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Case Report

Hyperglycemia in Acute Stroke

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Abstract

Background: The priority given to thrombolysis (still inaccessible in our countries) should not make us forget other factors of aggression and/or aggravation in the management of strokes. So-called stress hyperglycemia, the result of oxidative stress, is implicated in the occurrence of a poor functional prognosis, and possibly higher mortality. Recent studies recommend 1.55 grams per liter (g/l) as the critical threshold, whereas in our department this threshold is 2 g/l. This study aims to determine the functional prognosis of an acute cerebral infarction associated with uncorrected hyperglycemia before the threshold value of 2g/l.

Method: Thus over a period of 3 months, we recruited patients who had had a Stroke within 24 hours and in whom we measured blood sugar on admission as well as monitored their functional outcomes by administering different evaluation scales of motor disability over a period of 6 weeks.

Results: In 70 patients of different sexes and of varying ages, 13 had blood sugar levels above 2g/l; 19 with blood sugar between 1.55 g/dl and 1.99 g/dl (therapeutic abstention group) and finally 38 with normal blood sugar (0.85 g/dl to 1.54 g/dl). On admission, the NIHSS score was higher for the therapeutic abstention group at 11.84. A poor evolution was also observed in the same group with worse scores at 6 weeks for the NIHSS at 10.21; for the Rankin's scale at 3.47 and for the Barthel's scale at 53.15. They also had a longer stay in hospital and greater mortality than the other two groups.

Conclusion: We believe that hyperglycemia should be normalized in the acute phase of stroke, despite fears of hypoglycemia when correcting it. With careful monitoring, we can follow the literature recommendations for the wellness of our patients.

Keywords: Hyperglycemia; Acute Stroke; Thrombolysis

Introduction

Stroke is one of the leading causes of death and disability in the world. The global incidence is 16 million new cases per year or 1 stroke every second [13,22]. In France, the incidence is estimated at 130 000 new cases per year [5]. About 10% of deaths are due to stroke [18]. According to WHO, in 2004, stroke will be responsible in Africa for 18 and 23 million deaths annually in 2015 and 2030 respectively. Stroke is the second neurological pathology at the neurological clinic at Fann Hospital in Senegal by its morbidity- mortality [23].

The urgent management of stroke is essential [1] : it is a "race against the clock", and priority is given to thrombolysis in the case

of ischemic stroke (AVCI), as well as prevention of recidivism by managing risk factors and preventing possible complications. This priority given to thrombolysis (still inaccessible in our countries) must not make us forget other factors of aggression and/or aggravation (which we could possibly manage with our means) which also compromise the functional prognosis and possibly life-threatening. This is the case of disorders of blood glucose that are implicated in the occurrence of a poor prognosis in DALYs. Indeed, it usually occurs in patients with stroke, a so-called stress hyperglycemia [11,16,27] , result of oxidative stress [14] , which is incriminated in the occurrence of a poor functional prognosis [12] and possibly higher mortality [12,25]. Recent studies in this field recommend 1.55 grams per liter (g/l) as the discriminating threshold from which insulin therapy must be used to avoid the poor prognosis associated with hyperglycemia [15,26,28]. But in our service, we intervene on a hyperglycemia, only from 2 g/l. And this in general for all neurological conditions, prevention of possible hypoglycemia considered extremely deleterious, which can occur during the correction of low hyperglycemia. Thus, considering the literature data on the subject and in order to adjust our care practices to the latest recommendations in this area ; we undertook this study to determine the attitude to be followed, between a therapeutic abstention for low hyperglycemia for fear of hypoglycemia and the functional consequences incurred by these patients if their hyperglycemias are corrected only from 2g/l .

Thus, over a period of 3 months, we recruited patients who had a DALY, who reached us within 24 hours and in whom we measured blood glucose on admission and monitored their functional outcomes by administering different scales. assessment of motor disability over a period of 6 weeks.

This study aims to determine the functional prognosis of acute cerebral infarction associated with uncorrected hyperglycemia before the threshold value of 2g/l.

Patient and Method

This is a prospective study of seventy cases of DALYs diagnosed between February 2015 and April 2015 in the department and whose records were complete, ie a period of 3 months.

This study was conducted in the neurology department of CHU Fann , Dakar, Senegal. This service has a triple purpose: patient care, training in the field of neuroscience and research on neurological conditions.

Patients

Patient selection was based on defined and applied criteria.

Inclusion criteria

Was included in this study, any patient

- With an imaging-confirmed stroke that occurred less than 24 hours prior to admission to the Fann University Hospital Neurological Clinic , Dakar-Senegal;
- With Rankin scale score ≥ 2;
- With an NIHSS score at admission ≥ 5;
- Who accepts (or his accompanying person) by informed and/or signed consent to participate in the study.

Criteria of non-inclusion

Was excluded from this study, any patient

Under 18 years old; comatose or confused (score 2-3 in section 1a of the NIHSS scale); with:

- A transient ischemic attack;
- A neurological or systemic condition or other factor that may interfere with the pathology being evaluated;
- An evolutionary affection for less than 1 year that poses a vital problem;
- A condition that requires neurosurgical intervention within 24 hours (PEIC, AVCH)
- Hypotension (systolic BP <90 mm HG)

Criteria for withdrawal from the study

- Voluntary withdrawal
- Diagnosis of severe intercurrent illness.

Method

Pre-hospital phase

It consists of

- Receive the patient as quickly as possible;
- Do not administer Glucose Serum except in case of hypoglycaemia;

- Do not administer an antihypertensive except in cases of hypertensive encephalopathy, angina pectoris or heart failure;

To note

- Time of onset of stroke;
- The numbers of the blood sugar
- Check the ABC protocol;
- Do brain X-ray scan within 30 minutes of clinical evaluation;
- Type of treatment instituted.

Hospital phase

- It is conducted as follows collect information about the patient from the family; Clinical evaluation of the patient (use the different scales - see appendix) Do ECG and routine biology. Oxygen therapy pending the results of brain imaging Central blood sugar
- If temperature> 37 ° C, use an antipyretic
- If blood pressure> 220 mmHg systolic or 120 mmHg diastolic after 15 minutes rest, then use an antihypertensive check all anthropometric data note the time of stroke, arrival at the hospital, performing cerebral scan, treatment and performing biological assessments ensure patient monitoring
- **Visit 1:** 48 hours after admission : temperature, blood pressure, NIHSS scale, other treatments, side effects observed. If worsening of the neurological picture, then again brain scan.
- **Visit 2:** J7 or at the exit of the patient ; temperature, blood pressure,
- pulse, Rankin Scale, NIHSS Scale, side effects, recurrence, other treatments, rehabilitation, biology.
- **Visit 3:** 6 weeks of onset of illness : Blood pressure, pulse, clinical evaluation with Barthel , NIHSS, Rankin et etiologic classification of stroke, ECG, biology, other treatments, patient's length of stay, evolution-prognosis.

