Original Article

Short Term Outcome of Acute Ischemic Stroke with Aspiration Pneumonia

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ABSTRACT

A cross-sectional, observational study was conducted in Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, between January 2016 and June 2018, to determine the short-term outcome of acute ischemic stroke with aspiration pneumonia (AP). Patients who were suffering from acute ischemic stroke (AIS) and were admitted under the Departments of Medicine, Neurology and Neurosurgery were approached for inclusion in the study. Detail history taking and physical examination were done. For analysis, total population were subdivided into two groups: group A (AIS with AP) and group B (AIS without AP). All patients in both groups (43 patients from group A and 44 patients in group B) were interviewed, examined and followed up for 2 weeks. Data related to the sociodemographic characteristics and risk factors were observed. Outcome was assessed by Modified Rankin Scale (MRS) score: '0' = no symptoms at all; '1' = no significant disability; '2-5'= slight to severe disability; and '6' = death. Out of 87 patients, mean age of group A and group B patients were 63.86±10.92 years and 60.89±9.75 years respectively. A male preponderance was observed, i.e., 76.7% and 70.5% males in group A and group B respectively. Among group A patients, 51.2% were smokers and 4.7% were alcoholics, while among group B patients, 45.5% were smokers and 4.5% were alcoholics. In group A, 60.5% were hypertensive, 32.6% were diabetic, 11.6% had coronary artery disease (CAD) and 55.8% had family history of stroke. In group B, 59.1% were hypertensive, 25% were diabetic, 11.4% had CAD and 34.1% had family history of stroke. Initial NIH Stroke Score (NIHSS) ≥21 was found more prevalent in group A than that of group B patients (51.2% vs. 13.6%; $p<0.001$). However, after two weeks, group B had higher proportion of patients having modified Rankin scale (MRS) score 0–2 than that of group A (47.7% vs. 9.3%; $p<0.05$). A higher proportion of group A patients having MRS score 3-5 than that of group B (55.8% vs 45.5%; $p>0.05$). MRS score 6 at week two implied that the patients were deceased (34.9% vs. 6.8%; $p<0.05$). The relative risk of aspiration pneumonia for leading to death within 2 weeks was 5.11 (95% CI 1.59-16.42) ($p<0.001$) Aspiration pneumonia is a predictor of worse outcome in acute ischemic stroke patients and imposes a 5-times increased risk of death within 2 weeks.

Keywords: *Acute ischemic stroke, aspiration pneumonia, short-term outcome.*

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INTRODUCTION

Stroke is the second most common cause of death worldwide,[1] and one of the leading causes of disability.[2] It has been observed that in spite of increasing life expectancy all over the world due to advancement of science and technology, the burden of stroke is likely to increase worldwide particularly in middle- and low-income countries.[3,4] According to World Health Organization (WHO), the majority of deaths (86%) related to stroke occurred in developing countries[1] and South Asia is thought to be the highest affected region with accounting for more than 40% of global stroke deaths.[5] At least half of the patients with neurologic disorders attending general hospitals have been suffering from stroke.[6] Disability- adjusted life-years lost due to stroke are high (485 per 10000 people) and have a profound impacts in the economy of Bangladesh.[7] Overall prevalence of stroke in Bangladesh is approximately 3 per 1000 person-year and 10 per 1000 person-year in people aged 70 years or more.[8]

Dysphagia is one of the common presentations of acute stroke occurring in approximately 50 percent cases.[9] Although most patients recover spontaneously, a significant minority still have dysphagic at six months. Approximately half of the dysphagic patients fail to recover swallowing within 1 week and are subject to an increasing risk of aspiration pneumonia,[10] which is a common complication of acute stroke and affecting approximately one third of patients. Aspiration pneumonia is a major cause of morbidity and mortality after stroke and increase length of hospital stay.[11]

The risk of aspiration after stroke has been related to brain stem lesions.[12] However, aspiration is not uncommon in stroke in other location.[13] As fewer studies are available in our country context, we proposed this study to assess the short-term outcome of acute ischemic stroke patients along with aspiration pneumonia admitted into a tertiary care hospital in Bangladesh.

METHODS

This cross-sectional, observational study carried out in the Departments of Medicine, Neurology, and Neurosurgery of Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, between January 2016 and June 2018. A total of 87 patients of acute ischemic stroke were enrolled in this study. Group A consists of 43 patients having acute ischemic stroke along with aspiration pneumonia, while group B consists of 44 patients of acute ischemic stroke without aspiration pneumonia. After taking proper history, a meticulous neurological examination was done. Then patients were sent for computed tomography (CT) scan of brain. The interpretation of the CT scan of brain was done by an expert radiologist and verified by a consultant neurologist. It could be noted that, in this study, all patients received the standard medical management of acute ischemic stroke according to the guideline of American Heart Association/ American Stroke Association.[14]

The patients were followed up daily during the first two week of hospital admission with special attention to vital parameters and neurological features. The severity of stroke was assessed by NIH Stroke Scale (NIHSS) on the day of admission and extent of neurological disability was measured by Modified Rankin Scale (MRS) at the end of the second week following admission. In addition, mortality within first two weeks was also recorded. All necessary data regarding socio-demographic profile, stroke severity and history, signs and symptoms of aspiration pneumonia was noted in data collection sheet.

