Original Article

The frequency of stroke-acquired pneumonia in patients admitted to ICU with Cerebrovascular accident (CVA)

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Author's Contribution
[1] Conception of study
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[2,5] Manuscript Writing
[2,4] Critical Review

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Article Processing
Received: 11/05/2022
Accepted: 31/08/2022

Cite this Article: *Rehman, M.A., Saddique, M.A., Bilal, M., Rauf, K., Jabeen, K., Qureshi, Q.A. The frequency of stroke-acquired pneumonia in patients admitted to ICU with Cerebrovascular accident (CVA). Journal of Rawalpindi Medical College. 30 Sep. 2022; 26(3): 491-496.*
DOI: https://doi.org/10.37939/jrmc.v26i3.1947

Conflict of Interest: *Nil*
Funding Source: *Nil*

Access Online:

Abstract

Introduction: Stroke is the most prevalent disorder. In our country, it can cause significant mortality and morbidity due to its associated complications such as stroke-associated pneumonia (SAP). Stroke can be fatal directly due to affecting the respiratory system and neurological damage. Stroke-acquired pneumonia is defined as any respiratory tract infection acquired within 7 days of stroke.
Objective: To find out the actual frequency of stroke-acquired pneumonia in ICU patients.
Study Design: Descriptive case series.
Setting: Department of Medicine, DHQ Teaching Hospital, Sargodha.
Duration: Six months from 15th October 2018 to 15th April 2019.
Materials and Methods: In this study, the cases of either gender or aged 30 to 70 years suffering from stroke within 12 hours were included. SAP was labelled based on fever, cough, and non-homogenous opacities on chest X-ray.
Results: Current study comprises about 160 cases of stroke and out of these 78 were (48.75%) females and 82 (51.25%) were males. The mean duration of stroke was 7.05±2.54 hours and the average age of the subjects was 54.24±7.15 years. They were 30 (18.75%) cases that had a history of smoking, 28 (17.50%) had HTN, and 35 (21.88%) cases that had DM. Stroke-acquired pneumonia (SAP) was seen in 20 (12.50%) of the cases. SAP was seen in 12 (15.38%) female cases as compared to 8 (9.75%) males with p= 0.34. SAP was more seen in cases with DM where this was observed in 7 (20%) of the cases as compared to 13 (10.4%) with no DM with p= 0.15. SAP was seen in 5 (17.85%) cases with HTN and 4 (13.33%) cases with a history of smoking with p values of 0.35 and 1.0 respectively. SAP was seen in 15 (14.42%) cases with a duration of stroke of 6-12 hours in contrast to 5 (8.92%) cases with a duration less than this with p= 0.45.
Conclusion: SAP is not infrequent and is found in more than 1 out of every 10 cases and the cases of SAP were found more in females and those who have a history of DM, HTN, and a duration of stroke of 6 to 12 hours; though none of this variable was found statistically significant.
Keywords: SAP, HTN, DM, Smoking.

Introduction

Because of its consequences, acute ischemic stroke is associated with a poor clinical prognosis. By assessing the occurrence and adopting suitable therapeutic approaches, such complications can be avoided. Pneumonia is among the most frequent respiratory complications of a stroke, affecting 4 to 9% of those who have it. The prevalence of this type of pneumonia seems to be much higher among the patients in the neurologic intensive care unit (21%) with acute ischemic stroke and the patient with tube feeding (44%).[1,2] When compared with individuals lacking pneumonia, people with stroke-related pneumonia had a mortality rate and a worse protracted prognosis. Clinical manifestation of pneumonia is high fever during the first 48 hours after facing the acute stroke and moreover, it is among the commonest complication up to a month after supra tentorial ischemic infarction. Furthermore, evidence suggests that pneumonia and respiratory disease are by far the most common causes of re-hospitalization among stroke survivors in the first five years following the ischemic stroke. A total of 412 individuals with acute ischemic stroke were included in the investigation. In a prospective study, 412 patients with acute stroke were included. Amongst this population age >65 years, dysarthria or aphasia, severe post-stroke disability, cognitive impairment, and an abnormal water swallow test were all deemed independent predisposing factors for stroke-related pneumonia. A total of 124 patients with acute stroke who have been treated in the medical ICU were studied in another prospective study. Mechanical ventilation, an abnormal chest radiograph upon admission to the hospital, and dysphagia were all the predisposing factors in this study. Admitted patients with facial palsy and a low state of consciousness were both independent risk factors for pneumonia, necessitating nasogastric feeding.[3,4]

