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Cerebral Venous Thrombosis in the University Hospital of Ouagadougou in Burkina Faso

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ABSTRACT

Introduction: Cerebral venous thrombosis (CVT) accounts for less than 1% of strokes in Western countries, and probably more in sub-Saharan Africa (SSA). The aim of this study was to investigate CVT in the University Hospital Centres (UHC) of Ouagadougou in Burkina Faso. Patients and methods: This was a prospective, multicentre, cross-sectional hospital-based study in the University Hospital of Ouagadougou, Burkina Faso, from 1 June 2018 to 31 January 2023. It concerned patients admitted for CVT confirmed by the demonstration of a thrombus seated in the dural sinus and/or cortical vein on brain CT or MRI. The socio-demographic, clinical, paraclinical, aetiological and evolutionary characteristics of the patients were analysed using Epi-Info 7.2.5.0 software. Results: We consecutively included 37 patients (1% of all strokes), predominantly female (64.9%), with an average age of 38.2 years. The clinical picture was polymorphous, dominated by focal neurological deficit in 24 cases (64.9%), intracranial hypertension (ICHT) in 18 cases (48.6%) and epileptic seizures in 12 cases (32.4%). On neuroimaging, the most frequent topographies were the lateral sinus with 23 cases (62%), followed by the superior sagittal sinus with 16 cases (43%) and multiple localisations with 9 cases (24%). Cerebral oedema in 18 cases (48.6%), cerebral infarction in 7 cases (18.9%) and meningoencephalitis in 6 cases (16.2%) were the other cranioencephalic lesions most frequently found on neuroimaging. Isolated or associated aetiological factors were found in 29 patients (78.4%), dominated by gynaeco-obstetrical factors in 13 patients (35.1%) and cervicocephalic infections in 12 patients (32.4%). Clinical outcome on curative anticoagulants was favourable in 35 patients (94.6%); 2 patients (5.4%) died in hospital. Conclusion: CVT accounts for 1% of strokes in Ouagadougou. Our study confirms the clinical and paraclinical polymorphism and good prognosis of CVT. However, aetiological factors are dominated by gravidopuerperal factors and cervicocephalic infections.

Keywords: CVT, focal neurological deficit, intracranial hypertension, lateral sinus, superior sagittal sinus, gravido-puerperal aetiological factors, cervicocephalic infections, Ouagadougou University Hospital.

INTRODUCTION

Cerebral venous thrombosis (CVT) accounts for less than 1% of all strokes in Western countries, affects young women more often and is characterised by its clinical, neuroradiological and aetiological polymorphism. Clinically, the mode of onset can be highly variable, ranging from acute (<2 days), subacute (between 2 and 30 days) to chronic (more than 30 days) [1, 2, 3, 4]. The clinical presentations of CVT are also highly variable, and may be due to an increase in intracranial pressure or a focal parenchymal lesion, with or without a mass effect [2, 3, 4], causing intracranial hypertension (ICH) and/or diffuse encephalopathy and/or focal neurological signs of deficits and/or epileptic seizures [5, 6]. Diagnostic neuroimaging of CVT based on MRI and magnetic resonance venography (MRV) or CT and encephalic CT venography, also shows direct images of the thrombus and its extension and the consequences of venous obstruction at tissue level (venous infarction, oedema and haemorrhagic transformation, intracranial hypertension and hydrocephalus) [2, 3, 4]. In high-income countries, the aetiological factors of CVT are dominated by thrombophilia, gynaeco-obstetric factors (oestrogenic oral contraceptives, gravido-puerperium) and malignant tumours [2, 3, 4],

whereas in low-income countries such as sub-Saharan Africa and India, infectious aetiological factors predominate, in proportions ranging from 24% to 59% in some series [7, 8, 9]. If diagnosed and treated early, the prognosis for CVT is usually favourable, with an in-hospital mortality rate of around 5%, and most patients now survive without physical disability in developed countries [3, 6], as in low-income countries in recent publications [7, 8, 9]. In our sub-Saharan African context, characterised by poor availability and accessibility of specialists and diagnosic procedures of CVT, we conducted the present prospective cross-sectional study with the aim of describing the clinical, paraclinical, evolutionary and aetiological aspects of CVT in the university hospitals of Ouagadougou, Burkina Faso.