Procedure

Patients were classified according to the rate of their blood glucose (central blood glucose intake) in three groups

- Normal glucose level : blood sugar ≤1.54 g/l; this group is considered to have normal blood sugar levels without any need for intervention.
- Class of therapeutic abstention : 1.55g/l ≥ blood glucose ≤ 1.99g/l ; this group is considered as the one on which an intervention is possible but however this intervention is limited and/or canceled (therapeutic abstention) because of the risks posed by the correction of a minimal hyperglycemia by insulin therapy for fear of occurrence of a hypoglycemia, considered extremely deleterious.
- Class of insulin therapy : blood sugar ≥ 2 g/l this group is one whose hyperglycemia is judged to be able to receive treatment without the risk of hypoglycaemia. Correction of hyperglycemia was made according to the following protocol
- Upon discovery of hyperglycemia, immediate administration of 5 IU intravenous fast insulin (Actrapid); control every 2 hours with, in each case, 5 IU intravenous fast insulin up to the therapeutic target area of less than 2 g/l capillary blood glucose level; continuous control of the dextro every 2 hours with stopping insulin injections as soon as the dextro is less than 2/l 24 hours surveillance with end of protocol if other hyperglycemia is not objectified. NB : In case of hypoglycaemia, complete discontinuation of the protocol and administration of 10% glucose serum (G10).

Then we proceeded to the comparison of each class according to the results obtained at different scales of assessment of the motor handicap

- The class of therapeutic abstention is compared to the class of normal blood glucose to determine the exact difference in functional prognosis induced by therapeutic abstention in the class of therapeutic abstention ;
- The abstention class is compared to the insulin therapy class to determine whether patients who have received a correction for their hyperglycaemia have a better future than the group of therapeutic abstention, if there have been cases of hypoglycemia during correction and compare the functional outcome of these cases with that of the therapeutic abstention group.

The scales used for this purpose are the NIHSS score, the Rankin scale and the Barthel scale. Indeed each patient was evaluated by each scale in 7 occasions: J0, J7, S3 and S6.

Equipment

To carry out our study, we had as material from

- The NIHSS scale (see Appendix 1) : This is a hetero-evaluation scale of the different clinical deficiencies of acute stroke, described in 1989 by the National Institute of Health : NIH StrokeScale . The switching time of the scale is 6 minutes 30 on average. There is a correlation between the score obtained in the first 24 hours and the volume of infarcted tissue measured on the tomodensitometry performed at the 7th day. The initial score allows a more reliable prediction of the residual disability of the patient than the other pre-existing scales
- A score less than 10 before the 3rd hour allows to expect 40% of spontaneous cures.
- A score above 20 excludes any possibility of spontaneous recovery.
- **The Rankin scale:** The Rankin scale (see Annex 2) proposes a very comprehensive approach to disability. It has six scores from 0 to 5, ranging from "No symptoms" (score 0) to "Severe disability" (score 5).
- **The Barthel scale:** Barthel's index (see Appendix 2) is an index also used preferentially after hemiplegia. In addition to its simplicity, its interest is to quickly give an indication of the functional situation. The maximum score is 100, corresponding to complete independence. A bedridden state is rated between 0 and 20, an addiction to consider a return home is above 60.

Data analysis

Data has been entered on SPSS version 16 for Windows. We proceeded by univariate analyzes (calculation of frequencies, averages and standard deviations). Then we compared the averages observed with the different scales as a function of the follow-up time by the ANOVA test. The results are expressed with a risk of error α <5%.

Constraints

Difficulties enameled the conduct of this study namely

- The follow-up of the patients at the time of their exit: the appointments often not honored, demotivation of the patients; difficulty to reach patients by phone, carrying out additional examinations left to the care of patients who are often poor;

Ethical considerations

Patients were selected after obtaining their informed consent about the general purpose of the study.

Results

Main features

We recruited 70 patients with an average age of 56.5 years ± 14.8 and a median of 55 years (the minimum: 22 years and maximum: 85 years). The 41-60 age group was in the majority.

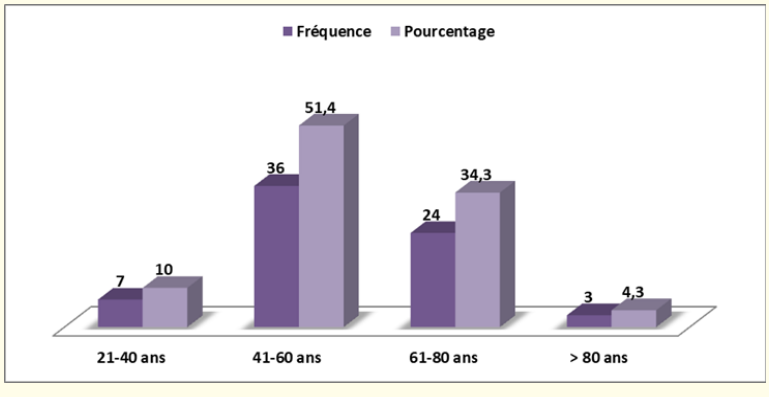

Figure 1: Distribution of patients by age group.

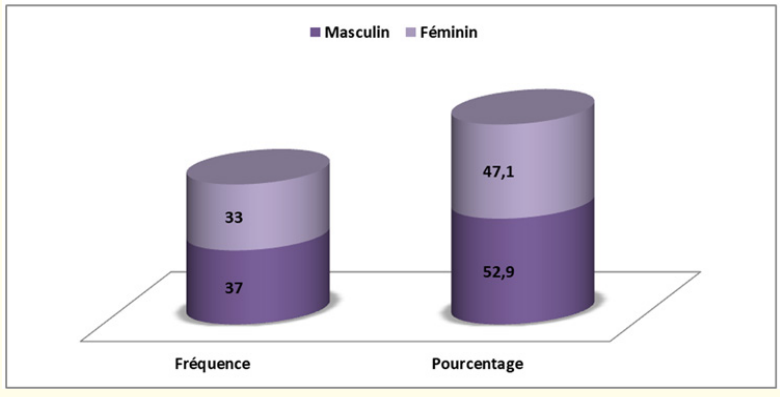

Figure 2: Distribution of patients by sex.

