

THE PREVALENCE OF STROKE-ACQUIRED PNEUMONIA IN ICU PATIENTS FOLLOWING A CEREBROVASCULAR ACCIDENT (CVA)

ANWAR U¹, ILAHI I^{1*}, USMAN M², KHAN FL², SALAHUDDIN HS², ARIF M²

¹Department of Emergency and ICU, DHQ City Hospital Okara, Pakistan

²Department of Emergency and ICU, DHQ South City Hospital, Okara, Pakistan

*Correspondence author email address: ih-san-elahi01@yahoo.com

(Received, 27th February 2024, Revised 20th May 2024, Published 14th June 2024)

Abstract: Acute ischemic stroke often has a poor clinical prognosis due to its significant complications, including serious pulmonary and neurological problems. Stroke-acquired pneumonia (SAP) refers to any respiratory tract infection developing within 7 days following a stroke. **Objective:** To determine the actual incidence of SAP in ICU patients. **Methods:** A descriptive analysis was conducted on stroke patients hospitalized at DHQ City and South City Okara hospitals. Personal data such as name, age, sex, and duration of stroke were collected and recorded on a prepared proforma, along with previous histories of hypertension, diabetes, and smoking. Patients were then transferred to the intensive care unit and observed for three consecutive days. Data were collected if pneumonia associated with a stroke was diagnosed within 72 hours, according to the operating criteria, and recorded on the proforma. **Results:** Among the 80 stroke patients included in the study, 38 (47.5%) were female and 42 (52.5%) were male. The participants' average age was 53.75±8.75 years, and the mean duration since stroke onset was 7.42±3.63 hours. SAP was observed in 11 (13.75%) patients. SAP occurred in 6 (15.78%) female patients compared to 5 (11.90%) male patients ($p=0.35$). SAP was present in 5 (26.3%) diabetic patients versus 6 (9.83%) non-diabetic patients ($p=0.14$). SAP was detected in 4 (25%) hypertensive patients and 2 (11.7%) patients with a history of smoking, with p -values of 0.41 and 0.37, respectively. SAP was identified in 9 (17.3%) patients with a stroke duration of 6-12 hours. **Conclusion:** Stroke-associated pneumonia affects more than one in ten patients. Females, individuals with a history of hypertension, and diabetes, and those with a stroke duration of 6 to 12 hours are more likely to develop this condition. However, none of these factors reached statistical significance.

Keywords: Acute Ischemic Stroke, Pneumonia, Stroke-Acquired Pneumonia, Intensive Care Units, Risk Factors

Introduction

Acute ischemic stroke has a poor clinical outcome due to its serious complications. Complications can be prevented by recognizing their prevalence and using appropriate treatment techniques. Pneumonia is a common pulmonary complication after a stroke, affecting 4-9% of patients (1). This kind of pneumonia is more common among those suffering from acute ischemic stroke in the neuro intensive care unit (21%) (2), as well as those on tube feeding (44%) (3).

Stroke-related pneumonia was associated with higher death rates and a poorer prognosis compared to those without pneumonia (4). Pneumonia typically manifests as a high fever within 48 hours following an acute stroke. In the first 5 years after an ischemic stroke, pneumonia and respiratory diseases are the most prevalent causes of re-hospitalization in survivors (5). A prospective research included 124 individuals with acute stroke managed in the medical ICU. This study identified mechanical ventilation, abnormal chest X-rays at admission, and dysphagia as contributing factors (6). Patients having facial palsy and low GCS were susceptible to pneumonia, requiring nasogastric feeding (7). Stroke-related impairment of sensory and motor systems involved in deglutition, as well as a lower level of consciousness that limits expectoration and epiglottis closing, are the main contributors to aspiration pneumonia after an acute stroke. Nosocomial pneumonia is now referred to as ventilator-associated pneumonia (VAP) or hospital-acquired pneumonia (HAP). Despite changes in

terminology, the phrase "nosocomial pneumonia" remains widely used worldwide. Stroke is the most common illness. Stroke-associated pneumonia (SAP) is a common consequence in our nation, leading to high mortality and morbidity.

The current study was designed to assess the actual incidence of SAP in ICU patients and predicted some of the patient parameters that are more linked with the development of SAP.

Methodology

A descriptive analysis was conducted on individuals with stroke hospitalized at DHQ City and South City Okara hospitals between July 30, 2023, and January 10, 2024. The study received approval from the hospital ethical committee and the institutional review board.

This prospective, descriptive study was carried out at DHQ City and South City Okara hospitals. The sample size was computed to include 80 patients, based on a 95% confidence level, a 5% margin of error, and an anticipated SAP incidence of 11.7% among stroke patients.

