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Full Length Research Paper

Medical complications among stroke patients at the University of Maiduguri Teaching Hospital, Northeastern Nigeria

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Abstract

Complications during strokes adversely affects outcome. This study sought to assess the types and frequency of complication occurring in African stroke patients. The study population consisted of 524 patients admitted for stroke during the period January 2005 to May 2011. We recorded clinical state and all complications during hospital stay and follow–up. Deaths within this period were also recorded. A total of 201 (38.4%) of stroke patients had complication during admissions and follow-ups. The most common complications were aspiration pneumonia 65 (12.4%), depression 48 (9.2%), urinary tract infection 33 (6.3%), pressure sore 20 (3.8%), contractures 18 (3.4%), seizure 16 (3.1%) and hyperglycaemia 12 (2.3%). Forty-eight (9.2%) patients had more than one complication. Urinary tract infection was commoner in females (P = 0.015). Sixty–day fatality was higher in those with complications (P = <0.001). Factors associated with the development of complications include: Glascow coma scale ≤ 12 on admission (OR, 4.1; 95% CI, 2.50 – 6.54. P = < 0.001), admission mRDS ≥ 4 (OR, 2.0; 95% CI, 1.19 – 3.32. P = 0.009), admission NIHSS ≥ 11 (OR, 2.2; 95% CI, 1.46 – 3.31. P = <0.001), admission Barthel's ADL index ≤30 (OR, 2.4; 95% CI, 1.53 – 3.69. P = <0.001), elevated white blood cell count >8x10^9/L (OR, 1.9 95% CI, 1.20 – 3.14. P = 0.007). Common medical complications in stroke include aspiration pneumonia, depression and urinary tract infections, and are associated with prolonged hospital stay and decreased survival. Prevention and treatment of complications could improve patient survival.

Keywords: Stroke, Complications, Blacks, Nigeria.

INTRODUCTION

Stroke is the second most common cause of death, (Murray and Lopez, 1997) and a leading cause of disability worldwide (WHO, 1997). Only about half of stroke survivors are independent 6 months after a stroke (WHO, 1997). Although there has been a decline in stroke mortality in Caucasians (Tong et al., 2010), this cannot be said of Nigeria, where case fatality rates remain as high as 45% (Komolafe et al., 2006).

Complications following strokes significantly contribute to these mortalities (Wahab et al., 2008). Common causes of death following acute stroke include brain herniation from raised intracranial pressure, cardiac arrhythmias and pulmonary thromboembolism (Kalra et al., 1995; Hong et al., 2010). Other complications, such as seizures, pressure sores and depression also contribute to stroke mortality, but most often, they are the cause of long-term disability among stroke survivors (Kalra et al., 1995; Johnston et al.,1998; Hong et al., 2010; Smithard et al., 1996; Bae et al., 2005). For instance, post-stroke complications may aggravate initial neuronal injury, increase the likelihood of stroke recurrence, hinder rehabilitation efforts and interfere with doctor-patient relationship, all of which impact negatively on long-term survival and functional outcome (Bae et al., 2005; Roth et al., 2001). A study by Wahab et al (2008) in southwestern Nigeria, reported in a study on predictors of short-term mortality that the presence of complications had the strongest correlation with 30-day case fatality. Factors associated

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with higher prevalence include advanced age and worse stroke severity (Kalra et al., 1995; Johnston et al., 1998). The prevalence of medical complications after stroke varies widely, ranging from 28% to 90% in western countries (Kalra et al., 1995; Johnston et al., 1998; Bae et al., 2005; Davenport et al., 1996; Langhorne et al., 2000; Indredavik et al., 2008); however, stroke complications have not been well studied in Nigeria. There are few studies with limited sample size (Wahab et al., 2008; Oladiji et al., 2009; Otegbayo et al., 2006), and to the best of our knowledge, no study in Nigeria has evaluated the long-term effects of medical complications.

In order to improve stroke care in Nigeria, studies are needed to examine the effect of complication on stroke outcome, and the role of prevention and treatment of these complications.

The aim of this study was to assess the types, frequency and independent predictors of medical complications in stroke patients attending a university teaching hospital followed over a long-term period.

