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## ORIGINAL RESEARCH ARTICLES

### Neurological disorders in the emergency centre of the Douala General Hospital, Cameroon: A cross-sectional study



### *Les troubles neurologiques au centre des urgences de l'hôpital général de Douala, Cameroun: étude transversale*

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**Introduction:** The aim of this study was to determine the prevalence, aetiologies and outcome of neurological disorders at the emergency centre (EC) of the Douala General Hospital (DGH).

**Patients and methods:** A cross-sectional study was carried out from 1st January to 30th April 2014, at the EC of the DGH, in Cameroon. We included all patients above 15 years of age who presented with isolated or associated neurological complaints. Data collected for each patient were: socio-demographic, clinical and laboratory characteristics, time lapse before management and the prognosis. Patients with no definitive diagnosis made in the EC, had their files reviewed on the wards by the investigators for the final diagnosis and/or aetiology.

**Results:** Of 1844 patients who were consulted in the EC over the study period, 502 of them presented with neurological disorders (27.2%). The mean age was  $44.4 \pm 17.8$  years with 53.6% males. The common symptoms were headache (47.8%), loss of consciousness (19.5%), lumbar pain (11%), hemiparesis (8.4%), and seizure (7%). Non-traumatic neurological disorders were common (86.1%). The common aetiologies were malaria (16.9%), stroke (13.5%), primary headaches (13.1%), head injury (12.9%) and metabolic encephalopathy (12.4%). Mean time lapse to be consulted by a general practitioner was  $23.1 \pm 20.7$  min and  $2.1 \pm 1.3$  h for neurologist's consultation. The time lapse to receive initial medical care was  $26.3 \pm 30.6$  min. The mean duration to have an imaging result was  $1.3 \pm 0.9$  h and  $3.1 \pm 1.7$  h for laboratory tests. The in-hospital mortality rate of neurological disorders was 15.1%.

**Conclusion:** Neurological disorders are common in the emergency centre of the DGH. Aetiologies are diverse and in-hospital mortality is high. This highlights the need to organize neurologist calls at the EC and/or to improve the human resources capacity through regular training and evaluation.

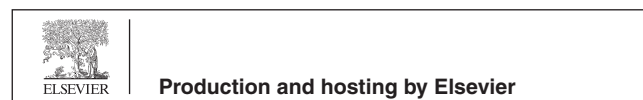
**Introduction:** L'objectif de cette étude était de déterminer la prévalence, les étiologies et l'évolution des troubles neurologiques au centre des urgences (CU) de l'Hôpital Général de Douala (HGD).

**Patients et méthodes:** Une étude transversale a été réalisée du 1er janvier au 30 avril 2014 au CU de l'HGD, au Cameroun. Nous avons inclus tous les patients âgés de plus de 15 ans se présentant aux urgences en se plaignant de troubles neurologiques isolés ou associés. Les données recueillies sur chaque patient étaient les suivantes : sociodémographiques, cliniques et résultats des tests en laboratoire, temps écoulé avant la prise en charge et le diagnostic. Les dossiers des patients pour lesquels aucun diagnostic définitif n'était réalisé au CU ont été examinés par les enquêteurs dans les services vers lesquels ils avaient été envoyés afin d'obtenir le diagnostic définitif et/ou l'étiologie.

**Résultats:** Sur les 1 844 patients qui avaient consulté au CU au cours de la période d'étude, 502 présentaient des troubles neurologiques (27,2 %). L'âge moyen était de  $44,4 \pm 17,8$  ans, 53,6 % étant des hommes. Les symptômes courants étaient les maux de tête (47,8 %), la perte de connaissance (19,5 %), les douleurs lombaires (11 %), l'hémiplégie (8,4 %) et les attaques (7 %). Les troubles neurologiques non traumatiques étaient courants (86,1 %). Les étiologies courantes étaient le paludisme (16,9 %), les accidents vasculaires cérébraux (13,5 %), les céphalées primitives (13,1 %), les traumatismes crâniens (12,9 %) et les encéphalopathies métaboliques (12,4 %). Le temps d'attente moyen avant d'être examiné par un médecin généraliste était de  $23,1 \pm 20,7$  min et de  $2,1 \pm 1,3$  heures avant d'être examiné par un neurologue. La durée moyenne pour bénéficier d'une prise en charge médicale initiale était de  $26,3 \pm 30,6$  min. La durée moyenne pour obtenir un résultat d'examen radiographique était de  $1,3 \pm 0,9$  heures et de  $3,1 \pm 1,7$  heures pour obtenir des résultats d'examens du laboratoire. Le taux de mortalité hospitalière associé aux troubles neurologiques s'élevait à 15,1 %.