The study comprised 80 patients, both male and female, aged 30 to 70 years, who were admitted to the intensive care unit (ICU) within twelve hours of stroke onset. Patients with comorbid conditions such as hepatic issues (AST > 40 IU), nephritic issues (serum creatinine > 1.2 mg/dL), asthma (documented), prior acute coronary syndrome

(documented), or pneumonia (documented within the last thirty days before stroke) were excluded.

Eligible patients were identified in the emergency department and provided written informed consent. Personal data, including name, age, sex, and stroke duration, were collected and recorded on a pre-prepared proforma, alongside histories of hypertension, diabetes, and smoking. Patients were then transferred to the ICU and observed for three consecutive days. Data on pneumonia associated with stroke, if diagnosed within 72 hours according to established criteria, were recorded.

Patients were monitored for signs of SAP during their ICU stay. SAP was defined and diagnosed based on clinical criteria, including fever, leukocytosis, new or progressive pulmonary infiltrates on chest radiography, and respiratory symptoms such as cough or dyspnea within 72 hours of stroke onset.

The study was conducted following ethical guidelines, and all participants provided informed consent. Data confidentiality and patient anonymity were maintained throughout the study.

Data were entered and analyzed using SPSS version 21.0. Means and standard deviations were calculated for quantitative variables such as age and stroke duration. Frequencies and percentages were computed for categorical variables, including the outcome variable SAP, as well as sex, hypertension, diabetes, and smoking status. Data were stratified by age, sex, stroke duration, diabetes, hypertension, and smoking to examine their influence on

SAP occurrence. The chi-square test was used to assess the statistical significance of differences, with a p-value of less than 0.05 considered significant.

Results

Among the 80 stroke patients included in the present study, 38 (47.5%) were female and 42 (52.5%) were male (Figure 1). The participants' average age was 53.75±8.75 years (Table 1), and the mean duration of the stroke turned out 7.42 ±3.63 hours.

