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Stroke (Cerebrovascular Accident): Epidemiological, Clinical and Evolving Aspects in the Internal Medicine Department of the Public Health Establishment 1 (EPS1) of Tivaouane

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Abstract

Introduction: The frequency, severity, cost of treatment, morbidity and mortality of stroke make it a real public health problem. In industrialized countries, strokes are the leading cause of physical disability in adults, the second leading cause of dementia (after Alzheimer's disease), and the third leading cause of death (after cancer and cardiovascular disease). It's also a major cause of depression. The objective of our study was to describe the epidemiological, clinical and evolutionary aspects of stroke in the internal medicine department of Tivaouane Hospital. **Material and Method:** This is a retrospective study carried out from January 1, 2015 to December 31, 2018 on the files of patients hospitalized for stroke in the medical department of the EPS1 in Tivaouane. We took into account all the patients who had a brain CT (computed tomography) scan. We collected data related to socio-demographic characteristics, history, risk factors, reasons for admission, clinical signs, paraclinical examinations, as well as evolution. **Results:** Out of 1999 patients, 206 files of patients with stroke were collected, *i.e.* a proportion of 10.3%. Our study population had a mean age of 65.53 years [16 - 97 years]. We noted a clear predominance of women (50.5%). The majority of the population came from the outskirts of Tivaouane (56.7%). Risk factors for stroke were domi-

nated by hypertension (90.3%), dyslipidemia (19.4%), previous stroke (18.9%), and diabetes (16%). The clinical signs were dominated by a motor deficit (94.1%), speech disorders (67.4%) and consciousness disorders (47%). Ischemic strokes were predominant (65%) over hemorrhagic strokes (34.5%). The outcome was generally unfavorable with 14.6% total recovery, 58.7% recovery with sequelae and a case fatality of 26.7%. **Conclusion:** It emerges from this study that strokes still remain a real public health problem. Knowledge of populations of risk factors as well as their proper management is fundamental in primary prevention strategies, the only guarantee for a reduction in the still very high morbidity and mortality of this disease.

Keywords

Cerebrovascular Accident, Epidemiology, Risk Factors, Tivaouane EPS1

1. Introduction

Cerebrovascular accidents (CVA) pose a major public health problem, due to their frequency, residual physical and cognitive disabilities, their financial cost, the number of recurrences and their mortality rate. Each year in France, the number of new cases of stroke is very high, estimated at around 140,000 [1]. They represent the first (1st) cause of acquired disability in adults, the second (2nd) cause of vascular dementia, and the third (3rd) cause of mortality, *i.e.* 9% of deaths, a major cause of depression in patients and their entourage, a cost of care estimated at 2.4% of the total cost of health expenditure in the world [2]. In Senegal, strokes are at the forefront of neurological conditions. They represent more than 30% of hospitalizations and are responsible for two thirds of mortality in the neurology department of Dakar. In developed countries, thanks to the improvement of care through the creation of neurovascular emergency units and the treatment of risk factors, we are witnessing a constant reduction in morbidity and mortality [3]. In Tivaouane, no study on stroke has been carried out to date, although the incidence of stroke in Africa in general and in Senegal in particular has been growing constantly in recent years due to reasons of galloping urbanization, change in eating habits, increase in risk factors. This is why we proposed to study strokes in their epidemiological, clinical and evolutionary aspects at the EPS of Tivaouane.

The general objective of our study was to study the epidemiological, clinical and evolutionary aspects of cerebrovascular accidents in the internal medicine department of the Mame Abdou Sy Dabakh Hospital in Tivaouane and to formulate recommendations to reduce morbidity and mortality. The specific objectives of our study were to determine the prevalence, to identify the risk factors, to study the clinical and paraclinical aspects and to evaluate the evolution during hospitalization of cerebrovascular accidents in the internal medicine department of the Mame Abdoul Sy Dabakh Hospital in Tivaouane.