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**Conclusion:** Les troubles neurologiques sont courants au Centre des urgences de l'HGD. Les étiologies sont variées et le taux de mortalité hospitalière est élevé. Cela souligne la nécessité de mettre en place un neurologue de garde au CU et/ou d'améliorer la capacité en termes de ressources humaines par une formation et une évaluation régulières.

### African relevance

- Neurological disorders account for 27.2% of disease at the emergence centre.
- The common aetiologies were malaria, stroke, primary headache, head injury and metabolic encephalopathy.

### Introduction

The emergency centre (EC) is usually the first place where acutely ill patients meet with medical personnel in a hospital setting. A few years ago, neurological disorders were less prevalent in the emergence centres.<sup>1</sup> However, this has changed, due to a better understanding of the physiopathology of these disorders, improved diagnostic methods using medical imaging (CT Scanning, Magnetic Resonance Imaging, and angiography), electrophysiology and nerve biopsy, as well as new therapeutic options. Most neurological disorders present as acute cases and thus require rapid and appropriate intervention. The profile of neurological disorders might vary from one continent to another, one region to another and even within the same country. In our setting, knowledge of the profile of these neurological emergencies will help in planning strategies for improved management. It was with this in mind that we carried out a cross-sectional study on the prevalence, aetiologies and outcome of neurological disorders at the EC of the Douala General Hospital (DGH) in Cameroon.

### Methodology

This cross-sectional study was carried out in the DGH, situated in the city of Douala, the economic capital of Cameroon with a population of about 3 million inhabitants. The DGH is a tertiary health institution with a capacity of 325 beds. The neurology unit is staffed with four neurologists, and offers neurophysiological tests such as electroencephalography and electromyography. There is a neurosurgical unit with three neurosurgeons. The radiology department is equipped with a magnetic resonance imaging and an 8 barrettes CT scan machine.

Our study was carried out in the EC over a period of 4 months from January 1st to April 30th, 2014. We included all patients above 15 years of age who presented with neurological disorders and who consented to take part in the study. After a detailed physical and neurological examination, patients were investigated further with laboratory, electrophysiological and radiological tests as indicated. For each patient the following data were recorded: socio-demographic (age, sex, occupation, and health insurance), presenting complaints, physical examination findings, the diagnosis, and time lapse before management at the EC. Length of stay and outcome of the patients were also recorded. We defined as neurological disorder a patient who presented in the EC with neurological symptoms or signs relative to motor and/or sensitive functions,

myotatic and/or cutaneo-plantar reflex, cranial nerve abnormalities, coordination dysfunction, meningeal signs, cognitive function and altered conscious state. We classified headache according to the Headache Classification Subcommittee of the International Headache Society.<sup>2</sup> Data were collected, coded and saved via the SPSS software, version 20 of Windows. The Chi-squared and Student's *T* tests were used to compare proportions and means respectively.  $p < 0.05$  was considered statistically significant.

An ethical clearance was obtained at the Institutional Ethical Committee of the Douala University. The aim of the study was explained to all patients or their families (in case of comprehension difficulties) and a written and informed consent obtained.

### Results

Of the 1884 patients admitted in the EC of the DGH during the study period, 502 (27.2%), presented with neurological disorders. Our study population included 269 men and 233 women with no significant difference between the sexes ( $p = 0.6$ ); giving a male/female sex ratio of 1.15. Patients' mean age was  $44.36 \pm 17.79$  years with no significant difference between males and females ( $p = 0.6$ ). 420 patients (83.7%) were salaried workers while 122 (24.3%) had health insurance. Most of the patients (75.5%) came from their homes or workplaces while 20.7% were from intermediary level hospitals and 3.8% from other hospitals of the central level.