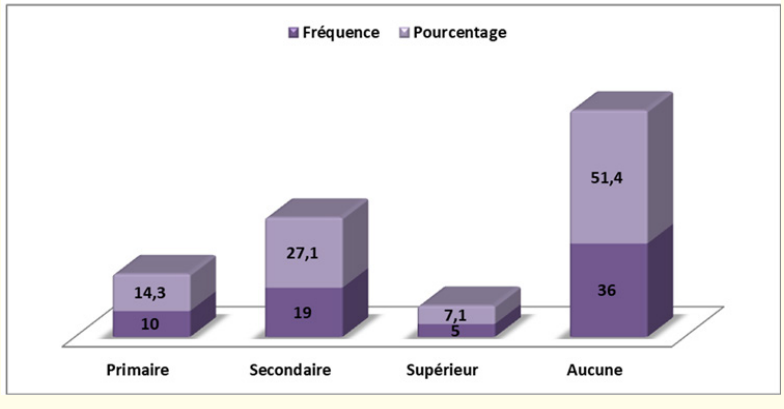

Figure 3: Distribution of patients by level of education.

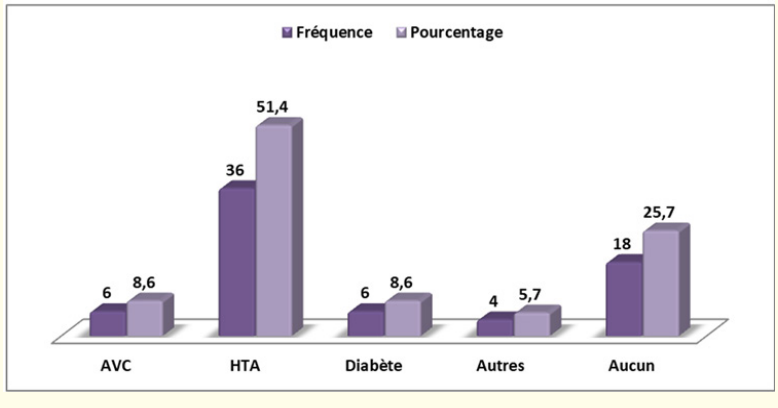

Figure 4: Distribution of patients according to risk factors.

Way of life	Number	Percentage
Tobacco	18	25.7
Alcohol	8	11.4
Coffee	39	55.7
Tea	33	47.2

Table 1: Distribution of patients by lifestyle.

Smoking was the most common lifestyle with 25.7% of our patients.

Physical activity	Number	Percentage
Market	12	17.1
Bike	5	7.2
Martial Arts	7	10
Other	1	1.4

Table 2: Distribution of patients according to the physical activity practiced.

Walking was the most popular physical activity at 17.1%.

Clinical features

Consultation time	Number	Frequency
<12 h	46	65.7
12 - 24 h	24	34.3
Total	70	100

Table 3: Distribution of patients according to consultation time.

The majority of our patients (65.7%) consulted within 12 hours after occurrence of the deficit.

Neurological deficit	Number	Percentage
hemiparesis	16	22.9
Hemiplegia	52	74.2
Central facial paralysis (PFC)	2	2.9
Total	70	100

Table 4: Distribution of patients according to the neurological deficit.

The hemi-corporeal motor deficit was present in all our patients. This deficit was complete with hemiplegia in 74.2%.

Arterial pressure	Number	Percentage
Systolic hypertension -diastolique	25	75.8
Systolic hyperpressure	7	21.2
Diastolic hyperpressure	1	3
Total	33	100

Table 5: Distribution of patients according to blood pressure on admission.

75.8% of patients had systolic- diastolic hypertension.

Paraclinical characteristics

Time to perform the brain scanner	Number	Frequency
<12 h	45	64.3
12 - 24 h	25	35.7

Table 6: Distribution of patients according to the time of realization of the scanner.

Forty-five patients (64.3%) performed their CT scan within 12 hours of the onset of the deficit.

ECG Echocoeur	ACFA	HVG	BB	Sinus tachycardia	Other	Normal	Total
Par	1	-	-	1	1	5	8
CMH	7	13	2	-	1	8	31
CMD	2	2	-	-	-	2	6
Heart Valve	-	2	-	-	1	-	3
Other	2	-	-	1	1	1	5
Total	12	17	2	2	4	16	53

Table 7: Distribution of electrocardiographic and echocardiographic abnormalities found.

The most frequent anomaly found in functional explorations with 31 cases is hypertrophic cardiomyopathy (44.3%).

Biology	Number	Percentage
Serum electrolytes	58	82.9
Creatinine	61	87.1
Blood sugar	70	100
Cholesterol	59	84.3
Transaminases	56	80

Table 8: Distribution of patients according to the biological examinations carried out.

With regard to blood glucose, 100% of our patients were dosed on admission.

Biological abnormalities	Number	Percentage
Hypercréatinémie	9	12.9
Hypercholesterolemia	3	4.3
Hyperglycemia	32	45.8

Table 9: Distribution of patients according to biological abnormalities.

Biological assessment could not be performed by all patients. Blood glucose disorders were the most common with 45.8%.

Evolutionary and prognostic characteristics

Classification of patients according to their blood glucose levels

Patients with normal blood glucose are the most numerous with 54.28% of the study population.

Functional prognosis in the acute phase

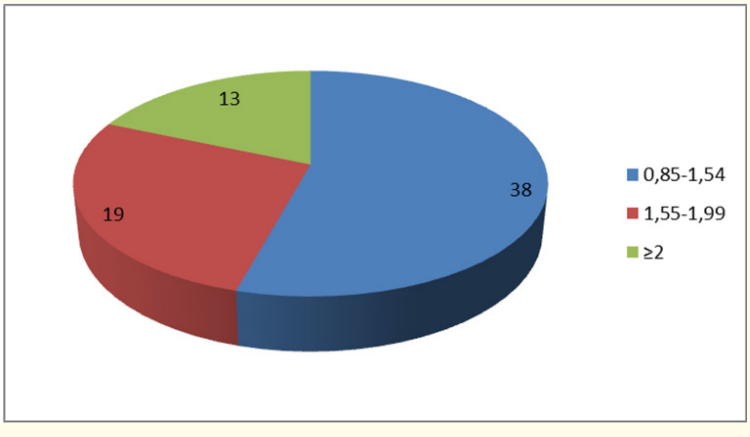

Figure 5: Number of patients based on blood glucose classes.

For each scale except Barthel , the best scores were obtained by the normal blood glucose group and the worst score by the intermediate blood glucose group, that is, the therapeutic abstention class. .

Scalable characters according to different scales

Evolution according to the NIHSS score

Over the 6 weeks of observation, the NIHSS rating found the lowest scores by the normal glucose group and the highest scores by the therapeutic abstention group.

