



Stroke severity predicts poststroke delirium and its association with dementia: Longitudinal observation from a low income setting[☆]



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ARTICLE INFO

Article history:

Received 15 December 2016

Received in revised form 4 February 2017

Accepted 16 February 2017

Available online 20 February 2017

Keywords:

Acute confusional state

Risk factors

Prevention

Vascular dementia

Stroke burden

ABSTRACT

Objective: The effect of delirium on stroke outcome has not been quantified in sub-Saharan Africa. We investigated the prevalence of delirium occurring within one week of stroke in Nigerian survivors and its association with dementia and mortality at 3 months.

Methods: Delirium was ascertained after repeated assessments within one week of stroke using the Confusion Assessment Method. Demographic and clinical characteristics, stroke severity, current and pre-morbid cognitive functioning were also assessed. Participants were then followed up for 3 months using culturally-validated neuropsychological tools. Probable dementia was ascertained according to the National Institute of Neurological Disorders and Stroke (NINDS-AIREN) criteria. Associations were investigated using both binomial and multinomial logistic regression analyses and presented as odds ratios (O.R) and relative risk ratios (RRR).

Results: Of 101 consenting stroke survivors, 99 had two assessments for delirium within one week of the stroke. Delirium was present in 33.3% of stroke survivors (65.6% hypoactive, 21.9% hyperactive, and 12.1% mixed type). Having a severe stroke was associated with delirium (O.R = 6.2, 95% C.I = 1.1–13.8) after adjusting for age, gender, education and economic status, lifestyle factors, multimorbidities and laterality. At follow-up, those with severe stroke had a stronger association between delirium and dementia (RRR = 4.3, 95% C.I = 1.2–15.6) or death (RRR = 3.7, 95% C.I = 1.1–12.1).

Conclusion: Delirium, in this sub-Saharan African sample, was already present in about one-third of survivors within one week of stroke. Survivors of severe stroke are at higher risk of delirium and its complications, and could be important target for delirium preventive interventions.

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1. Introduction

The neurobehavioural syndrome of delirium is the most common complication of hospital admission in the elderly [1]. It is also an important early marker of poor outcome of in-patient care [2], including long term cognitive impairment or dementia [3]. Among many disorders and interventions that have been associated with delirium [4], having a stroke rank high as an important trigger of its onset. According to some studies conducted in Western Europe and Australia, the prevalence of delirium among stroke survivors may be as high as 48% [5,6]. Currently, very little is known about delirium in sub-Saharan Africa. In a review of 46 studies, drawn from across all 54 countries in the sub-region, where ‘organic brain syndromes’ (including delirium) were

investigated [7], only one [8] included a systematic assessment of delirium. That study was conducted using a general psychiatric out-patient sample [8]. Yet, there are no studies of the prevalence and outcome of delirium occurring in the early post stroke period among sub-Saharan African survivors.

Stroke is now among the leading causes of disease, disability, and death in sub-Saharan Africa [9]. A large proportion of the disability and mortality outcomes of stroke in the sub-region may be due to inefficient management in the acute phase after the stroke [10]. Given the paucity of information about post-stroke delirium in sub-Saharan Africa, it is feasible that part of the inefficiency in acute phase management of stroke may include unidentified and untreated delirium [11]. Therefore, epidemiological studies identifying factors associated with post-stroke delirium may provide valuable information that will stimulate the development and use of evidence based delirium preventive measures, thereby reducing the risk of short term mortality and longer term disability after stroke.

[☆] Funding support: Fogarty International Center award number 1R24008878.

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In the present study, we investigated the prevalence, associated factors and 3-month outcome of delirium occurring within one week after a stroke among 101 survivors admitted for acute phase management in a Nigerian university hospital.

2. Methods

The study is a longitudinal observation of adults Nigerians with delirium occurring in the first week after surviving a stroke. Participants were residents of Ibadan and surrounding communities, and admitted for acute stroke care at the University College Hospital (UCH) Ibadan South-Western Nigeria. Ibadan is inhabited by about 3 million people, who are mostly Yoruba speaking. The UCH is the main referral hospital serving Ibadan and surrounding communities.

Ethical approval was obtained from the University of Ibadan/UCH ethics committee.

2.1. Subjects

Consecutive adult ischaemic or haemorrhagic stroke survivors were recruited after they had been seen by a consultant neurologist primarily responsible for their care. The diagnosis of stroke was confirmed based on neuroimaging and clinical examination criteria [12]. Written consent was obtained from all eligible stroke survivors and/or their spouses or adult children after the procedure of the study was explained to them either in English or the local Yoruba languages. We excluded patients who were unable to communicate reliably, usually because of aphasia, and those with severe co-morbidities (e.g., chronic kidney disease, metastatic cancer, or open tuberculosis).

Following recruitment, subsequent evaluations were conducted during outpatient follow-up visits after discharge from the hospital. In a few cases, usually because of non-attendance to scheduled follow-up visits due to transportation cost, seeking of alternative therapies, or industrial actions in the hospital, follow-up assessments had to be conducted in the homes of the patients.