Of the 502 patients, 362 (72%) presented solely with neurological complaints while 140 (28%) presented with both neurological and non-neurological complaints. Table 1 shows the reasons for neurological consultations. Amongst the 240 patients consulting for headaches, 174 (72.5%) were suffering from secondary headaches. Primary headache was observed in 66 patients (27.5%) of whom 34 (51.5%) and 32 (48.5%) were suffering from migraine and tension-type headache respectively. Aetiologies of secondary headache were:

**Table 1** Neurological reasons for consultations in the emergency centre.

Reasons for consultations	Total number	Percentage
Headache	240	47.8
Loss of consciousness	98	19.5
Lumbar pains	55	11.0
Hemiparesis	42	8.4
Seizures	35	7.0
Incoherent speech	9	1.8
Disequilibrium	7	1.4
Speech disorders	6	1.2
Hemiparesis and aphasia	4	0.8
Paraesthesia	3	0.6
Absence	1	0.2
Amnesia	1	0.2
Visual disorders	1	0.2

infectious in 118 cases (67.8%), mild head injury 46 (26.4%), stroke 7 (4.0%), brain tumour 2 (1.2%) and neuralgia 1 (0.6%).

Neurological disorders were non-traumatic in 432 patients (86.1%) and traumatic in 70 patients (13.9%). Infectious causes were found in 143 patients (28.5%), with malaria in 85 (59.4%), meningo-encephalitis 26 (18.2%) and others 22 (22.4%). Causes of meningo-encephalitis were cerebral toxoplasmosis (6 cases), viral meningitis (4 cases), cryptococcal meningitis (3 cases) one case each of bacterial meningitis, cerebral malaria, and an association of cerebral toxoplasmosis and cryptococcal meningitis. No aetiology was found in 10 patients (38.4%). Twenty-four patients (92.30%) suffering from meningo-encephalitis were HIV positive. Neurovascular disorders represented 73 cases; these consisted of 68 (93.2%) cases of stroke and 5 (6.8%) cases of hypertensive encephalopathy. Stroke cases included 46 patients with ischaemic stroke (41 were cerebral infarction and 5 cases of transient ischaemic strokes) and 22 cases of haemorrhagic stroke (18 intracerebral haemorrhage and 4 subarachnoid haemorrhage). Toxic and metabolic neurological disorders were found in 62 patients (Table 2) while mechanical or compressive neurological disorders were observed in 56 patients (Table 3).

Traumatic neurological disorders represented 70 cases (13.9%) with 65 cases (92.9%) of head trauma classified as mild head injuries in 46 patients (70.7%), 12 (18.5%) severe head injuries and 7 (10.8%) as moderate head injuries. We also

diagnosed four cases (5.7%) of chronic subdural haematoma and one case (1.4%) of vertebro-spinal injury. These traumatic neurological disorders were caused by road traffic accidents in 52 patients (74.3%), falls in 9 patients (12.9%), fighting in 7 patients (10%) and assaults in 2 patients (2.8%).

Table 4 presents the anatomical distribution of neurological disorders at the EC. The aetiologies of the neurological disorders we registered varied according to whether the patients were hospitalized or not. For the hospitalized patients, the main neurological disorders included strokes (28.8%), toxic or metabolic encephalopathy (20.4%), head trauma (18.2%), meningo-encephalitis (10.2%), and epileptic seizures (7.1%), whereas in the non-hospitalized patients the main aetiologies were malaria (30.3%), primary headache (24%), compressive and mechanical pathologies (16.2%), and head trauma (8.9%).

Upon arrival at the EC, it took patients about  $23.1 \pm 20.7$  min to meet a general practitioner and a time lapse of  $2.1 \pm 1.3$  h to be consulted by a specialist. Delays in management and para-clinical investigations are given in Table 5.

Of the 225 patients who were hospitalized (44.8%), 115 (51.1%) were in the internal medicine department, 50 (22.2%) in intensive care unit, 45 (20.0%) in surgery and 15 (6.7%) were discharged against medical advice. After medical consultation, 210 patients (41.8%) were discharged home normally, 61 (12.2%) were put under observation and 6 (1.2%) died in the EC.