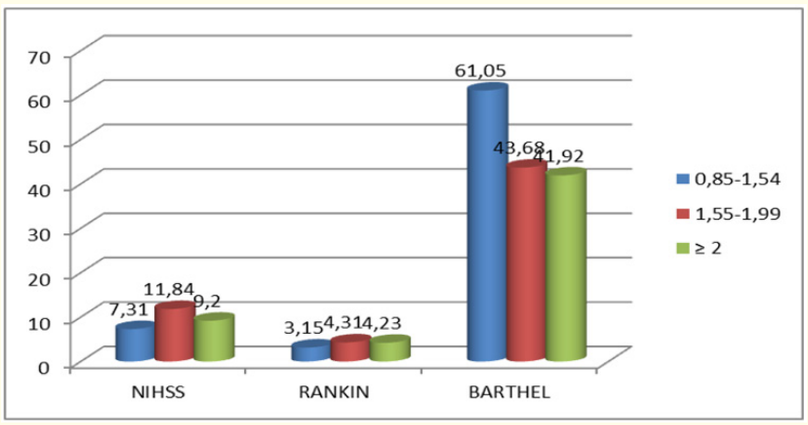

Figure 6: Functional prognosis of different scales at D0.

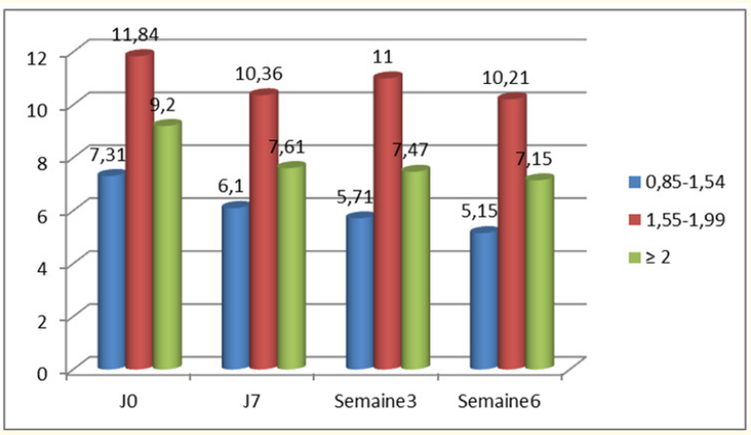

Figure 7: Evolutionary characteristics of the different classes of glycemia according to the NIHSS score.

Evolution according to the Rankin scale

Over the 6 weeks of observation, the Rankin scale assessment found the lowest scores by the normal blood glucose group and the highest scores by the therapeutic abstention group.

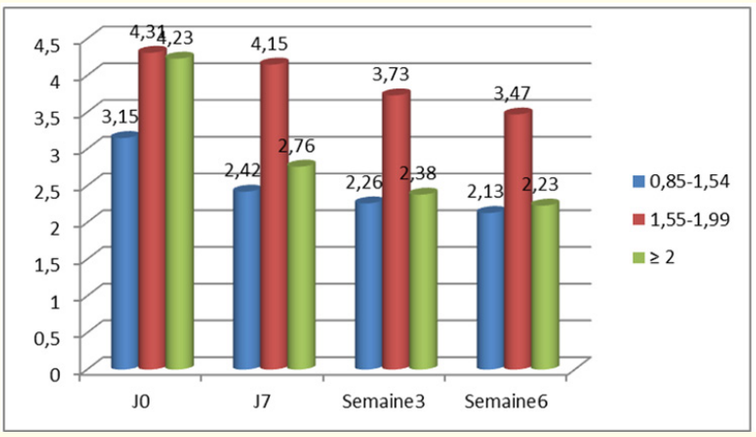

Figure 8: Evolutive characters of different classes of blood glucose levels according to the Rankin scale.

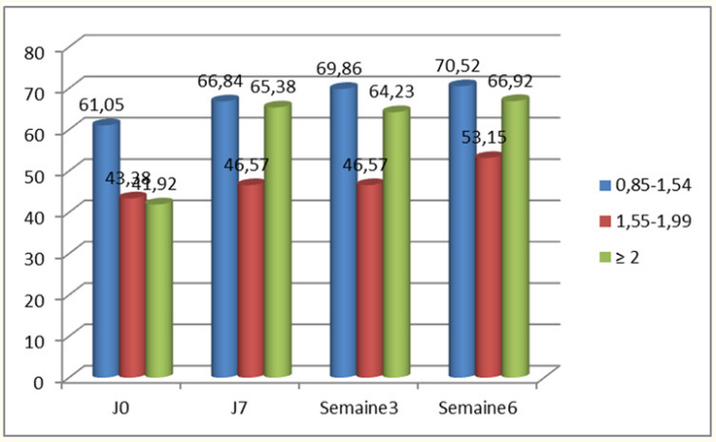

Figure 9: Evolving characters of different blood glucose classes according to the Barthel scale.

Evolution according to the Barthel scale

On the 6 weeks of observation, the Barthel index assessment found the highest scores by the normal blood glucose group and the lowest scores by the therapeutic abstention group.

Evolution according to days of hospitalization

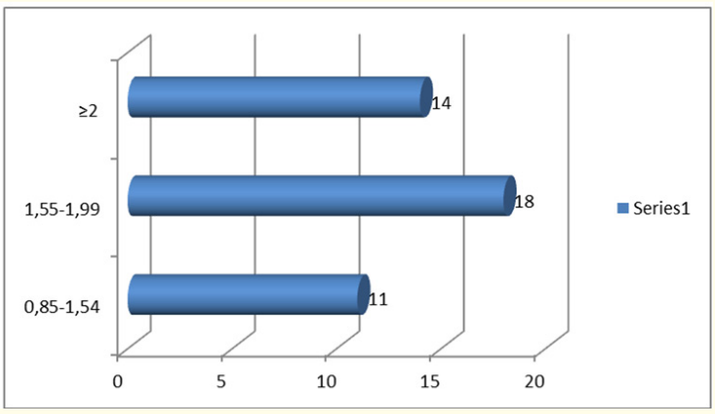

Figure 10: Evolutionary characteristics of the different classes of glycemia according to the NIHSS score.

The longest period of hospitalization was observed in the intermediate blood glucose group with 18 days of hospitalization.

Evolution according to the number of deaths

The highest number of deaths was observed in the intermediate blood glucose group with 50% of all deaths.

