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Early disturbances of consciousness after intracerebral hemorrhage in Burkina Faso: Prevalence and associated factors

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ABSTRACT

Background: Intracerebral hemorrhage (ICH) in sub-Saharan Africa is associated with high mortality, particularly in resource-limited settings. Early disorders of consciousness (EDC), occurring within the first 72 hours, are major prognostic indicators but remain understudied in Burkina Faso. **Objective:** This study aimed to determine the prevalence and factors associated with EDC during the acute phase of ICH in Ouagadougou. **Methods:** We conducted a descriptive and analytical cross-sectional study with prospective data collection from October 1, 2023, to October 31, 2024, in three university hospitals in Ouagadougou. Patients aged ≥15 years, admitted within 72 hours of symptom onset, and with CT- or MRI-confirmed ICH were included. Clinical, biological, and neuroimaging data were analyzed using multivariate logistic regression, with a significance threshold of $p<0.05$. **Results:** A total of 266 patients were enrolled, of whom 121 (45.5%) developed EDC within the first 72 hours. The mean age was 55.7 ± 13.6 years, and males predominated n(56.3%). Hypertension was the most common vascular risk factor n(69.4%). On admission, oxygen desaturation (<95%) occurred in n(42.1%) of cases, and n(38.0%) presented with coma (GCS ≤8). In multivariate analysis, independent predictors of EDC were oxygen desaturation on admission (OR 7.83; $p<0.001$), severe neurological deficit (NIHSS > 16: OR 5.57; $p<0.001$), intraventricular extension (OR 2.66; $p=0.002$), and hematoma volume > 30 cc (OR 2.87; $p=0.004$). **Conclusion:** Severe initial neurological impairment, oxygen desaturation, intraventricular hemorrhage, and large hematoma volume are major determinants of early disorders of consciousness, highlighting the need for intensive neurological and respiratory monitoring during the acute phase.

Keywords: Intracerebral hemorrhage; Early disorders of consciousness; Prognosis; Sub-Saharan Africa; Stroke care.

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INTRODUCTION

Intracerebral hemorrhages (ICH) are frequent in sub-Saharan Africa and are associated with high mortality, particularly in resource-limited settings [1]. The acute phase of ICH is especially critical, with a high rate of early neurological complications, notably consciousness disorders. Early disorders of consciousness (EDC), ranging from drowsiness to coma, represents an important

prognostic indicator, correlated with an increased risk of early death and functional disability [2].In African studies, between 40% and 70% of patients hospitalized for ICH develop impaired consciousness within 72 hours of the initial event [3,4].

In Burkina Faso, data on the frequency and factors associated with EDC during the acute phase of ICH remain limited [5]. This lack of data hinders improvement in patient management, particularly regarding risk stratification and optimization of care. The findings of this study aim to help adapt international recommendations to the African context and improve outcomes for patients with ICH.

METHODOLOGY

Study design and setting:

This descriptive and analytical cross-sectional study was conducted with prospective data collection in the departments of Neurology, Medical Emergencies, and Intensive Care at three university hospitals in Ouagadougou, Burkina Faso: Tengandogo University Hospital, Bogodogo University Hospital, and Yalgado Ouédraogo University Hospital.

Participants

Inclusion Criteria: Patients aged ≥15 years admitted with spontaneous intracerebral haemorrhage (ICH) within 72 hours of symptom onset were eligible. Diagnosis was confirmed by brain computed tomography (CT) and/or magnetic resonance imaging (MRI) performed within six hours of hospital admission.

Exclusion Criteria: Patients who died on arrival, had no neuroimaging or imaging performed more than six hours after admission, were admitted more than 72 hours after symptom onset, or declined participation (or whose families declined consent) were excluded.