Various field studies indicate that gastric acid inhibition via H2 receptor blockers or proton pump inhibitors has been associated with a higher risk of acquiring nosocomial pneumonia. In a report of 1676 hospitalized patients admitted with acute stroke, it was seen that these medications were ordered in 80% of the patients, and hospital-acquired pneumonia developed in 17% of this population. The occurrence of nosocomial pneumonia was considerably greater in the acid-suppressive drug group compared to the control group (21 Vs 4 percent, adjusted odds ratio 2.3, 95 percent CI 1.2-4.6).[5] Almost 60% of stroke-related pneumonia is caused by aspiration of stomach contents. The pulmonary complications of improper admission of fluid, particulate foreign substances, or natural secretions into the lower airways are known as aspiration pneumonitis. Condition of pneumonia appears upon "aspiration" of pathogenic microorganisms from the oropharynx or nasal passage. The most common causes of aspiration pneumonia following the acute stroke are mainly due to stroke-related dysfunction of sensory and motor mechanisms involved in deglutition, or a lower state of consciousness that compromises the expectoration and epiglottis closure.[1] Aspiration pneumonia tends to affect interdependent pulmonary sections. If the patient aspirates when recumbent, the far more common locations of involvement are the posterior sections of the upper lobes or apex segments of the lower lobes, and the lower lobes if the patient aspirates whilst upright or semi-upright. Healthcare-associated pneumonia (HCAP) is defined as pneumonia that develops in an outpatient clinical setting or within 48 hours of hospitalization in admitted patients who are at high risk of infection from multidrug-resistant bacteria. Hospitalization for 2 or more days in an inpatient facility within ninety days of present ailment, exposure to antibiotics, chemo, or wound management during thirty days of existing ailment, hemodialysis, or clinic-acquired infections are all potential causes for MDR bacterial infection in HCAP. Nowadays the term nosocomial pneumonia is reinstating as ventilator-associated pneumonia (VAP) and hospital-acquired pneumonia (HAP). Nonetheless, the term nosocomial pneumonia to date has its way in the nomenclature and is used still in many parts of the world. Hospital-acquired infections have been considered as a "tip of the hat towards the more aggressive management of the populace, typified via the use of advanced techniques and special equipment," a significant factor in gravely ill individuals in pulmonary care.[11] When pneumonia emerges at least 48 hours after hospitalization, it is referred to as hospital-acquired pneumonia (HAP). It is characterized by an increased risk of being exposed to multi-drug resistance microorganisms [6] along with gram-negative pathogens.[12] The below are major predisposing factors for interaction with such pathogens in HAP:

- Antibiotics within ninety days of the illness being caught in the hospital.
- A five-day or longer stay in the hospital.
- Increased antibiotic resistance in the community or the vicinity of a hospital.

- Immuno-compromised status of the patient or chemotherapy
- HCAP predisposing factors that determine exposure to MDR pathogens.

Materials and Methods

Study Design: The design for this investigation was a descriptive case study.
Study Area/ Settings: Department of Medicine, DHQ Hospital, Sargodha.
Duration of Study: Approximately 6 months.
Sample Size: A total of 160 samples size were calculated with a 95% confidence level, 5% margin of error, and taking an expected percentage of SAP i.e. 11.7% in patients of stroke.[5]
Sampling Technique: Non-probability, consecutive sampling.
Inclusion Criteria: Patients within the 30 – 70 years age group of both genders (male, female) presenting within 12 hours of stroke and admitted to ICU were included in this study.
Exclusion Criteria: Patients with co-morbidity with other conditions like hepatic problems (AST>40IU, AST>40IU), nephritic problems (serum creatinine >1.2gm/dl), asthma (on medical record), previous ACS (on medical record) and patients with pneumonia before stroke (on history) within last 1 month of stroke were excluded.
Data Collection Procedure: After the acceptance from the institutional ethical review committee, Patients meeting the inclusion criteria were chosen from the emergency of the medical department of DHQ in Sargodha. It was decided to gain explicit consent. On a pre-configured Performa, personal information such as name, age, gender, stroke duration, and recorded history of high blood pressure, diabetes, and smoking was also acquired and recorded. Patients were then brought to the ICU and monitored for 3 consecutive days. Data was gathered if the patient acquired stroke-associated pneumonia within 72 hours, as defined by the operational criteria. All of this data was entered into Performa.
Data / Statistical Analysis: All the data was entered in SPSS version 21.0, which was then used to analyze it. The mean and SD of quantitative variables including age and stroke duration were calculated. Gender, diabetes, hypertension, smoking, and the outcome variable, SAP, were all computed as percentages and frequency. To see how age, gender, stroke duration, hypertension, diabetes, and smoking affected the outcome variable, data were divided by age, gender, stroke duration, hypertension, diabetes, and smoking. The chi-square test was used after stratifying, and a p-value of 0.05 was found to be significant.