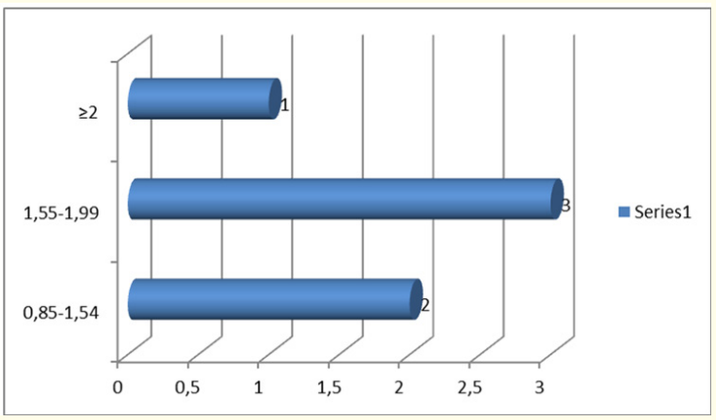

Figure 11: Evolutionary characteristics of the different classes of glycemia according to the NIHSS score.

Comparison of the functional prognosis between the group of normal glucose and that of intermediate glucose

The comparison found a better evolution in the normal blood sugar group on the three scales.

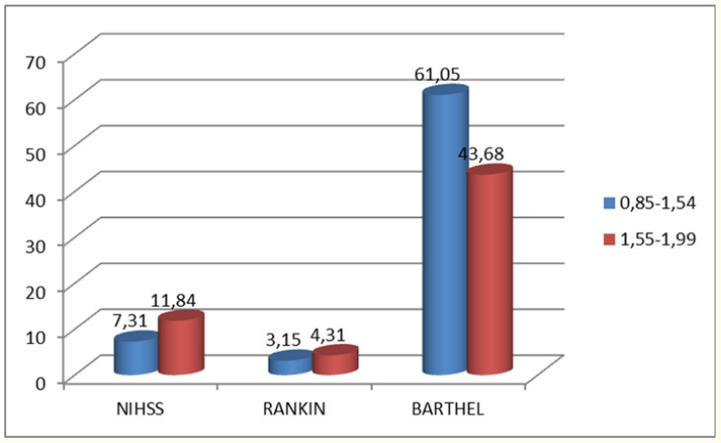

Figure 12: Evolutionary characteristics of the different classes of blood glucose levels according to different scales of evaluation.

Comparison based on NIHSS score

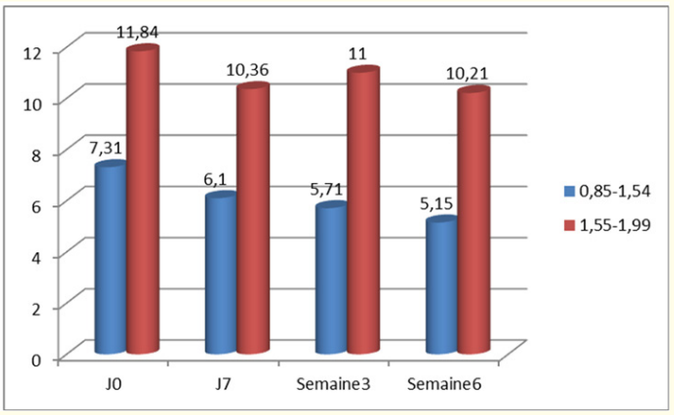

Figure 13: Evolutive characteristics of different classes of blood glucose based on the NIHSS score

The class of the therapeutic abstention obtained the highest scores with however an improvement from week to week. This weekly improvement is also observed in the group of therapeutic abstention.

Comparison according to the Rankin scale

The class of the therapeutic abstention obtained the highest scores with however an improvement from week to week. This weekly improvement is also observed in the group of therapeutic abstention.

Comparison according to the Barthel scale

Therapeutic abstention class showed poor functional progression with lower scores on the 6-week Barthel Scale

Comparison according to the duration of hospitalization

The class of therapeutic abstention observed the longest period of hospitalization with an average of 18 days.

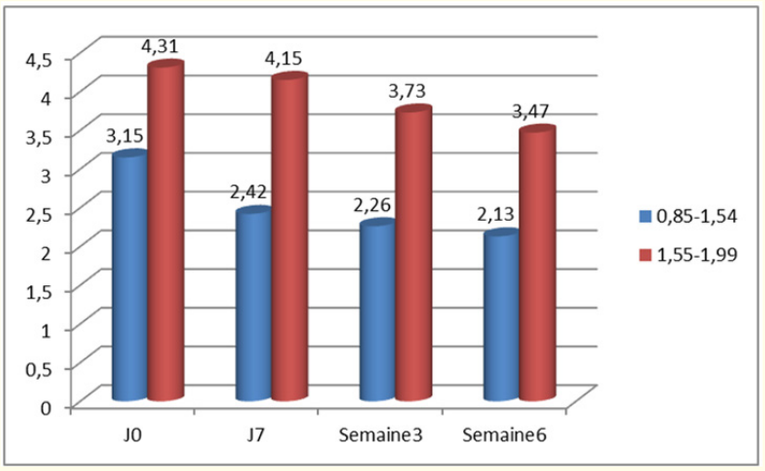

Figure 14: Evolutive characters of different classes of blood glucose levels according to the Rankin scale.

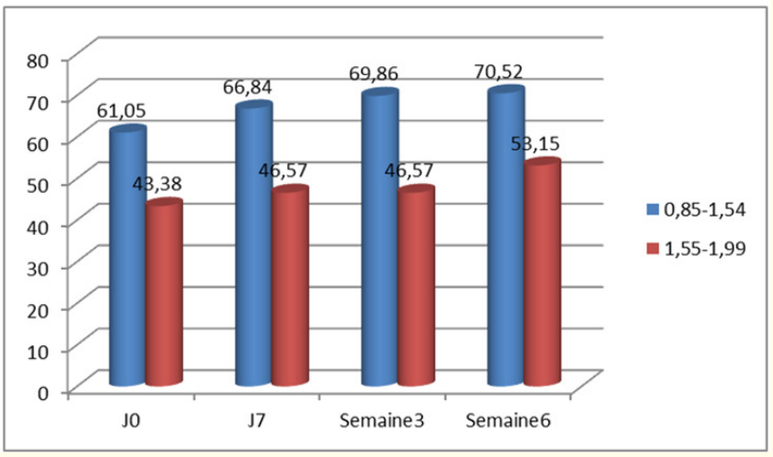

Figure 15: Evolving characters of different blood glucose classes according to the Barthel scale.

