

Research Article**Risk factors for morbidity and mortality in patients with hemorrhage spontaneous cerebral**Archila CA¹, Pérez SE Internist², Peña Martinez SL^{3*}¹Internist, Rosales National Hospital, USA²Rosales National Hospital, USA³Neurologist, Rosales National Hospital, USA**Abstract.**

Background: The cerebrovascular event can be of the ischemic or hemorrhagic type. The hemorrhagic type can be spontaneous or secondary to structural abnormalities. Spontaneous bleeding is more frequently associated with arterial hypertension. Depending on the location and size, they can be associated with a high degree of disability and high mortality, especially when accompanied by complications such as hydrocephalus or intracranial hypertension.

Objectives: To describe the clinical and radiological characteristics of patients with spontaneous cerebral hemorrhage.

Methodology: Descriptive, retrospective, longitudinal study of patients diagnosed with cerebral hemorrhage who consulted the Emergency Department of the Rosales National Hospital in 2019. Results. 102 patients were included, with an average age of 61 years, without difference between sex, the most frequent cardiovascular risk factor was arterial hypertension, followed by Diabetes Mellitus. The location of the hemorrhage was at the level of the cerebral hemispheres, basal ganglia, cerebellum, and brainstem. Mortality was 74.5%

Conclusion: Spontaneous cerebral hemorrhage is a pathology with high mortality and requires management in specialized units with a multidisciplinary approach, for timely detection and management of associated complications, thereby reducing the degree of neurological sequelae, improving the quality of life of patients, and reducing mortality.

Keywords: brain hemorrhage, cerebral hemorrhage, cerebral parenchymal hemorrhage, spontaneous cerebral hemorrhage.

INTRODUCTION

Spontaneous cerebral hemorrhage is non-aneurysmal or intracranial hemorrhage not associated with trauma or other structural injury. It constitutes 10-15% of all strokes¹. Depending on the location, it can be supratentorial or infratentorial. Its most frequent location is in the basal ganglia, associated with the most frequent cause, which is uncontrolled arterial hypertension, its incidence increasing with age².

***Corresponding Author:** *Peña Martinez SL, Neurologist, Rosales National Hospital, USA

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Intracerebral hemorrhage, although it is much less frequent than ischemic stroke, presents a higher mortality and morbidity, with sequelae that lead to severe disability. Management requires a multidisciplinary team and specialized care units, with continuous monitoring to timely detect complications and provide timely treatment.

METHODS

This is a descriptive, longitudinal (measurements at admission and discharge), retrospective study. The present study was based on the review of information from clinical records and neuroimaging reports. It was submitted for evaluation by the hospital's Ethics Committee and approved for execution. All patients diagnosed with spontaneous cerebral hemorrhage, over 18 years of age, who consulted from January 1 to December 31, 2019, were included. 102 patient's records with a diagnosis of spontaneous cerebral hemorrhage were analyzed. Cases with incomplete records or without neuroimaging were excluded, as well as bleeding secondary to trauma or other structural pathology. Demographic characteristics (age, sex, origin), comorbidities (arterial hypertension, diabetes mellitus, nephropathy), use of anticoagulant or antiplatelet drugs, clinical characteristics, radiological characteristics of cerebral hemorrhage, associated complications, clinical evolution, and outcome were evaluated. SPSS Program was used for the systematization of the information and descriptive statistical analysis.

RESULTS

102 patients with spontaneous cerebral hemorrhage were included. The characteristics of the cases are presented in Table 1. The average age was 61 years, with a standard deviation of 15 years, with the highest frequency in the age range between 60 and 80 years. The distribution by sex was 51% men and 49% women. The initial approach to health care systems in 37% of the patients went to another hospital, from where they were referred to the Rosales National Hospital, and the rest attended directly to the Rosales National Hospital emergency room. The patients consulted with less than 24 hours of symptoms onset in 35.3% of the cases (n=36), with 12 to 24 hours of symptoms onset in