2. Patients and Methods

The study was conducted in the Internal Medicine department of the Mame Abdou Aziz Sy Hospital in Tivaouane (EPS1 (Public Health Establishment 1)). It was a retrospective study concerning the study of the files of the patients hospitalized for AVC in the Department of Internal Medicine. It covers the period from January 1, 2015 to December 31, 2018. Our study concerned all patients hospitalized for stroke in the Internal Medicine Department of Mame Abdoul Sy Dabakh Hospital in Tivaouane during this period. Included in this study, all patients, without distinction of sex, age and area, were hospitalized in the Internal Medicine Department of EPS1 of Tivaouane during the study period and presenting a stroke confirmed by a Brain CT. Not included in the study were patients hospitalized in the department for another pathology, non-hospitalized patients followed on an outpatient basis, patients hospitalized in the department for a stroke not confirmed by brain CT and patients whose records were not found. Data were collected from patient files. A standard survey form was completed for each patient and included: sociodemographic data, history, conditions and lifestyle, length of hospitalization, cardiovascular risk factors, clinical signs, particularly neurological signs on admission, vital parameters, paraclinical examinations (fasting blood sugar, lipid profile, creatinine clearance by the MDRD (modification of diet in renal) method, blood ionogram, ECG (electrocardiogram), cardiac ultrasound, brain scan), pathologies associated with Stroke during hospitalization, treatment received and evolution during hospitalization. The data collected was first coded and then entered using Excel software. These were then cleaned and corrected before being analyzed, using SPSS 21 software. The univariate analysis consisted of determining the dispersion and central tendency characteristics of each variable studied. The measurement of associations between death and variables, which were categorical, was made using Pearson's Chi-square test and Fischer's test. Regarding the association of death with a continuous variable, the Student test was used.

3. Results

During our study, we collected 206 files.

Descriptive study: during the study period, from January 1, 2015 to December 31, 2018, a total of 1999 patients were hospitalized in the department, of which 206 had a stroke, representing a prevalence of 10.3%. Ninety-seven (97) were excluded.

Analytical study: the most representative year of admission was the year 2016 with a proportion of 30.7% followed by the year 2015 with 30.2% then the year 2017 with 23.7% and finally the year 2018 with 15.4%.

Socio-demographic characteristics: the average age of patients is 65.53 years with a minimum of 16 years and a maximum of 97 years. Most (75.2%) patients were over 59 years old. They were distributed as follows: 1.9% were under 30 years old, 3.4% between 30 - 39 years old, 7.8% between 40 - 49 years old and the rest, 11.7% between 50 - 59 years old. Not that the 70 - 79 year-old age group

was more representative followed by the 60 - 69 year-old age group. Figure 1 shows the distribution of patients across different age groups.

In our study, among the 206 patients, we had 104 women (50.5%) and 102 men (49.5%), *i.e.* a M/F sex ratio of 0.98. Regarding their professional activity, they worked in the primary sector in the vast majority of cases (88.3%). This is represented by the following figure.

From the point of view of medical history, about 9 out of 10 patients (90.3%) were known hypertensives, 18.9% of whom had had a stroke in the past. Diabetes was noted in 12.6% of patients. Slightly more than a third (36.9%) said they had had a migraine in the past and 5 of them, or 2.4% reported taking estrogen-progestogen. As far as lifestyle habits are concerned, the consumption of alcohol (0.5%) or tobacco (4.4%) was infrequent among patients. The figure below represents the habits and lifestyle.

Clinical characteristics: the reasons for admission are strongly represented first by motor deficits with a rate of 94% of patients then by language disorders with a rate of 67.5% of patients and finally by disorders of consciousness with a rate of 47.1% of patients. Headaches are also noted with a rate of 33.5% of cases. Clinically, patients had clear consciousness in a little more than half of the cases (52.9%). The other most common clinical signs were dysarthria (36.4%), headaches (33.5%), obtundation (34.5%), aphasia (31.1%), right hemiplegia (28.2%) and left hemiplegia (21.8%), cases of light (9.2%) and deep (3.4%) coma. Table 1 gives the distribution of clinical data.

Paraclinical characteristics: from a biological point of view, blood sugar levels were normal in just over 7 out of 10 cases (70.9%) and hyperglycemia was noted in 29.1% of cases. No cases of hypoglycaemia were found. Concerning the lipid profile, 40 patients had dyslipidemia (19.4%). Ionic disorders were present in 91 patients (44.1%) including 36 cases of dysnatremia (17.5%) and 55 cases of dyskalemia (26.7%). In our study, 120 patients (58.3%) had normal serum creatinine. According to creatinine clearance calculated by the MDRD method: 32

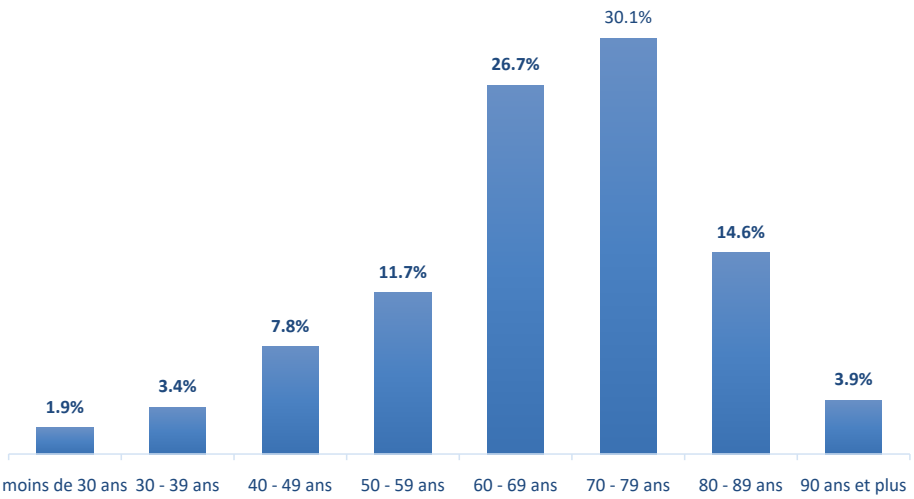

Figure 1. Distribution of patients by age.