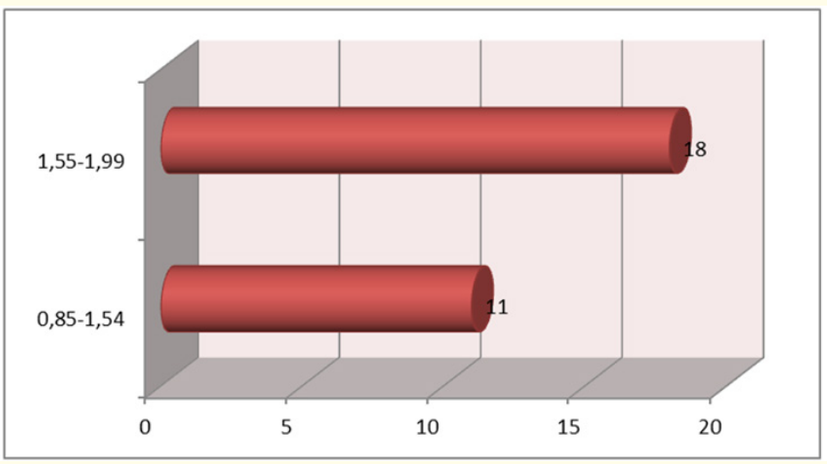

Figure 16: Evolutive characteristics of the different classes of blood glucose levels according to length of hospital stay.

Comparison according to mortality

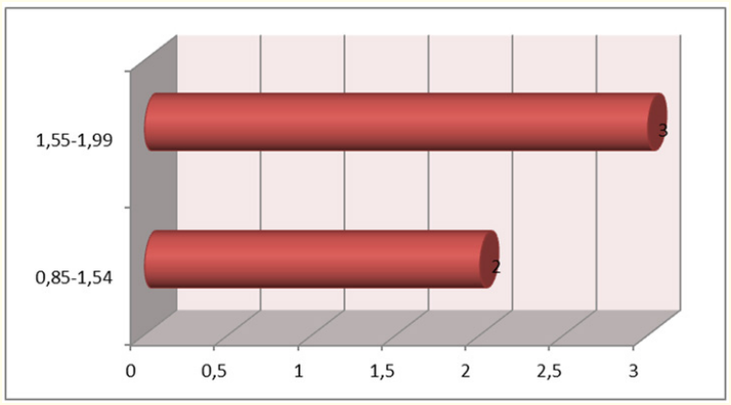

Figure 17: Evolutionary characteristics of different classes of blood glucose as a function of mortality.

The therapeutic abstention class observed more deaths with 3 deaths over the 6 weeks of observation.

Comparison of the functional prognosis between the intermediate blood glucose and that greater than or equal to 2

On all assessment scales, the therapeutic abstention class scored lower.

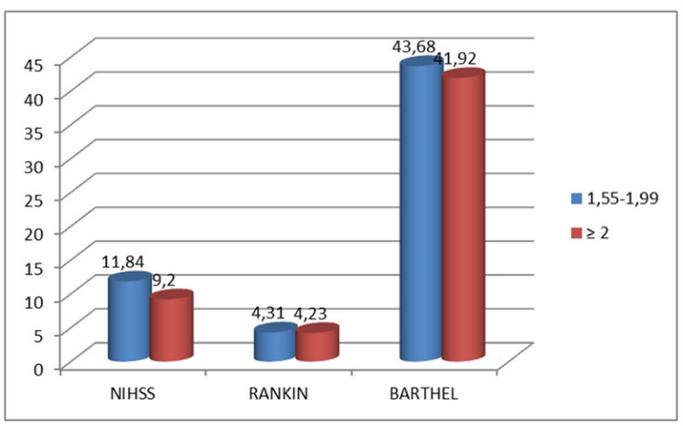

Figure 18: Evolutionary characteristics of the different classes of blood glucose levels according to different scales of evaluation.

Comparison based on NIHSS score

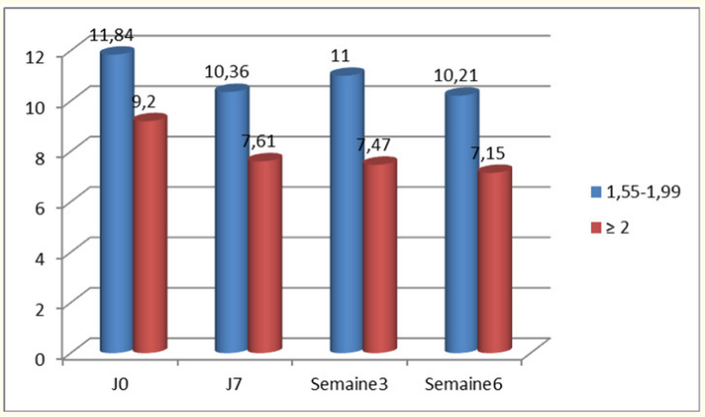

Figure 19: Evolutive characteristics of different classes of blood glucose based on the NIHSS score.

The class of therapeutic abstention had the highest scores with a gradual improvement from week to week as the class of insulin therapy.

Comparison according to the Rankin scale

The class of therapeutic abstention had the highest scores with a gradual improvement from week to week as the class of insulin

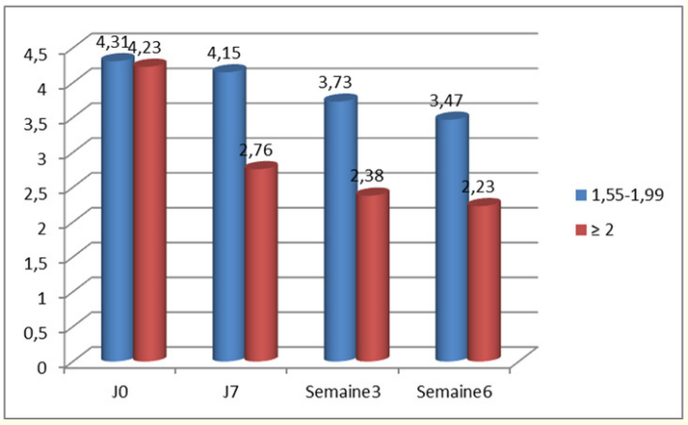

Figure 20: Evolutive characters of different classes of blood glucose levels according to the Rankin scale.

therapy. However, on day 0, the class of therapeutic abstention achieved a better score than the class of insulin therapy with respectively 4,31 and 4,23.

