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A Comparative Analysis of Acute Stroke Patients with and without Steroid (Dexamethasone) Therapy: A Prospective Observational Study

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Abstract **Original Research Article**

Background: The role of corticosteroids in acute stroke remains controversial and their use in routine clinical practice varies, particularly in severe and hemorrhagic stroke. This study aimed to compare clinical characteristics, complications, mortality and functional outcomes between acute stroke patients who received steroid therapy and those who did not. ***Methods:*** This prospective observational comparative study was conducted in the Department of Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh, from October 2023 to September 2025. A total of 300 adult patients with confirmed acute stroke were enrolled and categorized into steroid-treated (n=180) and non-steroid (n=120) groups. Categorical variables were compared using chi-square test, with $p<0.05$ considered significant. ***Results:*** Most patients were aged 61–70 years (28%), female (59.3%) and had hemorrhagic stroke (55.3%). Severe disability at admission (mRS 5) was present in 79.7%. Overall mortality was 31.3% and favorable follow-up outcome (mRS 0–2) occurred in 17%. Compared with the non-steroid group, steroid-treated patients had higher proportions of hemorrhagic stroke (77.8% vs 51.7%), severe admission disability (86.1% vs 70.0%) and severe GCS ≤8 (47.2% vs 24.2%) ($p\leq0.002$). Complications were more frequent with steroid therapy (61.1% vs 25.8%, $p<0.001$), while favorable functional recovery was lower (10.0% vs 27.5%, $p<0.001$). Mortality did not differ significantly (35.6% vs 25.0%, $p=0.58$). ***Conclusion:*** Steroid (Dexamethasone) therapy in acute stroke was mainly used in more severe and hemorrhagic cases and was associated with higher complications and poorer functional recovery without survival benefit. Routine steroid use in acute stroke is not supported.

Keywords: Acute stroke; Dexamethasone; Steroid therapy; Functional outcome; Hemorrhagic stroke; Modified Rankin Scale.

INTRODUCTION

Stroke remains a leading cause of mortality and long-term disability worldwide and poses a substantial public health burden, particularly in low- and middle-income countries.[1] Both ischemic and hemorrhagic stroke frequently result in significant neurological impairment, complications and poor functional recovery, especially when patients present with severe deficits at admission.[2] Stroke accounts for a major proportion of neurological cause of hospitalization and is often associated with delayed presentation, high rates of hemorrhagic stroke and limited rehabilitation resources, contributing to unfavorable outcomes.[3]

Cerebral edema and secondary brain injury are key determinants of neurological deterioration and mortality following acute stroke, particularly in intracerebral and subarachnoid hemorrhage.[4]

Corticosteroids, such as dexamethasone, have been widely used in neurological practice for their anti-inflammatory and anti-edema effects in conditions like brain tumors and meningitis.[5] Historically, steroids were also administered in acute stroke with the rationale of reducing cerebral edema, stabilizing the blood–brain barrier and improving neurological outcomes.[6] However, evidence regarding their effectiveness in stroke has remained inconsistent and controversial. Several clinical trials and reviews have failed to demonstrate clear benefit of steroid therapy in ischemic stroke and concerns have been raised regarding potential adverse effects, including infections, hyperglycemia, gastrointestinal bleeding and delayed recovery.[7]

Despite limited supporting evidence, steroid therapy continues to be used in some clinical settings, particularly in severe stroke and hemorrhagic subtypes, where clinicians may anticipate benefit from edema reduction.[2] In resource-limited contexts, treatment practices may vary and observational data on real-world steroid use and outcomes are scarce. Understanding how steroid therapy is associated with baseline severity, complications and functional recovery in routine stroke care is therefore clinically important.[8] Such evidence can help clarify whether steroid use reflects disease severity, influences outcomes, or contributes to complications in hospitalized stroke patients.[9]

Comparative data between steroid-treated and non-treated acute stroke patients in South Asian populations are limited.[10] Moreover, few studies have evaluated functional recovery using standardized scales such as the modified Rankin Scale (mRS) in both discharge and follow-up periods within routine clinical practice.[11] Generating local evidence from prospective hospital-based cohorts is essential to guide rational therapeutic decisions and optimize stroke management in Bangladesh and similar settings.[12]

Therefore, this prospective observational study aimed to compare socio-demographic and clinical characteristics, complications, mortality and functional outcomes between acute stroke patients who received systemic steroid (dexamethasone) therapy and those who did not in a tertiary neurology center in Bangladesh.