Following collection, data editing and encoding, all data were recorded into a statistical software. In this study, for data analysis Statistical Package for Social Sciences (SPSS) version 20.0 for Windows and Microsoft Excel 2010 were used. In addition, mean difference of in between groups were assessed by Chi-square test. Significance level was set at a two-tailed $p<0.05$.

The study was approved by the Ethical Review Committee of Dhaka Medical College, Dhaka, Bangladesh.

RESULTS

The mean age of the patients was 62.36±10.39 years (in group A 63.86±10.92 years and group B 60.89±9.75 years). The majority belonged to the age group 45-70 years (in group A 72.1% and in group B 84.1%). In total, 73.6% patients were males, while 26.4% were females. The majority patients were married in both groups. Among 87 patients, 65.5% patients came from rural areas and 34.5% from urban areas. Most of the patients in this study completed primary education (51.7%). Most prevalent occupation was business, followed by govt. or private

service and housewife. Most of the patients had monthly income between 30001 to 50000 BD Taka (in group A 34.9% and in group B 56.8%) (Table-I).

Table-I
Sociodemographic characteristics of the study participants (n=87)

Variables	Group A (n=43)	Group B (n=44)	p-value
Age group (in years)			
<45	3 (7)	3 (6.8)	
45-70	31 (72.1)	37 (84.1)	0.29
>70	9 (20.9)	4 (9.1)	
Sex			
Male	33 (76.7)	31 (70.5)	0.50
Female	10 (23.3)	13 (29.5)	
Marital status			
Married	39 (90.7)	40 (90.9)	
Widowed	3 (7.0)	3 (6.8)	0.99
Divorced	1 (2.3)	1 (2.3)	
Residence			
Rural	26 (60.5)	31 (70.5)	0.32
Urban	17 (39.5)	13 (29.5)	
Education level			
Primary	20 (46.5)	25 (56.8)	
Up to SSC	6 (14.0)	6 (13.6)	
Up to HSC	8 (18.6)	9 (20.5)	0.47
Graduation and above	9 (20.9)	4 (9.1)	
Occupation			
Housewife	9 (20.9)	9 (20.5)	
Service	9 (20.9)	11 (25.0)	
Business	12 (27.9)	12 (27.3)	
Teacher	2 (4.7)	3 (6.8)	0.49
Day labourer	3 (7.0)	0	
Retired	8 (18.6)	9 (20.5)	
Monthly income (in BD Taka)			
<10000	8 (18.6)	4 (9.1)	
10000 – 30000	14 (32.6)	12 (27.3)	0.17
30001 – 50000	15 (34.9)	25 (56.8)	
>50000	6 (14)	3 (6.8)	

Figures in parentheses indicate percentages; p-value determined by Chi-square test.

Regarding risk factors, among group A patients, 51.2% were smokers and 4.7% were alcoholics, while among group B patients, 45.5% were smokers and 4.5% were alcoholics. In group A, 60.5% were hypertensive, 32.6% were diabetic, 11.6% had coronary artery disease (CAD) and 55.8% had family history of stroke. In group B, 59.1% were hypertensive, 25% were diabetic, 11.4% had CAD and 34.1% had family history of stroke. (Table-II). Initial NIH Stroke Score (NIHSS) ≥21 was found more prevalent in group A than that of group B patients (51.2% vs. 13.6%; p<0.001) (Table-III). However, after two weeks, group B had higher proportion of patients having modified Rankin scale (MRS) score 0–2 than that of group A (47.7% vs. 9.3%; p<0.05). A higher proportion of group A patients having MRS score 3-5 than that of group B (55.8% vs 45.5%; p>0.05). MRS score 6 at week two implied that the patients were deceased (34.9% vs. 6.8%; p<0.001) (Table-III). Looking at mortality, 34.9% patients in group A died, while in group B only 6.8% died. The relative risk of aspiration pneumonia for leading to death within 2 weeks was 5.11 (95% CI 1.59-16.42) (p<0.001) (Table-IV).

Table-II: *Risk factors among study participants (n=87)*

Variables	Group A (n=43)	Group B (n=44)	p-value
Smoking	22 (51.2)	20 (45.5)	0.59
Alcohol	2 (4.7)	2 (4.5)	0.98
HTN	26 (60.5)	26 (59.1)	0.89
DM	14 (32.6)	11 (25.0)	0.43
CAD	5 (11.6)	5 (11.4)	0.96
Family history of stroke	19 (44.2)	15 (34.10)	0.33

Figures in parentheses indicate percentages; p-value determined by Chi-square test.