METHODOLOGY

From January 2005 to May 2011, we prospectively enrolled a total 524 consecutive patients with a diagnosis of stroke; patients who consented were admitted to the neurology unit of the University of Maiduguri Teaching Hospital, Maiduguri in Northeastern Nigeria. Stroke was defined as rapidly developing clinical sign of focal and/or global disturbance of cerebral function, with symptoms lasting twenty-four hours or longer or leading to death with no apparent cause other than of vascular origin (WHO, 1988).

Patients demographic information and risk factors were recorded, viz: Age, sex, hypertension, diabetes mellitus, past history of stroke, transient ischaemic attack (TIA), atrial fibrillation (AF), human immunodeficiency virus (HIV) infection, significant alcohol intake and cigarette smoking.

Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS), while stroke disability was assessed using the modified Rankin Disability Stroke Scale (mRDS) and the Barthel's Activity of Daily Living (ADL) index; these indices were rated both on admission and discharge. The patients conscious level was assessed using the Glasgow coma score (GCS). A record of 60-day case fatality was documented. The length of stay in the hospital was also recorded.

The rate and types of medical complication were recorded while patients were on admission and during follow-ups. Medical complications were defined as complications requiring intervention (Bae et al., 2005). These include aspiration pneumonia, pressure sore, urinary tract infection (UTI), painful shoulder, hyperpyrexia, deep vein thrombosis, or pulmonary embolism (Davenport et al., 1996; Roth et al., 2001). We also included depression, hyperglycaemia, hypoglycaemia, cerebral oedema, seizures, and falls/fracture.

The Hospital Anxiety and Depression Scale (HADS) were used for screening patients with depression. A score of > 7 was used as a depressive mood (Zigmond and Snaith, 1983).

Temperature of patients was taken three times a day, hyperpyrexia was taken as temperature of $\geq 38^{o}C$ in the absence of a recognized infection. Hyperglycaemia was recorded as random blood sugar of 11.1mmol/L or greater during admission, in patients who are not diabetic and with normal glycosylated haemoglobin. Hypoglycaemia is taken as a random blood sugar of 2.5mmol/L or less, and is not attributed as the cause of neurological deficit.

A univariate analysis was conducted using a χ^2 or student's t-test to determine relationship of patient's demographics, risk factors and indices of stroke severity, comparing patient with and without complications. The frequency of complications in relation with sex was also analyzed. Multiple logistic regression analyses were conducted for those factors that were significant on univariate analysis.

All statistical analysis was conducted using SPSS version 16.0 package for windows, (SPSS Inc., Chicago, IL, USA). The study was approved by the research and ethics committee of the hospital.

RESULTS

One or more complications occurred in 201 (38.4%) of our patients. The types and frequency of these complications are represented in figure 1. Aspiration pneumonia was the commonest complication occurring in 65 (12.4%) of patients, followed by, depression in 48 (9.2%), UTI in 33 (6.3%), pressure sore in 20 (3.8%), contractures in 18 (3.4%), seizures in 16 (3.1%), hyperglycaemia in 12 (2.3%), pains in 11 (2.1%), hyperpyrexia in 7 (1.3%), cerebral oedema 6 (1.2%), hypoglycaemia 4 (0.8%), DVT in 3 (0.6%), falls/fracture in 2 (0.4%), PTE in 1 (0.2%). About 48 (9.2%) had more than one complications.

Baseline stroke characteristics, risk factors, stroke severity, are represented in Table 1, showing that those with complication(s) where significantly more likely to be of older age, to have a more severe stroke and disability both on admission and discharge as measured by the NIHSS, mRDS, Barthel's ADL index and GCS. In addition, those with complications were more likely to have a higher WBC on admission, a longer duration of hospital stay and a higher 60-fatality.