patients had chronic renal failure stage 2 (15.5%), 28 patients had chronic renal failure stage 1 (13.6%), 24 patients had renal failure chronic stage 3 (11.7%), 1 patient had chronic renal failure stage 4 (0, 5%) and 1 patient had stage 5 chronic renal failure (0.5%). The stages of chronic insufficiency are listed in the following table. The ECG was normal in the majority of cases (57.3%) or 118 cases. More than 7 times out of 10 (73.8%) the CT scan completion time did not exceed 24 hours and in 22.3% of cases this time was 48 hours. In a small proportion (2.9%) the CT scan was performed 72 h after the patient's admission as illustrated in Figure 2.

In our study, 135 patients had ischemic stroke (65.5%) and 71 patients had hemorrhagic stroke (34.5%).

Treatment: Regarding drug treatment, solutions were administered in almost all cases (95.6%). The other molecules administered were often antihypertensives (77.2%), analgesics (73.8%), antiaggregants (66.0%) and anticoagulants (56.8%).

Table 1. Distribution according to neurological signs on admission.

	Effective	%
Clear awareness	109	52.9%
Dysarthria	75	36.4%
Obstinacy	71	34.5%
Headaches	69	33.5%
Aphasia	64	31.1%
Right hemiplegia	58	28.2%
dizziness	49	23.8%
Left hemiplegia	48	23.3%
Left hemiparesis	45	21.8%
Right hemiparesis	43	20.9%
Convulsion	27	13.1%
Coma	26	12.6%
Brain death	0	0.0%

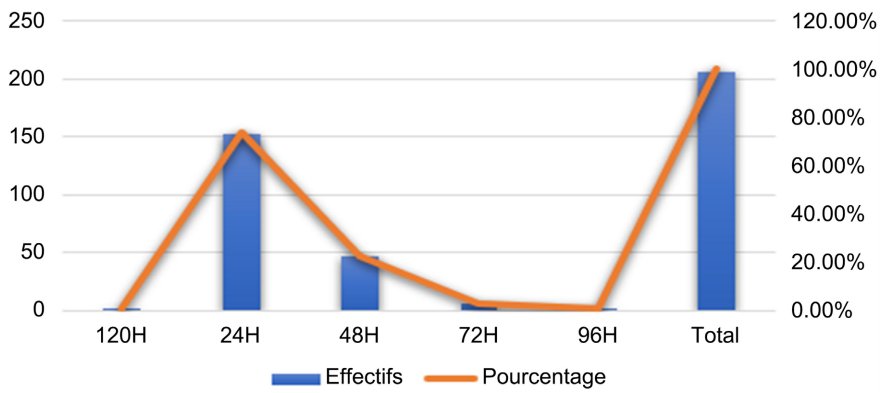

Figure 2. Scanner completion time.

In almost 3 out of 10 cases (24.8%) the patient was put on antibiotics and anticonvulsants were administered in 10.2% of cases. It should be noted that in more than 4 cases out of 10 (44.2%) the product administered was not specified. No surgical treatment was performed and the use of physiotherapy was observed in 122 patients (59.2%).

Evolution: among the 206 hospitalized patients, 30 patients (14.6%) had a favorable evolution with a complete recovery without sequelae, which was generally obtained between 96 H (96 hours) and 168 H (168 hours), 121 patients (58.7%) had a favorable evolution with sequelae, no patient was referred to neurosurgery, in the observed group, the lethality was 26.7%. Death generally occurred between 48 and 144 hours (94.3%). Deaths still occurred at 24 hours (1 case), 192 hours (1 case) and 360 hours (1 case).

Association between mortality and sociodemographic characteristics: the average age of deceased patients is 66.4 years compared to 65.2 years in non-deceased subjects. The difference is not significant (p-value = 0.605). Among the 55 deaths recorded, 35 were men, or 34.3% of the mortality, and 20 were women, or 19.2% of the mortality, with a significance level of p = 0.014. The risk of death for male subjects is 2.2 times higher compared to that of women (OR = 2.19 [1.161 - 4.146]. The proportion of deaths among patients in the primary sector is 26.4% compared to 29.2% among those in the secondary sector this observed difference is not significant.

