

# Hydroelectrolytic Disorders in Cerebroleted Patients in the Intensive Care Unit of Gabriel Touré Teaching Hospital

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## Abstract

A cerebrole is a patient with a neurological deficit of central origin; these patients very often present disorders of the ion concentration, hence the need for hospitalization in intensive care. The aim of our study was to study hydro-electrolyte disorders in brain-damaged patients, to describe the clinical aspects, to identify the contributing factors and to determine the prognosis of these patients in the intensive care unit of gabriel touré teaching hospital.

**Material and Methods:** It was a prospective cross-sectional study, descriptive of a period of 11 months going from June 2015 to April 2016 in the intensive care unit of CHU Gabriel TOURE we included all the cerebral patients admitted in intensive care in which hydro-ionic disorders have detected on arrival or during hospitalization. Data were collected through transfer sheets, a survey sheet and medical records. Data entry and analysis were done respectively on SPSS software (version 19) and Microsoft Word Starter 2010 software. **Results:** During our study, out of 450 hospitalization patients, we identified 110 brain-damaged patients and 75 patients were retained in our study, *i.e.* a prevalence of 16.6%. Male was predominant with 72% with a sex ratio of 2.5 the age group 20 - 50 years was majority with 45.3%, the average age was 38.49 years. The majority of patients (58.7%) were admitted from the emergency department. The most common reason for admission was impairment of consciousness in 94.7% (**Table 1**) of cases and the Glasgow ad-

mission score was less than or equal to 8 in 58.7% (**Table 1**) of patients. Hydro-electrolyte disturbances were present in 93.3% of patients on admission. Hyponatremia was the most common disorder with 56% (42 cases). Followed by hyperkalemia 10.7% (8 cases), hypernatremia 9.3% (7 cases), at hypocalcemia 9.3% (7 cases), associated disorders 8% (6 cases). Brain CT was performed in 52% of the patients. In our study, malaria was the most common etiology of ionic disorders with 36%. Of the patients who died, 80% had developed hyponatremia after 5 days in hospital, and the overall lethality was 73.3%. **Conclusion:** Hydro-electrolyte disorders are frequent in the intensive care setting and their management must be rapid in order to reduce morbidity and mortality.

### Keywords

Hydro-Electrolyte Disorders, Cerebroleses, Resuscitation, Teaching Hospital Gabriel Toure

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## 1. Introduction

A brain injured person is a patient with a neurological deficit of central origin. These patients can develop disorders of the ion concentration, hence the need for hospitalization in a specialized intensive care unit [1]. Disorders of the metabolism of water and ions and in particular sodium and potassium are frequently encountered in intensive care and could be responsible for significant morbidity and mortality [2] [3].

Their disturbance is the consequence of a disease or syndrome which causes a loss and/or a hindrance of regulatory mechanisms [4]. Digestive disorders, operating procedures, polytrauma, renal and hepatic insufficiency, endocrine diseases, disturbances of consciousness are situations where one should fear an abnormality of the ionogram [5]. Ionic disorders have an influence on the distribution of water in the various compartments of the organism. The movements of water are subject to the difference in concentration of osmotically active ions from one compartment to another. The water moving from the least concentrated compartment to the most concentrated is the phenomenon of osmosis. This phenomenon makes it possible to restore the disturbances linked to the ion concentration. The ions that make up the different compartments of the body are also involved in cell metabolism, neuromuscular electrophysiology. The study of ion disorders is very useful in the intensive care setting. It has two interests: Avoid the occurrence of ionic disorders complicating the clinical condition of the patient, and evaluate the management of neurolegia patients. Their evolution is used as an indicator of the quality of care [6]. The majority of disorders occur during hospitalization. In an Austrian series of more than 150,000 patients, upon admission to intensive care, 25% of patients had developed an abnormality in sodium metabolism [7]. In a series of 8000 patients with normal serum sodium admission,

37% of patients developed an abnormality in sodium metabolism during hospitalization [8]. A comparative study, carried out in a university hospital in Abidjan in the Ivory Coast on the occurrence of ionic disorders in patients in intensive care, had found a 55% prevalence of ionic disorders [9]. In Mali there are no data on these ionic disorders in the intensive care unit which leads us to initiate this study which aimed to study hydro-electrolytic disorders in brain-damaged patients. To describe the clinical aspects, to identify the favorable factors and to determine the prognosis of these patients in the intensive care unit of the Gabriel Touré teaching hospital.

## 2. Material and Methods

This was a prospective, descriptive cross-sectional study spanning an 11-month period from June 2015 to April 2016 in the intensive care unit of CHU Gabriel TOURE. Included were all cerebral patients admitted to intensive care in whom the disorders were detected on arrival or during hospitalization. We have defined a cerebrolese as any patient with a neurological deficit of central origin, clinically confirmed with a Glasgow score less than 15 and/or a cerebral computed tomography (CT) showing lesions of the brain lesions. The parameters studied: age, sex, profession, reason for admission, neurological state, underlying pathology, nature of ionic disorders, biological data (blood ionogram, calcemia) and the patient's progress. The data were collected using transfer sheets, survey sheets and medical records, entered and analyzed using SPSS software (version 19.) and Microsoft Word Starter 2010 software respectively. Pearson's chi-square and Fisher's exact test were used as statistical tests with a significance level of 5%. The results are in the form of simple tables, cross tables.