**Table 2** Causes of metabolic/toxic neurological disorders.

Causes	Total number	Percentage* ( <i>n</i> = 62)	Percentage** ( <i>n</i> = 432)
Uraemic encephalopathy	13	21.0	3.0
Hypoglycaemia	11	17.7	2.5
Hyperglycaemic coma	10	16.1	2.3
Sepsis associated encephalopathy	10	16.1	2.3
Hepatic encephalopathy	9	14.5	2.1
Coma caused by drug abuse	3	4.8	0.7
Coma caused by alcoholism	2	3.2	0.5
Metabolic encephalopathy of undetermined cause	1	1.6	0.2
Total	62	100.0	14.3

\* Percentage according to the total of metabolic/toxic encephalopathy (*n* = 62).

\*\* % following non-traumatic neurological disorders (*n* = 432).

**Table 3** Causes of mechanical/compressive neurological disorders.

Causes	Total number	Percentage* ( <i>n</i> = 56)	Percentage** ( <i>n</i> = 432)
Spinal cord compression	15	26.8	3.5
Disc herniation	8	14.3	1.9
Metastatic compression	7	12.5	1.6
Cancer of the Prostate	03	–	–
Breast cancer	02	–	–
Metastatic spinocellular carcinoma	01	–	–
Multiple myeloma	01	–	–
Mechanical disorders	4	7.1	0.9
Lumbar osteoarthritis	3	–	–
Lumbar osteoarthritis + disc herniation	1	–	–
Non investigated lumbago	37	66.1	8.6
Total	56	100.0	13.0

\* Percentage according to total of number mechanic/compressive aetiologies (*n* = 56).

\*\* % following non-traumatic neurological disorders (*n* = 432).

**Table 4** Anatomic distribution of causes of neurological disorders at the emergency centre.

	Total number	Percentage (n = 502)
Neurological diseases	389	77.5
Central nervous system	385	76.7
Encephalopathy	302	60.2
Focal	145	46.8
Stroke	68	–
Head Injuries	65	–
Chronic subdural haematoma	4	–
Brain tumour	4	–
Vestibular neuritis	3	–
Cerebellitis	1	–
Diffuse	67	13.4
Metabolic/toxic encephalopathy	62	–
Hypertensive encephalopathy	05	–
Others	90	–
Primary headache	66	–
Epilepsy	22	–
Dizziness	2	–
Spinal cord disorders	57	11.3
Lumbar mechanic/compressive pathology	56	–
Cervical vertebro-medullar trauma	1	–
Meningeal disorders	26	5.2
Meningo-encephalitis	26	–
Peripheral nervous system	4	0.8
Cervico-brachial neuralgias	4	–
Extra neurological infections	113	22.5
Systemic or general	88	17.5
Malaria	85	–
Tetanus	3	–
Respiratory	10	2
ENT	8	1.6
Gastro-enterology	7	1.4
Total	502	100

**Table 5** Mean time lapse for management and initial paraclinical tests.

Mean time	Average	Standard deviation	Minimum	Maximum	Confidence interval to 95%
Mean time lapse for consulting a general practitioner (in min)	23.1	20.7	0.3	143	[20.8–25.5]
Mean time lapse for consulting a specialist (in h)	2.1	1.3	0.3	5.9	[1.8–2.3]
Time lapse at the emergency (in h)	3.1	1.9	0.3	8.6	[2.8–3.3]
External patients	1.2	1.0	0.3	4.5	[1.0–1.5]
In-hospital patients	3.9	1.7	0.3	8.6	[3.6–4.19]
Time lapse for first laboratory report (in h)	3.1	1.7	1.7	6.8	[2.7–4.1]
Time lapse for first laboratory report (in h)	1.3	0.9	0.1	3.9	[0.96–1.71]
Time lapse for initial nursing care (in min)	26.3	30.6	1.0	211	[21.9–31.4]

Concerning the outcome, 196 patients (15.1%) died and the main causes were: stroke 21 (4.2%), meningo-encephalitis 13 (2.6%), uraemic encephalopathy 9 (1.8%), hepatic encephalopathy 7 (1.4%) and others 26 (5.1%).