This was a descriptive and analytical cross-sectional study with prospective data collection, which took place from 1 June 2018 to 31 January 2023 in the Ouagadougou teaching hospitals (University Hospital Center Yalgado Ouédraogo, University Hospital Center Tengandogo and University Hospital Center Bogodogo). The study involved patients aged 16 years or older hospitalised for CVT during the study period. The diagnosis of CVT was documented on the basis of the patients' clinical presentation and the demonstration of thrombosis in the cerebral venous sinuses on cerebral computed tomography (CT), magnetic resonance imaging (MRI) and magnetic resonance venography (MRV) according to established diagnostic criteria [10].

All patients (or their parents or guardians) gave informed consent. The study did not include patients for whom no thrombus could be identified in a venous sinus and/or cerebral vein on neuroimaging, despite clinical symptoms of CVT. The following data were collected: sociodemographic data, clinical symptoms and neurological signs on initial admission to hospital, radiological and biological assessments, aetiological factors, acute and maintenance treatment, and clinical course at the end of hospitalisation. The choice and duration of anticoagulant treatment was left to the discretion of the senior neurologist. The prognosis at the end of hospitalisation was classified according to the modified Rankin score (mRS) into favourable (mRS ≤2) or unfavourable (mRS between 3 and 6) functional outcome.

The following variables were filled in:
-**Socio-demographic variables:** age, sex, origin, level of education, marital status and occupation.

- Clinical variables: mode of admission, clinical signs on admission [signs of intracranial hypertension such as progressive headache, nausea, vomiting; epileptic seizures classified as focal epileptic seizures, generalised epileptic seizures, generalised and focal epileptic seizures; disorders of consciousness according to the Glasgow coma score; cognitive disorders (memory, praxis, gnosic, language, reasoning, judgement, ideational slowing, etc.), etc.].); behavioural disorders (psychomotor agitation, apathy, depression, mental confusion, etc.); focal neurological deficits (hemiplegia/hemiparesis, homonymous lateral hemianopsia, hemihypoesthesia, ataxia, cranial nerve damage, etc.); National Institutes of Health Stroke Scale (NIHSS); infectious syndrome (fever, sabral tongue, infectious facies, etc.); signs of damage to other organs.

Clinical signs were grouped into 4 syndromes: isolated intracranial hypertension syndrome and/or isolated headache, focal neurological syndrome, cavernous sinus syndrome or diffuse encephalopathy syndrome.

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- Neuroradiological variables on admission (CT, MRI, encephalic MRV): number of sinuses or cerebral veins involved, location of thrombi and parenchymal lesions (ischaemic infarction, haemorrhagic infarction, intracerebral haemorrhage, cerebral oedema, mass effect, cerebral involvement), acute hydrocephalus, subarachnoid haemorrhage, subdural haematoma, meningoencephalitis lesions.

-Aetiological variables: these were the aetiological and presumed risk factors for CVT, which were investigated through the patient's history, clinical examination and blood tests (depending on the patient's financial resources): systemic or cervicocephalic infections such as sinusitis, otitis, mastoiditis, oral and dental infections, facial infections, meningoencephalitis, cerebral abscesses or empyema; gynaecological and obstetric factors (gravidopuerperium, use of oral hormonal contraceptives); systemic inflammatory diseases; rheumatological or connective tissue diseases; malignant tumours (including haematological malignancies), haematological diseases and other specified causes.

Variables on acquired or congenital thrombophilic abnormalities obtained by serum biological analyses (including antithrombin III, protein C/S deficiency, homocysteine, anticardiolipin and antiphospholipid antibodies, mutations in the methylenetetrahydrofolate reductase (MTHFR) gene, prothrombin gene, factor V Leiden or plasminogen activator inhibitor (PAI) gene, and antinuclear antibodies), were not available in almost all cases, due to financial inaccessibility or lack of availability.

- The other variables analysed were local cervicocephalic lesions: cranioencephalic or facial trauma, lumbar puncture.

