonstrating discharge outcomes of patients from ICU, including transfer to ward, high-risk ward, discharge on patient request (DOPR), DOPR in intubated state, and mortality. Most patients were transferred to the ward following clinical improvement.

Discussion

Aneurysmal subarachnoid hemorrhage (aSAH) continues to be a major contributor to neurological morbidity and mortality despite advances in endovascular therapy and neurocritical care management^{1,2}. This retrospective ICU-based study from Nepal provides important insight into complication patterns and short-term outcomes following endovascular intervention in a resource-limited setting.

The mean age of 55.9 ± 10.8 years observed in this study was consistent with global epidemiological trends³. The female predominance (56%) also aligns with prior studies, where hormonal influences, particularly estrogen deficiency, and vascular risk factors have been implicated in increased susceptibility among women^{3,4}. Hypertension was the most prevalent comorbidity in our cohort (50%), further reinforcing its well-established role as a principal modifiable risk factor in both the formation and rupture of intracranial aneurysms¹⁴, likely mediated through chronic hemodynamic stress and progressive vascular wall degeneration.

Among the 50 patients in this cohort, 29 (58%) did not receive any antiplatelet therapy, while 15 (30%) were on single antiplatelet therapy (SAPT) and 6 (12%) received dual antiplatelet therapy (DAPT). This likely reflects the predominance of simple coiling procedures, where routine antiplatelet therapy is less commonly required than in stent-assisted techniques or flow diversion. The relatively low DAPT use may additionally reflect concerns regarding hemorrhagic complications, cost, limited access to platelet function testing, and restricted use of adjunctive devices.

Endovascular coiling contributed to the majority of interventions, consistent with the global shift toward minimally invasive management following the International Subarachnoid Aneurysm Trial⁷. The limited use of adjunctive techniques such as flow diverters (6%) and stent-assisted coiling (4%) may further suggest institutional practice patterns, operator expertise, aneurysm selection, cost, and device availability, potentially limiting generalizability of outcomes.

Early intervention within 24 hours was achieved in only 24% of patients, despite guideline recommendations favoring prompt aneurysm securing to reduce rebleeding risks^{5,15}. Resource constraints, referral dynamics, and late presentation were probably the causes of the delays. The rebleeding rate, however, stayed low at 4%. This should be interpreted cautiously due to potential selection bias, underreporting of early rebleeding, exclusion of patients deteriorating prior to intervention, and the small sample size, even though good ICU handling might have influenced the result.

The overall complication profile observed is comparable to previously reported literature^{8,9}. Infection was the most common complication (24%). The high infection burden likely reflects prolonged ICU stay, invasive monitoring, and mechanical ventilation¹⁰. Among infectious complications, urinary tract infection (UTI) and ventilator-associated pneumonia (VAP) were the most frequently observed, consistent with patterns

reported in ICU-based studies. In UTI cases, *Escherichia coli* and multidrug-resistant (MDR) *Klebsiella* species were the predominant pathogens. VAP was most commonly associated with MDR *Klebsiella*, carbapenem-resistant *Acinetobacter baumannii* (CRAB), *Pseudomonas* and *Enterobacter* species as well. Bacteremia was identified in two patients, with one case due to CRAB and the other caused by MDR *Klebsiella*. Notably, one patient had polymicrobial colonization, required tracheostomy, and experienced a prolonged ICU stay of 55 days, reflecting increased morbidity and complexity of care.

Cerebral vasospasm occurred in 22% of patients, which is somewhat lower than the 30–70% incidence reported in earlier studies⁹. This could be the result of early aneurysm securing, close observation, or the underdiagnosis that comes with retrospective research. Transcranial Doppler (TCD) was the main method used to support the diagnosis of vasospasm; selective neuroimaging was used when diagnostic doubt persisted. Oral Nimodipine (60 mg every 4 hours for 21 days) was administered to all patients as a conventional preventative measure against delayed cerebral ischemia. The majority of individuals demonstrated clinical improvement after receiving intravenous Milrinone infusion as a conservative treatment. One refractory case underwent digital subtraction angiography (DSA) and intra-arterial Nimodipine as a last resort unfortunately had mortality. These findings suggest that pragmatic multimodal neurocritical care strategies can be successfully implemented in resource-limited settings such as Nepal.

Procedure-related complications, including intracranial hematoma (18%) and infarction (8%), were within the expected range for endovascular interventions. However, the requirement for additional procedures—such as external ventricular drain (EVD) placement (12%), decompressive craniectomy (4%), and tracheostomy (4%) reflects disease severity and the requirement of complex Neurocritical care emphasizing the importance of coordinated communication among neurointerventionists, neurosurgeons, and ICU teams.

Other complications like hyponatremia was observed in 12% of patients, with cerebral salt wasting identified in three cases and were treated with Fludrocortisone. Diabetic ketoacidosis, third nerve palsy, and femoral hematoma were each observed in 4% of patients. Complications including arrhythmia, bedsores, seizure, malignant cerebral edema, cardiomyopathy, and hypernatremia, occurred in 2% each. Hyponatremia is most often due to cerebral salt wasting or SIADH, while hypernatremia typically results from central diabetes insipidus due to hypothalamic–pituitary dysfunction¹⁶.

The median ICU stay of 5.5 days (IQR 4–8) observed in this study is relatively short compared to some international reports, possibly reflecting efficient patient triaging and early step-down practices. The observed mortality rate of 4% is lower than previously reported Nepalese data (16–22%)^{11,12}. This finding should be interpreted cautiously because post-discharge follow-up was unavailable, and outcomes of patients discharged on patient request (DOPR) were not documented, potentially underestimating late mortality.

The absence of standardized severity grading scales such as Hunt-Hess grade, WFNS grade, and modified Fisher grade limited risk stratification and adjustment for baseline disease severity, thereby restricting interpretation of outcome predictors and comparisons with existing literature.

These findings emphasize the critical role of

structured ICU care in improving outcomes following aSAH. Early detection and management of complications such as infection and vasospasm remain essential components of care. Furthermore, strengthening institutional protocols, optimizing timing of intervention, and enhancing infection control practices could further improve patient outcomes in similar settings.

Conclusion

In our study, comparatively lower in-hospital mortality and favourable short-term clinical outcomes were linked to endovascular treatment of aneurysmal SAH. However, issues like vasospasm and infection persisted and continued to contribute substantially to ICU morbidity. These results emphasize the significance of timely identification of problems, thorough monitoring in neurocritical care, and a coordinated multidisciplinary management approach. The study's shortcomings, such as its retrospective single-center design, small sample size, lack of long-term follow-up data, and lack of uniform clinical grading scores, should be taken into consideration when interpreting the results.

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Disclosures

The authors have no relevant financial or non-financial disclosures to declare.

Conflict of Interest

The authors declare that they have no conflict of interest.

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