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Cost of Stroke Care in the Neurology Department of the Gabriel Touré Teaching Hospital

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Abstract

Introduction: Strokes are emerging in developing countries due to demographic transition and changes in lifestyle habits. **Objectives:** We aimed to assess the cost of stroke care in Bamako, Mali. **Methods:** A descriptive and analytical cross-sectional study was conducted from June 1 to November 30, 2018, over a period of 6 months. All inpatients with a confirmed diagnosis of stroke by brain imaging were included after providing informed consent. **Results:** Overall, 114 patients were included and males were the most represented gender, with a sex ratio of 1.19. Approximately 37% of our patients possessed either AMO (Assurance Maladie Obligatoire: Mandatory Health Insurance) or ANAM (Agence Nationale pour l'Assistance Médicale: National Agency for Medical Assistance) health insurance. The average cost of stroke care was 179.945 ± 86.140 FCFA (about 274 ± 131 Euros) with a median of 168.255 FCFA. Laboratory analyses accounted for the majority of expenses, in 45.01%. Among uninsured patients, 31.9% incurred expenses ranging from 251,000 to 300,000 FCFA, while insured patients' expenses never reached this amount. **Conclusion:** Stoke care is still costly in Mali. The implementation of more accessible and widespread social security insurance is crucial to alleviate the economic burden associated with stroke care.

Keywords

Strokes, Care, Cost, Mali

1. Introduction

In the recent past, strokes were considered the prerogative of developed countries. Strokes are now emerging in developing countries due to various factors, including demographic transitions and changes in lifestyle habits such as industrialization, urbanization, alterations in eating habits, and an increased incidence of vascular risk factors like hypertension, diabetes, obesity, and sedentary lifestyles [1]. In Mali, strokes rank as the second leading cause of neurological emergencies, following head injuries [2]. They persist as the primary cause of non-traumatic motor disability in young adults, who remain economically active within this population [3].

The cost of stroke care varies among different countries. However, it consistently remains higher in developed countries compared to developing countries, including African nations. For instance, the average cost was $20,396 in the United States (2006-2008) [4], equivalent to 533150 CFA, whereas it was approximately 316810.3 CFA in Benin (2010-2011) [5]. A decade later, an increasing number of patients are enrolling in health insurance. This study aims to evaluate the cost of stroke care, taking into consideration the socioeconomic characteristics of patients.

2. Methodology

This was a descriptive and analytical cross-sectional study conducted in the Neurology Department of the Gabriel Touré Teaching Hospital, Bamako, Mali, over a period of 6 months from June 1 to November 30, 2018. After obtaining informed consent, all inpatients with a confirmed diagnosis of stroke based on brain imaging were included. Patients who did not perform brain imaging (CT-scan or MRI), those hospitalized for stroke outside the study period, or those admitted for another condition were excluded from this study. Data were collected using a questionnaire and analyzed using Excel 2013 and SPSS 25. The comparison of means was calculated using Pearson's chi-squared (χ^2) test, with a significance threshold of 0.05.

To ensure confidentiality, each participant was assigned a unique identification number. Patients had the freedom to withdraw from the study at any point without any impact on their rights. There was no financial compensation provided to the participants in this study.

3. Results

Overall, 114 patients consented to participate. Males were the most represented, in 54% (sex ratio 1.19; **Table 1**). The average age of participants was 59 years, and the age group of 56 - 75 years was the most affected, accounting for 57.9% (**Table 2**). The majority were married (73.7%), with housewives being the most represented at 36.8%. Regarding severity, NIHSS scores between 5 - 15 represented 88.6% of cases. More than one-third of patients had health insurance coverage (AMO or ANAM). In 56% of cases, the length of hospitalization did not exceed 10 days. Ischemic strokes accounted for 60% of cases, while hemorrhagic strokes accounted for 40%. The average cost of stroke care was 17994.5 ± 86,140 FCFA (274 ± 131 Euros), with

a median of 168,255 FCFA and a range from 44,732 to 450,570 FCFA.

Table 1. Sex distribution of patients.

Sexe	Number	Percentage (%)
Females	52	46
Males	62	54
Total	114	100

Table 2. Age group distribution of patients.