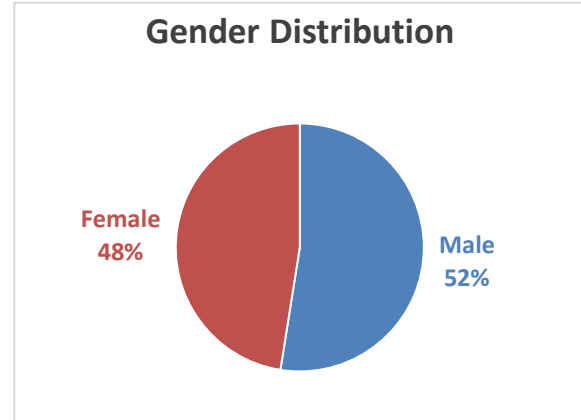


Figure 1 shows the gender distribution of the study population

Table 1 Age of the study population

Variable	Age in years
Mean	53.75
Std. Deviation	8.75
Minimum	33
Maximum	70

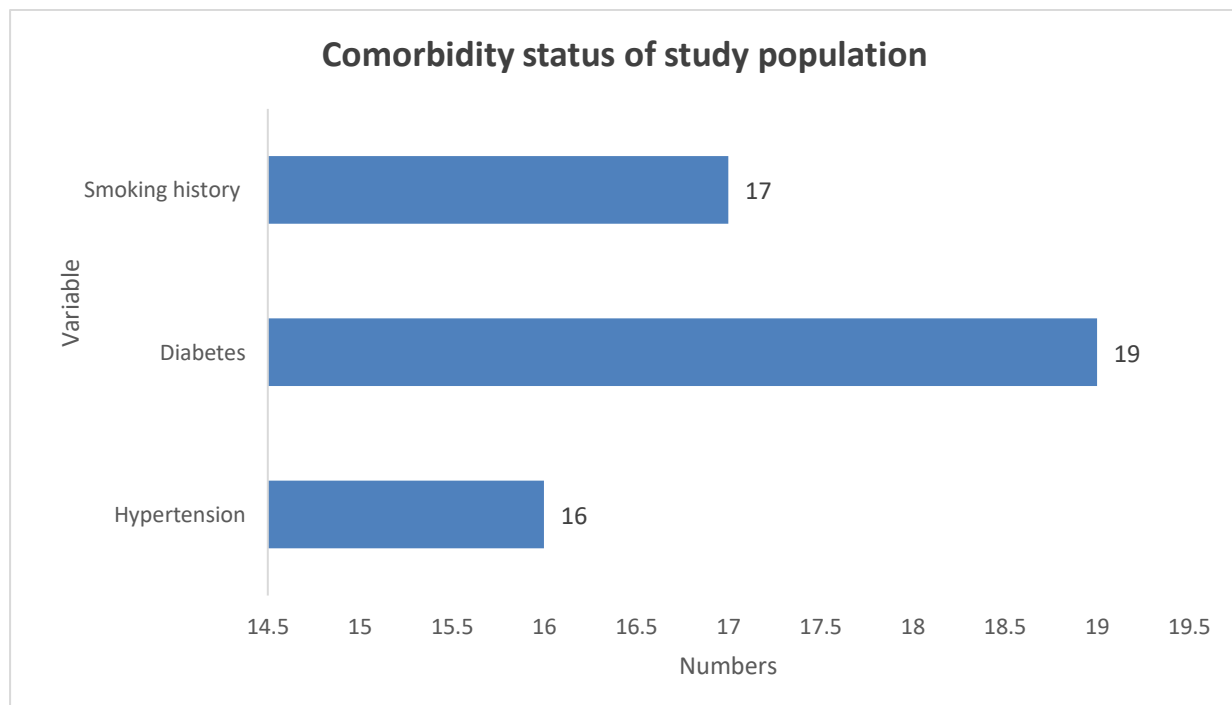


Figure 2 shows the comorbidity status of the study population

[Citation: Anwar, U., Ilahi, I., Usman, M., Khan, F.L., Salahuddin, H.S., Arif, M. (2024). The prevalence of stroke-acquired pneumonia in ICU patients following a cerebrovascular accident (CVA) *Biol. Clin. Sci. Res. J.*, 2024: 874. doi: <https://doi.org/10.54112/bcsrj.v2024i1.874>]

Table 2: Risk variables related to Stroke Acquired pneumonia(SAP)

Variable	Stroke acquired pneumonia		Total	p-value
	Yes	No		
Age				
30-49	2(9.52)	19(90.47)	21(100)	1.2
50-70	9(15.25)	50(84.74)	59(100)	
Total	11(13.75)	69(86.25)	80(100)	
Gender				
Male	5(11.90)	37(88.09)	42(100)	0.35
Female	6(15.78)	32(84.21)	38(100)	
Total	11(13.75)	69(86.25)	80(100)	
Hypertension				
Yes	4 (25)	12(75)	16(100)	0.41
No	7(10.9)	57(89.06)	64(100)	
Total	11(13.75)	69(86.25)	80(100)	
Diabetes				
Yes	5 (26.3)	14 (73.68)	19(100)	0.14
No	6(9.83)	55 (90.1)	61(100)	
Total	11(13.75)	69(86.25)	80(100)	
Smoking				
Yes	2 (11.7)	15(88.2)	17(100)	0.37
No	9(14.28)	54(85.71)	63(100)	
Total	11(13.75)	69(86.25)	80(100)	
Duration of SAP				
<6 hr.	2 (7.14)	26 (92.8)	28(100)	0.48
6-12 hr.	9 (17.3)	43 (82.6)	52(100)	
Total	11(13.75)	69(86.25)	80(100)	

There were 19 (23.75%) patients with DM, 16 (20%) cases with HTN, and 17 (21.2%) cases with a history of cigarette smoking. SAP was observed in 11 (13.75%) of the patients. SAP occurred in 6 (15.78%) female patients versus 5 (11.90%) male patients, having $p=0.35$. The results showed no statistically significant difference in SAP across different age groups ($p = 1.2$)(Table 2). SAP occurred in 5 (26.3%) of DM patients compared to 6 (9.83%) of non-DM cases ($p= 0.14$). SAP was detected in 4 (25%) people who had HTN and 2 (11.7%) patients who had a smoking history, having p -values of 0.41 and 0.37, respectively. SAP was detected in 9 (17.3%) patients having a stroke duration of 6-12 hours.

Discussion

Stroke is a leading cause of disability and death, affecting a variety of entities and negatively impacting their standard of life (8). A recent survey conducted in Pakistan found that 21.8% of the population had experienced a stroke or transient ischemic episode (9). Stroke mortality rates in our nation range from 7-20%, according to various research (10). Approximately 60% of stroke victims face serious complications, and 89% require assistance with everyday tasks (11). In Western nations, where many people have predisposing diseases like heart disorders, hypertension, diabetes, obesity, and lipid disorders, the leading causes of strokes are similar to those in our nation (12). Pneumonia, among other medical and neural problems, is a primary cause of death following a stroke (13).