- Therapeutic variables (anticoagulant drugs, anti-epileptic drugs, analgesics, antibiotics) and outcomes at the end of hospitalisation (vital status, recovery with or without sequelae, type of neurological sequelae, clinical outcome according to the modified Rankin score (mRS).

These data were analysed using Epi-Info statistical software, version 7.2.5.0.

These data were presented as percentages for qualitative variables and as averages and percentages for quantitative variables.

The tables and graphs were designed using Microsoft Excel 2019. Where appropriate, Student's t-tests (comparison of quantitative and qualitative variables) and chi-square tests (comparison of qualitative variables) were used to search for a statistically significant association between certain patient characteristics and the unfavourable or favourable course of CVTs observed in our study. The alpha significance level was set at 5%.

RESULTS

During the study period, 3955 cases of all types of stroke were recorded in the 3 university teaching hospitals, including 37 cases of CVT, i.e. a frequency of 0.9% of all strokes.

The average age of the patients was 38.2 years (+/-18.8 years) (16-81 years); the majority of patients, 25 cases (67.6%), were under 40 years of age (Figure 2).

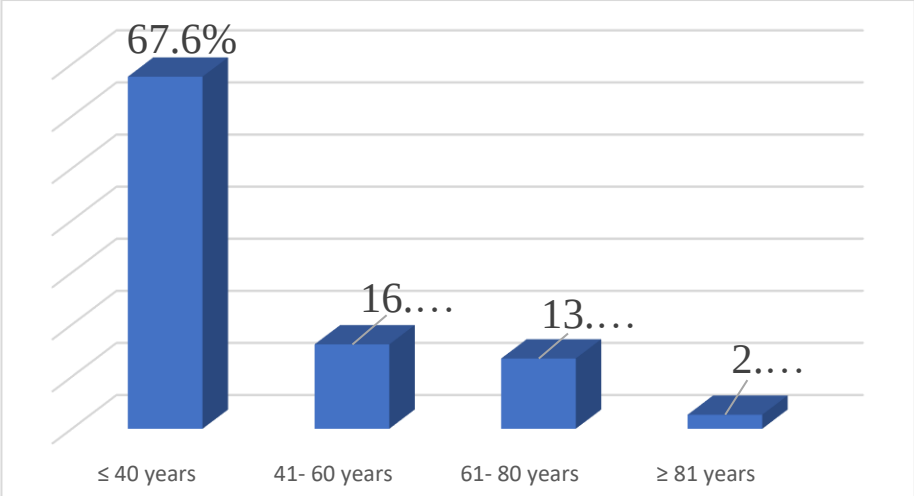

Figure 1: Age distribution of patients with CVT

There were 24 female patients (64.86%), giving a sex ratio F/M of 1.8. There were 19 patients with schooling (51.3%) and 18 patients without schooling (48.6%). The majority of patients, 25 cases (67.6%), were married, 8 patients (21.6%) were single and 4 patients (10.8%) were still teenagers. Employees (11 cases, 29.7%) and housewives (9 cases, 24.3%) were the most common occupations.

The mode of onset was acute in 11 patients (30%), sub-acute in 22 (60%) and chronic in 4 (10%). The circumstances of diagnosis were dominated by headache in 30 cases (81.1%) and focal neurological signs in 19 cases (32.4%).

According to the severity of the initial neurological clinical picture, 18 patients (49%) had no or minor neurological deficit, compared with 19 patients (51%) who had moderately severe to very severe neurological deficit (Figure 2).