Association between mortality and medical history and lifestyle: only stroke was associated with patient death. Deaths were more frequent in subjects with a history of stroke (53.8% vs 20.4%, with $p \leq 0.001$). Patients who had a stroke in the past were 4.56 times more likely to die than those who had not (0R = 4.56, with 95% CI = [2.191 - 9.505]. On the other hand, antecedents such as diabetes, hypertension, and migraine, taking estrogen-progestins, active smoking and alcoholism were not significantly associated with death. The differences observed in the proportions of deaths are comparable.

Association between mortality and clinical data: from a clinical point of view, patients who presented with impaired consciousness or convulsions were more exposed to the risk of death. In the group of patients with a coma, the proportion of deaths was 65.4% against 21.1% in the opposite case ($p < 0.001$) and the risk of death being 7.058 times higher (OR = 7.058 with 95% CI = [2.917 - 17.081]). For those who had convulsions the proportion of deaths was 23.5% versus 23.5% with a statistically significant difference (p = 0.010). As for the risk of death, it was 3.029 times higher compared to patients who did not experience a seizure. The finding was the same for patients who presented obtundation, left hemiplegia or aphasia. In the case of obtundation, the percentage of patients who died in 39.4% Vs 20.0% (p = 0.005) and the risk of death is 2.605 higher (OR = 2.605 with 95% CI = [1.379 - 4.919]). Regarding subjects who had left hemiplegia or aphasia, the proportions of deaths were respectively 39.6% Vs 22.8% (p = 0.026) and 35.9% Vs 22.5% (p = 0.0034). As for the risks of death, they were multiplied respectively by 2.22 (0R = 2.220; 95% CI = [1.116 - 4.416])

and 1.928 (OR = 1.928; 95% CI = [1.012 - 3.674]). When patients had clear consciousness, the percentage of death was (10.1% Vs 45.4%; with p < 0.001). (OR = 0.135; 95% CI = [0.064 - 0.283]. In the case of left hemiparesis the probability of death is 15.6% Vs 29.8% (p = 0.026). (OR = 0.434; 95% = [0.181 - 1.039]). The same observation is made on patients with dysarthria where the proportion of deaths was 13.3% Vs When patients had clear consciousness, the percentage of death was (10.1% Vs 45.4%; with p < 0.001). (OR = 0.135; 95% CI = [0.064 - 0.283]. In the case of left hemiparesis the probability of death is 15.6% Vs 29.8% (p = 0.026). (OR = 0.434; 95% = [0.181 - 1.039]). The same observation is made on patients with dysarthria where the proportion of deaths was 13.3% Vs When patients had clear consciousness, the percentage of death was (10.1% Vs 45.4%; with p < 0.001). (OR = 0.135; 95% CI = [0.064 - 0.283]. In case of left hemiparesis the probability of death is 15.6% Vs 29.8% (p = 0.026). (OR = 0.434; 95% = [0.181 - 1.039]). The same observation is made on patients with dysarthria where the proportion of deaths was 13.3% Vs 34.4% (p = 0.001), (OR = 0.294; 95% CI = [0.138 - 0.627]). In the case of the other clinical data studied, no association with death was noted because the differences found in the proportions of deaths were not significant. Table 2 illustrates mortality based on clinical data.

Table 2. Mortality based on clinical data.

		NOT	Death	p-value	OR [95% CI]
Clear awareness	Yes	109	11 (10.1%)	<0.001	0.135 [0.064 - 0.283]
	No	97	44 (45.4%)		
Obstinacy	Yes	71	28 (39.4%)	0.005	2.605 [1.379 - 4.919]
	No	135	27 (20.0%)		
Coma	Yes	26	17 (65.4%)	<0.001	7.058 [2.917 - 17.081]
	No	180	38 (21.1%)		
Right hemiplegia	Yes	58	18 (31.0%)	0.386	NS
	No	148	37 (25.0%)		
Left hemiplegia	Yes	48	19 (39.6%)	0.026	2.220 [1.116 - 4.416]
	No	158	36 (22.8%)		
Right hemiparesis	Yes	43	9 (20.9%)	0.439	NS
	No	163	46 (28.2%)		
Left hemiparesis	Yes	45	7 (15.6%)	0.039	0.434 [0.181 - 1.039]
	No	161	48 (29.8%)		
Dysarthria	Yes	75	10 (13.3%)	0.001	0.294 [0.138 - 0.627]
	No	131	45 (34.4%)		
Convulsion	Yes	27	13 (48.1%)	0.010	3.029 [1.320 - 6.948]
	No	179	42 (23.5%)		
Headaches	Yes	69	14 (20.3%)	0.182	NS
	No	137	41 (29.9%)		
Dizziness	Yes	49	11 (22.4%)	0.579	NS
	No	157	44 (28.0%)		
Aphasia	Yes	64	23 (35.9%)	0.034	1.928 [1.012 - 3.674]
	No	142	32 (22.5%)		