Study Procedures:

Eligible patients underwent standardized clinical assessment from admission through discharge. Baseline data included demographic characteristics, vascular risk factors, medical history, vital signs, neurological examination, Glasgow Coma Scale (GCS), and National Institutes of Health Stroke Scale (NIHSS) scores. Following initial stabilization, all patients underwent brain CT to confirm ICH and were admitted either to a neurology ward or to the intensive care unit according to clinical severity.

During hospitalization, patients received routine clinical monitoring, laboratory investigations (including blood glucose, complete blood count, serum creatinine, electrolytes, and coagulation profile), electrocardiography, and additional investigations when clinically indicated, such as echocardiography, chest imaging, repeat brain CT, urine culture, cerebral MR angiography, or other etiological tests [6]. Patients were followed until hospital discharge, when outcomes were classified as alive or deceased. Survivors were reassessed three months after ICH using the modified Rankin Scale (mRS).

Study Variables

The following variables were analyzed: 1) sociodemographic data: age and sex ; 2) Clinical at admission: comorbidities, vascular risk factors, time to admission, level of consciousness (Glasgow score), NIHSS, vital signs, neurological findings; 3) Paraclinical findings: ICH characteristics on brain CT (location, volume, associated neuroradiological complications such as oedema, mass effect, herniation, intraventricular extension, acute hydrocephalus and other abnormalities); 4) Biological findings: admission blood glucose, blood count, electrolytes, serum creatinine; 5) Etiological factors: chronic hypertensive microangiopathy, cerebral amyloid angiopathy, iatrogenic causes, vascular malformations, other causes, undetermined causes; 6) Therapeutic factors: admission to intensive care, use of antihypertensive agents, anti-edema therapy, prophylactic anticoagulants, antibiotics, antiepileptic drugs, etc ; 7) Evolutionary: in-hospital complications (neurological—worsening neurological deficit, consciousness disorders, seizures; infections; thromboembolic; metabolic; others), hospital outcome (alive/deceased), modified Rankin scale (mRS) at 3 months post-ICH.

Data were collected using a standardized case report form based on patient and family interviews, clinical examinations, laboratory investigations,

and imaging findings from admission through the three-month follow-up.

Outcomes: The acute phase of ICH was defined as the first 72 hours after symptom onset. Early disorders of consciousness (EDC) were defined as impaired consciousness occurring during this period. Consciousness was assessed using the Glasgow Coma Scale, where a score of 15 indicated normal consciousness, scores of 9–14 indicated mild to moderate impairment, and scores ≤8 defined coma. Neurological deterioration was defined as a reduction of ≥4 points in the NIHSS score from baseline.

Statistical analysis:

Data were analyzed using Epi Info version 7.2.5.0. Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as means ± standard deviations or medians with ranges, as appropriate. Factors associated with EDC were evaluated using bivariate analysis followed by multivariable logistic regression. Associations were expressed as odds ratios (ORs) with 95% confidence intervals (CIs). Statistical significance was defined as $p < 0.05$.

Ethical considerations

Administrative approval was obtained from the three participating university hospitals: Tengandogo University Hospital (No. 2024_145/MS/SG/CHU-T/DG), Yalgado Ouédraogo University Hospital (No. 2024_1733/MS/SG/CHU-YO/DG/DGS/SPIH), and Bogodogo University Hospital (No. 2024/00000180/MS/SG/CHU-B/DG). Written informed consent was obtained from all participants or their legally authorized representatives. Patient confidentiality and data anonymity were maintained throughout the study.

RESULTS

Sociodemographic characteristics

A total of 266 patients were consecutively admitted for intracerebral hemorrhage (ICH) during the study period. Disorders of consciousness (DC) were observed in 121 patients (45.48%), of these, 103 (85.12%) were of the early onset type. The mean age of patients with EDC was 55.74 ± 13.56 years (range 27-89 years). The most represented age groups were those aged 51–60 years (36 patients, 29.75%) and 61–70 years (26 patients, 21.48%), with males predominating at 67 cases (55.37%).