Apart from UTI that was commoner in females (P=0.015), there was no significant sex difference in complications. (Table 2)

Table 3 reports that 5 factors were independently associated with the development of complications, they were: Initial Glascow coma scale ≤ 12 (OR, 4.1; 95%

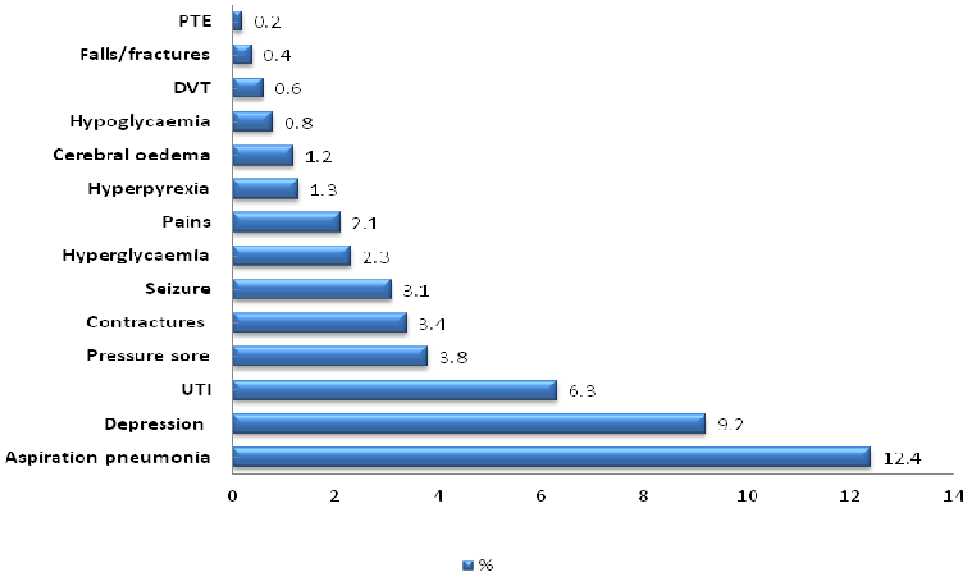

Figure 1. Percentages of various complications

Table 1. Baseline Characteristics of study subjects

Medical complications	Yes (n=201)	No (n=323)	P value
Age ± SD	57.9 ± 12.2	55.5 ± 13.5	0.041*
Males	132 (65.7)	194 (60.1)	0.198
Females	69 (34.3)	129 (39.9)	0.198
Stroke severity (mean)			
NIHSS Admission	17.4 ± 8.1	11.8 ± 4.9	<0.001*
NIHSS Discharge	20.7 ± 16.7	8.5 ± 9.9	<0.001*
mRDS on admission	4.1 ± 0.7	3.8 ± 0.7	<0.001*
mRDS on discharge	4.2 ± 1.7	2.9 ± 1.3	<0.001*
Barthel's ADL on admission	18.1 ± 19.2	30.0 ± 22.0	<0.001*
Barthel's ADL on discharge	38.3 ± 34.4	60.9 ± 26.3	<0.001*
GCS on admission	13.0 ± 3.2	14.4 ± 1.9	<0.001*
Hypertension	179 (89.1)	277 (85.8)	0.275
Diabetes mellitus	24 (11.9)	29 (9.0)	0.274
Previous stroke	25 (12.4)	35 (10.8)	0.575
Alcohol	17 (8.5)	27 (8.4)	0.968
Smoking	14 (7.0)	21 (6.5)	0.836
TIA	11 (5.5)	17 (5.3)	0.917
AF	4(2.0)	4 (1.2)	0.495
HIV	3 (1.5)	4 (1.2)	0.703
Mean SBP	158.4 ± 35.5	157.1 ± 32.2	0.666
Mean DBP	98.4 ± 19.3	97.1 ± 19.5	0.457
Mean WBC	7.2 ± 2.8	6.6 ± 3.7	0.049*
Duration of hospital stay	51.7 ± 37.0	25.3 ± 15.7	<0.001*
60-day fatality	73 (41.3)	19 (4.5)	<0.001*

Students' t-test for continuous variable and χ^2 for categorical variable. * P-value ≤ 0.05, GCS – Glasgow coma score.TIA – Transient ischaemic attack. AF – Atrial fibrillation.