## Discussion

Our study shows that neurological disorders represent about 27.22% of the consultations in the EC of the DGH. This prevalence is similar to the 25.7%<sup>3</sup> obtained in Nigeria in 2013. This similarity can be explained by the fact that Nigeria as well as Cameroon are Sub-Saharan African

countries with the same environmental factors and socio-cultural habits. However, our prevalence was higher than the 16%, 14.7% and 2.85% obtained in Haiti,<sup>4</sup> France<sup>5</sup> and Spain<sup>6</sup> respectively. This great difference between our study and those from France and Spain could be due to tropical specificities on the one hand and to the fact that traumatic neurological disorders were not taken into account by these two countries on the other hand. The average age of our study population was  $44.36 \pm 17.79$  years. It is similar to the 49.76 years reported in Nigeria<sup>3</sup> but is still less than that found in Europe, notably in France and in Spain where it was estimated at  $56, 9 \pm 21$  years and 59 years<sup>7,8</sup> respectively. Younger ages were

obtained in other studies: in India the average age was  $37.4 \pm 19.5$  years.<sup>9</sup> Men represented 53.6% with a men/women sex ratio of 1.15. These findings are not far from the 56.7% obtained in Nigeria,<sup>3</sup> the 63% obtained in India,<sup>9</sup> and the 52% in France.<sup>7</sup> However, other studies like those carried out in the United Kingdom and Spain with 56% and 56.3% of women respectively<sup>10,8</sup> showed a female predominance.

Of 502 patients, 72% of our patient population consulted exclusively for neurological complaints while 28% of them presented neurological and non-neurological symptoms. Their main complaints were mostly headache (47.8%), altered state of consciousness (19.5%), lumbar pains (11%), hemiparesis (8.4%) and seizures (7%). These findings are close to those obtained in Spain where the most frequent complaints were headache (20%), focal neurological deficits (16%) and loss of consciousness (14%).<sup>11</sup> Our findings are also similar to another study in Spain where headache was the main presenting complaint in the neurological emergency centre.<sup>12</sup> The most common symptoms in the United Kingdom were hemiparesis (40%), headache (24%) and seizures (15%).<sup>10</sup>

Non-traumatic neurological disorders were present in 86.1% of the patients presenting at the EC. The aetiologies were classified as infectious causes (33.1%), vascular causes (16.9%), primary headache (15.3%), metabolic/toxic causes (14.3%) and compressive/mechanical pathologies (13.0%). The main causes of non-traumatic neurological diseases were: malaria (19.7%), stroke (15.7%), primary headache (15.3%), metabolic/toxic encephalopathy (14.3%), mechanical/compressive pathologies (13.0%) and meningo-encephalitis (6.0%). Garcia-Ramos et al. in Spain found that stroke was the leading cause of non-traumatic neurological disease at the emergency unit, representing 24.57% of causes followed by epilepsy with 13.06% and headache 6.07%.<sup>6</sup> In France, Moulin et al. found that stroke (33.1%), epilepsy (20%), loss of consciousness (9%), headache (9%)<sup>5</sup> were the main causes of neurological disorders. Findings by Carroll and Zajicek in the United Kingdom also revealed that stroke (29%) topped the list, followed by headache (13%) and seizures (12%).<sup>10</sup> This epidemiologic variation can be associated with environmental considerations since Cameroon has high malaria endemicity.

In our study stroke cases represented 15.7% of patients and were mostly ischaemic (67.6%). Other researchers<sup>3-6</sup> did not specify the nature of the stroke. Primary headache (15.3%) was the third cause of non-traumatic neurological disorders, and was mainly represented by tension-type headache (51.5%) and migraine (48.5%). These findings are also similar to those of a study carried out in Greece, the latter revealed that tension-type headache was the main cause of headache in the EC.<sup>13</sup> Metabolic encephalopathy was dominated by uraemic encephalopathy (21%), hypoglycaemia (17.7%), hyperglycaemic comas (16.1%), sepsis associated encephalopathy (16.1%) and hepatic encephalopathy (14.5%). Meningo-encephalopathy was the sixth most common disease, representing 6% of non-traumatic causes. These were mainly 15.4% and 11.5% of cerebral toxoplasmosis and cryptococcal meningitis respectively. 11.5% of cases were caused by a virus, of which 7.6% were HIV associated encephalitis. Causes of meningo-encephalitis could not be determined in 38.4% cases because the patients died before the tests or because of financial problems since 24.3% had no health insurance.