In terms of vascular risk factors; hypertension, migraine, and smoking were the most frequently identified, affecting 84 (69.42%), 23 (19.00%), and 10 (8.26%) patients with EDC, respectively. Comorbidities were present in 20 patients (16.52%), the most notable being a prior history of stroke with residual neurological deficits, recorded in 4 cases (3.30%).

Clinical features

The mean time to hospital admission was 16.56 ± 12.34 hours (range: 3–72 hours), with 38 patients (31.40%) arriving within 12 hours of symptom onset. Upon admission, the mean Glasgow Coma Scale (GCS) score among patients with EDC was 9.58 ± 2.91, with a median of 10 (range: 3–14), and coma defined as a GCS score of 8 or below was observed in 46 patients (38.01%). Hypertension was present in 104 patients (85.95%) at admission, accompanied by oxygen desaturation below 95% in 51 patients (42.14%) and hyperthermia in 32 patients (26.44%). The mean NIHSS score at admission was 10.73 ± 7.38 (range: 2–28), and neurological deficit was classified as severe to very severe, corresponding to an NIHSS score of 15 or above, in 65 patients (53.71%). The sociodemographic and clinical characteristics of all patients hospitalised for ICH and of those with EDC are presented in Table I.

Neuroimaging and laboratory findings

Neuroimaging findings on brain CT scan revealed that among patients with EDC, 105 (86.77%) presented with pure ICH while 16 (13.22%) had intracerebroventricular haemorrhage. The haemorrhage was supratentorial in 114 patients (94.21%), of whom 88 had deep cerebral involvement (72.72%) and 26 had lobar haemorrhage (21.48%). Infratentorial haemorrhage was identified in 7 cases (5.78%), as was purely intraventricular haemorrhage (5.79%). The initial haematoma volume exceeded 30 cc in 58 patients (47.93%), and ventricular flooding (87 cases, 71.90%) and mass effect (51 cases,

42.14%) were the most frequent neuroradiological complications.

Laboratory findings at admission showed leukocytosis in 34 patients (28.09%), renal failure in 25 (20.66%), and hyperglycaemia in 23 (19.00%). Chronic hypertension-related cerebral microangiopathy was the predominant aetiology, accounting for 99 cases (81.81%). The neuroradiological, biological, aetiological, and clinical characteristics of patients hospitalized with ICH and with ICH with EDC are detailed in Table II.

Outcomes

During hospitalisation, 41 patients (33.88%) recovered consciousness, with a mean GCS improvement of 3.74 ± 1.61 points (range: 1–5). Conversely, worsening of consciousness occurred in 83 patients (68.59%), with a mean GCS decline of 7.65 ± 4.52 points (range: 2–9). The most frequent in-hospital complications were infectious bronchopneumonia (29 cases, 23.96%), sepsis (22 cases, 18.18%), and malnutrition (21 cases, 17.35%).

At hospital discharge, 90 of the 266 patients admitted for ICH had died, corresponding to an overall in-hospital mortality rate of 33.83%. The immediate causes of death were predominantly direct complications of ICH (49 cases, 54.44%), followed by sepsis (24 cases, 26.66%) and aspiration bronchopneumonia (12 cases, 13.33%). Among the 121 patients with EDC specifically, the in-hospital mortality rate was considerably higher at 65.28%, accounting for 79 deaths, with direct ICH complications (47 cases, 59.49%) and sepsis (19 cases, 24.05%) again representing the leading immediate causes of death.

Factors associated with the occurrence of EDC

Bivariate analysis identified several variables significantly associated with the occurrence of EDC, including a history of stroke and a history of migraine, as well as the following findings at admission: oxygen desaturation, an NIHSS score above 16, leukocytosis, hypernatraemia, an initial ICH volume greater than 30 cc, the presence of ventricular flooding, cerebral oedema, and brain herniation. The full results of the bivariate analysis are presented in Table III.