METHODOLOGY & MATERIALS

This prospective observational comparative study was conducted in the Department of Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh, over a two-year period from October 2023 to September 2025 to evaluate differences in clinical characteristics and outcomes between acute stroke patients who received steroid therapy and those who did not.

A total of 300 consecutive adult patients (≥18 years) admitted with acute stroke during the study period were enrolled and categorized into steroid-treated (n=180) and non-steroid (n=120) groups. Stroke diagnosis was confirmed by clinical evaluation and neuroimaging (CT/MRI brain) and included ischemic stroke, intracerebral hemorrhage and subarachnoid hemorrhage. Patients with transient ischemic attack, traumatic brain injury, intracranial tumors, or incomplete clinical data were excluded.

Baseline socio-demographic data (age, sex, residence) and clinical characteristics, including stroke type, onset-to-admission time, Glasgow Coma Scale (GCS), modified Rankin Scale (mRS) and comorbidities, were recorded at admission. Patients were categorized into two groups according to exposure to systemic steroid therapy (intravenous dexamethasone): steroid group and non-steroid group. Information on steroid status, duration of therapy and hospital stay was documented. All patients received standard stroke care according to institutional protocols. In addition, steroid group received intravenous dexamethasone 15 to 20 mg daily in divided doses for a maximum period of seven days.

Outcome measures included in-hospital mortality, complications during hospitalization, discharge mRS (DC-mRS) and follow-up mRS (Fup-mRS) to assess functional recovery. Functional outcome was categorized as favorable (mRS 0–2), moderate disability (mRS 3–4) and severe disability/death (mRS 5–6).

Statistical analysis was performed using SPSS version 25. Categorical variables were summarized as frequency and percentage. Comparisons between steroid and non-steroid groups were performed using Pearson's chi-square test or Fisher's exact test where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

In this study table 1 presents the socio-demographic characteristics of the study population comprising 300 patients with acute stroke. The majority of patients were aged between 61–70 years (28.0%), followed by 51–60 years (23.3%) and 41–50 years (19.7%), indicating that stroke was more prevalent among middle-aged and elderly individuals. Only a small proportion of patients were aged ≤40 years (12.0%) and >80 years (4.0%). Female patients constituted a higher proportion of the study population (59.3%) compared to males (40.7%). Regarding residence, more than half of the participants were from urban areas (54.3%), while 45.7% were from rural areas. Table 2 illustrates the baseline clinical and stroke-related characteristics of the 300 enrolled patients at admission. Intracerebral hemorrhage (ICH) was the most common stroke type, accounting for 55.3% of cases, followed by ischemic stroke (32.7%) and subarachnoid hemorrhage (12.0%). Nearly half of the patients (47.0%) presented to the