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30.3% (n=31) of the cases and with more than 24 hours of evolution in 34.4% (n=35). In the initial evaluation, the Glasgow scale was used, describing at admission; 38% patients with 3 to 8 points, 58% with 9 to 14 points and 4% with 15 points. Epileptic seizures were reported in 24.5% of patients (n=25). Among the risk factors and frequent comorbidities, arterial hypertension was identified in 77% (n=79). In the initial evaluation, they presented systolic blood pressure (SBP) greater than 180 mmHg in 47% and the rest with SBP less than 180 mmHg. Regarding the time of diagnosis of arterial hypertension, 27% reported less than 10 years of diagnosis of hypertension, 19% more than 10 years of diagnosis and the rest (54%) unknown time of disease. Of the 79 patients identified with arterial hypertension, 38% were on antihypertensive treatment; being among the drugs used the angiotensin-converting enzyme (ACE) inhibitors, angiotensin 2 receptor antagonists (ARA 2), beta blockers, and calcium channel blockers. 62% reported not being on antihypertensive treatment, despite having identified values of hypertension in the initial evaluation.

Patients diagnosed with diabetes mellitus were 20.5% (n=21). Of which 33% had less than 10 years of diagnosis, 5% more than 10 years and the rest of unknown evolution. 48% of the diabetic patients had a glucose value greater than 180 mg/dL and less than 180 mg/dL and 19% less than 180 mg/dL. Of these, 24% were being treated with oral hypoglycemic agents, 33% with insulin regimens, and 43% without treatment. Other comorbidities identified were chronic kidney disease in 29 patients (28%). According to clinical stage, stage 2 (one patient), stage 3 (10 patients), stage 4 (11 patients) and stage 5 (7 patients). The use of anticoagulants was verified in one patient and antiaggregants in 2 patients. Regarding the record of personal habits, only 5 patients reported being alcoholics (5%) and 4 smokers (4%). To assess the degree of dysfunction, Rankin score registered at admission; of 0 to 3 points was identified in 37% of the patients and a score between 4 to 6 points in 63%. At discharge, 24.5% had 0 to 3 points and 75.5% 4 to 6 points. The mean hospital stay was 11 days, with a standard deviation of 9.8 days. 22.5% of the patients remained hospitalized for less than 48 hours, between 2 and 7 days 33.3% and more than 7 days 44.2%. Among the complications, mechanical ventilation (the most frequent indication was neurological deterioration) was required in 75 patients (73.5%). Of them, 36.6% were ventilated for less than 48 hours, between 48 hours and 7 days, 33.4% and 30% for more than 7 days. Complications associated were nosocomial pneumonia in 17 patients (16.6%), aspiration pneumonia in 10 patients (9.8%), urinary tract in-

fection in 7 (6.8%) patients, bacteremia in 3 patients, ventriculitis in 5 patients, infection at the gastrostomy placement site in one patient and tracheitis in one patient. When evaluated in the emergency unit, 22% patients were admitted to the intensive care unit and 34% to internal medicine services. According to the neuroimaging findings, 92 cases were supratentorial hemorrhages and another 10 cases were located at the infratentorial level. According to anatomical location, 52 in cerebral hemispheres (51%) and 30 (29.4%) in basal ganglia, 8 cerebellar (7.8%) and 2 in brain stem (2%). The rest of the cases had several combined locations, the most frequent being hemisphere and basal ganglia hemorrhage. With ventricular drainage in 53 cases and hydrocephalus in 37 cases. Fig. 1.

The size of the hemorrhage described in the records reports an average volume of less than 30 ml in 5 cases and more than 30 ml in 31 cases. In the rest of the cases (66) the volume of the hemorrhage is not described. In evaluating neurosurgical criteria, 55 patients (54%) presented an indication for a surgical procedure. Of these, 18 underwent ventriculostomy, 17 hematoma drainage, 8 patients submitted hematoma drainage plus ventriculostomy. Table 1.

Of 102 patients, 76 patients died, which represents 74.5%. In the group of deceased patients, the mean age was 59 years, with a standard deviation of 24.2 years. The youngest patient was an 18 year-old patient, who had nephropathy and arterial hypertension as comorbidities; the oldest patient was 89 years old, with a comorbid diagnosis of arterial hypertension. No differences between sexes. In the assessment of the state of consciousness on admission using the Glasgow scale, among the deceased patients, 50% presented 3 to 8 points, 47% 9 to 14 points, and 3% 15 points. When evaluating functional status, it was verified that 17% (13) at admission had 0 to 3 points on the Rankin scale and 83% (63) had 4 to 6 Rankin points.