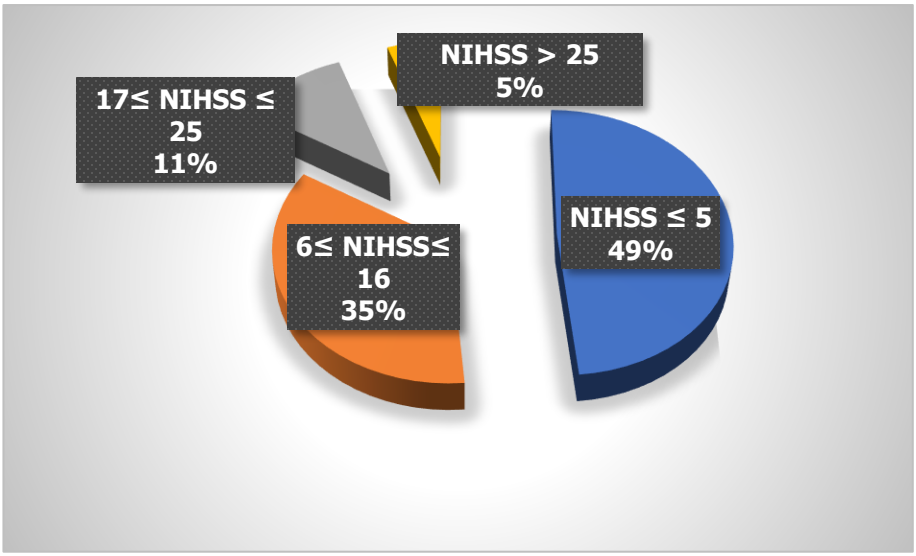

Figure 2: Distribution of patients by severity of neurological deficit on admission according to NIHSS at admission

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On admission, clinical neurological signs were dominated by focal neurological deficit in 24 cases (64.9%), intracranial hypertension in 18 cases (48.6%), and epileptic seizures in 12 cases (32.4%). Other signs were dominated by an altered general condition and fever, with 14 cases (37.8%) and 13 cases (35.1%) respectively (Table I).

Table I: distribution of patients hospitalised for CVT according to clinical signs on admission, abnormalities on brain CT or MRI on admission, biological abnormalities on admission.

Clinical signs on admission	**Numbers (N=37)**	**Percentage (%)**
Headache	30	81.1
Fever	13	35.1
Impaired general condition	14	37.8
Disturbed alertness (Glasgow Score 13)	6	16.2
Focal neurological deficits	24	64.9
• Hemiplegia/hemiparesis	18	48.6
• Hemi hypoesthesia	3	10.8
• Aphasia	10	27.0
• Visual field deficit	5	13.5
Intracranial hypertension	18	48.6
Secondary generalised focal or focal seizures	12	32.4
Meningeal stiffness	9	24.3
Confusional syndrome	7	18.9
Brain CT or MRI abnormalities	**Numbers(N=37)**	**Percentage (%)**
Brain parenchymal and/or meningeal lesions	**28**	**75.7**
Cerebral oedema	18	48.6
Cerebral infarction	7	18.9
Haemorrhagic infarction	4	10.8
Ischaemic infarction	3	8.1
Meningoencephalitis	6	16.2
Mass effect/cerebral involvement	3	8.1
Intracerebral haemorrhage	3	8.1
Subdural haematoma	2	5.4
Meningeal haemorrhage	1	2.7
No brain or meningeal lesions	**9**	**24.3**
Biological abnormalities	**Numbers (N=37)**	**Percentage (%)**
Elevated CRP	15	40.5
Elevated D-dimer	9	24.3
Renal insufficiency	8	21.6
Hyponatremia	5	13.5
Hypokalaemia	5	13.5
Hyperglycaemia	4	10.8
Positive HIV serology	3	8.1

All our patients underwent an initial cerebral CT scan; cerebral CT coupled with encephalic venography was performed in 10 patients (27%) and encephalic MRI coupled with encephalic venography in 27 patients (73%). A CVT was detected in all our patients (100%), including a delta sign in 13 patients (35.1%) on cerebral CT.

Topographically, the lateral sinus was the most affected with 23 cases (62%), the transverse sinus with 13 cases (35%) and the sigmoid sinus with 10 cases (27%); followed by the superior sagittal sinus with 16 cases (43%), the right sinus with 6 cases (16%) and the cortical veins with 3 cases (8%). There were multiple locations in 9 patients (24%): superior sagittal sinus + lateral sinus, 3 cases; lateral sinus + right sinus, 2 cases; superior sagittal sinus + right sinus, 2 cases; superior sagittal sinus + right sinus + cortical vein, 2 cases. Cerebral oedema in 18 cases (48.6%), cerebral infarction in 7 cases (18.9%) and meningoencephalitis in 6 cases (16.22%) were the other cranioencephalic lesions most frequently found on neuroimaging (Table I).