Comparison according to the Barthel scale

The therapeutic abstention class had the lowest scores with a gradual improvement from week to week as the class of

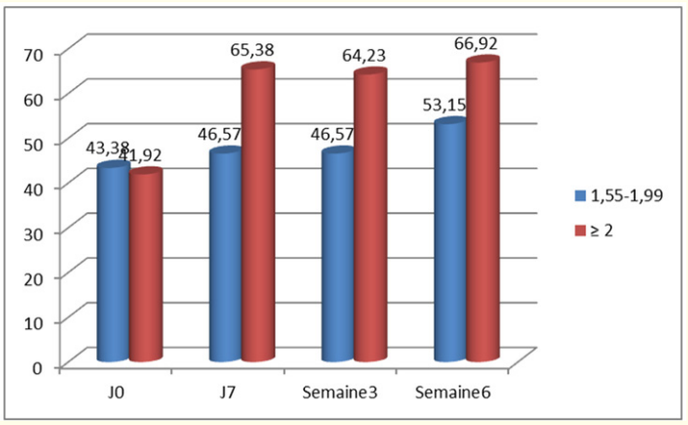

Figure 21: Evolving characters of different blood glucose classes according to the Barthel scale.

insulin therapy. However, on day 0, the therapeutic abstention class achieved a better score than the insulin therapy class with 43.38 and 41.92, respectively.

Comparison by days of hospitalization

The class of therapeutic abstention observed the longest period of hospitalization with an average of 18 days.

Comparison according to mortality

The therapeutic abstention class observed more deaths with 3 deaths over the 6 weeks of observation.

-

Lethality and cumulative probability of survival

During the observation, we had 6 deaths and 1 lost sight, a global lethality of 8.83%. The second and third weeks were my most lethal with 2 deaths for each of them. At week six, the cumulative probability of survival was 91.42%.

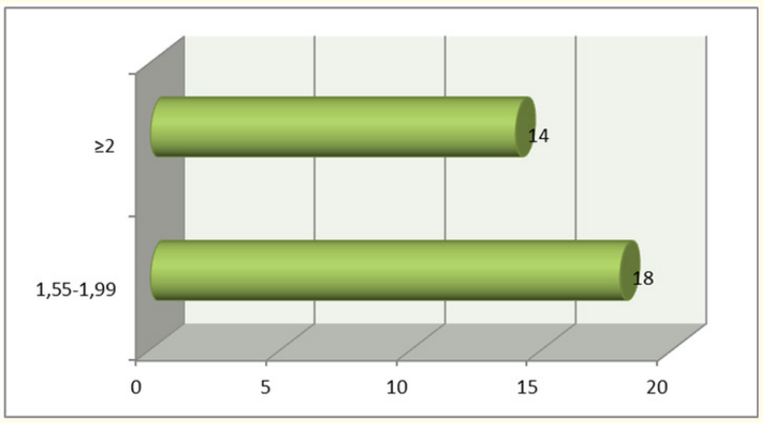

Figure 22: Evolutive characteristics of the different classes of blood glucose levels according to days of hospitalization.

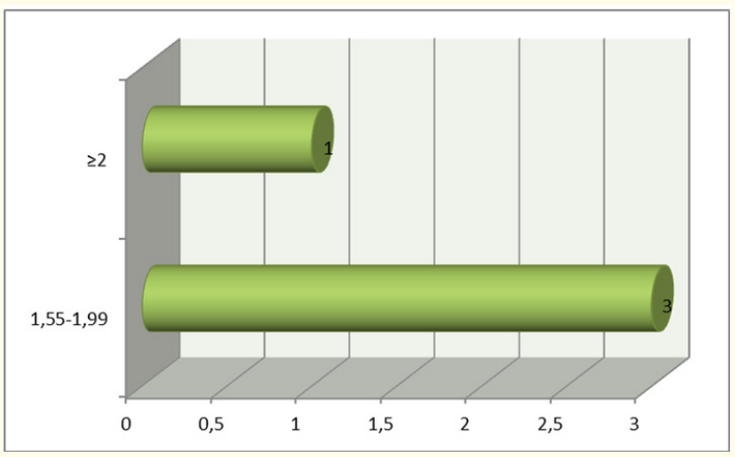

Figure 23: Evolutionary characteristics of different classes of blood glucose as a function of mortality.

	Number of patients	No. of deaths	lethality	Percentage of survival	Cumulative probability of survival
1st Week	70	1	1.43	98.57	98.57
2nd Week	69	2	2.89	97.1	95.71
3rd Week	67	2	2.98	97.01	92.85
3th Week	65	0	0	100	92.85
6th Week	65	1	1.53	98.46	91.42

Table 11: Distribution of patients according deaths and survival.

Discussion

Main Features

Age distribution

The mean age of the cohort in our study was 56.5 ± 14.8 years with extremes ranging from 22 to 85 years. The most represented age group was 41 to 60 years old, representing 51.4% of the workforce. This average age is similar to the results obtained in most African studies. Indeed, Keita., *et al.* [9] found that for all strokes combined, mean age ranged from 44.5 to 61 years. Identical results were obtained bySene Diouf F., *et al.* [19] in Senegal. In Europe, Goldstein., *et al.* [8] find an average age of 55 years. This study also shows that the occurrence of stroke increases with the age of patients and this regardless of gender [19,20,28].

Repair by sex

We recruited 33 female patients, compared to 37 male, a slight male predominance. This result is superimposed on that obtained by Rothwell [17,19] but also other studies conducted on the continent [19,20], which notes a higher incidence rate among men under 75, but the trend is reversed. The reversal of the trend is explained by the author by a longer life expectancy among women. For us, it would be due to the loss of hormonal protection after menopause. However, male dominance has not been observed around the world [6].

Distribution of patients by level of education

Our study shows a strong representation of non-educated patients is 51.4%. These results are similar to those obtained by Desalu et *al* in Nigeria [6]. For the latter, the level of education is often a reflection of the socio-economic level. Socio-economic status is a function of social success, level of education, and type of occupation. His argument is the following Patients with a higher level of education, who were most often men, were more aware of their risk factors for stroke than low-educated patients strongly represented by women in this locality. Nigeria.

Breakdown of patients by major risk factors

The continuing relationship between systolic or diastolic blood pressure (BP) level and the risk of AIC and HIP has been demonstrated in several studies including that of Lewington et *al* in 2002 [10] in Europe. In our study, high blood pressure (hypertension) was present in 51.4% of cases. This means that the fraction of stroke risk attributable to high BP is very important. In 13.1% of stroke cases in our study, this was a recurrence. This observation raises the interest of primary and secondary prevention in order to reduce the incidence of stroke in the world by a good management of modifiable risk factors such as diabetes observed in 8.6% of the cases in our study. However, in a significant way, 25.7% of the cases, no FDR was found. Despite the significant progress made in recent years in understanding the mechanisms and causes of stroke, a large proportion remains unexplained, as is the case in our work.

Distribution of patients by lifestyle and physical activity

Of the modifiable risk factors, smoking and drinking were observed in 25.7% and 11.4% of our patients, respectively. This rate of alcoholism may be underestimated because of the religious context in a predominantly Muslim population where alcohol consumption is disavowed.