Seizures were recorded in 19 patients (25%). The time from onset of symptoms to the consultation, 33% consulted within 12 hours of initial presentation, 33% with 12 to 24 hours and 34% with more than 24 hours. 85.5% of the patients consulted in another center. Regarding comorbidities, 80% were classified as arterial hypertension; 21% with less than 10 years of diagnosis and 23% with more than 10 years. The rest did not give a history of time of evolution of the diagnosis. In their initial evaluation, 51% presented PAS more than 180 mmHg and the rest PAS less than 180 mmHg. Another comorbidity described as a

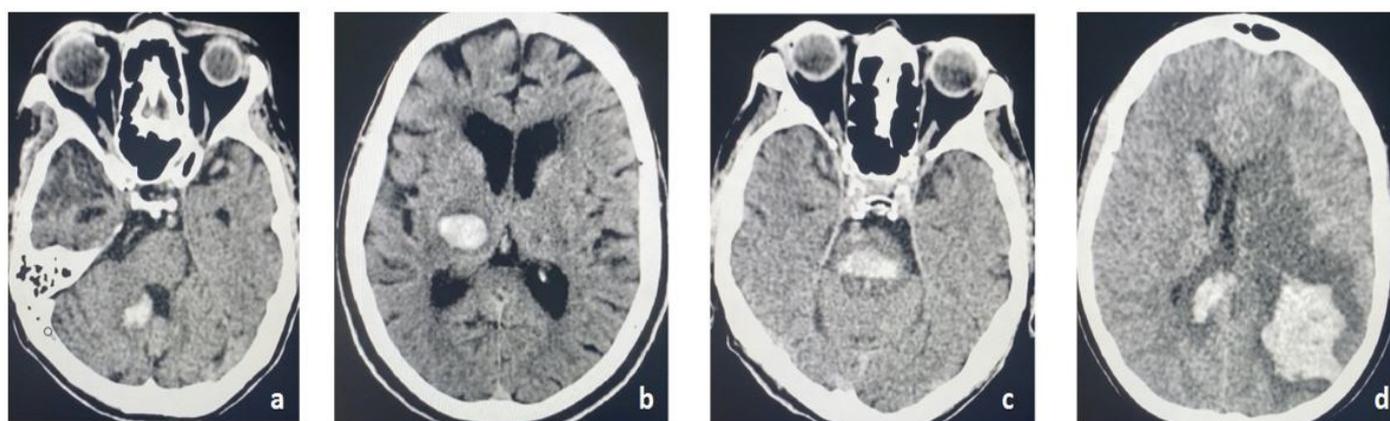


Figure 2: A) Right cerebellar hemorrhage. B) Right thalamic hemorrhage. C) Pontine hemorrhage D) Left parietal occipital hemorrhage with perilesional edema, drainage to the ventricular system with midline deviation to the right.

TABLE I: CLINIC CHARACTERISTIC	TOTAL CASES
	No.= 102
Average age	61 years (+- 15)
Men: women	1:1:04 (51%/49%)
Initial consultation to another hospital center	37%
Time from onset of symptoms to consultation:	
<24 hours	35.3%
12-24 hours	30.3%
>24 hours	34.4%
Epileptic seizures	24.5% (N=25)
Risk factor's	
Arterial hypertension	77% (n=79)
Mellitus diabetes	20.5% (n=21)
Chronic kidney disease	28% (n=29)
Use of anticoagulant	1 patients
Use of antiplatelet agents	2 patients
Glasgow scale on admission	
3- 8 points	38%
9- 14 points	58%
15 points	4 %
Degree of dysfunction on admission: Rankin score	
0 -3 points	37%
4 -6 points	63%
Degree of dysfunction at discharge: Rankin score	
0 -3 points	24.5%
4 -6 points	75.5
Average hospital stay	11 days (+ - 9.8 days)
Hospital stay:	
< 48 hours	22.5%
2- 7 days	33.3%
>7 days	44.2%
Mechanic ventilation	73.5% (n= 75)
< 48 hours	36.6%
48- 7 days	33.4%
>7 days	30%
Complications	
Nosocomial pneumonia	16.6%
Aspiration pneumonia	9.8%
Urinary tract infection	6.8%
Ventriculitis	5 %
Bacteremia	3 %
Anatomical location of the hemorrhage	
Supratentorial	90%
Infratentorial	10%
Anatomical location (according to CT)	
Brain hemispheres	51%
basal ganglia	29.4%
Cerebellum	7.8%
brain stem	2 %
2 or more sites	9.8%
Volume of hemorrhage (described cases)	n=36
<30ml	5 (14%)
>30ml	31 (86%)
Neurosurgical procedures	n=55
Ventriculostomy	33%
hematoma drainage	31%
Ventriculostomy + hematoma drainage	15%

