

STROKE ASSOCIATED PNEUMONIA (SAP) IN INTENSIVE CARE UNIT: ITS PREVALENCE, IMPACT ON ECONOMICAL COST AND LENGTH OF HOSPITAL STAY

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ABSTRACT

Objective: To determine the frequency of stroke associated pneumonia in Intensive Care Unit patients, and its impact on economical cost and length of hospital stay.

Study Design: Descriptive case series study.

Place and Duration of Study: Intensive Care Unit-National Hospital and Medical Centre Lahore, during Aug 2017 to Sep 2018.

Methodology: The cases of acute stroke were selected on the basis of clinical symptoms and computed tomography (CT) scan findings irrespective of the gender with age >30 years. Stroke associated pneumonia was labelled on the basis of consensus definition of stroke group.

Results: In this study out of total 80 cases 60% were males, mean age of the participants was 62.01 ± 9.79 years. Ischemic stroke was seen in 75%. Stroke associated pneumonia was observed in 10 (12.5%) cases. Stroke associated pneumonia was significantly high in cases with haemorrhagic stroke where this was seen in 30% of the cases ($p=0.006$). This difference was also statistically significant in cases with diabetes mellitus where it was seen in 28.57% of the cases with $p=0.02$. The mean hospital stay and cost were also statistically significant in cases with stroke associated pneumonia as compared to those with no pneumonia with $p \leq 0.01$ each.

Conclusion: Stroke associated pneumonia is not uncommon and is significantly associated with haemorrhagic stroke and diabetes mellitus. It also has significant impact on length of hospital stay and cost of treatment.

Keywords: Diabetes mellitus, Intensive care unit, Stroke associated pneumonia.

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INTRODUCTION

Stroke is a highly morbid and fatal neurological condition across the globe. Its prevalence is around 15 million worldwide and death or permanent disability is seen in 1/3rd of these cases. United states have shown the incidence of new or recurrence in stroke in 78 thousand people and is ranked among the top causes of death along with cardiac disease and cancers^{1,2}.

Stroke is a spectrum of clinic-pathological manifestations leading to loss in sensory or motor functions of the body due to either interrupted blood supply; courtesy embolization of a clot or atherosclerosis leading to ischemic infarct or haemorrhagic one due to leakage of the blood called ahaemorrhagic stroke. The signs and symptoms rely upon the site of involvement and

the extent of the injury associated with this³⁻⁵.

Pneumonia is defined as the inflammation of the lung parenchyma usually due to bacterial invasion and is associated with cough, sputum, shortness of breath and fever. Its usually a clinical diagnosis supported by the radiological investigations in the form of Chest x-rays and Ultrasonography (USG) and even computed tomography (CT) needed to localize the site and also to look for the complications associated with this. The stroke patients are thought to suffer more from the pneumonia due to either aspiration during the period of loss of consciousness or fits, or due to hospital admission and the change of flora predisposing them to infections with newer organism and this risk even increases when the ventilatory support is added, that carrying its own risk factors. There are multiple scoring systems to document the severity of the pneumonia and to triage the cases for admission places and include CURB 65 and pneumonia

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severity index (PSI) etc. where the latter is preferred in cases with co morbid conditions⁶⁻⁸.

There was no proper definition of the Stroke-associated pneumonia (SAP); until 2015 when a consensus was made to define it by stroke group⁹. The data has shown its variable prevalence but has significant impact on the overall morbidity, mortality and increased medical cost and the length of hospital stay. The major risk factors associated with this are geriatric people, haemorrhagic stroke and those having ventilatory support or co morbid conditions like immunocompromised state or prior neurological abnormality¹⁰. The overall prevalence of SAP varies from 3.9% to 44% in cases admitted to stroke units. However, the prevalence varies a lot in subjects according to the site of admission in the hospital i.e. wards, neuro ICUs, medical ICUs, high dependency units and stroke centres etc. The local data regarding its burden and impact on hospital stay and cost was lacking.