Subsequent binary logistic regression identified four variables as significantly and independently associated with the occurrence of EDC: oxygen desaturation at admission (OR = 7.83; $p < 0.001$), severe neurological deficit at admission defined as NIHSS greater than 16 (OR = 5.57; $p < 0.001$), intraventricular extension (OR = 2.66; $p = 0.002$), and initial ICH volume exceeding 30 cc (OR = 2.87; $p = 0.004$). The results of the multivariate binary logistic regression analysis are presented in Table IV.

DISCUSSION

In African studies, between 40% and 70% of patients with intracerebral hemorrhage (ICH) develop disturbances of consciousness within 72 hours after the initial event [3,4]. In the multicenter Stroke Investigative Research and Educational Network (SIREN) study on spontaneous ICH in West Africa, Komolafe et al. (2024) reported that more than half of the patients presented with altered consciousness at admission, which was significantly associated with higher 30-day mortality [3]. Similarly, in a retrospective Ghanaian study, Limann et al. (2024) found that about two-thirds of patients admitted for ICH had impaired consciousness at presentation [4]. In Nigeria, Owolabi et al. observed a comparable proportion, with nearly 58% of patients having a Glasgow Coma Scale (GCS) ≤13 at admission [7]. In South Africa, a multicenter study reported approximately 47% of patients with a GCS <15 within the first 24 hours [8]. In our study, early disturbances of consciousness (EDC) were observed in 45% of patients within 72 hours after ICH onset, consistent with previous findings from sub-Saharan Africa (SSA).

Across these African studies, the depth of consciousness impairment varies, but severe comatose forms (GCS ≤8) are frequently reported, accounting for 25–40% of all EDC cases. These severe forms are strongly associated with early mortality and complications such as cerebral edema, brain herniation, and nosocomial infections [3,4,7,8]. In our series, 38% of patients with EDC were comatose, and in-hospital mortality among these comatose patients reached 95%, confirming these previous observations.

Table I: Sociodemographic and clinical characteristics of patients hospitalized for intracerebral hemorrhage (ICH) and those with early disturbances of consciousness (EDC).

Characteristics	Total ICH N=266 (%)	ICH with EDC N= 121 (%)
Age (years)		
< 50	82 (30.82)	37 (30.57)
50–59	73 (27.44)	36 (29.75)
60–69	63 (23.68)	26 (21.48)
70–79	34 (12.78)	18 (14.87)
≥ 80	14 (5.26)	4 (3.30)
Sex		
Male	150 (56.39)	67 (55.37)
Female	116 (43.60)	54 (44.62)
Vascular Risk Factors		
Hypertension	219 (82.33)	84 (69.42)
Migraine	42 (15.78)	23 (19.00)
Alcohol consumption	29 (10.90)	7 (5.78)
Tobacco use	20 (7.51)	10 (8.26)
Oral contraception	19 (7.14)	9 (7.43)
Diabetes mellitus	17 (7.39)	8 (6.61)
Sedentarity lifestyle	15 (5.63)	7 (5.78)
Obesity	14 (5.26)	4 (3.30)
Hemoglobinopathy	7 (2.63)	4 (3.301)
Previous stroke	7 (2.63)	4 (3.301)
Comorbidities		
Stroke sequelae	7 (2.63)	4 (3.301)
Cardiopathy	4 (1.50)	3 (2.478)
Chronic bronchopulmonary disease	2 (0.75)	1 (0.823)
Chronic kidney disease	2 (0.75)	0 (0.00)
Time to Admission		
0–6 h	26 (9.77)	13 (10.74)
7-12h	79 (29.69)	37 (30.57)
7–72 h	161 (60.524)	71 (58.679)
Abnormal Vital Signs at Admission		
Hypertension	219 (82.383)	104 (85.95)
Fever	42 (15.789)	32 (26.445)
Oxygen desaturation (SpO_2 < 95%)	59 (22.18)	51 (42.145)
Glasgow Coma Scale within 72 Hrs		
Normal (15)	145 (54.51)	0 (0.00)
EDC (≤ 14)	121 (45.489)	46 (38.012)
of which coma	46 (17.29)	75 (61.98)
Seizures at Admission	9 (3.38)	8 (6.61)
NIHSS at Admission		
Mild deficit (NIHSS ≤ 4)	65 (24.434)	10 (8.2640)
Moderate deficit (NIHSS 5–14)	127 (47.74)	44 (36.3697)
Severe deficit (NIHSS 15–20)	36 (13.53)	28 (23.1453)
Very severe deficit (NIHSS > 20)	38 (14.289)	37 (30.571.09)