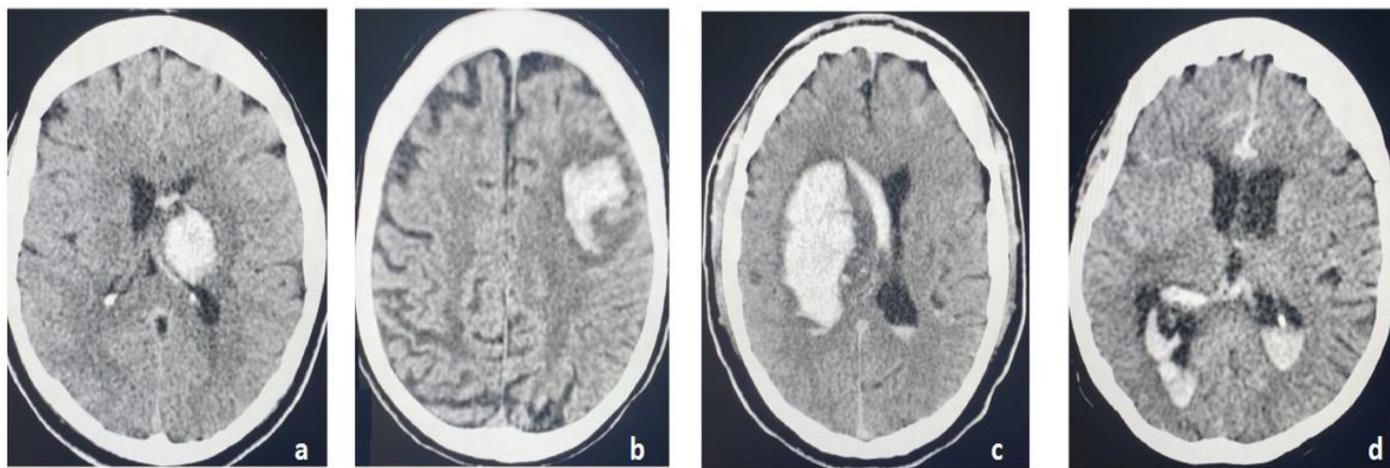


Figure 2: Examples of complications associated with cerebral hemorrhage. A) Left basal ganglia hemorrhage B) Left frontal intraparenchymal hemorrhage. C) Right putaminal hemorrhage with drainage to the ventricular system D) Intraventricular hemorrhage.

risk factor for cerebrovascular event is diabetes mellitus, identified in 9 patients (12%), one patient under 10 years of age, one over 10 years of age, and the rest of unknown diagnostic evolution. 44% of them with a glucose value of more than 180 mg/dl at admission and the rest with a value of less than 180 mg/dl. Another risk factor is kidney disease, recorded in 13 patients (17%) with a history of chronic kidney disease, 77% in stages 4 and 5. None of the deceased patients used anticoagulants or antiplatelet agents. In terms of days of hospital stay until the outcome, the average number of days was 8.9 days (standard deviation of 7.8), 28% (n=21) stayed less than 48 hours, from 2 to 7 days, 37% (n=28) and more than 7 days 35% (n=27). Among the complications, 68 patients required mechanical ventilation (90% of the deceased). Of which 32% (22) for less than 48 hours, from 2 to 7 days 40% (27) and more than seven days on mechanical ventilation 28% (19). Among the associated complications, 13 patients with pneumonia associated with the use of mechanical ventilation (19%) are mentioned, and 6 patients diagnosed with aspiration pneumonia (9%). According to the neuro-radiological findings, of the non-survivors, 66 patients (86.8%) had a supratentorial location, and the rest were infratentorial. In the cerebral hemispheres 41 cases (60%), in the basal ganglia 18 cases (26%), in the cerebellum 8 cases (12%) and in the brain stem two cases. With drainage to the ventricle in 48 cases (71%) and hydrocephalus in 34 cases (50%). The volume of the described hemorrhage was more than 30 ml in 41% of the cases. Fig. 2.

