ASPIRATION PNEUMONIA IN PATIENTS WITH STROKE, NORTHEAST NIGERIA

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Objectives: Aspiration pneumonia is a common complication in patients with stroke, having a negative influence on morbidity and mortality. This study sought to assess the frequency of aspiration pneumonia and the independent predictors for its development among Nigerian patients with stroke.

Methods: Five hundred and twenty-four stroke patients were prospectively enrolled during the study period at the University of Maiduguri Teaching Hospital, Maiduguri, from January 2005 and May 2011. All patients who developed aspiration pneumonia during hospital stay and follow-up were recorded. A student's t-test and a Pearson chi-square analysis was used to compare baseline characteristics of subjects who developed aspiration pneumonia and those who did not. A multiple logistic regression was used to assess the independent predictors of aspiration pneumonia. We also recorded the rate of deaths and duration hospital stay within this period.

Results: Aspiration pneumonia occurred in 65 (12.4%) of our stroke patients, A univariate analysis showed that patients with aspiration pneumonia were older ($P<0.001$), had a lower Glasgow coma score on presentation ($P<0.001$), were more likely to have swallowing ($P<0.001$) and speech problems ($P=0.003$). They were also more likely to have severe stroke (NIHSS, $P<0.001$) and disability (mRDS, $P<0.001$; Barthel' ADL index, $P<0.001$) both on admission and discharge. They had a higher 60 – day fatality (75.4% versus 9.4%; $P<0.001$) and a lower duration of stay (25.3 ± 17.5 versus 34.6 ± 28.3 ; $P=0.01$). Factors associated with the development of aspiration pneumonia are; Age > 60 years (OR, 2.3; 95% CI, 1.37 – 3.91; $P=0.002$); Initial GCS ≤ 12 (OR, 4.5; 95% CI, 2.60 – 8.00; $P<0.001$); dysphagia (OR, 12.1; 95% CI, 6.50 – 22.70; $P<0.001$); dysphasia (OR, 2.2; 95% CI, 1.29 – 3.70; $P=0.004$); admission mRDS ≥ 4 (OR, 4.1; 95% CI, 1.43 – 11.50; $P=0.008$); admission NIHSS ≥ 11 (OR, 2.5; 95% CI, 1.34 – 4.66; $P=0.004$); admission Barthel' ADL index <30 (OR, 16.9; 95% CI, 4.07 – 70.29; $P<0.001$).

Conclusion: Aspiration pneumonia is a common complication in our stroke patients. Decline in consciousness, swallowing and speech difficulties, and severe strokes are associated with the development of aspiration pneumonia.

Keywords: Stroke, Complications, Aspiration pneumonia, Nigeria, Sub-Saharan Africa.

Introduction

Pneumonia associated with stroke is a common complication and a major cause of disability and death [1, 2, 3]. The frequency of pneumonia in acute stroke may reach up to 42%, with aspiration pneumonia contributing

significantly to these pneumonias [4]. Aspiration pneumonia contributes to the development of worse stroke, poor functional outcome and longer duration of stay⁵; by inducing hypoxaemia, hyperpyrexia, and systemic inflammatory response, which are deleterious in strokes [6, 7]. The risk of

aspiration pneumonia in stroke patients has been linked to several factors which include; weakness of swallowing muscles and swallowing apraxia [8], altered consciousness [9], severe strokes [2, 10], recumbency [11], poor oral health [12], older age [9, 10], speech problems [10], large infarct, multiple strokes, and brainstem strokes [2, 8, 13]. Aspiration in normal persons usually provokes protective violent cough, which is depressed in stroke patients [8].

Only limited data are available regarding poststroke complications in Nigeria; and to the best of our knowledge only one available study examined gastrointestinal complications in stroke patients [14]. Therefore, we sought to study the frequency of aspiration pneumonia and the predictors for developing aspiration pneumonia in patients treated for stroke at a university teaching hospital.

Methods

The study was conducted at the University of Maiduguri teaching hospital (UMTH), a major referral center in northeast Nigeria. The study was conducted concurrently with a prospective study on medical complications in stroke in this center [15], between January 2005 and May 2011. There were 524 consecutive patients enrolled for the study, the subjects included those with first-ever and recurrent strokes; irrespective of stroke subtype. Stroke was defined based on the World Health Organisation (WHO) criteria [16].