Stroke-associated pneumonia is more prevalent in patients treated in a medical ICU, with twenty-one per cent to forty-four per cent needing tube feeding (14). Pneumonia is the primary cause of fever in the initial 48 hours following an acute stroke. It is also commonly associated with frequent

health complications within 30 days of stroke episode (15). Stroke-acquired pneumonia was observed in 11 (13.75%) of 80 individuals hospitalized with a stroke. These results of our research were similar to previous research (16). Previous research on stroke patients found that SAP occurred in 3.9% to 44% of individuals hospitalized due to stroke (17). research by Badve et al found that pneumonia was identified in 44 per cent of acute stroke victims hospitalized in the ICU (18). Another research by Patel et al found this in 3.53% of patients (19). research found that SAP occurred in 18 (18%) of 100 stroke patients, with no significant gender differences (20). In that research, 51% of patients were male and 49% comprised female. These findings are in line with the findings of our study. A previous study found that older individuals were more likely to experience SAP (21). These results are similar to the findings of our study.

Studies suggest that the prevalence of SAP may vary depending on regional guidelines and admission places. Patients admitted to the ICU were more likely to get early ventilation to preserve their airways, relative to those not admitted to ICU. Additionally, the timing and manner of feeding might influence the risk of developing SAP. Other factors, such as care level, head position, aspiration periodic checks, and ionotropic support, have been linked to a higher risk of SAP development (19).

SAP occurred in 5 (26.3%) of DM patients compared to 6 (9.83%) of non DM cases ($p= 0.14$). SAP was detected in 4 (25%) people who had HTN and 2 (11.7%) patients who had a smoking history, having p -values of 0.41 and 0.37, respectively. Previous research provided limited data on these factors. Research indicates that individuals with comorbid diseases such as heart failure, hypertension, diabetes, or immune-compromised status are more likely to develop SAP (16). A research by Lin et al. found that having

a history of fever, regardless of the etiology, increased the likelihood of developing SAP(22).

Invasive mechanical ventilation was related to a greater incidence of SAP, possibly due to a greater likelihood of ventilator-associated pneumonia (22). These findings were equally validated by the earlier investigations. SAP was found in 9 (17.3%) patients having stroke duration of 6-12 hours at admission, compared to 2 (7.14%) in patients having stroke duration of under six hours at admission ($p=0.48$). There is no information regarding the relationship between stroke duration and SAP. However, unsupervised or referred cases from small treatment centers are more likely to acquire SAP in comparison to those cases presented to ICU earlier.

Our study includes limitations that should be considered. The study is limited by its descriptive nature. Second, the limited sample size reduces the research's statistical significance. The research has another limitations, including a lack of consideration for different types of stroke, like hemorrhagic or ischemic, and a previous history of temperature and eating habits.

Conclusion

The nurses in Pakistan have good knowledge but a comparably less favourable attitude toward pain management.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department concerned. (IRBEC-7724 letter issued dated 05-03-23)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