Table II: Neuroimaging, Laboratory, Etiological, and In-Hospital Outcomes of Patients Hospitalized for Intracerebral Hemorrhage (ICH) and Those with Early Disorders of Consciousness (EDC)

Neuroradiological Findings at Admission	Total ICH N= 266 (%)	ICH with EDC N= 121 (%)
ICH location		
Deep cerebral	196 (73.68)	88 (72.723)
Capsulothalamic	63 (23.68)	42 (34.710)
Capsulolenticular	41 (15.41)	16 (13.22)
Diffuse deep	57 (21.42)	30 (24.79)
Lobar	53 (19.92)	26 (21.489)
Pure intraventricular	11 (4.134)	7 (5.79)
ICH volume		
≤ 30 cc	187 (70.30)	63 (52.067)
31–60 cc	58 (21.80)	40 (33.056)
> 60 cc	21 (7.89)	18 (14.878)
Neuroimaging signs		
Ventricular flooding	148 (55.634)	87 (71.90)
Mass effect	97 (36.467)	51 (42.145)
Cerebral edema	71 (26.69)	41 (33.88)
Brain herniation	56 (21.05)	39 (32.23)
Acute hydrocephalus	29 (10.90)	21 (17.356)
Leukoaraiosis	25 (9.3940)	13 (10.74)
Associated subarachnoid hemorrhage	24 (9.02)	16 (13.22)
Old scar lesions	5 (1.878)	2 (1.65)
Biological Abnormalities		
Hyperglycemia	41 (15.4153)	23 (19.001)
Leukocytosis	47 (17.6687)	34 (28.0981)
Anemia	25 (9.3951)	7 (5.7883)
Thrombocytopenia	15 (5.6370)	6 (4.955.00)
Renal failure	46 (17.2949)	25 (20.661.01)
Hypernatremia	19 (7.1422)	15 (12.3940)
Hyponatremia	23 (8.6475)	11 (9.0924)
Hyperkalemia	9 (3.3842)	5 (4.1320)
Hypokalemia	43 (16.1635)	21 (17.3565)
Etiology of ICH		
Chronic hypertension–related microangiopathy	229 (86.09)	99 (81.81)
Cerebral amyloid angiopathy	4 (1.50)	2 (1.65)
Iatrogenic cause	2 (0.75)	1 (0.823)
Ruptured cerebrovascular malformation	7 (2.63)	3 (2.478)
Undetermined cause	24 (9.02)	16 (13.22)
In-Hospital Clinical Course		
Neurological deficit		
Worsening	92 (34.589)	83 (68.5960)
Improvement	85 (31.95)	21 (17.35)
Stable	61 (22.93)	17 (14.04)
Seizures	8 (3.00)	7 (5.789)
Sepsis	28 (10.523)	22 (18.18)
Bronchopneumonia	40 (15.034)	29 (23.967)
Urinary tract infection	4 (1.50)	1 (0.823)
Malnutrition	25 (9.3940)	21 (17.356)
Pressure ulcers	4 (1.50)	1 (0.823)
Pulmonary embolism	3 (1.123)	2 (1.65)
Deaths	90 (33.83)	79 (65.289)
Direct ICH complications	49 (54.44)	47 (59.49)
Sepsis	24 (26.667)	19 (24.05)
Bronchopneumonia	12 (13.33)	10 (12.656)
Pulmonary embolism	1 (1.11)	1 (1.267)
Metabolic complication	1 (1.11)	0 (0.00)
Unknown cause	3 (3.33)	2 (2.53)