METHODOLOGY

This descriptive case series study was carried out at ICU of the National Hospital and Medical Centre Lahore during August 2017 to September 2018. The cases were selected according to non probability consecutive sampling of either gender having age more than 30 years with stroke irrespective of its types. The cases who were already bed ridden, had any neurological deficit due to previous stroke, immunocompromised and those with end organ liver or renal failure were excluded from this study. The diagnosis of stroke was made on the basis of sudden loss of consciousness and/or any sensory or motor deficit associated with either hypodense or hyper dense area on CT brainin at least two consecutive slices done within 48 hours of admission labelled as ischemic and haemorrhagic strokes respectively. Then these cases were evaluated for detailed clinical and demographic information collection and were looked for stroke associated pneumonia. SAP was labelled on the basis of consensus definition of stroke group where the presence of first two (a) signs and

symptoms of lower respiratory tract infection (cough/sputum/ increased and muco-purulent secretions if on ventilator) within 7 days of stroke along with (b) non homogenous opacities on chest x-ray with or without (c) rise in total leucocyte count (TLC) more than 11,000 mm³ and rise in C reaction protein.

The data were entered and analyzed by using SPSS version 23.0. Quantitative variables were presented as mean and standard deviation and qualitative variables as frequency and percentages. Chi square test was applied for categorical data and independentsample t-test was used for quantitative data and *p*-value of ≤0.05 was considered as significant.

RESULTS

In the present study there were total 80 cases of stroke with mean age of 62.01 ± 9.79 years. There were 48 (60%) males and 32 (40%) females. Ischemic stroke was seen in 60 (75%) while haemorrhagic in 20 (25%) cases as shown in table-I. Stroke associated pneumonia (SAP) was observed in 10 (12.5%) of cases (figure). There was no

Table-I: Demographic and clinical data.

| Variables | Mean ± SD |
|----------------------------------|--------------|
| Age (years) | 62.01 ± 9.79 |
| Duration of stroke (days) | 1.34 ± 0.59 |
| Duration of hospital stay (days) | 5.53 ± 4.15 |
| | n (%) |
| Male | 48 (60%) |
| Female | 32 (40%) |
| Ischemic stroke | 60 (75%) |
| Hemorrhagic stroke | 20 (25%) |

Table-II: Stroke Associated Pneumonia with respect to gender and age.

| | | Stroke Associated Pneumonia | | <i>p</i> -value |
|------------|--------|-----------------------------|-------------|-----------------|
| | | Yes | No | |
| Gender | Male | 5 (10.42%) | 43 (89.58%) | 0.51 |
| | Female | 5 (15.63%) | 27 (84.37%) | |
| Age groups | 30-60 | 4 (10%) | 36 (90%) | 0.74 |
| | >60 | 6 (15%) | 34 (85%) | |

statistically significant difference in term of gender and age for SAP, with *p*-values of 0.51 and 0.74 respectively; however, it was more common in case with age more than 60 years as in table-II. SAP was significantly high in cases with haemo-

rhagic stroke where this was seen in 30% of the cases as compared to 6.67% in ischemic stroke with $p=0.006$. This difference was statistically significant in cases with DM where it was seen in 28.57% of the cases with $p=0.02$. SAP was also high in cases with ventilator support affecting 20% of the cases with $p=0.39$ as in table-III. The

Table-III: Stroke Associated Pneumonia with respect to type of stroke, diabetes mellitus and ventilator support.

| | | Stroke Associated Pneumonia | | p-value |
|--------------------|--------------|-----------------------------|-------------|---------|
| | | Yes | No | |
| Type of stroke | Haemorrhagic | 4 (6.67%) | 56 (93.33%) | 0.006 |
| | Ischemic | 6 (30%) | 14 (70%) | |
| Diabetes mellitus | Yes | 6 (28.57%) | 15 (71.43%) | 0.02 |
| | No | 4 (6.78%) | 55 (93.22%) | |
| Ventilator support | Yes | 3 (20%) | 12 (80%) | 0.39 |
| | No | 7 (10.77%) | 58 (89.23%) | |

Table-IV: Stroke associated pneumonia with respect to hospital stay and cost.

| | Stroke Associated Pneumonia | | p-value |
|-----------------------------|-----------------------------|-------------|---------|
| | Yes | No | |
| Hospital stay (days) | 12.70 ± 6.99 | 4.50 ± 2.21 | <0.01 |
| Hospital cost (100,000 PKR) | 10.50 ± 6.64 | 3.38 ± 2.06 | <0.01 |

mean hospital stay was significantly high in cases with SAP; seen as 12.70 ± 6.99 vs 4.50 ± 2.21 days with no SAP with $p=0.0001$. Similar statistical significant difference was seen in terms of