Table 2. Frequency of complications in relation to sex

Complications	Total (%)	Male (326)	Female (198)	p-value
Total	201 (38.4)	132 (40.5)	69 (34.8)	0.198
Aspiration pneumonia	65 (12.4)	40 (12.3)	25 (12.6)	0.905
Depression	48 (9.2)	30 (9.2)	18 (9.1)	0.966
UTI	33 (6.3)	14 (4.3)	19 (9.6)	0.015*
Pressure sore	20 (3.8)	13 (4.0)	8 (4.0)	0.976
Contractures	18 (3.4)	12 (3.7)	6 (3.0)	0.692
Seizure	16 (3.1)	13 (4.0)	3 (1.5)	0.111
Hyperglycaemia	12 (2.3)	7 (2.1)	5 (2.5)	0.779
Pains	11 (2.1)	8 (2.5)	3 (1.5)	0.467
Hyperpyrexia	7(1.3)	3 (0.9)	4 (2.0)	0.288
Cerebral oedema	6 (1.2)	4 (1.2)	2 (1.0)	0.821
Hypoglycaemia	4 (0.8)	2 (0.6)	2 (1.0)	0.613
DVT	3 (0.6)	2 (0.6)	1 (0.5)	0.873
Falls/fractures	2 (0.4)	1 (0.3)	1 (0.5)	0.721
PTE	1 (0.2)	1 (0.3)	0 (0.0)	0.435
> one complication	48 (9.2)	33 (10.1)	15 (7.6)	0.327
60-day fatality	92 (17.6)	57(17.5)	35 (17.8)	0.955

χ 2 for categorical variables. * P-value $\leq$ 0.05. UTI – Urinary tract infection. DVT – Deep vein thrombosis. PTE – Pulmonary thromboembolism.

Table 3. Independent predictors for the development of complications

Independent variable	OR	95% CI	P-value
Age >60	1.2	0.82- 1.71	0.363
Elevated WBC count >8x10^9/L	1.9	1.20 – 3.14	0.007
Initial Glascow coma scale $\leq$ 12	4.1	2.50 – 6.54	<0.001
Admission mRDS $\geq$ 4	2.0	1.19 – 3.32	0.009
Admission NIHSS $\geq$ 11	2.2	1.46 – 3.31	<0.001
Admission Barthel's ADL index < 30	2.4	1.53 – 3.69	<0.001

Logistic regression analysis of variables, P $\leq$ 0.05

CI, 2.50 – 6.54. P = < 0.001), admission mRDS $\geq$ 4 (OR, 2.0; 95% CI, 1.19 – 3.32. P = 0.009), admission NIHSS $\geq$ 11 (OR, 2.2; 95% CI, 1.46 – 3.31. P = <0.001), admission Barthel's ADL index $\leq$30 (OR, 2.4; 95% CI, 1.53 – 3.69. P = <0.001), Elevated white blood cell count >8x10^9/L (OR, 1.9 95% CI, 1.20 – 3.14. P = 0.007).

DISCUSSIONS

This is the first prospective study in our centre on stroke complications. Our study showed that pneumonia, depression, UTI, pressure sores, contractures and seizures were the commonest complications in our patients. The percentage of our patients with complication(s) is similar to other studies, (Hong et al., 2010; Bae et al., 2005; Ingeman et al., 2011) but lower than in several other studies; (Kalra et al., 1995; Johnston et al., 1998; Davenport et al.,1996; Langhorne et al., 2000; Indredavik et al., 2008; Roth et al., 2001) with most of these studies reporting a prevalence of about 40–90%. The disparity in the frequency of complications may be attributed to the differences in the criteria for definitions and types of complications in our study, in addition to differences in the index of suspicion and diagnosis of these complications. For example, our study did not include constipation as in the study by Ingeman *et al.* (2011), or gastrointestinal bleeding, arrhythmias and heart failure as in the study by Roth et al (2001).

In agreement with other studies; (Johnston et al., 1998; Roth et al., 2001), a higher stroke severity and a lower GCS were the most important predictors of stroke complications, and these complications significantly affect mortality. Studies have reported that complications increase the likelihood of death, which supports our findings (Bae et al., 2005; Indredavik et al., 2008; Wahab et al., 2008). Our study reported a significantly higher proportion of fatality among patients with complications of 41.3%. This is similar to the study by Indredavik et al (2008) but lower than the RANTTAS trial of 14% (Johnston et al., 1998). Our study shows that those who were admitted with depressed conscious

level were more than four times likely to have complications. The presence of complications in stroke increases the likelihood of longer duration of stay; (Bae et al., 2005; Tirschwell et al., 1999) this is congruent with our study.