While the risk of stroke increases with exposure to tobacco [21], for alcohol there seems to be a protective effect of moderate consumption for doses of 12 to 24g/d [17].

Walking was practiced in 17.1% of cases. This result is explained by the fact that most of our patients were over 60 years old. Indeed, the African cultural context does not favor the practice of physical exercises that are considered activities that are not his age. The effectiveness of the practice of a physical activity (in the professional or of leisure) is observed only when it is carried out regularly and this relation is dose-effect [22].

Clinical features

The admission time was generally within 12 hours of the onset of symptoms and the CT scan was obtained within one hour for the majority of patients, with AIC or HIP categorization requiring brain imaging. In this study AIC was observed in 81.4% of cases against 18.6% for HIP. These results are identical to those described by European studies [8,17] , but also African [9,19,24] with different proportions for both types. The differences observed may be related to recruitment bias, but also technical, or case definition as some authors still include other entities consistent with the WHO definition, such as subachnoid haemorrhage or thrombophlebitis. Clinically, these neurological disorders resulted in: hemiplegia in 74.2%, 22.9% hemiparesis and 2.9% central facial paralysis (PFC).

Characteristics of functional explorations

Atrial fibrillation with cardiac arrhythmia (ACFA) was noted in 17.1% of cases. It is a potent risk factor for AIC multiplying the risk by five. Currently it is the most common embolism heart disease .About 15% of patients with ACI are in FA and this proportion has a tendency to increase in subjects. These results

confirm the observations made in our study. However other cardiac functional abnormalities have been observed namely left ventricular hypertrophy (LVH) in 24.3% of cases. LVH, a reflection of hypertrophic cardiomyopathy (HCM), is a common complication of hypertension that is found in 24.3% of our patients. Approximately half of the MHC cases (41.9%) have an electromyogram (ECG) LVH. Several studies have shown that there is an inverse relationship between the ejection fraction (EF) and the risk of AIC. AF is a common complication during heart failure, the greater the risk of developing the condition that left ventricular dysfunction is severe [3,8].

Biological characteristics

Hyperglycemia and hypercholesterolemia were the main biological abnormalities observed in the study population with respective proportions of 45.71% and 4.3%. Indeed, as shown by the works of Mr. Mazighi and P. Amarenco [12], hyperglycemia is a common condition affecting 50% of hospitalized stroke patients.

With regard to hypercholesterolemia, the few studies on the relationship between LDL- cholesterol and AIC have so far shown contradictory results [8].

Prognostic and progressive characteristics

Prognostic characteristics

All our patients had a good prognosis at admission because of our admission criteria. Indeed, we have recruited only conscious patients with a good Glasgow score (15/15) and whose deficits are at most hemi corporal or less. These inclusion criteria were justified on the one hand, for ethical reasons, because the patient had to give his consent himself and on the other hand, because of our short period of investigation.

Nevertheless it should be said that patients with normal blood glucose levels have the best prognosis across the different rating scales.

However, in terms of comparison, the class of therapeutic abstention is the one that presented the worst prognosis at the different scales of assessment and this in agreement with data from the literature that addresses the issue [2,7,12].

It should be noted, however, that at admission (J0 only), the insulin therapy class (correction of hyperglycemia by insulin administration from 2 g/l of blood glucose) presented the worst score in the Barthel evaluation with 43,38 and 41,92, respectively. This could be explained by the fact that, apart from any therapeutic intervention, the prognosis, is altered proportionally to the blood glucose level, which means the higher the blood sugar, the worse the outcome.

Evolutionary characteristics

On the whole, our patients had a favorable evolution at the end of the 6 weeks of observation with the different scales of evaluation. At the sixth week, the patients obtained scores representing minor disorders: between 53.15 and 70.52 for Barthel , 2.13 and 3.47 for Rankin and 5.15 and 10, 21 for NIHSS . This could be explained by the inclusion criteria of the study but also and especially by the surveillance offered by the framework of our study even after hospitalization.

In terms of comparison of the recovery of motor disability, the class of the therapeutic abstention is the one which presented the slowest recovery in a gradual way week by week and which also presented at the end of the observation of 6 weeks, the most of residual handicap with a score of 10,21 at NIHSS against respectively 5,15 and 7,15 for the class of normal glucose and the class of insulin therapy; in Rankin, 3.47 against 2.13 and 2.23; at Barthel 53.15 against 70.52 and 66.92. In the literature, recovery of motor disability may be poor if hyperglycemia is not corrected from 1.55 g/l [12,16,25,27].

In terms of duration of hospitalization, the class of refraining from treatment was the one whose patients lasted the most in the hospital with an average duration of 18 days compared with 11 days and 14 days for normal glucose classes respectively. insulin therapy. This could be explained by the fact that the patients in the therapeutic abstention class presented many more complaints during daily visits to the hospital, thus justifying their longer stays on the part of the doctors who had to investigate these complaints. A team from Indiana University also found acute phase hyperglycemia in DALY associated with a longer hospital stay as well as a high cost of fees.hospitalization [27].

NB Although the NIHSS is not indicated in motor disability surveillance, we wanted to keep it for its items that assess sensitivity. Indeed, we felt that this is well indicated given the high frequency of sensitivity disorders in diabetes which is also a hyperglycemia.

In terms of mortality, we had in any death. This time again it is the class of therapeutic abstention which holds the greatest number of deaths. This is described in several literature studies, uncorrected hyperglycemia starting at 1.55g/l can lead to higher mortality [27,28]. This time we cannot validly explain this high number of deaths in this class because we do not have opportunities for autopsy because of religious considerations that are against the practice of autopsy. Experimental studies indicate that hyperglycemia increases the neuronal damage that occurs during ischemia, and is associated with decreased cerebral blood flow, increased edema, and increased blood size. cerebral infarction. In contrast to animal models, the risk of haemorrhagic transformation of cerebral infarction is not increased in hyperglycemic patients , with the exception of patients treated with rt-PA [12].

Conclusion

In the light of our investigations, we believe that even minor hyperglycemia should be normalized in the acute phase of ischemic stroke, despite fears of hypoglycaemia during correction.

In terms of prognosis or progression, morbidity and mortality are higher in patients with no treatment than in patients who have received insulin therapy. However, it is imperative for caregivers to adopt a rigorous management and monitoring protocol to avoid possible complications and mainly hypoglycaemia.

With this study, we prove that by making the effort of a rigorous surveillance, we can give ourselves the means to follow the updated recommendations in the literature and this for the greater good of all our patients.

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