DISCUSSION

In this study the cerebrovascular events have been identified as one of the most important causes of disability in the population and is associated with multiple cardiovascular risk factors, preventable (arterial hypertension, diabetes mellitus, obesity, smoking, alcoholism, sedentary lifestyle). In published statistics, in the US, a prevalence of cerebrovascular event in adults of 3.2% is recorded, but with projections of an increase in prevalence¹. Regarding the subtypes of cerebrovascular event, it has been described that 87% are ischemic, 10% hemorrhagic, and 3% spontaneous subarachnoid hemorrhage¹. The objective of this study was the analysis of cases with hemorrhagic cerebrovascular event, specifically of the spontaneous hemorrhage type. In its characterization, in terms of age, a wide age range was identified, older associated with hypertensive crisis. This is associated with

the high frequency for more than 10 years of chronic diseases such as hypertension and diabetes mellitus, already described as important cardiovascular risk factors³. A high percentage of patients (62%) did not report being with antihypertensive treatment, which is associated with a higher frequency of hypertensive crises, which can be complicated by intracerebral hemorrhage. It has been described that 87% of strokes are associated with modifiable risk factors such as hypertension, obesity, hyperglycemia, hyperlipidemia and renal dysfunction⁴. In the series of patients investigated, the most frequent risk factor was arterial hypertension in 78%, even higher than the statistics published in other studies. Important is the finding that a third of the patients have more than 10 years of diagnosis and treatment, but the rest of unknown evolution, so it can be connoted that the lack of timely detection for the respective treatment could be associated with an increase in the frequency of stroke in this group of patients. Diabetes mellitus was the second cardiovascular risk factor, in 20.5% of the patients. An interesting finding is the fact that 48% were identified with value more than 180 mg/dl in the first evaluation in the emergency room, of which nearly half had treatment (oral hypoglycemic agents or with insulin schemes), but the rest did not receive treatment. This should be correlated with the fact that diabetes has been reported to be an independent risk factor for stroke recurrence in general and increased risk of complications after stroke⁵.

Regarding kidney disease as a risk factor, a meta-analysis concluded that the risk of stroke increases by 43% (RR 1.43) among patients with a GFR <60 ml/min^{6, 7}. In the series evaluated, bleeding was associated in a third of patients with chronic kidney disease, in stage 3 to 5, being the group with the highest mortality. The use of anticoagulants was verified in one patient and antiaggregants in two patients, which was not associated with increased mortality.

It has also been published that 47% of cerebrovascular events are associated with risk behaviors such as smoking, sedentary lifestyle, and unhealthy diet⁴. In the cases investigated, few patients reported risk behaviors in the clinical record (5% ethylists and 4% smokers), although it is a data that should be evaluated in a more standardized way to more precisely detail the degree of tobacco and alcohol consumption.

Globally, the cerebrovascular event leads to degrees of disability, which increases when associated with comorbidities that lead to higher mor-

tality and worse functional prognosis⁸. In the investigation, 63% of the patients were admitted with 4 to 6 Rankin points, that is, a high degree of dysfunction, increasing to 75.5% upon discharge, especially due to the high degree of mortality, this is related to the severity of the bleeding, advanced age, more comorbidities, increase in complications, creating a set of factors that worsen the functional prognosis and increase the probability of mortality.