Results

The current study comprises about 160 cases of stroke and out of these 78 were (48.75%) females and 82 (51.25%) males (Figure 1). The mean duration of stroke was 7.05±2.54 hours and the average age of the subjects was 54.24±7.15 years. They were 30 (18.75%) cases that had a history of smoking, 28 (17.50%) had HTN, and 35 (21.88%) cases that had DM. SAP was seen in 20 (12.50%) of the cases. SAP was seen in 12 (15.38%) female cases as compared to 8 (9.75%) males with p= 0.34. There was no significant difference in terms of SAP with different age groups (p= 1.0).SAP was highly found in cases with DM where this was detected in 7 (20%) of the cases as compared to 13 (10.4%) with no DM with p= 0.15. SAP was found in 5 (17.85%) cases with HTN and 4 (13.33%) cases with a history of smoking with p values of 0.35 and 1.0 respectively. SAP was seen in 15 (14.42%) cases with a duration of stroke of 6-12 hours in contrast to 5 (8.92%) cases with a duration less than this with p= 0.45.

Table 1: Risk Factors stratification with Stroke Acquired Pneumonia (SAP)

Risk Factors stratification		*Stroke Acquired Pneumonia (SAP)*			*P-Value*
		Yes	No	Total	
Age group	30-49Y	5(11.11%)	40(88.89%)	45(100.0%)	1.0
	50-70Y	15(13.04%)	100(86.96%)	115(100.0%)	
	Total	20(12.5%)	140(87.50%)	160(100.0%)	
Gender	Male	8(9.75%)	74(90.25%)	82(100.0%)	0.34
	Female	12(15.38%)	66(84.62%)	78(100.0%)	
	Total	20(12.50%)	140(87.50%)	160(100.0%)	
Hypertension	Yes	5(17.85%)	23(82.15%)	28(100.0%)	0.35
	No	15(11.36%)	117(88.64%)	132(100.0%)	
	Total	20(12.5%)	140(87.5%)	160(100.0%)	

	Yes	7(20%)	28(80%)	35(100.0%)	
Diabetes	No	13(10.4%)	112(89.6%)	125(100.0%)	0.15
	Total	20(12.5%)	140(87.5%)	160(100.0%)	
	Yes	4(13.33%)	26(87.67%)	30(100.0%)	
Smoking	No	16(12.3%)	114(87.7%)	130(100.0%)	0.35
	Total	20(12.5%)	140(87.5%)	160(100.0%)	
	<6 hr	5(8.92%)	51(8.92%)	56(100%)	
Duration of SAP	6-12 hr	15(14.42%)	89(85.59%)	104(100%)	0.45
	Total	20(12.5%)	140(87.5%)	160(100%)	

Table 2: Age in study subjects (n=160)

	Age (years)
Mean	54.24
Std. Deviation	7.15
Minimum	34
Maximum	70

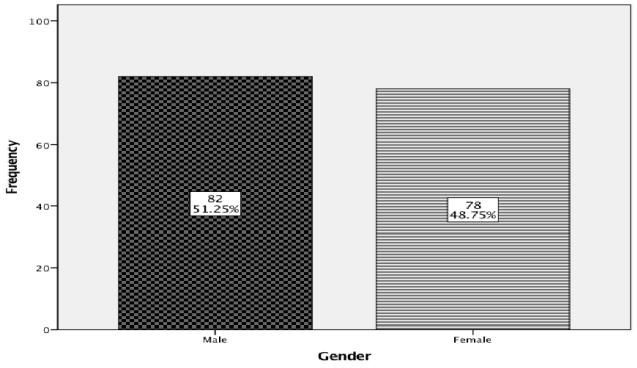

Figure 1: Gender distribution in study subjects (n=160)

Discussion

Stroke is a primary cause of disability, with fatal consequences, and can affect a wide range of entities, all of which have a significant impact directly or indirectly on one's life and life quality.[11-15] According to a latest survey in Pakistan, 21.8 percent of people have had a stroke or a transient ischemic attack.[16] In our country, numerous studies on stroke mortality have found that mortality rates vary from 7 to 20%.Nearly 60% of the patients affected by stroke are at increased risk of severe complications, and a large number of patients (89%) are unable to do normal tasks unaided. Likewise the Western world where a large proportion of the population has predisposing factors such as cardiac disorder, obesity, diabetes, high BP and dyslipidemia [16-17] the possible causes for strokes are the same in our country. Pneumonia, along with other clinical and neurological problems, is one of the leading causes of mortality after a stroke.[17]