Information on patients demographic and baseline characteristics were recorded, including: age, sex, stroke risk factors, swallowing, dysphasia and dysarthria.

All patients who developed pneumonia attributable to aspiration while on admission or seen during follow up were recorded. Aspiration pneumonia was diagnosed based on the criteria by Langhorne *et al.* [17], these include respiratory symptoms and signs, auscultatory respiratory crackles, chest radiographic evidence or new purulent sputum.

Dysphagia/swallowing problems were assessed using a simple bed side swallowing test in which increasing quantity of water was given, starting with about a spoon full, and swallowing was assessed for coughing, choking or breathing difficulty [18].

Patients' conscious level was assessed using

the Glasgow coma score (GCS). Stroke severity was measured using the national institutes of health stroke score (NIHSS), while disability was measured using the modified Rankin disability score (mRDS) and the Barthel's activity of daily living (ADL) score, these indices were assessed both on admission and discharge, and the measurement was done by a member of the team or a trained intern.

The duration of hospital stay and 60-day fatality were recorded for all patients.

Consent was sought from all patients or their surrogates, and the study was approved by the Hospital's Ethics committee.

Statistical analysis: A univariate analysis (Student's t-test for continuous variable and Pearson's χ^2 for categorical variable) was used to compare baseline stroke characteristics, risk factors, GCS, indices of stroke severity (NIHSS, mRDS and Barthel's ADL, on admission and discharge), duration of hospital stay, and 60-day fatality, between those with and those without aspiration pneumonia. A multiple logistic regression was used for those factors that were significant on univariate analysis to determine independent predictors and odds ratio of factors that influence the development of aspiration pneumonia. Data were analyzed using Statistical Package for the Social Sciences software (SPSS, version 16.0). Statistical significance was accepted as $P \leq 0.05$.

Results

Table 1 shows the baseline characteristics of patients. Aspiration pneumonia occurred in 65 (12.4%) patients. Comparing characteristics between those who had aspiration pneumonia and those who did not; those with aspiration pneumonia were more likely to be older ($P < 0.001$), to have a lower GCS on admission ($P < 0.001$), to have dysphagia ($P < 0.001$), and speech problems ($p = 0.003$). There was no significant sex difference in the development of aspiration pneumonia. Stroke patient with aspiration pneumonia were also more likely to have a severe stroke (NIHSS, $P < 0.001$) and disability on admission (mRDS, $P < 0.001$; Barthel' ADL index, $P < 0.001$), while on discharge, patients with aspiration pneumonia were more likely to have poorer recovery (NIHSS, $P < 0.001$), and are more likely to be disabled on discharge (mRDS, $P < 0.001$; Barthel' ADL index,

P<0.001). Patients with aspiration pneumonia had a higher 60 – day fatality (75.4% versus 9.4%; P<0.001), with a lower duration of hospital stay (25.3±17.5 versus 34.6±28.3; P=0.01)

Table 2 shows the factors that were independently associated with the development of aspiration pneumonia. These includes: Age > 60 years (OR, 2.3; 95% CI, 1.37 – 3.91; P=0.002); Initial GCS≤12 (OR, 4.5; 95% CI, 2.60 – 8.00; P<0.001); dysphagia (OR, 12.1; 95% CI, 6.50 – 22.70; P<0.001); dysphasia (OR, 2.2; 95% CI, 1.29 – 3.70; P=0.004); admission mRDS≥4 (OR, 4.1; 95% CI, 1.43 – 11.50; P=0.008); admission NIHSS≥11 (OR, 2.5; 95% CI, 1.34 – 4.66; P=0.004); admission Barthel' ADL index <30 (OR, 16.9; 95% CI, 4.07 – 70.29; P<0.001).

Discussion

Aspiration pneumonia is a common complication, occurring in 12.4% of our study population. Our study showed that increased risk of aspiration pneumonia is associated with increasing age, severe stroke, a lower conscious level, swallowing and speech difficulties. Patients with aspiration pneumonia were more likely to die from the complication. This study revealed that there was no sex difference in pneumonia occurring during a stroke, this is in keeping with the study by Sellars *et al.* [10], although a different study [19] reported a reduced risk of pneumonia in females.