Globally, one third of strokes require mechanical ventilation². In cases of cerebral hemorrhage, it depends on the severity, extent and other complications such as intracranial hypertension and hydrocephalus. In this study, a high number of patients, 73.5% required ventilatory support, most of them due to neurological deterioration due to the extension of the hemorrhage, a third of them less than 48 hours, and this is even associated with higher mortality, as published⁹.

Infectious complications are associated with a poor long-term prognosis, increase days of hospital stay, and increase the probability of readmission 30 days after discharge, with pneumonia, urinary tract infections, sepsis reported as the most frequent^{10, 11, 12}. In this series, it coincides that the most frequent were nosocomial pneumonia, aspiration pneumonia, urinary tract infection, ventriculitis and sepsis, increasing the percentage of complications in the group of deceased patients, as described¹³.

In the context of spontaneous cerebral hemorrhage, according to the International League Against Epilepsy (ILAE) reports the new onset of epileptic seizures between 2.8% and 28%, especially in the first 24 hours¹⁴. In this study, 24.5% of the patients presented epileptic seizures, being within the expected range and without varying between the groups of deceased vs. not deceased.

Regarding the location of spontaneous cerebral hemorrhage, mainly due to arterial hypertension and diabetes mellitus, they are associated with the pathophysiological mechanism of lipohyalinosis in penetrating arterioles of basal ganglia such as the thalamus, putamen, cerebellum, and brain stem². Spontaneous hemorrhage in hemispheres brain disorders is more associated with age and amyloid angiopathy¹⁵. In the group studied, the most frequent risk factor was arterial hypertension, but the age was older than the average reported for spontaneous cerebral hemorrhage, which would explain the high frequency of hemorrhage in the cerebral hemispheres, basal ganglia, cerebellar ganglia, and brain stem. The rest of the cases had combined locations between hemispheric and basal ganglia, with drainage to the ventricle in 53 cases, of which 37 cases were complicated by hydrocephalus, which eventually required surgical intervention. This is similar to what was expected, since intraventricular extension of intracerebral hemorrhage has been described as occurring in 30 to 50%, with a predisposition to the development of hydrocephalus in half of them¹⁶.

Regarding the management of spontaneous cerebral hemorrhage, it is multidisciplinary and includes the control of blood pressure, glycemia, temperature, timely detection and management of infectious processes, among others. In addition to the determination of surgical criteria for the drainage of the hematoma. Of the patients analyzed, 67% underwent surgery, performing ventriculostomy due to associated hydrocephalus or hematoma drainage, with variable evolution. In the case of posterior fossa hemorrhages, the recommendations to assess surgical criteria include neurological impairment, brain stem compression, hydrocephalus due to ventricular obstruction, cerebellar

hemorrhage of more than 15 ml. Drainage has been reported to reduce mortality, although its efficacy for improving the functional prognosis is still uncertain and more studies are needed¹⁸. In the cases analyzed, the ten cases of cerebellar and brain stem hemorrhages were associated with a poor prognosis and died.

CONCLUSIONS

The group of patients with spontaneous cerebral hemorrhage in this study presented the main risk factors traditionally described such as advanced age, arterial hypertension, and diabetes mellitus. The degree of disability is high on admission and discharge. Mortality is increased when associated with complications such as aspiration pneumonia, pneumonia associated with ventilatory support, urinary tract infections, and ventriculostomy. The location with the highest mortality is posterior fossa hemorrhage.

Spontaneous cerebral hemorrhage is a disease with high mortality and associated with a high degree of disability, whereby when consulting the emergency unit with compatible symptoms, an appropriate clinical and neuroradiological diagnosis must be made to characterize the case and give treatment and prevent complications associated, the use of standardized management protocols is recommended (fever monitoring, hyperglycemia, swallowing evaluation, enteral nutrition, thromboembolism prophylaxis, management in stroke units), to reduce complications such as infections and thereby reduce the degree of disability and mortality.

Therefore, the management of patients with cerebral hemorrhage is multidisciplinary and ideally made in neurointensive care units, with monitoring and management of neurological cardiorespiratory variables and monitoring of intracranial pressure, which allows a better prognosis. In addition, new surgical techniques are currently being incorporated to improve prognosis, such as endoscopic or stereotaxic techniques, reducing mortality and improving functional prognosis.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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