Elevated C Reactive Protein in 15 patients (40.5%), increased D-dimer levels in 9 patients (24.3%) and renal failure in 8 patients (21.6%) were the main laboratory abnormalities found (Table I).

All our patients (100%) received anticoagulant treatment with low molecular weight heparins (LMWH) as soon as the diagnosis of CVT was confirmed, regardless of the nature of the associated encephalic parenchymal lesions (even in the presence of intra-cerebral haemorrhage or haemorrhagic cerebral infarction). The other treatments most frequently used were: probabilistic antibiotic therapy in 33 patients (89.2%), level I analgesics (paracetamol) or level II analgesics (paracetamol + codeine or paracetamol + tramadol) in 30 patients (81.1%) and antiepileptic drugs in 16 patients (43.2%) (table I).

During hospitalisation, 2 patients died, giving an in-hospital mortality rate of 5.4%; irreducible cerebral oedema was the immediate cause of these deaths. At the end of hospitalisation, there were 35 survivors, including 20 patients (54.1%) who had recovered completely without sequelae and 15 patients (40.5%) who had recovered but still had sequelae: hemiparesis in 9 patients (24.3%), expressive aphasia in 3 patients (8.1%), epilepsy in 2 patients (5.4%) and ataxia in 1 patient (2.7%).

At the end of hospitalisation, functional autonomy or independence was observed in 25 patients (mRS 0-2: 67.6%), moderate functional dependence in 10 patients (mRS 3-4: 27%) and death in 2 patients (mRS 6: 5.4%), according to the modified Rankin score (mRS).

Aetiological and/or risk factors for isolated or associated CVT were found in 29 patients (78.4%), dominated by gynaecological and obstetric factors in 13 patients (35.1%); infections in 12 patients (32.4%), including 9 cases of Otorhinolaryngological infections (otitis, sinusitis, mastoiditis) (24.3%) and 3 cases of cutaneous staphylococcal disease of the face (8.1%); and a prothrombotic clinical context (prolonged immobilisation, postoperative condition, etc.) in 10 patients (27%) (Table II).

Table II: Distribution of patients hospitalised for CVT according to aetiological factors identified

Aetiological factors	Numbers (N= 37)	Porcentages (%)
Gynaecological and obstetrical factors	**13**	**35.1**
Hormonal contraception	7	18.9
Gravidopuerperal state:	6	16.2
Pregnancy/postpartum	4	10.8
Abortion	1	2.7

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In vitro fertilisation	1	2.7
Prothrombotic clinical context	**10**	**27**
Anemia	5	13.5
Sickle cell anaemia	1	2.7
Systemic disease (lupus)	2	5.4
Neoplasia (bronchial cancer)	1	2.7
Infectious causes	**12**	**32.4**
ORL infection	9	24.3
Facial skin infection	3	8.1
Recent cranioencephalic trauma	**1**	**2.7**
Lumbar puncture	**1**	**2.7**
Aetiological factor not found	**8**	**21.6**

After uivariate analysis, the presence of epileptic seizures on admission (p=0.01) or focal neurological signs on admission (p=0.003) were significantly associated with an unfavourable clinical course of CVT (table III).

Table III: univariate analysis of factors associated with adverse clinical outcome in patients with CVT

Variables	**mRS≥4**	**mRS<4**	**P-value**
Age ≤50	7	20	0.27
Age >50	4	6	
Male sex	4	10	0.39
Female sex	7	16	
Comorbidities:			
Yes	7	15	0.38
No	4	11	
Infectious causes	3	6	
Other causes	8	20	0.24
Superior Sagittal sinus	3	6	0.78
Other sites	8	20	
Lateral sinus	6	12	0.64
Other sites	5	14	
Cerebral infarction-type lesion	3	8	0.27
Other cerebral lesions	8	18	
Intracerebral haemorrhage-type injury	1	3	0.88
Other brain lesions	10	23	
Focal neurological deficits:			
Yes	17	19	0.003
No	1	16	
Language disorders:			
Yes	1	9	0.11
No	10	24	
Focal motor deficit:			
Yes	8	7	0.9
No	3	6	
Déficit sensitif focal:			
Yes	1	9	0.88
No	10	17	