Association between mortality and biological data: hyperglycaemia was associated with a higher proportion of death than in the case where fasting blood sugar was normal (36.7% vs. 22.6%). The difference is significant (p-value < 0.030). The risk of death was halved when fasting blood sugar levels were normal (OR = 0.504). The following table details this analysis. Among the 55 deaths, 47 patients did not have dyslipidemia, *i.e.* 28.3% of mortality, and 8 had dyslipidemia, *i.e.* 20% of mortality. However, this observed difference is not significant (p-value = 0.326). Patients who presented with dysnatremia had a significantly higher probability of death than patients who did not present this factor (55.6% Vs 20.6%). The difference is significant (p < 0.001). Their risk of death was 4, 821 times higher compared to subjects without this factor. Like dysnatremia, dyskalemia was also associated with death in stroke patients. The percentage of deaths in subjects who had dyskalemia was 49.1% Vs 18.5%. The difference is significant with P-value < 0.001. When the patient presented with dyskalemia, their risk of death was multiplied by 4.236, compared to subjects free of this factor.

Association between death and treatment: treatments based onantiplatelet, anticoagulant and statins have been shown to be quite effective. The proportions of deaths are much lower. Indeed, the proportion of deaths when the patient received an anticoagulant is 16.2% versus 47.1% otherwise, with p < 0.001. The odds ratio is 0.22 with 95% CI = [0.112 - 0.416], which means that patients who did not receive this treatment had a 4.54 (1/0.22) times greater risk of death. In the case of treatment with an anticoagulant, the proportion of deaths is 16.2% vs 40.4%, with p < 0.001. The odds ratio (0.285 with 95% CI = [0.149 - 0.546]) indicates that patients who did not receive this treatment had a 3.5 times higher risk of death. The same observation is made for treatment based on statins. (15.8% Vs 37.1%; with p = 0.001). The value of the odds ratio (0.319 with 95% CI = [0.164 - 0.619]) indicates a significantly lower risk of death in patients who received this treatment. On the other hand, deaths were more frequent in patients who received antibiotics (41.2% Vs 21.9%; p = 0.007), and an anticonvulsant (52.4% Vs 23.8%; p = 0.005). When the patient received an antibiotic, the risk of death is 2.491 times higher (OR = 2.491 with 95% CI [1.268 - 4.893]. This same risk is multiplied by 3.525 when the patient has received an anticonvulsant (OR = 3.525 with 95% CI = [1.404 - 8.853]).

Mortality depends on the practice of physiotherapy: the proportion of patients who died among those who benefited from physiotherapy is quite low (2.5%). On the other hand, in patients who did not benefit from it, the proportion of deaths was 61.9%. The difference is significant (p = 0.001). Patients who had to do physiotherapy sessions had a much lower risk of death (OR = 0.016 with 95% CI = [0.005 - 0.053]).

4. Discussion

Prevalence: In our study, we had a prevalence of 10.3%. A proportion which

seems quite significant to us taking into consideration that the medicine department receives all adult patients who have a medical pathology requiring hospitalization. In Senegal, according to Touré K *et al.*, strokes are at the forefront of neurological conditions, representing 30% of hospitalizations in the neurology department of Fann University Hospital [4]. Socio-demographic characteristics: in our study, the average age was 65.53 years with a minimum of 16 years and a maximum of 97 years. The most represented age group was from 60 to 79 years old (56.8%). This is similar to the study carried out by Hadi carried out in Marrakech (66.3 ± 12.5 years) [5]. In our study, we noted a female predominance (50.5%) compared to 49.5% for men, *i.e.* a sex ratio of 0.98. The female sex was predominant at 57.3% in the Senegalese study by Sène-Diouf *et al.* [3] with a sex ratio of 0.68 in agreement with our data. Our results are also comparable with those of, Touré *et al.* [5]. This female predominance could be explained by an increase in cardiovascular risk factors among Senegalese women.

Risk factors: High blood pressure was found to be one of the most common risk factors for stroke known in our work, with a rate of 90.2%. This is consistent with data from an Ivorian series by N'goran *et al.* 86.4% [6]. In our study, 33 patients were diabetic (16.01%), On the other hand, we noted in the Sene-Diouf series a low rate of 11.76% [3]. Diabetes increases the risk of DALYs 2 to 6.5 times, particularly in women.

In our study, 4.4% of patients were smokers. Our results are close to those of Sene-Diouf *et al.* with a rate of 5.8% [3]. The role of tobacco as a risk factor has been established for stroke with a relative risk (RR) of 1.9, *i.e.* a risk almost doubled in smokers.