Stroke-related pneumonia is more common in those who have had an acute ischemic stroke and are being treated in a neurology intensive care unit, with 21% and 44% requiring nasogastric tube feeding, respectively. Pneumonia is the most prevalent cause of pyrexia in the first 48 hours after an acute stroke, and it is also found in most cases with common health consequences within 30 days after a supra-tentorial ischemic infarction.[19]

In the present study, stroke-acquired pneumonia was seen in 20 (12.50%) out of the 160 cases admitted with stroke. These results were comparable to the findings of the studies done in the past; however, a wide variable prevalence of this is seen in the past. SAP was seen in 12 (15.38%) female cases as compared to 8 (9.75%) males with p= 0.34 in the present study. According to various studies done in the past on stroke patients, the frequency of stroke-acquired pneumonia ranged from 3.9 to 44% of cases that were admitted to the stroke units.[20] According to a study by Dziewas R et al, **pneumonia related to stroke** was diagnosed in 44% of the patients with acute stroke admitted to the ICU.[21] According to another study by Teh WH et al it was seen in 11.7% of the cases.[22] In a study overall prevalence of the stroke associated pneumonia was seen in 18 (18%) out of 100 cases admitted with stroke and out of these cases that had this there was no significant difference in terms of gender and 51% of the cases were males and 49% females. They further described that the chance of SAP was highest in cases that had higher age groups where 3/4th of the cases were aged more than 50 years. However, there was no significant difference in both the age groups of the present study with a p-value of 1.0.[23]

According to various studies, the variability of the frequency of strokes can be due to the difference in the local protocols and the site of admission of these cases. The cases that were admitted to ICU had better chances of early ventilation to protect the airways as compared to those that were admitted to the medical floors. Furthermore, other factors like the time of the

start of feeding and the mode of this i.e. continuous, intermittent, and bolus have also been shown to impact the likelihood of development of this. There are a few other factors as well that can result in its high probability and that can be the difference in the level of care, regarding head postures, aspiration rechecks, and the need for ionotropic supports; all of these have shown their association with a variable degree as a risk factor for the development of SAP.[24-28]

SAP was more seen in cases with DM and HTN, where this was observed in 7 (20%) of the cases as compared to 13 (10.4%) with no DM with p= 0.15 and 5 (17.85%) cases with HTN with a p-value of 0.35; non-significant in both the aspects. There was not much data regarding these particular variables in previous studies. However, they had shown that the cases with co-morbid conditions like heart failure, DM and those with the immune-compromised condition had a higher likelihood of SAP.[29-33] In one study it was seen that the cases that had already a history of fever due to any causes, led to more cases with SAP in a study done by Yan F et al.[29]

Furthermore, these studies described that the subtypes of stroke have also an influence on the development of SAP, and more cases had a hemorrhagic stroke. In a study done by Adrees et al, they found that hemorrhagic stroke leads to a higher risk of SAP and was seen in around 2/3rd of the cases and so was seen in the other studies and this can be explained by the factor that this leads to an earlier and more detrimental effect on a consciousness level and that's why this had more risk of aspiration.[30]

Along with all these parameters, the cases that needed invasive mechanical ventilation had a higher risk of SAP and that can be explained by the possibility of an increased risk of ventilator-associated pneumonia. The same above-mentioned studies also supported this data.[31-36]

SAP was observed in 15 (14.42%) cases with a duration of stroke of 6-12 hours in contrast to 5 (8.92%) cases with a duration less than this with p= 0.45. There was no such data regarding the duration of stroke and SAP, but this can be attributed to the fact that the cases that were left unattended or referred from the clinics and smaller centers were more at risk of aspirations and to develop SAP as compared to the cases that presented earlier to the intensive care units where airways were relatively better managed.

Conclusion

Stroke-related pneumonia is prevalent, occurring in higher than 1 out of each 10 cases. It is much more common among females, those with a history of diabetes, high blood pressure, and a stroke lasting 6 to 12 hours; however, none of these variables were shown to be statistically significant.

Limitation

This study has a few limitations, such as not looking for the kinds of stroke, such as hemorrhagic and/or ischemic, as well as the preceding history of fever and food tendencies in such instances. However, there were numerous positive aspects to this study, as it highlighted a previously underappreciated element of stroke that has a significant impact on total morbidity and death in such cases.

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