Age group (years)	Number	Percentage (%)
16 - 35	10	8.8
36 - 55	28	24.5
56 - 75	66	57.9
76 - 95	9	7.9
≥96	1	0.9
Total	114	100.0

Imaging and laboratory tests constituted the majority of expenses, totaling 45.01% (Table 3). Among the 114 patients, 51 had hospitalization costs below 20,000 FCFA. Imaging costs ranged between 21,000 and 40,000 FCFA for the majority of patients (n = 41), accounting for 36%. However, they exceeded 80,000 FCFA for seven patients, constituting 6.1%.

Table 3. Distribution of the cost per expenditure.

Expenditure	Average cost et standard deviation (FCFA)	Percentage (%)
Hospitalization	32863.16 ± 27830.862	18.26
Laboratory analyses	80996.75 ± 40553.817	45.01
Drugs	66085.40 ± 47910.964	36.73
Total	179945.31 ± 86140.486	100

Biological analysis costs ranged between 10,000 and 20,000 FCFA for 51 patients, or 44.7%. However, 15 patients, or 13.2%, spent more than 50,000 FCFA on laboratory tests. During hospitalization, medication costs ranged from 20,000 to 40,000 FCFA for 37.7% and exceeded 100,000 FCFA for 19.4%. The overall cost of stroke management ranged from 50,000 to 100,000 FCFA for 52.4% of insured patients (n = 42). In the uninsured patient group (n = 72), only 1.4% spent the same amount, while 31.9% spent between 251,000 and 300,000 FCFA (Table 4).

We found that the type of hospital room did not significantly influence the cost of stroke management (p = 0.0557). However, the duration of hospitalization had a significant impact (p = 0.003) (Table 5). There was no relationship between the

type of stroke and the cost of management (p = 0.466) (Table 6). The initial NIHSS score did not correlate with expenses (p = 0.918) (Table 7).

Table 4. Relationship between insurance (AMO or ANAM) and cost of stroke care.

Total cost (FCFA)	Social insurance (%)		P-value
	uninsured	AMO or ANAM	
[50,000 - 100,000]	1.4	52.4	
[101,000 - 150,000]	13.9	26.2	
[151,000 - 200,000]	36.1	11.9	0.000
[201,000 - 250,000]	16.7	9.5	
[251,000 - 300,000]	31.9	0.0	

Table 5. Relationship between duration of hospitalization and the cost of stroke care.

Total cost (FCFA)	Duration of hospitalization (%)		P-value
	< 10 hours	>10 hours	
[50,000 - 100,000]	23.4	16	
[101,000 - 150,000]	23.4	12	
[151,000 - 200,000]	34.4	18	0.003
[201,000 - 250,000]	9.4	20	
[251,000 - 300,000]	9.4	34	

Table 6. Relationship between type of stroke and cost of stroke care.

Total cost (FCFA)	Type of stroke (%)		P-value
	Ischemic stroke	Hemorrhagic stroke	
[50,000 - 100,000]	18.8	22.1	
[101,000 - 150,000]	20.3	15.6	
[151,000 - 200,000]	31.9	20.0	0.466
[201,000 - 250,000]	13.0	15.6	
[251,000 - 300,000]	15.9	26.7	

Table 7. Relationship between NIHSS score and cost of stroke care.

Total Cost (FCFA)	NIHSS at admission			P-value
	1 - 4	5 - 15	16 - 20	
[50,000 - 100,000]	0	21	2	
[101,000 - 150,000]	0	18	2	
[151,000 - 200,000]	1	27	3	0.918
[201,000 - 250,000]	0	15	1	
[251,000 - 300,000]	0	20	4	

4. Discussion

In our study, males predominated with a sex ratio of 1.19. This result is consistent with Adoukonou *et al.*'s findings [5] in Benin and Mapoure *et al.* [6] in Cameroon, where sex ratios were 2 and 1.02, respectively. While strokes are thought to be more prevalent in women due to circumstances like pregnancy, postpartum, and contraception, the male predominance in our study could be due to the fact that males represent the socioeconomically active population, facilitating access to healthcare centers.

The average age of 59 years was almost the same across sub-Saharan Africa (58 years in Côte d'Ivoire [7], 57 years in Benin [5], 63.15 years in the Central African Republic [8], 61.55 years in Guinea Conakry [9]). In fact, as age is a cardiovascular risk factor, strokes are more common in older individuals (above 55 years in men and 65 years in women) [10].

In our study, married patients were predominantly represented (73.7%). This is consistent with Chevreul *et al.*'s data [11] in emergency medical centers in Metropolitan France, where they found 75% ± 5.97 of married patients.