The estrogen-progestogen-tobacco-migraine association is an explosive cocktail multiplying by 30 the risk of stroke.

In our study, 0.48% of patients were alcoholics. Our results are similar to those of Chimi Mbonda *et al.* (0.5%) [7]. It should be noted in the literature that moderate alcohol consumption of less than 24 g/d, *i.e.* one to two glasses of wine, has a protective effect by reducing the risk of occurrence of stroke by 20% to 40%. Alcohol abuse is associated with an unfortunate risk of developing it [8].

In our study, we identified 5 cases (2.4%) of taking estrogen-progestogens. Our results are similar to those of Sene-Diouf *et al.* (1.8%) [2], 1.9% for Onwuchekwa in Nigeria [9]. This low rate could be explained by the absence of information on the possible use of a contraceptive method during the interview, but also by the age of our patients where this treatment is not a risk, although hormonal treatment A highly indicated substitute for menopause is not common practice in our regions.

In our study, 76 patients (36.8%) suffered from migraine against a rate of 3.8% in a study conducted by Chraa [10]. According to Love *et al.*, migraine is involved in 10 to 15% of strokes. This risk triples in the event of association with tobacco and quadruples in the event of taking estrogen-progestins. In our study,

19.4% of patients had dyslipidemia. Recent studies have shown an association between a high level of LDL cholesterol, total cholesterol or triglycerides and risk of DALY, especially of atheromatous and lacunar origin. The Northern Manhattan study stroke (Nomass) showed, on the other hand, that a high level of HDL cholesterol is a protective factor for stroke [11].

Clinical characteristics: the main neurological clinical sign was hemicorporal motor deficit which was present in 94.1% of cases. According to a cohort study carried out in around ten countries including China, Australia, Canada, certain European countries and the United States, hemiplegia is also the most frequently found sign in patients [12]. Language was affected in 67.4% of our patients. These proportions are slightly close to those found by Chraa (53.9%), and Diagne (52.5%) [10]. Other studies reveal the presence of convulsions and involuntary movements, as well as intellectual decline. As in Obama's studies [13], a disturbance of consciousness was found in 97 patients with a rate of 47%. But this symptom is more common in 61 patients with ChVA with a rate of 62.8% against 36 stroke patients with a rate of 37.2%. Our results are superior to those found by Gaye (20.6%) and Chraa *et al.* (34.3%) and [10]. Headaches are more frequent during strokes affecting the vertebro-basilar territory than the carotid territory [14]: our study allowed us to corroborate this because headaches were present in 66.7% of vertebro-basilar infarctions and 18.8 % of carotid infarctions.

Biological data: in our study, fasting hyperglycaemia was discovered on admission in 60 patients, a rate of 29.1%. In our patients who had a state of hyperglycemia on admission compared to the percentage of known diabetics before the stroke episode (10 cases), explorations were not carried out to confirm whether it was old diabetes or a state of transient hyperglycaemia frequently reported during strokes. Dyslipidemia was discovered in 40 patients with a rate of 19.4%. The type of dyslipidemia was not specified. According to the creatinine clearance calculated by the method of 15.5%, recently several studies have shown that CKD (chronic kidney disease) is associated with a risk of stroke. A cohort study of dialysis patients (CHOICE) reports an overall incidence of 4, 9 strokes per 1000 person-years and demonstrates that the risk of stroke is 10 times higher compared to the general population [15]. Our results reaffirm the increased importance of risk factors such as chronic renal failure, diabetes and dyslipidemia as well as the complications they can cause.

The different types of stroke: our study revealed a rate of 65% of ischemic stroke and 34.5% of hemorrhagic stroke. These results agree with those of Sene-Diouf *et al.* in 2006 in Senegal with 35.3% hemorrhagic stroke vs 64.7% ischemic stroke [3]. We note that all studies show a strong presence of ischemic stroke which would be the main consequence linked to the multiplicity of risk factors for ischemic stroke compared to hemorrhagic stroke.

Treatment: antihypertensive treatment was administered to 77.2% of patients according to different modalities. When treating high blood pressure, it is rec-

ommended to preferably use intravenous (IV) infusion for precise blood pressure adjustment. The intramuscular and sublingual routes should be avoided. Preferential use of urapidil or labetalol or nicardipine is recommended [10], avoiding loading doses. In the acute phase of the ischemic stroke, blood pressure must be respected and must only be treated if it is greater than 220/120 mmhg without any hypertensive complication and indication for thrombolytic treatment. However, in the acute phase of the hemorrhagic stroke, the BP (blood pressure) is lowered gradually and maintained under 185/110 mmhg. In our work, 56.8% of patients had received heparin therapy, and 66% of patients had received antiplatelet treatment (aspirin). According to the ANAES [16], the systematic use of heparin is not recommended in the acute phase of stroke even in the case of non-valvular atrial fibrillation. Almost half of our patients, or 122 patients (59.2%), benefited from motor physiotherapy. Indeed this precocity of the motor physiotherapy is in conformity with the recommendations of good practice allowing to improve the functional future of the patients. Symptomatic treatment in the acute phase is important because certain symptoms (hyperthermia, swallowing disorders, acute retention of urine, etc.) can be a potential source of aggravation of the patient's neurological state, leading to poorer vital prognosis [17].