Traumatic neurological disorders were found in 70 patients (13.9%). This prevalence is relatively similar to that obtained in a study from Haiti showing 19%<sup>4</sup> of traumatic neurological disorders. The causes of these disorders as well as the circumstances in which they occurred were similar to those found in our study, and include road traffic accidents (59%), falls (20%) and attacks (17%).<sup>4</sup>

The main causes of neurological disorders, whether traumatic or non-traumatic neurological disorders were mostly caused by malaria (16.9%), stroke (13.5%), primary headache (13.1%), head trauma (12.9%) and metabolic encephalopathy. These findings are different from those revealed by the study in Haiti where stroke (31%), neuro-trauma (28%) and loss of consciousness were found as the main causes of neurological disorders. However, these percentages vary whether the patients were discharged or hospitalized. From our study, stroke was the predominant cause among patients who were hospitalized with 28.90%; which is similar to findings from other African studies that ranged from 42.1% to 77.6%.<sup>14-16</sup> In western countries these figures varied from 24.57 to 33.1% in the hospitalized patients.<sup>6,5</sup> Malaria (30.3%) was the main cause of neurological disorders in non-hospitalized patients.

The time lapse between arrival at the hospital and the consultation by a general practitioner was 23.11 min. This time lapse was shorter than that revealed by studies carried out in the United State of America in 2006, where the average time was 31 min<sup>17</sup> meanwhile it was estimated by other researchers from the same country at 56.3 min one year earlier.<sup>18</sup> In France, Moulin and colleagues found 32 min as mean time lapse before consultation.<sup>5</sup> 225 patients (44.8%) benefited from consultation by a specialist in the EC and the time lapse was 2.05 h. In previous studies the time lapse for a specialist's consultation was not mentioned.<sup>3-6</sup> The time lapse for nursing care was 26.32 min. Although this figure is reasonable there is lack of nursing personnel in the DGH emergency centre. In fact this personnel works in groups of two and sometimes three people. Upon admission into the EC, privilege is given to patients who are clinically unstable while those who are apparently stable unfortunately have to wait and this could be long. Mean time to obtain the first radiological report was 1.31 h. A study in Switzerland revealed that this time was estimated at 15 min.<sup>19</sup> As concerns the laboratory reports, the mean time was 3.1 h to obtain the first ones. In our study, the length of this time could be explained firstly by the fact that patients who need to be hospitalized must go through administrative formalities and secondly that during calls there is only one laboratory technician who carries out the tests of all the patients in the hospital, including those from the emergency; and lastly by financial difficulties faced by some patients as the care is mostly financed out-of-pockets. The mean time spent in the EC was estimated in this study at 3.07 h<sup>18</sup> and at 1.24 h for non-hospitalized patients and at 3.90 h for in-hospital patients. This difference is due to the fact that before their hospitalization, patients have to fulfil several administrative formalities.

Of the 502 patients who were consulted at the DGH EC, 225 (44.8%) were hospitalized, 210 (41.8%) discharged back home; 61 (12.2%) placed under medical observation and 6 (1.2%) died. These hospitalization figures are high compared to those observed in the USA in 2006 with 12.8% hospitalized patients and 1.9% admitted for intensive care.<sup>17</sup> The high

difference between our findings and those in the western countries could be explained by the fact that patients in developed countries are regularly followed up by family doctors while in Africa in general, patients go to health centres only when they feel sick and sometimes when they face severe clinical conditions. The total in-hospital mortality rate was 15.1% of which 51.3% occurred in the intensive care unit. This is similar to those reported in Nigeria (52, 4%).<sup>3</sup>

This study had some limitations, as the lack of evaluation of factors associated with the outcome, short duration and this study is a single centre experience which does not necessarily cover the epidemiology of the country.

## Conclusion

Neurological disorders represent more than a quarter of all the consultations done in the EC. The main reasons for consultation were headache and loss of consciousness. The main causes of neurological disorders were malaria, stroke, primary headache, head trauma and metabolic encephalopathy. Mortality rate was high. There is an urgent need to reorganize neurologist call duties at the EC and/or to improve the human resources capacity through regular training and evaluation.

## Dissemination of results

Results from this study were shared during a defence of thesis at the Faculty of Medicine and Pharmaceutical Sciences, and with the staff of Emergence Centre of the Douala General Hospital.

## Author contribution

YNM, Conception and design of the work, analysis and interpretation of data, drafting the work; JSO, Acquisition, analysis and interpretation of data; CN, Drafting the work; GB, and ASM, Revising of the draft for important intellectual content; HNL and all authors: Approval of the final draft.

## Conflict of interest

The authors declare no conflict of interests.

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