Table III. Bivariate Analysis of Factors Associated with the Occurrence of Early Disturbances of Consciousness (EDC)

Variables	EDC – Yes	EDC – No	P-value
Age			
<65 years	33 (49.25%)	34 (50.74%)	
≥65 years	88 (44.22%)	111 (55.77%)	0.475
Sex			
Male	68 (42.76%)	91 (57.23%)	0.278
Female	53 (49.53%)	54 (50.46%)	
Admission delay			
≤12 h	63 (48.09%)	68 (51.90%)	
>12 h	58 (42.96%)	77 (57.03%)	0.402
Hypertension			
Yes	104 (47.88%)	115 (52.51%)	0.158
No	17 (36.17%)	30 (63.82%)	
Tobacco use			
Yes	10 (50.00%)	10 (50.00%)	0.674
No	111 (47.23%)	135 (57.44%)	
History of stroke			**0.040***
Yes	17 (65.38%)	9 (34.16%)	
No	108 (45.00%)	132 (55.00%)	
Alcohol use			
Yes	15 (40.54%)	22 (59.45%)	0.515
No	106 (46.28%)	123 (53.71%)	
Diabetes			
Yes	8 (47.05%)	9 (52.94%)	0.893
No	113 (45.38%)	136 (54.61%)	
Migraine			**0.002***
Yes	28 (66.66%)	14 (33.33%)	
No	93 (41.51%)	131 (58.48%)	
Obesity			
Yes	4 (33.33%)	8 (66.66%)	0.388
No	117 (46.06%)	137 (53.93%)	
Hemoglobinopathy			
Yes	5 (71.42%)	2 (28.57%)	0.138
No	112 (43.24%)	147 (56.75%)	
Oral contraception			
Yes	5 (26.31%)	14 (73.68%)	0.071
No	118 (47.77%)	129 (52.22%)	
Sedentary lifestyle			
Yes	7 (46.66%)	8 (53.33%)	0.935
No	114 (45.60%)	136 (54.40%)	
Fever at admission			0.001*
Yes	32 (76.19%)	10 (23.80%)	
No	89 (39.55%)	135 (60.26%)	
Oxygen desaturation at admission			0.000*
Yes	51 (86.44%)	8 (13.55%)	
No	70 (33.81%)	137 (66.18%)	
Hypertension at admission			0.856
Yes	103 (49.28%)	116 (55.50%)	
No	18 (48.64%)	19 (51.35%)	
Seizures at admission			0.186
Yes	6 (66.66%)	3 (33.33%)	
No	114 (44.35%)	143 (55.64%)	
NIHSS at admission			0.000*
≤16	66 (32.35%)	138 (67.64%)	
>16	55 (88.70%)	7 (11.29%)	
Blood glucose			0.138
Normal	98 (43.55%)	127 (56.44%)	
Hyperglycemia	23 (56.09%)	18 (43.90%)	
Leukocytes			0.000*
Normal	84 (38.88%)	132 (61.11%)	
Leukocytosis	34 (72.34%)	13 (27.65%)	
Platelets			0.674
Normal	113 (45.56%)	135 (54.43%)	
Thrombocytopenia	6 (40.00%)	9 (60.00%)	
Serum sodium			0.002*
Normal	93 (41.89%)	129 (58.10%)	
Hypernatremia	15 (78.94%)	4 (21.05%)	
Hyponatremia	11 (47.82%)	12 (52.17%)	0.584
Serum potassium			
Normal	92 (43.60%)	119 (56.39%)	
Hyperkalemia	5 (55.55%)	4 (44.44%)	0.481
Hypokalemia	21 (48.83%)	22 (51.16%)	0.529
Supratentorial location			0.712
Yes	114 (45.78%)	135 (54.21%)	
No	7 (41.17%)	10 (58.82%)	
Initial hematoma volume			0.000*
>30 cc	58 (73.41%)	21 (26.58%)	
≤30 cc	63 (33.68%)	124 (66.31%)	
Intraventricular extension			0.000*
Yes	87 (58.78%)	61 (41.21%)	
No	34 (28.81%)	84 (71.11%)	
Mass effect			0.079
Yes	51 (52.57%)	46 (47.42%)	
No	70 (41.42%)	99 (58.57%)	
Cerebral edema			0.015*
Yes	41 (57.74%)	30 (42.25%)	
No	80 (41.02%)	115 (58.97%)	
Brain herniation			0.001*
Yes	39 (69.64%)	17 (30.35%)	
No	82 (39.04%)	128 (60.95%)	
Leukoaraiosis			0.492
Yes	13 (52.00%)	12 (48.00%)	
No	108 (44.81%)	133 (55.18%)	
Chronic hypertensive microangiopathy			0.066
Yes	99 (43.23%)	130 (56.76%)	
No			
Serum proteins			0.799
Normal	111 (44.75%)	137 (55.24%)	
Hypoproteinemia	3 (50.00%)	3 (50.00%)	
Hemoglobin			0.068
Normal	113 (47.05%)	127 (52.91%)	
Anemia	7 (28.00%)	18 (72.00%)	
Renal failure			0.173
No	94 (43.31%)	123 (56.68%)	
Yes	25 (54.34%)	21 (45.65%)	