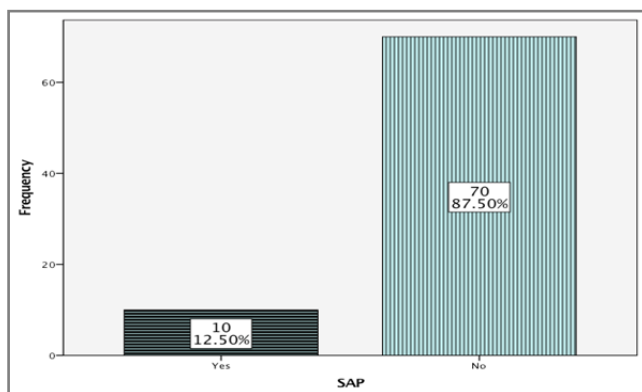


Figure: Stroke associated pneumonia in stroke patients.

hospital cost which was higher in cases of SAP (10.50 ± 6.64) lac (100,000) PKR with $p<0.01$ as in table-IV.

DISCUSSION

Stroke is a highly morbid entity and super-added conditions like pneumonia which itself is very fatal can further add to the decline in the health of such cases. Lower Glasgow come scale (GCS), loss of gag reflex, longer duration of unconsciousness and co morbid conditions are the major risk factors for its development. This can not only increase the morbidity and mortality, but can also increase the length of hospital stay and cost of treatment¹¹⁻¹³.

Stroke associated pneumonia (SAP) was observed in 10 (12.5%) out of 80 cases admitted for stroke in ICU in this study. The results were wide variable in the past at different sites of admission and indirectly attributed to the overall health of these cases. According to an analysis done by Hannawi *et al*, it was found that SAP was seen in 4.1 to 56.6% of the cases admitted to neuro ICUs and relatively lower incidence was seen in cases that were admitted in Medical ICUs where this was seen in 3.9 to 23.8% of the cases while this prevalence was seen to be 3.2 to 11% in cases which were admitted to stroke centres¹⁴. These results indirectly revealed that the cases that were admitted in neuro ICUs had a haemorrhagic stroke and had more number of cases with SAP. Similar results were seen in our study where SAP was significantly high in cases with haemorrhagic stroke where this was seen in 30% of the cases as compared to 6.67% in ischemic stroke with $p=0.01$. This can be explained by the factor that the cases that had haemorrhagic stroke, had more degree of unconsciousness, so led to higher chances of aspiration and then SAP. In another study done by Hilker *et al* SAP was seen closer to the results of the present study and was observed in 17% of the cases¹⁵. A Pakistani study done at Faisalabad, showed that SAP was seen in 18% of their 100 cases admitted with stroke but these cases were admitted to the medical wards¹⁶.

Yan *et al*, in their study showed that SAP was seen in 44% of the cases and it was observed that their 18% of the cases were ventilated and those

with ventilator therapy had higher likelihood of developing SAP, which was similar to the results of the present study where ventilator was needed in 15 (18.75%) out of 80 cases and SAP was seen in 20% of cases as compared to 10.77% where no ventilator was required with $p=0.39$ ¹⁷. Ventilator associated pneumonia are well know entity and the cases that were ventilated due to lower GCS had nasogastric tube and endotracheal tube placed, which both lead to increase likelihood of micro aspirations and then development of consolidation. Number of steps have been taken to avoid this and include, subglottic suctioning, oral hygiene, minimal movement of the circuits etc.

In another study done by Arshad *et al* on a relatively larger sample size of 285 cases admitted in medical wards and out patient department, the frequency of SAP was seen to be 17.89% of the cases¹⁸.

In our study the mean hospital stay was significantly high in cases with SAP; seen as 12.70 ± 6.99 vs 4.50 ± 2.21 days with no SAP with $p=0.0001$. These results were in line with the results of the study done in UK setting where costs were significantly greater in patients having SAP vs those without it £14,371 (9484) versus £6,103 (5,735); $p \leq 0.001$ ¹⁹. This can be explained by the fact that the consolidation may lead to ventilation and even difficult in weaning and its adds to overall cost due to prolonged stay in ICUs.

The hospital cost was also significantly higher in cases of SAP (10.50 ± 6.64) lac vs 3.38 ± 2.06 lac in non SAP with $p=0.0001$. The results were supported by the findings of the previous study done by Teh *et al*, where it revealed that SAP was seen in 11.7% of the cases and after adjusting the other risk factors the length of hospital stay was longer in cases with SAP then non SAP [OR 1.93 (1.67-2.22)]²⁰.

CONCLUSION

Stroke associated pneumonia is not uncommon and is significantly associated with haemorrhagic stroke and DM. It also has significant impact on length of hospital stay and cost of treatment.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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