The percentage of patients with aspiration pneumonia in our study is similar to other studies [11, 20], higher than other studies [1, 21, 22], and lower than other studies [10, 17, 23]. These discrepancies in incidence may be due to differences in definition, identification and diagnosis of patients with pneumonia. Our study did not include other causes of pneumonia not attributed to aspiration; this may have reduced the percentage. Our percentage appears lower, and may be that we missed some of the patient, when aspiration is of small volume it may be difficult to diagnose [9].

Our study showed that those with pneumonia are less likely to survive beyond the earlier post stroke period than other patients, the effect of pneumonia on stroke mortality has been widely reported in several studies [2, 3, 5, 9], reasons given include; decreased pulmonary oxygen saturation, increase in temperature, worsening of strokes and its role in increasing

mediators of inflammations [4, 6, 7]. Studies have reported that those with aspiration pneumonia had a longer duration of hospital stay [2, 24], but our study reported a shorter duration of stay in patients with aspiration pneumonia, and this may be due to the excess early post-stroke fatality.

There is increased risk of pneumonia in patients with dysphagia in this study. Studies have shown that patients with dysphagia were more likely to have pulmonary complications, and it is in itself an independent predictor of mortality and longer duration of hospital stay [10, 25, 26]. The study by Smithard *et al.* [25] and Reynolds *et al.* [24] showed that patients with swallowing problem had a higher risk of pulmonary complications and advised that bedside assessment of swallowing is of use in identifying patients at risk of developing complications, and noted that the value of routine screening with videofluoroscopy may be better in detecting swallowing problems, especially for some patients in whom swallowing difficulty may not be clinically obvious.

The risks of aspiration pneumonia have been related with multiple lesion and vertebrobasilar stroke signifying that this area control swallowing reflex and its dynamics [2]. This is a limitation this study had, since only a negligible patient had neuroimaging [15].

Despite our routine bedside swallowing assessment, our patients or their surrogates hardly agree to a nasogastric tube insertion. In our environment there is a belief that NG tube insertion signifies a poor prognosis, and so except for very ill patients, NG tube insertions are usually objected to by patients and their caregivers, in patients with dysphagia. Although, the insertion of an NG tube may be beneficial in patients with dysphagia [27]; some studies infer that insertion of nasogastric tube offers little protection or may make patients prone to aspiration pneumonia [28, 29].

Some of the limitations of the study are: lack of objective swallowing analysis using videofluorographic studies [18]; most of our patient had no neuroimaging, and so we could not assess the effect of stroke subtype, area and size of lesion with swallowing problems and pneumonia. We did not study the influence of nasogastric tube insertion in aspiration pneumonia.

In Conclusions, this study suggests that aspiration pneumonia is a common complication; its

development is associated with altered consciousness, swallowing and speech difficulties, and severe strokes. Those with aspiration pneumonia are more likely to die within 60 – days. This study should help in designing future stroke care by assessing swallowing difficulties in our stroke patients and to reorganize our process of care.

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РЕЗЮМЕ

АСПИРАЦИОННАЯ ПНЕВМОНИЯ У

БОЛЬНЫХ С ИНСУЛЬТОМ В СЕВЕРОВОСТОЧНОЙ НИГЕРИИ

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Аспирационная пневмония является частым осложнением у больных с инсультом и оказывает негативное влияние на уровень заболеваемости и смертности. Это исследование ставило целью оценить частоту аспирационной пневмонии и выявить независимые прогностические факторы для ее развития среди нигерийских пациентов с инсультом.

Методы: 524 больных с инсультом проспективно изучены в течение периода исследования в Университете клинической больницы Майдугури, (январь 2005 года-май 2011 года). Все пациенты, у которых во время пребывания в больнице развилась аспирационная пневмония последующим были исследованы. Множественная логистическая регрессия была использована для оценки независимых предикторов аспирационной пневмонии. Также были изучены уровень смертности и продолжительность пребывания больных в течение этого периода.

Вывод: Аспирационная пневмония являлось частым осложнением у пациентов, перенесших инсульт. У больных с тяжелым инсультом снижение уровня сознания, нарушения глотания и речи были связаны с развитием аспирационной пневмонии.

Ключевые слова: инсульт, осложнения, Аспирационная пневмония, Нигерии, Суб-Сахарская Африка.

INSULTU XƏSTƏLƏRDƏ ASPİRASION

PNEVMONIYA, ŞİMAL-ŞƏRQİ NİGERİYA

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Aspirasion pnevmoniya insultlu xəstələrdə ümumi ağrılaşmalardandır və xəstələnmə və ölümə mənfi təsir göstərir. Təqdim edilmiş tədqiqat işi Nigeriyalı insultlu xəstələr arasında aspirasion pnevmoniyanın rastgəlinmə tezliyinin və yaranmasının müstəqil prediktorlarını araşdırmışdır.