Table IV. Binary Logistic Regression Analysis of Factors Independently Associated with Early Disorders of Consciousness

Variables	OR	95% CI	p-value
Oxygen desaturation at admission			
Yes	7.83	[2.95–20.77]	0.000*
No	1		
NIHSS at admission			
>16	5.57	[2.11–14.67]	0.000*
≤16	1		
Intraventricular extension			
Yes	2.66	[1.04–5.07]	0.002*
No	1		
Initial ICH volume			
>30 cc	2.87	[1.39–5.95]	0.004*
≤30 cc	1		

The overall in-hospital mortality rate from ICH in our study (34%) aligns with figures from SSA but remains markedly higher than those reported in high-income countries. Although ICH-related mortality remains globally high, it is particularly severe and concerning in SSA. Regional clinical series report hospital mortality rates ranging from 30% to over 50% and 30-day mortality between 40% and 60%, which is much higher than in high-income countries, where these rates vary between 20% and 35%.

Several factors contribute to this excess early mortality in SSA compared with high-income regions: structural and organizational weaknesses in healthcare systems leading to delayed patient management, limited access to or unavailability of diagnostic neuroimaging, scarcity or absence of stroke units, mechanical ventilation, intracranial monitoring, and neurosurgical care-all of which restrict therapeutic options. Additionally, poor control of vascular risk factors, particularly chronic hypertension, and underdiagnosis of comorbidities contribute to larger and recurrent hemorrhages associated with more severe neurological deficits [9-11].

Indeed, this reality is reflected in our study: fewer than one-third of patients received medical care within 12 hours of symptom onset, while approximately one-third had an initial ICH volume greater than 30 cc, and one in five presented with a severe to very severe neurological deficit. In contrast, in high-income countries, the presence of organized care pathways, standardized management protocols, and rapid access to neuroimaging and neurosurgical intervention significantly improves early survival [11,12].

Reducing mortality after ICH in SSA requires both primary prevention of vascular risk factors and a strengthening of health systems. This includes improving emergency prehospital transport, expanding and making neuroimaging more affordable, developing stroke units adapted to local resources, and providing training in neurocritical care [11,12].