Stroke complications affects the disability-adjusted life-years (DALY) as reported by Hong et al (2010) that a complication deprives patients of approximately 2 years of optimum health and the more the number of complications the additional DALY lost.

Aspiration pneumonia was the most frequent complication among our subjects, pneumonia is reported as the commonest complication in some studies, (Kalra et al., 1995; Smithard et al., 1996) but it is not universal (Tong et al., 2010). It has been reported that depressed conscious level and swallowing problems are the factors that predispose to aspiration pneumonia. A simple swallowing test for stroke patients could prevent its occurrence. This is a subject of further study in our patients.

Depression appears to be common, and this is in keeping with a prospective multicenter study, (Langhorne et al., 2000) which reported that mood and affective symptoms may be underestimated in stroke patients. The rate of depression in our study is lower than a study in the southwestern part of the country; (Oladiji et al., 2009) they reported that gender difference in depression exists and were commoner in females.

Our study showed that UTI is a relatively common complication, and more likely to occur in females. The frequency in this study is lower compared to other studies (Davenport et al., 1996; Ingeman et al., 2011; Stott et al., 2009). Female gender is a risk factor for UTI. (Aslanyan et al., 2004). In addition, urinary catheterization, severe stroke and increasing age are associated with increasing risk of stroke (Stott et al., 2009; Poisson et al., 2010). The fever and systemic inflammatory response associated with UTI may impair stroke recovery (Poisson et al., 2010). Unnecessary catheterization and early removal may assist in reducing the incidence (Stott et al., 2009).

Skin breaks is common but less than other studies. (Davenport et al., 1996). This may just reflect the poor nursing care, in a country with a high patient to nurse ratio.

Post stroke seizure in our study is 3.1%, which is similar to those reported by Kammersgaard et al (2005) of 3.2% and the Oxfordshire community project of 3.8%. (Burn et al., 1997) A study reported a higher frequency of 9% (Olsen et al., 1987). In contrast to our study, these study patients were followed up for greater than 5 years. We may expect a higher value if followed up for this longer duration.

DVT and PTE were not common in our study. A study by Tong et al (2010), reported an increasing trend of this complications, and that this may probably be due to new and improved diagnostic procedures, which may be lacking in our setting.

Medical complications following a stroke may be potentially preventable; certain medical intervention should be implemented, with clinicians proactively identifying patients at higher risk for complications. Studies have shown that managing patient in a stroke unit rather than the general ward is associated with earlier detection and management of stroke-related problems and prevention of potentially life-threatening complications, (Kalra et al., 1995; Govan et al., 2007; Vemmos et al., 2001) in addition managing patients in a dedicated stroke unit was associated with significant reductions in stroke progression and recurrence, complications of immobility, chest infections and pressure sores, (Craig et al., 2010) and this was achieved through increase in the use of oxygen, measures to prevent aspiration, use of paracetamol, reduction in the use of urinary catheterization and other medical tubes, (Johnston et al.,1998; Govan et al., 2007; Roth et al., 2002) and early mobilization (Craig et al., 2010; Ingeman et al., 2011). Early mobilization is associated with decrease rate of complications, (Kelley et al., 1987) and has a favourable effect on independence at 3 months (Craig et al., 2010).

A limitation in this study is the inability to relate stroke subtype, lesion location and the presence of complications, as most our subjects had no neuroimaging. Another limitation is our definitions for complications, as we included only 15 complications, and this might have affected the percentage of patients with complication. We also did not follow up these subjects beyond 60 days.

In view of the above we must begin to shift from managing patients in the general wards to dedicated stroke units, especially patients with severe stroke. This may be difficult in our resource poor setting. Some of these patients could be carefully selected, especially the severely ill ones, and managed in high dependency wards. Briggs et al. (2001) reported that it was not cost effective and there was no added benefit of managing mild to moderate stroke in the ICU or dedicated stroke units.

In conclusion, our study showed that complications are common occurrences in stroke patients. The commonest complication is aspiration pneumonia. Depressed conscious level, higher stroke severity and a worse disability are associated with the development of complications. More study is required to assess the effect of continuous monitoring and dedicated stroke unit care. We hope that this study may influence hospital policies and improve standard of care of our stroke patients.

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