hospital within 7–24 hours of symptom onset, while only 13.3% arrived within 6 hours, indicating delayed hospital presentation in a considerable proportion of cases. Assessment of baseline severity showed that the majority of patients had significant disability at admission, with 79.7% having an mRS score of 5. Regarding consciousness level, 38.7% had moderate GCS (9–12) and 38.0% had severe impairment (≤8), reflecting substantial neurological compromise at presentation. Hypertension was the most prevalent comorbidity (48.3%), followed by combined hypertension and diabetes (23.7%), whereas only 15.7% had no comorbid conditions. Table 3 summarizes the clinical outcomes and functional recovery of the 300 patients with acute stroke. Most patients were discharged alive (68.7%), while 31.3% died during hospitalization, indicating a substantial in-hospital mortality rate. Assessment of functional status at discharge using the modified Rankin Scale (mRS) showed that only 7.3% achieved a favorable outcome (mRS 1–2), whereas 35.6% had moderate disability (mRS 3–4) and the majority (57.0%) experienced severe disability or death (mRS 5–6). At follow-up, functional improvement was observed in some patients, with the proportion of favorable outcomes increasing to 17.0%. However, nearly half of the patients (49.3%) still remained severely disabled or deceased. Complications were reported in 47.0% of cases, while 53.0% had no complications. Electrolyte imbalance was the most common complication (23.7%), followed by multiple complications (10.7%), seizures (6.7%), aspiration pneumonia (5.3%) and urinary tract infection (0.7%). Table 4 compares key clinical characteristics and outcomes between acute stroke patients who received steroid therapy and those who did not. Patients in the steroid group had significantly higher proportions of hemorrhagic stroke (77.8% vs 51.7%), severe admission disability (mRS 5: 86.1% vs 70.0%) and severe GCS (≤8: 47.2% vs 24.2%) compared with the non-steroid group ($p < 0.01$ for all). Complications were also more frequent among steroid-treated patients (61.1% vs 25.8%, $p < 0.001$). However, favorable functional recovery at follow-up (mRS 0–2) was lower in the steroid group (10.0% vs 27.5%, $p < 0.001$), while mortality did not differ significantly between groups (35.6% vs 25.0%, $p = 0.58$).

Table 1: Socio-demographic characteristics of the study population (n = 300)

Variable	Frequency (n)	Percent (%)
Age group (years)		
≤ 40	36	12
41–50	59	19.7
51–60	70	23.3
61–70	84	28
71–80	39	13
> 80	12	4
Sex		
Male	122	40.7
Female	178	59.3
Residence		
Urban	163	54.3
Rural	137	45.7

Table 2: Baseline clinical and stroke characteristics of the study population (n = 300)

Variable	Frequency (n)	Percent (%)
Stroke type		
Intracerebral hemorrhage (ICH)	166	55.3
Ischemic stroke	98	32.7
Subarachnoid hemorrhage (SAH)	36	12
Onset to admission time (hours)		
≤ 6 hours	40	13.3
7–24 hours	141	47
25–48 hours	43	14.3
> 48 hours	76	25.3
Admission mRS		
2	1	0.3
3	21	7
4	39	13
5	239	79.7
Admission GCS		
Severe (≤ 8)	114	38

Variable	Frequency (n)	Percent (%)
Moderate (9–12)	116	38.7
Mild (13–15)	70	23.3
Comorbidities		
Hypertension (HTN)	145	48.3
Diabetes mellitus (DM)	15	5
HTN + DM	71	23.7
Multiple comorbidities	22	7.3
None	47	15.7

Table 3. Clinical outcomes and functional recovery of the study population (n = 300)

Variable	Frequency (n)	Percent (%)
Hospital outcome		
Discharged alive	206	68.7
Death	94	31.3
Discharge mRS (DC-mRS)		
1–2 (favorable outcome)	22	7.3
3–4 (moderate disability)	107	35.6
5–6 (severe disability/death)	171	57
Follow-up mRS (Fup-mRS)		
0–2 (favorable outcome)	51	17
3–4 (moderate disability)	101	33.7
5–6 (severe disability/death)	148	49.3
Complications		
Present	141	47
Absent	159	53
Type of complication		
Electrolyte imbalance	71	23.7
Aspiration pneumonia	16	5.3
Seizure	20	6.7
UTI	2	0.7
Multiple complications	32	10.7
No complication	159	53

Table 4. Clinical characteristics and outcomes between steroid and non-steroid groups (n = 300)

Variable	Steroid given (n = 180)	No steroid (n = 120)	P value
Age >60 yrs	85 (47.2%)	50 (41.7%)	0.36
Hemorrhagic stroke	140 (77.8%)	62 (51.7%)	<0.001
Admission mRS 5	155 (86.1%)	84 (70.0%)	0.002
Severe GCS (≤8)	85 (47.2%)	29 (24.2%)	<0.001
Complications present	110 (61.1%)	31 (25.8%)	<0.001
Death	64 (35.6%)	30 (25.0%)	0.58
Favorable Fup-mRS (0–2)	18 (10.0%)	33 (27.5%)	<0.001

DISCUSSION

This prospective comparative study evaluated differences in baseline characteristics and outcomes between acute stroke patients who received steroid therapy and those who did not. The findings demonstrate that steroid-treated patients presented with more severe disease and worse functional outcomes, while mortality did not significantly differ between groups.