Among prognostic factors, early impairment of consciousness (Glasgow Coma Scale ≤8–9) remains one of the most robust predictors. EDC, particularly coma (GCS ≤8), are major prognostic indicators in ICH, predicting high in-hospital mortality and poor functional outcomes. Several studies have reported that a GCS ≤8 at admission is associated with high in-hospital mortality rates ranging from 47% to 87%, with about one-third of deaths occurring within the first two days after admission [3,4,13,14].

In our study, in-hospital mortality among all ICH cases, ICH with EDC (GCS <14), and ICH with coma at admission (GCS ≤8) was 34%, 65%, and 95%, respectively. These findings confirm EDC as a major prognostic factor in ICH and underscore the importance of assessing consciousness and identifying risk factors for EDC during the acute phase of ICH.

In the literature, several universal determinants of EDC have been identified: (1) advanced age; (2) comorbidities and vascular risk factors, including chronic hypertension, diabetes, and heart disease; (3) variables related to initial ICH severity, such as initial ICH volume >30 cc, intraventricular extension, deep (capsulo-thalamic) and/or brainstem location, and early hematoma expansion; (4) factors associated with systemic complications (hypoxia, hypo- or hyperglycemia, infections, seizures, and sepsis); and (5) contextual variables specific to SSA, such as diagnostic delay and resource-limited settings [2,3,9,10,11,13,15-18].

In our study, among the factors associated with EDC identified in the literature, those related to initial ICH severity were confirmed: initial NIHSS >16, initial ICH volume >30 cc, and intraventricular extension. Among systemic complication-related factors, oxygen desaturation leading to hypoxia was also confirmed-likely secondary to aspiration pneumonia and/or brainstem compression due to mass effect or cerebral herniation.

An ICH volume >30 cc is associated with an early increase in intracranial pressure (ICP), leading to cerebral herniation and rapid onset of coma [10,16]. Intraventricular extension of the hemorrhage promotes acute hydrocephalus and a sudden rise in ICP, both directly responsible for impaired consciousness [9,12]. Chronic hypertension contributes not only to the occurrence of ICH but also to its extension and clinical severity [3,17]. Advanced age reduces cerebral reserve and promotes rapid decompensation in the event of ICH [8,16]. Comorbidities such as diabetes, heart disease, renal failure, and acute infections worsen both cerebral and systemic tolerance to ICH [18].

Extrinsic factors also play a role, including delayed hospital admission (often >24 h after symptom onset), respiratory complications such as aspiration pneumonia, and limited access to intensive care-all of which exacerbate disturbances of consciousness [4,10,11].

Limitations and strengths of our study:

This study has several limitations, including recruitment restricted to hospitals in Ouagadougou, which may limit national generalizability, and potential selection bias related to inclusion of patients who underwent neuroimaging within 72 hours. Variability in Glasgow Coma Scale assessment and the absence of systematic complementary investigations, combined with a cross-sectional design, precluded evaluation of the progression and long-term outcomes of consciousness disorders. Nevertheless, the study has important strengths: prospective data collection ensured data quality, and inclusion of imaging-confirmed cases improved diagnostic accuracy. As one of the first multicenter studies in Burkina Faso addressing early disorders of consciousness after intracerebral hemorrhage, it provides original, clinically relevant data using standardized assessment tools with direct implications for neurocritical care organization.

Recommendations: The establishment of specialized stroke care pathways and stroke units will contribute to improved patient outcomes and overall stroke management.

CONCLUSION

In Burkina Faso, early disorders of consciousness are frequent after intracerebral hemorrhage and represent a major prognostic indicator of early mortality. Their occurrence is linked to the initial clinical and radiological severity of the hemorrhage as well as to respiratory complications. Developing specialized stroke care pathways, establishing stroke units in hospitals, and improving access to neuroimaging are essential to enable early detection, optimize monitoring, reduce the frequency of consciousness disorders, and decrease stroke-related mortality. This study highlights the need for a complementary national multicenter prospective study to better define the determinants, progression, and prognostic impact of early consciousness disorders after intracerebral hemorrhage.

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