Evolution: in our study, the evolution was unfavorable in 73.3% of cases. A favorable evolution without sequelae was noted in 30 patients with a rate of 14.6%. This proportion is a little low compared to the data in the literature: with the series by Damorou *et al.* in Mali in 2008 which found a rate of 21.9% [18]. We noted in 121 patients, a proportion of 58.7%, a favorable evolution with sequelae. Our results are similar to those found in Kabba's study with a rate of 44.1% [18].

Mortality: in our study, the lethality was 26.7% compared to all strokes. Death generally occurred between 48 and 144 hours (94.3%). During this study, stroke was the leading cause of mortality with a rate of 17.9% from all causes. Our results are almost similar to those found in Damorou's study in Mali in 2008 [18]. Different studies have found mortality in the acute phase of 16% according to Love *et al.* According to the study by Sturm *et al.* in Canada in 2009, 10 to 23% of deaths occur in patients with a higher rate in black individuals. These significant proportions could undoubtedly be explained by the lack of adequate equipment in health structures in developing countries, but also by the delay in diagnosis. The average age of the deceased patients was 66.4 years. The highest mortality was in the 60 - 69 age group. Indeed we have noticed that mortality increases considerably with age. In our study, the mortality rate was higher in men compared to women with a proportion of 34.3% for men and 19.2% for women ($p = 0.014$). We note that the risk of death of male subjects is 2.2 times higher compared to that of females (OR = 2.19).

Early mortality is higher in cases of intraparenchymal hemorrhage than cerebral infarction, due to the mass effect [19]. In the general population, the mortality rate in the acute phase is higher in Senegal in 2007: 38% of DALYs and

56% of DALYs and in Mali: 35.2% of DALYs and 51% of DALYs [3].

5. Limitations of the Study

During the exploitation of the files, we were confronted with difficulties related to the retrospective nature of our study. In fact, in some files, there was missing data concerning cardiovascular risk factors, habits and lifestyle, and results and reports of certain assessments were not mentioned. For all the patients whose files were incomplete, that is to say the patients who did not have the results of the assessments, the insufficiency of the diagnostic means sometimes made it difficult to assert with certainty certain causes of death. The absence of certain paraclinical explorations which would be linked either to the limitation of the financial means of our patients or to an insufficiency of the technical platform.

6. Conclusions and Recommendations

Stroke remains a major public health problem worldwide. Its complications require treatment which must be urgent and appropriate.

In industrialized countries, strokes are the first cause of physical disability in adults, the second cause of dementia (after Alzheimer's disease), and the third cause of death (after cancer and cardiovascular disease). They are also a major cause of depression.

The risk factors have been the subject of several studies and are currently well known. The prognosis of the AVC still remains reserved. Mortality still remains high, especially in developing countries.

Despite a significant increase in the prevalence of strokes in Africa in general and in Senegal in particular, no study to date on strokes has been carried out in Tivaouane, which motivated the one we carried out at the end of which we awareness of the problem of stroke management, but especially of their risk factors in our health structures. We make a certain number of recommendations which essentially revolve around the treatment itself and preventive measures:

1) Emphasize the importance of screening and prevention of cardiovascular risk factors.

2) Reinforce information, education and communication through the media for more targeted prevention (health professionals, population at risk, and the most disadvantaged social categories).

3) Improve human resources in quantity and quality (neurologists, physiotherapists, specialized nurses, etc.).

4) Improve the technical platform with the availability of CT scanning at any time, but also MRI in the Thiès region.

5) A thorough etiological exploration for any stroke is essential to establish specific etiological treatment and thus limit the rate of recurrence.

6) Multidisciplinary consultation with neurologists, cardiologists, neurosurgeons, physiotherapists, psychologists, etc., is also necessary for optimal care.

7) The creation of a well-equipped neuro-vascular unit would be a considera-

ble contribution.