2.2. Measures

Participants age in years, marital status, and the number of years of completed education were recorded. We ascertained economic status using asset based measures relevant to developing countries [13].

Stroke severity was assessed using the Stroke Levity Scale (SLS) [14]. The SLS uses a stroke severity score of 0–15 calculated by adding up the maximum power in the dextrous upper limb, weaker lower limb, and score for mobility. Lower values represent greater severity. A score of 0–5 = severe stroke, 6–10 = moderate stroke, and 11–15 = mild stroke.

2.2.1. Ascertainment of delirium

Stroke survivors meeting study criteria underwent two assessments for delirium within the first seven days of admission (a maximum of four days between assessments) using both the Confusion Assessment Method (CAM) [15] and Delirium Rating Scale (DRS) [16].

The CAM consists of nine criteria which correlates with the Diagnostic and Statistical Manual (DSM IV) criteria for delirium [17]. The questionnaire takes about 5 min to complete after observation of the patients during a cognitive screening test, usually the Mini-Mental State Examination (MMSE). Additional information is also requested from primary caregivers of patients. The diagnosis of delirium is then made following a standard algorithm which is part of the CAM instrument. According to the scoring convention, a diagnosis of delirium is warranted when a patient displays acute onset and fluctuating course of; 1) inattention, and 2a) disorganised thinking or 2b) altered levels of consciousness [15]. Previous validation of delirium diagnoses made using the CAM compared with clinician diagnoses using DSM IV criteria found a sensitivity of 94–100% and a specificity of 90–95% [18]. In this

study, the CAM was administered by a research assistant with experience in epidemiologic research in the older population of south-Western Nigeria. She was trained using the CAM training manual. Inter-rater reliability on a sub-group of 29 stroke survivors independently assessed by the research assistant and a consultant in old age psychiatry (AO) produced Kappa values of between 0.51 and 0.76 for each CAM item, and 0.63 overall.

A psychiatrist administered the DRS which is a 10 item scale that generates a maximum score of 32. A score of 10 or more is compatible with a DSM IV diagnosis of delirium [17]. The DRS demonstrates a high agreement with the CAM.

2.2.2. Outcome

Following participants evaluations in the first week after stroke, outcome assessments were conducted at 3 months follow-up. Mortality data were collected when research supervisors have been reliably informed of the death of a participant usually by a close member of their household.

2.2.2.1. Ascertainment of probable dementia. Participants were characterised as having probable dementia provided that at 3-months post neurologist-confirmed stroke, there was evidence of decline in memory and two other cognitive domains from the following: orientation, attention, language, visuospatial functions, executive functions, motor control, and praxis. They also had to have additional impairment in activities of daily living (ADL). This corresponds to the 'National Institute of Neurological Disorders and Stroke and the Association Internationale pour la Recherche et l'Enseignement en Neurosciences (NINDS-AIREN) International Workshop criteria' [19].

The 10 words list learning and delayed recall tests (10 WDRT) were used for the assessment of memory registration and recall respectively. The 10 WDRT is widely used as a direct cognitive test for memory functions in epidemiological studies conducted in developing countries [20,21]. For the learning phase, participants were asked to repeat 10 words read out to them slowly for a total of three administrations to allow for adequate learning. For each administration, the number of words correctly remembered was noted. The recall phase of the test was assessed after approximately five minutes, during which they were asked other questions from the study. In the local (Nigerian) norms for the 10 WDRT, a score (to the nearest whole number) of 15 or less for the learning phase and 5 for recall warrants a suspicion of dementia in persons with at least one year of formal education. The corresponding scores are 11 and 4 respectively for learning and recall among those with no formal education [21,22].

The animal naming test was used for assessment of executive functions. In this test, participants are required to name as many animals as possible in one minute. In the local (Nigerian) norms for the Animal naming test, a score (to the nearest whole number) of 12 or less warrants a suspicion of executive dysfunction in persons with at least one year of formal education. The score is 9 or less for those with no formal education [22].

For the assessments of the other cognitive domains specified in the NINDS-AIREN criteria, we used the performance of participants in the total and domain scores of the MMSE according to previously published procedure [23]. The MMSE [24] is a 20 item instrument frequently used as a screening tool for global cognitive impairment. It takes about 5–10 min to administer and generates a maximum score of 30 from 10 cognitive domains; orientation (10 points), memory registration (3 points) and recall (3 points), attention (5 points), praxis (3 points), naming (2 points), language repetition (1 point) and reading comprehension (1 point), writing (1 point), and visuoconstructional ability (1 point). According to the local (Nigerian) norms for the MMSE, a total score of 22 or less warrants a suspicion of dementia in persons with at least one year of formal education. The score is 15 or less for those with no formal education [22]. In this study, participants scoring <1 standard deviation below the mean score for individual domain of

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