The average cost of stroke management in our study was 179,945 ± 86,140 FCFA with a median of 168,255 FCFA and extremes of 44,732 and 450,570 FCFA. This average cost is higher than that reported by Touré *et al.* [12] in Senegal (78,426 FCFA) but lower than Mapoure's [6] in Cameroon and Adoukonou's [5] in Benin, who previously reported 621,795 FCFA and 316,810 FCFA, respectively. A higher average cost was reported by Birabi *et al.* [13] in Nigeria ($8424), approximately 4,956,623 FCFA. There is significant variability in the cost of strokes from one region to another and from one country to another, likely due to differences in diagnostic tools and resources available for stroke care.

In our study, laboratory analyses accounted for the highest expenditure (45.01%), followed by medications (36.73%). Adoukonou *et al.* [5] found that the main areas of expenditure were also laboratory analyses (34.3%) and medications (28.4%), with physiotherapy representing 3.6% of the total cost. Physical therapy was provided free of charge to our inpatients.

We observed that the cost is higher for patients without any health insurance coverage compared to those with health insurance (AMO or ANAM), with a p-value < 0.001. Thus, patients under AMO insurance pay only 30% of the total expenses, while it is 100% for non-insured patients. As for ANAM, being a social service for the less privileged, these patients are fully covered by the state, except for medications and tests not available in public hospitals. The rate of 37% of patients with health insurance (AMO or ANAM), although low, is higher than that found by Mapoure [6], who reported 16.3% in Douala, Cameroon. This demonstrates that health insurance coverage in our countries is not yet widely spread.

The cost of rooms varies depending on whether it is an upgraded room or a shared room. However, in this study, we did not find a statistically significant correlation between the type of hospital room and the cost of stroke management (p = 0.06). This could be explained by the influence of AMO, as most patients hos-

pitalized in upgraded rooms had AMO. Therefore, the room price did not have a significant impact on the cost of their management compared to uninsured patients.

We observed that the cost was higher for patients with a longer hospitalization duration, with a statistically significant difference ($p < 0.001$). A prolonged hospitalization duration increases, in addition to its cost, the risk of infectious complications, which may necessitate more paraclinical examinations and the purchase of additional medications, as indicated by numerous studies [14]-[16].

According to literature data [5] [11] [17], several authors report a higher cost for hemorrhagic strokes (AVCH) compared to ischemic strokes (AVCI), sometimes due to the clinical severity of the hemorrhage requiring intensive care and a longer hospitalization duration. However, we did not find a link between the type of stroke and the cost of their management ($p = 0.466$). This is explained by less severe clinical severity in the majority of our patients, with a Glasgow score between 12 - 15 in 60.52% and an NIHSS score between 5 - 15 in 88.60% of patients.

5. Conclusion

Stroke remains a major public health concern with debilitating neurological consequences and a significant cost for its management. This study highlights that paraclinical examinations and a prolonged hospitalization duration are the main factors influencing the cost. Accessible and broader social coverage will help alleviate the financial burden for patients, who are often the socioeconomically active in our population.

Conflicts of Interest

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

References

[1] Connor, M.D., Walker, R., Modi, G. and Warlow, C.P. (2007) Burden of Stroke in Black Populations in Sub-Saharan Africa. *The Lancet Neurology*, **6**, 269-278. https://doi.org/10.1016/s1474-4422(07)70002-9

[2] Youssoufa, M., Mohamed, A., Djibo, D., Drissa, K., Minta, S.H., *et al.* (2013) Modalités de prise en charge des accidents vasculaires cérébraux au Mali (Afrique de l'Ouest): Une enquête de pratiques. *Mali Med*, **28**, 30-36.

[3] Sagui, E. (2007) Les accidents vasculaires cérébraux en Afrique subsaharienne. *Medecine Tropicale*, **67**, 596-600.