In the present study, stroke predominantly affected middle-aged and elderly individuals, with the highest proportion in the 61–70-year age group (28%). Similar age distributions in comparative neurological cohorts have been reported by Fullerton *et al.,* who observed increasing stroke severity and hospitalization in older patients. Our cohort also showed female predominance (59.3%), which may reflect regional demographic or healthcare utilization patterns.[8] Urban residence was slightly more common (54.3%), consistent with hospital-based stroke registries in developing settings.

Hemorrhagic stroke constituted the majority subtype in our population (55.3%), exceeding ischemic stroke (32.7%). This pattern contrasts with high-income countries but aligns with South Asian hospital data,

where intracerebral hemorrhage remains common and is associated with severe presentation. Notably, most patients in our study had marked disability at admission, with 79.7% presenting with mRS 5 and 38% with severe GCS (≤8), indicating advanced neurological compromise. Such severe baseline status is known to strongly influence outcomes in acute neurological diseases, as demonstrated in comparative survival analyses by Anbumathi *et al.,* where admission severity markers predicted mortality and complications.[13]

The comparative analysis revealed that steroid-treated patients had significantly higher proportions of hemorrhagic stroke (77.8% vs 51.7%), severe admission disability (86.1% vs 70.0%) and severe GCS (47.2% vs 24.2%) than non-steroid treated patient. These findings suggest that steroids were preferentially administered to more severe stroke cases, particularly hemorrhagic types, likely with the intention of reducing cerebral edema. Similar treatment selection bias toward more severe disease has been observed in corticosteroid studies across acute conditions, including sepsis and inflammatory disorders, where clinicians tend to use steroids in critically ill patients.[14]

Complications were markedly higher in the steroid group in our study (61.1% vs 25.8%, $p < 0.001$). Corticosteroids are known to increase susceptibility to infections, metabolic disturbances and electrolyte imbalance, which were also common in our cohort (electrolyte imbalance 23.7%). Meta-analyses of systemic corticosteroid therapy have consistently documented increased adverse events and complications, particularly in severe illness populations. [14,15] These observations support the possibility that steroid exposure may have contributed to higher complication rates, although underlying disease severity likely played a major role.

Functional recovery outcomes further reflected this pattern. Favorable follow-up outcome (mRS 0–2) was significantly lower in steroid-treated patients (10.0% vs 27.5%, $p < 0.001$). Similar associations between corticosteroid use and poorer functional or clinical outcomes have been reported in comparative observational studies where steroid therapy was linked with more severe baseline disease rather than therapeutic benefit. [16,17] Importantly, our results do not imply causation but rather highlight that steroid use in acute stroke practice may reflect severity-driven treatment decisions.

Despite differences in severity and complications, mortality did not significantly differ between groups in our study (35.6% vs 25.0%, $p = 0.58$). This suggests that steroid therapy did not confer survival benefit in acute stroke, consistent with prior evidence indicating limited effectiveness of corticosteroids in improving survival in acute neurological injury. Reviews of corticosteroid therapy across acute inflammatory and neurological conditions similarly report inconsistent survival effects despite biological plausibility. [18,19]

Limitations of the study

This study has several limitations. As a single-center observational study, treatment allocation was not randomized and steroid therapy was more frequently administered to patients with more severe and hemorrhagic strokes, introducing potential confounding by indication. Additionally, multivariable adjustment or propensity matching was not performed, which limits causal interpretation of the association between steroid therapy and outcomes.

CONCLUSION

In this prospective comparative study of acute stroke patients, steroid (Dexamethasone) therapy was predominantly used in more severe and hemorrhagic stroke patients and was associated with higher complication rates and poorer functional recovery at follow-up, without significant reduction in mortality. These findings suggest that routine steroid use in acute stroke does not confer clear clinical benefit and likely reflects treatment selection in critically ill patients. Further controlled studies with adjusted analyses are needed to clarify the role of corticosteroids in acute stroke management.

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Conflicts of interest
There are no conflicts of interest.

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