Tədqiqatın metodu. 524 insultlu xəstə Mayduquri kliniki xəstəxanasında prospektiv olaraq tədqiq edilmişdir (Yanvar 2005-ci il-may 2011-ci il). Xəstəxanada müalicə edilərkən və sonra aspirasion pnevmoniya inkişaf etmiş xəstələrin hamısı tədqiqata cəlb edilmişdir. Aspirasion pnevmoniyanın müstəqil prediktorlarının qiymətləndirilməsi üçün çoxsaylı loqistik reqressiya metodundan istifadə edilmişdir. Həm də bu dövrdə ölümün səviyyəsi və stasionar günlərin sayı tədqiq edilmişdir.

Nəticə. Bizim insultlu xəstələrdə aspirasion pnevmoniya tez-tez rast gəlinən ağrılaşmadır. Huşun vəziyyətinin aləqərləşməsi, udma və nitq pozulmaları və ağır insultlar aspirasion pnevmoniyanın inkişafı ilə əlaqəlidir.

Açar sözlər: insult, ağrılaşma, aspirasion pnevmoniya, Nigeriya, Sub-Saxara Afrikası.

Table 1. Baseline Characteristics of study subjects

	Aspiration Pneumonia		P value
	Yes (n=65)	No (n=459)	
Age±SD	62.2±10.5	55.6±13.1	<0.001*
Males	39 (60.0)	287 (62.5)	0.694
Females	26 (40.0)	172 (37.5)	
Hypertension	58 (89.2)	398 (86.7)	0.571
Diabetes mellitus	5 (7.7)	48 (10.5)	0.489
Previous stroke	10 (15.4)	50 (10.9)	0.287
Alcohol	5 (7.7)	39 (8.5)	0.827
Smoking	4 (6.2)	31 (6.8)	0.856
TIA	3 (4.6)	25 (5.5)	0.780
Dysphagia	28 (43.1)	27 (5.9)	<0.001*
Dysphasia	38 (58.5)	180 (39.2)	0.003*
Dysarthria	3 (4.6)	17 (3.7)	0.720
Glasgow coma score (admission)	12.2±3.4	14.1±2.3	<0.001*
Stroke severity (mean)			
NIHSS Admission	22.1±7.7	12.8±5.9	<0.001*
NIHSS Discharge	34.6±12.8	10.3±11.6	<0.001*
mRDS on admission	4.4±0.6	3.8±0.7	<0.001*
mRDS on discharge	4.9±1.4	3.1±1.4	<0.001*
Barthel's ADL on admission	9.5±12.9	27.6±21.8	<0.001*
Barthel's ADL on discharge	11.6±27.2	57.2±28.2	<0.001*
Mean SBP	153.3±32.7	158.2±33.6	0.260
Mean DBP	94.9±19.4	98.0±19.4	0.228
Mean RBS	7.6±3.8	7.7±5.0	0.877
Cholesterol	4.6±1.0	4.9±1.3	0.075
Mean WBC	7.5±3.2	6.8±3.4	0.118
Duration of hospital stay	25.3±17.5	34.6±28.3	0.010*
60-day fatality	49 (75.4)	43 (9.4)	<0.001*

Student's t-test for continuous variable and Pearson's χ^2 , (with Upton's adjustment) for categorical variable.

* P-value ≤ 0.05

Table 2. Independent predictors for the development of Aspiration pneumonia

Independent variable	OR	95% CI	P-value
Age >60	2.3	1.37 – 3.91	0.002
Elevated white blood cell count >8x10 ⁹ /L	1.4	0.70 – 3.80	0.344
Initial Glasgow coma scale ≤12	4.5	2.60 – 8.00	<0.001
Dysphagia	12.1	6.50 – 22.70	<0.001
Dysphasia	2.2	1.29 – 3.70	0.004
Admission mRDS ≥4	4.1	1.43 – 11.50	0.008
Admission NIHSS ≥11	2.5	1.34 – 4.66	0.004
Admission Barthel's ADL index <30	16.9	4.07 – 70.29	<0.001

Logistic regression analysis of variables, P<0.05