Conflicts of Interest

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

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Annex

DATA COLLECTION SHEET

I. CIVIL STATUS.

Age

Sex: 1 = M 2 = F

Occupation:

Address: Tivaouane: 1 = Yes 2 = No Outskirts: 1 = Yes 2 = No

Occupation: 1 = Primary sector

2 = Secondary sector

3 = Tertiary sector

II. HISTORY.

➢ MEDICAL:

- TIA < 7 DAYS: 1 = Yes 2 = No
- Stroke or CVA > 7 DAYS: 1 = Yes 2 = No

III. LAND AND LIFESTYLE

- HTA: 1 = Yes 2 = No
- DIABETES: 1 = Yes 2 = No
- ACTIVE SMOKING: 1 = Yes 2 = No
- ALCOHOLISM: 1 = Yes 2 = No
- MIGRAINE: With Aura: 1 = Yes 2 = No

Without Aura: 1 = Yes 2 = No

- ESTROPROGESTATIVE 1 = Yes 2 = No

IV. CLINICAL DATA:

- AVC installation date:
- Date of hospitalization:

✓ Constants:

- Arterial pressure:

1 = Normal

2 = HTA grade 1

3 = HTA grade 2

4 = HBP grade 3

✓ Neurological examination

➢ Clear consciousness (G = 15/15): 1 = Yes 2 = No

➢ Obnubilation (G = 9 to 14): 1 = Yes 2 = No

➢ Mild coma (G = 7 to 9): 1 = Yes 2 = No

➢ Deep coma (G = 3 to 7): 1 = Yes 2 = No

➢ Brain death (G = less than 3): 1 = Yes 2 = No

➢ Hemiplegia right: 1 = Yes 2 = No

➢ Hemiplegia gch = 1 = Yes 2 = No

➢ Hemiparesis drt = 1 = Yes 2 = No

➢ Hemiparesis gch = 1 = Yes 2 = No

➢ Dysarthria = 1 = Yes 2 = No

➢ Sensory disorders = 1 = Yes 2 = No

- Quadriplegia = 1 = Yes 2 = No
- Convulsion = 1 = Yes 2 = No
- Headache = 1 = Yes 2 = No
- dizziness = 1 = Yes 2 = No
- Aphasia = 1 = Yes 2 = No

V. PARACLINICAL EXAMINATIONS:

✓ Biology:

- GAJ: 1 = normal
  2 = hyperglycemia
  3 = hypoglycemia
- Dyslipidemia: 1 = Yes 2 = No

✓ Ionic disorder:

- Dysnatremia: 1 = Yes 2 = No
- Dyskalaemia: 1 = Yes 2 = No

✓ Creatinine clearance

- 1 = CKD Stage 1: 1 = Yes 2 = No - 2 = CKD Stage 2: 1 = Yes 2 = No
- 3 = CKD Stage 3: 1 = Yes 2 = No - 4 = CKD Stage 4: 1 = Yes 2 = No - 5 = CKD Stage 5: 1 = Yes 2 = No

VI. IMAGING:

- Electrocardiogram:
- Normal: 1 = Yes 2 = No
- HVG: 1 = Yes 2 = No, HVD=: 1 = Yes 2 = No,
- HAG: 1 = Yes 2 = No, HAD=: 1 = Yes 2 = No
- Conduction disorder=: 1 = Yes 2 = No,
- Rhythm disorder=: 1 = Yes 2 = No
- Echo TSA=: 1 = Yes 2 = No
- Completion times for the CT or MRI:
- CT or MRI results:
- Ischemic: 1 = Yes 2 = No
- Hemorrhagic: 1 = Yes 2 = No
- Normal: 1 = Yes 2 = No

VII. RISK FACTOR:

- Cardiac embolism = 1 = Yes 2 = No
- HTA = 1 = Yes 2 = No
- Diabetes=: 1 = Yes 2 = No
- Others=: 1 = Yes 2 = No

VIII. TREATMENT:

- Medical:

- Solutes: 1 = Yes 2 = No
- Antiaggregant: 1 = Yes 2 = No
- Anticoagulant: 1 = Yes 2 = No
- Thrombolysis: 1 = Yes 2 = No
- Antihypertensive: 1 = Yes 2 = No

- Anti-edematous: 1 = Yes 2 = No
- Analgesics: 1 = Yes 2 = No
- Statins: 1 = Yes 2 = No
- Antibiotic: 1 = Yes 2 = No
- Anticonvulsants: 1 = Yes 2 = No
- Neuroprotection 1 = Yes 2 = No
- Insulin therapy: 1 = Yes 2 = No
- TEEN: 1 = Yes 2 = No
- Others: 1 = Yes 2 = No
- Physiotherapy: 1 = Yes 2 = No
- Language rehabilitation: 1 = Yes 2 = No

➢ Surgical: 1 = Yes 2 = No

IX. EVOLUTION:

➢ Favorable with after-effects: 1 = Yes 2 = No
➢ Favorable without after-effects: 1 = Yes 2 = No
➢ stationary: 1 = Yes 2 = No
➢ referred to neurosurgery: 1 = Yes 2 = No
➢ Death: 1 = Yes 2 = No

Mortality time