## 3. Results

During our study, out of 450 hospitalization patients we identified 110 brain-damaged patients and 75 patients were retained in our study, *i.e.* a prevalence of 16.6%. Male was predominant with 72% with a sex ratio of 2.5 the age group 20 - 50 years was majority with 45.3%, the average age was 38.49 years. The majority of patients (58.7%) were admitted from the emergency department. The most common reason for admission was impairment of consciousness in 94.7% of cases and the Glasgow admission score was less than or equal to 8 in 58.7% (Table 1) of patients. Hydro-electrolyte disturbances were present in 93.3% of patients (Table 2) on admission. Hyponatremia was the most common disorder with 56% (42 cases) followed by hyperkalemia 10.7% (8 cases) (Table 2), hypernatremia 9.3% (7 cases) (Table 2), at hypocalcemia 9.3% (7 cases) (Table 2), associated disorders 8% (6 cases) (Table 2). Brain CT was performed in 52% of the patients (Table 3). In our study malaria was the most common etiology of ionic disorders with 36% (Table 4). Of the patients who died, 80% had developed hyponatremia after 5 days in hospital, and the overall lethality was 73.3%.

**Table 1.** Distribution of patients according to the state of consciousness upon entry.

Score de Glasgow	Numbers	Percentage (%)
≤à 8	44	58.7
10 à 8	27	36
15 à 11	4	5.3
<b>Total</b>	<b>75</b>	<b>100</b>

**Table 2.** Distribution of patients according to the hydro electrolytic disorders found.

Hydroelectrolytic disorders	Numbers	Percentage (%)
Hyponatrémia	42	56.0
Hyperkaliémia	8	10.7
Hypernatrémia	7	9.3
Hypocalcémia	7	9.3
Associated disorder	6	8
Hypokaliémia	5	6.7
<b>Total</b>	<b>75</b>	<b>100</b>

**Table 3.** Distribution of patients according to brain CT lesions.

Lésions	Location	Numbers	Total and Percentage (%)
Hématoma	Under dural	6	10 (13.3%)
	Extra dural	4	
	méninge	2	
Haemorrhage	internal Capsule	2	7 (9.3%)
	temporal	2	
	diffuse	1	
	Sylvienne superficial	3	
Ischémia	Sylvienne average	1	8 (10.7%)
	internal Capsule	3	
	diffuse	1	
Contusion	parietal	3	7 (9.3%)
	temporal	2	
	diffuse	2	
Pneumoencéphalie		1	1 (1.2%)
Hydrocephalus		1	1 (1.2%)
No lesion		6	6 (8%)
No made		36	36 (48%)
<b>Total</b>		<b>75</b>	<b>100</b>

**Table 4.** Distribution of patients according to the diagnosis of hospitalization.

Hospitalization diagnosis	Numbers	Percentage (%)
Severe malaria neurological form	27	36
Severe head trauma	24	32

**Continued**

AVC	14	18.7
Cerebral hematoma	5	6.7
Dehydration and undernutrition	2	2.7
Ischemic heart disease	1	1.3
Prostate adenoma	1	1.3
Hydrocephalus	1	1.3
<b>Total</b>	<b>75</b>	<b>100</b>

**4. Discussions**

During our study, we encountered difficulties especially for carrying out radiological examinations (brain CT) and certain biological assessments made difficult the follow-up of certain patients who were excluded from the study. During our study the age group 20 - 50 years was in the majority and the average age was 38.49 years and the male sex was predominant with 72% with a sex ratio of 2.5.

A study by Nguessan Y at the Abidjan University Hospital found a predominance for the age groups between 20 to 50 and 50 to 75 years with 49% and 48% respectively [9]. This result could be explained by the young age of the Malian population. Alteration of consciousness was the reason we encountered the most during the transfer to intensive care with 94.7%. In this population 58.7% was in a state of coma. Nguessan Y [9] found Neurological pathologies were the most frequent causal affections with 59% as the first reason for admission.

This result could be explained by the severity of the electrolyte disorders, a lack of knowledge of the clinical signs of ionic disorder and often the impossibility of performing the blood ionogram. Several patients (48%) were unable to perform a CT scan. Brain parenchyma lesions represented 53.8% of lesions found on CT. These lesions were hemorrhagic in nature (hematoma, subarachnoid hemorrhage, cerebral hemorrhage) in 22.6%, and ischemic in 10.7%. The etiologies encountered in order of frequency are: malaria (36%), head trauma (32%), stroke (18.7%). This could be explained by the fact that Mali is an area of high malaria endemicity and the recurrence of cases of severe malaria during the winter period even if a reduction in its incidence has been observed [10]. The accident rate on public roads (AVP) is explained by the fact that the teaching hospital Gabriel Toure is the main center for trauma care in Mali. In recent years, there has been a strong emergence of noncommunicable diseases such as hypertension with a prevalence of 40% in Africa according to WHO [11] which can explain the high rate of hypertension and its complications during our study. During our study hyponatremia with 56% was the most frequent disorder followed by hyperkalemia (10.7%), Nguessan Y [9] had found with different percentages, the same disorders Hyponatremia (65%) and the hyperkalemia (32%). This result was consistent with data from several authors in the literature,

for whom hyponatremia is the most frequent ionic disorder in intensive care [6] [7]. The mortality rate for ionic disorders on admission was 73.3%, 80% of deceased patients had a disorder discovered after the 5th day of hospitalization, the Ivorian study found 22% at admission versus 94% during hospitalization [9].

According to studies by Stelfox *et al.* [8] and Achinger *et al.* [12] Patients with hypernatremia and associated disorders had student mortality of 85.7% and 83.3%, respectively. These results could be explained by the seriousness of the admission disorders, the delay in diagnosis and the management of the disorders.

## 5. Conclusion

Hydro-electrolyte disorders are frequent in the midst of intensive care. The technical difficulties for carrying out the paraclinical assessments make the diagnosis difficult and delay the treatment. The improvement of the technical platform makes it possible to reduce the morbidity and mortality linked to this pathology

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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