Céphalées: Yes No	 8 3	 22 4	 0.39
Baisse de l'acuité visuelle: Yes No	2 9	3 23	0.29
Troubles psychiques: Yes No	 2 9	 3 23	 0.58

LIMITATIONS OF OUR STUDY

The main limitation of our study is the small number of patients, due on the one hand to our strict inclusion criteria, in particular the demonstration of a thrombus in a venous sinus or cerebral cortical vein on brain CT and/or MRI, and on the other hand to the low financial accessibility of CT or MRI examinations in our context. Most laboratory examinations for etiological purposes for the exploration of congenital or acquired thrombophilia could not be performed because they were not available in our context and financially inaccessible to our patients. Despite these shortcomings, our study produced relevant results that we will discuss.

DISCUSSION

Up-to-date data on CVT are well described in high- and middle-income countries [2, 3, 11, 12, 13, 14], whereas in low-income regions such as sub-Saharan Africa and India, data on CVT are still based on small numbers of patients, as the disease is still under-diagnosed there due to limited access to specialists and modern imaging techniques, particularly MRI and certain biological tests [7, 8, 9, 15]. However, available data on CVT in sub-Saharan Africa tend to show a probably higher hospital incidence, ranging from 0.9% of strokes in our series to 3% in Bamako, Mali [7, 16].

According to recent data in the literature, CVT affects all age groups, but is more common in young adults, particularly women [3, 6, 7, 8, 15, 17]. Our study, with an average age of 38 years and a predominance of women (65%), confirms these data. This could be explained by the preponderance of CVT aetiological factors specific to young middle-aged women, such as the use of oral contraceptives, pregnancy and puerperium [2].

In our study, subacute onset of clinical symptoms was predominant (60%), which is in line with the literature [6, 3, 7, 8]. Despite the clinical polymorphism of CVT, certain clinical presentations are fairly characteristic. Headache is the most frequently reported, at rates of > 70% in most series, whether Western [2, 3, 6, 12, 13], North African [18, 19] or sub-Saharan African [7, 8] or Chinese [20]. Our study, with headache present in 81% of patients, confirms these data.

Focal neurological deficits are observed with a frequency that tends to be higher in sub-Saharan Africa than in Europe or the USA: 85% in Madagascar [8], 74% in Senegal [7], 65% in our study compared with 20% to 50% in publications from Western countries [2, 3, 21, 22]. The more severe initial clinical presentation reported in sub-Saharan Africa is probably related to delays in diagnosis and the poor accessibility and availability of diagnostic methods in this region [3, 7].

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Approximately 20-40% of patients present with epileptic seizures on admission according to Western series [2, 21, 22]. In sub-Saharan Africa, the frequency of seizures was 25% in Kenya [15], 32% in our study, 37% in Senegal [7] and 67% in Madagascar [8]. The frequency of epileptic seizures associated with CT depends on the nature, severity and topography of cerebral parenchymal damage, in particular ischaemic or haemorrhagic lesions, following CVT, but also on the nature of the epileptic seizures, whether convulsive or not, and the diagnostic methods used [2, 3, 6, 7, 9].

The initial radiological characteristics of our patients were fairly similar to those reported in the literature for the location of thrombosis. In most studies [2, 3, 7, 9], as in our series, the superior sagittal sinus and the lateral sinus (transverse sinus and sigmoid sinus) were the most frequently occluded sinuses. However, for encephalic parenchymal lesions, in series from developed or high-income countries, ≈ 60% of patients had no parenchymal lesion on admission [2, 3, 12], whereas in our series, only 24% of patients were still free of encephalic lesions apart from CVT. The extent of ischaemic or haemorrhagic brain damage complicating CVT is evidence of the delay in diagnosis in our context.

Recent clinical studies reveal major differences in the aetiological factors or predisposing conditions associated with CVT. In developed and/or high-income countries, there is a predominance of gynaeco-obstetric factors, mainly oral hormonal contraception or hormone replacement therapy, and congenital or acquired thrombophilia [2, 3, 12]. Conversely, in developing or low-income countries, a predominance of infections with a frequency of > 30% in Senegal [7] and Burkina Faso (our study), and a frequency of around 20% in India [9], have been reported. The prothrombotic context, although rarely sought in these series, is also fairly frequent when it is reported: 62% in India [9], 27% in our study and 26% in Turkey [2]. However, the frequency of thrombophilia remains undetermined in the context of Sub-Saharian Africa, due to the poor accessibility or even non-availability of the methods of investigating these tests in our context.