Table-III: *Initial NIH Stroke Score (NIHSS) and Modified Rankin Scale (MRS) of the patients (n=87)*

Variables	Group A (n=43)	Group B (n=44)	p-value
NIH Stroke Score (NIHSS)			
<21	21 (48.8)	38 (86.4)	<0.001
≥21	22(51.2)	6 (13.6)	
Modified Rankin Scale (MRS)			
0–2	4 (9.3)	21 (47.7)	<0.05
3–5	24 (55.8)	20 (45.5)	>0.05
6	15 (34.9)	3 (6.8)	<0.001

Figures in parentheses indicate percentages; p-value determined by Chi-square test.

Table-IV: *Relative risk of mortality in ischemic stroke patients with aspiration pneumonia compared to ischemic stroke patients without aspiration pneumonia (n=87)*

Variables	Group A (n=43)	Group B (n=44)	Relative Risk	95% CI	p-value
Alive	28 (65.1)	41 (93.2)	5.11	1.59-16.42	<0.001
Dead	15 (34.9)	3 (6.8)			

Figures in parentheses indicate percentages; p-value determined by Chi-square test.

DISCUSSION

In this study, stroke patients with aspiration pneumonia were comparatively older than those without aspiration pneumonia. But the difference in age was not significant. This conforms to the findings of a large stroke registry based study conducted by Matz et al.[15] They showed that patients with post stroke pneumonia were much older.

The majority of the patients in this study were males. This was true for both groups of patients. In contrast to this Katzan el al.[16] found a difference in distribution of sex among affected group. They found that proportion of female was greater in group who did not have post-stroke pneumonia (41.9% vs. 57.6%; p<0.001). This implies that male gender is an important risk factor for developing aspiration pneumonia in stroke patients. Similar findings were observed by Wilson.[17] The result of the present study did not corroborate the findings of those studies. The explanation could be the design of present study. Taking age and sex matched subjects may have diminished sex related differences in developing aspiration pneumonia after stroke. The majority of our patients came from rural area (65.5%). There were no differences between groups (with or without pneumonia) in terms of residence. This mainly reflects the national distribution of population where around 65% are rural dwellers.[18] Approximately 51% patients completed primary education among all study patients. As majority of the patients in this study were aged more than 45 years, the finding on education just represents the earlier literacy rate in the country.[19] In this study, the major occupation was business, followed by govt./private service and housewife. Similarly, in a socio-demographic study of stroke done by Siddiqui et al.[20] also reported that business as occupation is the most prevalent, followed by housewife and service as major occupations.

Smoking and alcohol habit and other co-morbidities like HTN, DM, CAD and family history of stroke showed higher prevalence in patients of stroke with aspiration pneumonia, but the difference did not reach the level of significance. In comparison, Matz et al.[15] and Katzan et al.[16] found that HTN, DM, CAD, family history of stroke were significantly more common in patients of stroke with aspiration pneumonia.

The NIH Stroke Score (NIHSS) was obtained to assess that initial status of patients. A higher proportion of ischemic stroke patients with aspiration pneumonia had NIHSS score e"21 than that of the stroke patients without aspiration pneumonia (p<0.001). Matz et al.[15] reported that patients with post-stroke pneumonia had a higher NIHSS at admission indicating more severe stroke. Chumbler et al.[21] showed that for each unit increase in NIHSS, risk of pneumonia increases 3.1 folds.

Patients were followed up after two weeks and the MRS score for each patient was obtained. A higher percentage of patients without aspiration pneumonia improved by two weeks than those with aspiration pneumonia (p<0.05). 34.9% patients with aspiration pneumonia died (MRS score 6) compared to 6.8% patients without pneumonia (p<0.001). Our finding is remarkably higher than that of observed by Katzan et al.[16] and Reynolds et al.[22] The former reported 26.9% mortality among stroke patients with aspiration pneumonia and the latter reported 24% mortality.

A relative risk (RR) of death 5.11 (95% CI 1.59-16.42) was calculated for patients with aspiration pneumonia. This is also similar to the findings of Katzan et al.,[15] as they found a RR of 5.9 considering basic demographics of patients. This implies that aspiration pneumonia is an independent risk factor leading to death in ischemic stroke patients.

There were a number of limitations of the study. Firstly, stroke severity is responsible for worsening outcome, but it was not assessed in this study because of its cross-sectional nature. Etiology responsible for the development of aspiration pneumonia was not sorted out. Moreover, to explore the mechanism of aspiration

with regard to sociocultural factor was beyond the scope of the study.

CONCLUSION

The present study revealed that mortality rate could be 5-times higher in acute ischemic stroke patients with aspiration pneumonia than those having no aspiration pneumonia. However, this finding was not validated by measuring the stroke severity which itself might have been responsible for aspiration pneumonia. Further larger cohort study is needed to confirm the consistency of the findings.

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