USAMA ANWAR

Concept & Design of Study

IHSAN ILAHI

Analysis Final Approval of version

MUHAMMAD USMAN

Revisiting Critically & Data Analysis

FARAH LATAFAT KHAN

Drafting

HAFIZA SEMAAB SALAHUDDIN

Review of literature and drafting

MUHAMMAD ARIF

Revision and proofreading

References

- Chaves ML, Gittins M, Bray B, Vail A, Smith CJ. Variation of stroke-associated pneumonia in stroke units across England and Wales: a registry-based cohort study. *International Journal of Stroke*. 2022;17(2):155-62.
- Xu C-Y, Ye H-W, Chen B, Wu Y-F, Cao Z, Ding Z, et al. Analysis of risk factors and prognosis of post-stroke pulmonary infection in integrated ICU. *European Review for Medical & Pharmacological Sciences*. 2021;25(2).
- Ning X, Iftikhar S, Ghias M, Pervaiz A, Shabbir B, Akhtar MN. Stroke Associated Pneumonia in Patients of Acute Ischemic Stroke. *Annals of King Edward Medical University*. 2021;27(2).
- Tinker RJ, Smith CJ, Heal C, Bettencourt-Silva JH, Metcalf AK, Potter JF, et al. Predictors of mortality and disability in stroke-associated pneumonia. *Acta Neurologica Belgica*. 2021;121:379-85.
- de Jonge JC, van de Beek D, Lyden P, Brady MC, Bath PM, van der Worp HB. Temporal profile of pneumonia after stroke. *Stroke*. 2022;53(1):53-60.
- Soto-Cámara R, González-Bernal JJ, González-Santos J, Aguilar-Parra JM, Trigueros R, López-Liria R. Knowledge on signs and risk factors in stroke patients. *Journal of Clinical Medicine*. 2020;9(8):2557.
- George MG. Risk factors for ischemic stroke in younger adults: a focused update. *Stroke*. 2020;51(3):729-35.
- Falk-Kessler J. 15 Psychological Aspects of Stroke Rehabilitation. *Stroke Rehabilitation E-Book: A Function-Based Approach*. 2020;46(84):314.
- ZAMAN Q, SIDDIQUI M, WAQAR K, ZAIDI N. TRIGGERING FACTORS OF AN ACUTE ISCHEMIC STROKE: A CASE CROSSOVER STUDY FROM PAKISTAN. *Turkish Journal of Cerebrovascular Diseases*. 2018;24(3):98-102.
- Thayabaranathan T, Kim J, Cadilhac DA, Thrift AG, Donnan GA, Howard G, et al. Global stroke statistics 2022. *International Journal of Stroke*. 2022;17(9):946-56.
- Wang Y-J, Li Z-X, Gu H-Q, Zhai Y, Zhou Q, Jiang Y, et al. China stroke statistics: an update on the 2019 report from the national center for healthcare quality management in neurological diseases, China national clinical research center for neurological diseases, the Chinese stroke association, national center for chronic and non-communicable disease control and prevention, Chinese center for disease control and prevention and institute for global neuroscience and stroke collaborations. *Stroke and vascular neurology*. 2022;7(5).
- Peer N, Baatiema L, Kengne A-P. Ischaemic heart disease, stroke, and their cardiometabolic risk factors in Africa: current challenges and outlook for the future. *Expert review of cardiovascular therapy*. 2021;19(2):129-40.
- Asgedom SW, Gidey K, Gidey K, Niriayo YL, Desta DM, Atey TM. Medical complications and mortality of hospitalized stroke patients. *Journal of stroke and cerebrovascular diseases*. 2020;29(8):104990.
- Rabaut J, Thirugnanachandran T, Singhal S, Martin J, Ievliev S, Ma H, et al. Clinical outcomes and patient safety of nasogastric tube in acute stroke patients. *Dysphagia*. 2022;37(6):1732-9.

[Citation: Anwar, U., Ilahi, I., Usman, M., Khan, F.L., Salahuddin, H.S., Arif, M. (2024). The prevalence of stroke-acquired pneumonia in ICU patients following a cerebrovascular accident (CVA) *Biol. Clin. Sci. Res. J.*, 2024: 874. doi: <https://doi.org/10.54112/bcsrj.v2024i1.874>]

15. Assefa M, Tadesse A, Adane A, Yimer M, Tadesse M. Factors associated with stroke associated pneumonia among adult stroke patients admitted to university of Gondar hospital, Northwest Ethiopia. *Scientific Reports*. 2022;12(1):12724.
16. Azeem-ur-Rehman M, Saddique MA, Bilal M, Rauf K, Jabeen K, Qureshi QA. The frequency of stroke-acquired pneumonia in patients admitted to ICU with Cerebrovascular accident (CVA). *Journal of Rawalpindi Medical College*. 2022;26(3).
17. Hashim H, Shahid L, Bajwa D, Usman R, Ahmed SS, Khokhar M. Prevalence of stroke associated pneumonia in stroke patients. *Pakistan Journal of Medical & Health Sciences*. 2022;16(10):590-.
18. Badve MS, Zhou Z, van de Beek D, Anderson CS, Hackett ML. Frequency of post-stroke pneumonia: Systematic review and meta-analysis of observational studies. *International Journal of Stroke*. 2019;14(2):125-36.
19. Patel UK, Kodumuri N, Dave M, Lekshminarayanan A, Khan N, Kavi T, et al. Stroke-associated pneumonia: a retrospective study of risk factors and outcomes. *The neurologist*. 2020;25(3):39-48.
20. Sui R, Zhang L. Risk factors of stroke-associated pneumonia in Chinese patients. *Neurological research*. 2011;33(5):508-13.
21. Barlas RS, Clark AB, Bettencourt-Silva JH, Sawanyawisuth K, Kongbunkiat K, Kasemsap N, et al. Pneumonia and risk of serious adverse outcomes in hospitalized strokes in Thailand. *Journal of Stroke and Cerebrovascular Diseases*. 2019;28(6):1448-54.
22. Lin K-H, Lin H-J, Yeh P-S. Determinants of prolonged length of hospital stay in patients with severe acute ischemic stroke. *Journal of Clinical Medicine*. 2022;11(12):3457.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2024