[4] Wang, G., Zhang, Z., Ayala, C., Dunet, D.O., Fang, J. and George, M.G. (2014) Costs of Hospitalization for Stroke Patients Aged 18 - 64 Years in the United States. *Journal of Stroke and Cerebrovascular Diseases*, **23**, 861-868. https://doi.org/10.1016/j.jstrokecerebrovasdis.2013.07.017

[5] Adoukonou, T., Kouna-Ndouongo, P., Codjia, J., Covi, R., Tognon-Tchegnonsi, F., Preux, P., *et al.* (2013) Cout direct hospitalier des accidents vasculaires cérébraux à Parakou au nord du Benin. *Pan African Medical Journal*, **16**, Article 121. https://doi.org/10.11604/pamj.2013.16.121.2790

[6] Mapoure, Y.N., Kuate, C., Tchaleu, C.B., Ngahane, H.B.M., Mounjouopou, G.N., Ba,

H., *et al.* (2014) Stroke Epidemiology in Douala: Three Years Prospective Study in a Teaching Hospital in Cameroon. *World Journal of Neuroscience*, **4**, 406-414. https://doi.org/10.4236/wjns.2014.45044

[7] Diarra, É.A., Assouan, A.K., Yao, R.B., Kouame, L.K., Kajo, C. and Tanoh, C. (2016) Épidémiologie des AVC en Côte d'Ivoire et perspectives. *Revue Neurologique*, **172**, A164. https://doi.org/10.1016/j.neurol.2016.01.391

[8] Mbelesso, P., Yangatimbi, E. and Senekian, V.D.P. (2016) Épidémiologie des AVC en République Centrafricaine. *Revue Neurologique*, **172**, A165. https://doi.org/10.1016/j.neurol.2016.01.393

[9] Abass Cisse, F., Soumah, E., Camara, B., Lamine Toure, M., Djigué Barry, S. and Cisse, A. (2016) Délai de consultation après AVC et les facteurs associés au CHU Ignace Deen de Conakry. *Revue Neurologique*, **172**, A63. https://doi.org/10.1016/j.neurol.2016.01.148

[10] Feigin, V.L., Forouzanfar, M.H., Krishnamurthi, R., Mensah, G.A., Connor, M., Bennett, D.A., *et al.* (2014) Global and Regional Burden of Stroke during 1990-2010: Findings from the Global Burden of Disease Study 2010. *The Lancet*, **383**, 245-255. https://doi.org/10.1016/s0140-6736(13)61953-4

[11] Chevreul, K., Durand-Zaleski, I., Gouépo, A., Fery-Lemonnier, E., Hommel, M. and Woimant, F. (2013) Cost of Stroke in France. *European Journal of Neurology*, **20**, 1094-1100. https://doi.org/10.1111/ene.12143

[12] Toure, K., Ndiaye, N.M., Diouf, F., Sene, F., Ndiaye, M., Diallo, K., Ndao, A.K., *et al.* (2005) Evaluation du coût de prise en charge des accidents vasculaires cérébraux à Dakar-Sénégal. *Medecine Tropicale*, **65**, 458-464.

[13] Birabi, B.N., Oke, K.I., Dienye, P.O. and Okafor, U.C. (2012) Cost Burden of Post Stroke Condition in Nigeria: A Pilot Study. *Global Journal of Health Science*, **4**, 17-22. https://doi.org/10.5539/gjhs.v4n6p17

[14] Nor, A.M., McAllister, C., Louw, S.J., Dyker, A.G., Davis, M., Jenkinson, D., *et al.* (2004) Agreement between Ambulance Paramedic- and Physician-Recorded Neurological Signs with Face Arm Speech Test (FAST) in Acute Stroke Patients. *Stroke*, **35**, 1355-1359. https://doi.org/10.1161/01.str.0000128529.63156.c5

[15] Campbell, B.C.V., Mitchell, P.J., Kleinig, T.J., Dewey, H.M., Churilov, L., Yassi, N., *et al.* (2015) Endovascular Therapy for Ischemic Stroke with Perfusion-Imaging Selection. *New England Journal of Medicine*, **372**, 1009-1018. https://doi.org/10.1056/nejmoa1414792

[16] Christensen, M.C., Previgliano, I., Capparelli, F.J., Lerman, D., Lee, W.C. and Wainsztein, N.A. (2009) Acute Treatment Costs of Intracerebral Hemorrhage and Ischemic Stroke in Argentina. *Acta Neurologica Scandinavica*, **119**, 246-253. https://doi.org/10.1111/j.1600-0404.2008.01094.x

[17] Christensen, M.C., Valiente, R., Sampaio Silva, G., Lee, W.C., Dutcher, S., Guimarães Rocha, M.S., *et al.* (2008) Acute Treatment Costs of Stroke in Brazil. *Neuroepidemiology*, **32**, 142-149. https://doi.org/10.1159/000184747