The high frequency of gynaeco-obstetric aetiological factors, in particular gravido-puerperium and oral hormonal contraception, observed in low-income or developing countries could be explained by the high birth rates, the still high rate of unassisted pregnancies and deliveries and the trend towards expanding the use of oral hormonal contraception in these regions. The high frequency of infectious causes, essentially otorhinolaryngological and facial, in our context could be explained by the inadequacy of individual and collective hygiene measures, atmospheric pollution (harmattan), low vaccination coverage, under-medicalisation, etc.

Since the 4% in-hospital mortality rate reported by the international multicentre ISCVT study in 2004 [6], most recent studies worldwide have reported an in-hospital or 1-month mortality rate for CVT of less than 5% [2, 3, 7, 8, 9, 12]. These results, which were also found in our study, confirm the excellent prognosis of CVT. However, it should be remembered that this good prognosis is only possible with early diagnosis and management, in accordance with the guidelines of the European Federation of Neurological Societies (EFNS) [23], which recommend anticoagulation of patients even in the presence of haemorrhage [24]. These recommendations were applied in our study.

In our series, the presence of focal neurological deficits or the occurrence of epileptic seizures on admission were factors associated with an unfavourable clinical course defined by dependence or death at the end of hospitalisation. Our results confirm the findings of two recent European and American international multicentre studies, which identified the following factors as predictive of an unfavourable vital and functional prognosis (mRS between 3 and 6) in the short or long term following CVT: the presence of severe neurological deficit (high NIHSS), encephalopathy or coma, intracerebral haemorrhage, hyperglycaemia, low haemoglobin, on admission; the presence of active cancer or infection of the central nervous system; advanced age; black race; low haemoglobin; aetiologies other than gynaeco-obstetric [11, 12]. In fact, severe neurological deficit (high NIHSS), encephalopathy or coma, intracerebral haemorrhage, hyperglycaemia, present on admission, reflect the initial clinical and paraclinical severity and consequences of CVT; these factors more specifically predict mortality in acute phase CVT [25].

In our series, epileptic seizures on admission were identified as a risk factor for an unfavourable clinical course; this observation confirms the data from the ISCVT study, which also identified epileptic seizures on admission as one of the main risk factors for 30-day mortality in CVT [6]. In fact, epileptic seizures could reflect the initial potentially lethal severity of the stroke, in particular diffuse cerebral oedema, extensive intracerebral haemorrhage or even massive cerebral involvement, or lead to potentially rapidly lethal consequences such as cerebral anoxia or even sudden cardiopulmonary arrest [25].

CONCLUSION

CVTs represent ≈ 1% of all patients hospitalised for stroke in Ouagadougou. They are most often young women of childbearing age, presenting with unexplained headache, with or without focal neurological deficits and/or epileptic seizures. The diagnosis is confirmed by MRI and encephalic MRV, or failing that, by CT scan and encephalic CT venography. Multifocal sinus involvement is common. Gynaeco-obstetric aetiological factors, in particular hormonal contraception and gravido-puerperium, cervico-cephalic loco-regional infections and the prothrombotic context, are the most frequently found. Collaborative studies in sub-Saharan Africa are needed to better characterise CVT in our context.

State of knowledge on the subject:

CVT is a rare disease with clinical polymorphism;
Its aetiological factors are dominated in Sub-Saharan Africa by infections and gravidopuerperal factors; Its prognosis is usually favourable, particularly when it is treated early.

Contribution of our study to knowledge on the subject:

Our study provided recent data on CVT diagnosed on encephalic MRV or encephalic CT venography. Our study also showed that gravido-puerperium and infections were predominant aetiological factors in CVT.

Conflict of interest: The authors report no conflicts of interest.

Authors' contributions:

LOMPO Djingri Labodi: design of the study, documentary research, data collection, development of the study protocol, data analysis, drafting of the manuscript.

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