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How Common is Aspiration Pneumonia in Patients Presenting with Acute Stroke and Fed by Using Nasogastric Tube?

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ABSTRACT

Background: Stroke is the leading cause of fatalities and years lost due to incapacity. Due to the possibility of pneumonia developing, aspiration has long been recognized as a substantial cause of morbidity after a stroke.
Objective: To determine the frequency of aspiration pneumonia in nasogastric-tube fed stroke patients.
Material and Methods; This descriptive cross-sectional study was conducted in the department of Medicine, Lady reading hospital, Peshawar from 01-12-2020 to 30-05-2021.A total of 230 patients presenting with stroke and subjected to NG tube for enteral nutrition were included in the study in a consecutive manner and checked for aspiration pneumonia
Results: The mean age of the patients was 58.7 ± 9.1 years. 64.3% were males and 35.7% females. The mean duration of symptoms at presentation was 35.6 ± 7.6 hours. On CT brain, 56.2% patients had ischemic stroke and 43.9% had hemorrhagic stroke. Aspiration pneumonia was recorded in 20.4%.
Conclusion: Aspiration pneumonia is fairly common in our stroke patients who are on NG tube for enteral nutrition.
Keywords: Acute hemorrhagic stroke, Aspiration pneumonia, Hemorrhagic stroke, Ischemic stroke, Nasogastric tube.

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INTRODUCTION

Stroke is the leading cause of fatalities and years lost due to incapacity.[1] The majority of strokes (77%) are first-time events, highlighting the importance of primary prevention techniques.[2] Aspirin is recommended for cardiovascular prophylaxis together with blood pressure management and statin therapy because persons with atherosclerosis have a higher risk of stroke.[3] Aspirin lowers the risk of major vascular events (myocardial infarction, stroke, or vascular death) when used for primary prevention by just 12% and by 19% when taken for secondary prevention.[4] There is still a need for a more potent antithrombotic treatment to stop significant vascular events in persons with atherosclerosis.[5,6]

Aspiration has long been recognized as a significant cause of morbidity following a stroke due to the onset of pneumonia. [7] According to some studies, aspiration pneumonia is connected with a 6% mortality rate in the first year after a stroke. [8] This pneumonia is hypothesised to be caused by excessive and/or toxic (gastric contents) aspiration, which overwhelms the lungs' natural defences, which may already be impaired, resulting in a localised infection or chemical pneumonitis. [9] Because more than half of healthy people aspirate small amounts of saliva while sleeping, the mere fact of aspiration is insufficient.[10]

Aspiration with the possible consequence of aspiration pneumonia is the most important acute complication of dysphagia, affecting up to one third of dysphagia patients after stroke. Tube feeding is commonly recommended as an efficient and secure method of administering nutrition to these patients during the first two weeks, in addition to a proper diagnostic evaluation and an early start to rehabilitation activities. [11] However, observations from patients with post-acute stroke should not be generalised to patients with acute stroke because the clinical characteristics of acute and chronic stroke are fundamentally different.[12] It is estimated that aspiration pneumonia occurs in 12 percent of stroke patients,[13] 87.5 percent of stroke survivors,[14] 37.8 percent of survivors,[15] 30.1 percent of survivors,[16] and 5.7 percent of survivors.[17] According to a another study, dysphagia affected 44% of patients who needed to use an NG tube to feed themselves after surgery.[18]

This study aims to investigate the frequency of aspiration pneumonia in stroke patients receiving NG tube feedings. As previously mentioned, even within a given demographic, the pattern of aspiration pneumonia varies depending on the surroundings, and the results of this study will give us an idea of the problem's local scope. Additionally, there are very little local data on the occurrence of aspiration pneumonia in stroke patients associated with NG feeding.

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MATERIALS AND METHODS

This descriptive cross-sectional study was carried out in the medical department of Lady Reading Hospital in Peshawar for six months, from 01/12/2020 to 30/05/2021. The WHO calculator was used to calculate the sample size of 230 (proportion of aspiration pneumonia among stroke patients receiving NG feeding = 5.7%,[17] margin of error = 3%). 95% confidence interval. The study employed a non-probability consecutive sampling technique.

All patients aged 45 to 75 years with stroke (Defined as neurological deficit (focal or global) of cerebrovascular cause that persists beyond 24 hours, confirmed on CT scan brain showing an area of hypodensity (ischemic) or hyperdensity (hemorrhagic) within brain parenchyma) within 48 hours of stroke onset, patients with post stroke dysphagia and fed with NG tube, and patients with Swallowing performance status (SPS)[19] greater than or equal to 6 were included in the study, (Aspiration pneumonia will be diagnosed on the basis of any THREE of the following features among patients with acute stroke with chest X ray showing bilateral opacities in the middle or lower lung zones which may be localized to the posterior segments of upper lobes or to the superior segments of lower lobes.;History of sudden onset of chest pain, Shortness of breath,Wheezing, Cough productive of green sputum, blood or pus in it) while known asthmatic patients based on history, examination, and previous medical record and patients with acute myocardial infarction based on ECG (electrocardiogram) findings of ST segment elevation, ST depression, and pathological Q waves were excluded.

Following approval from the hospital's ethical committee (279/LRH/MTI, 16/03/2020), data was collected from all patients who presented with acute stroke with a history of focal or global neurological deficits lasting more than 24 hours (as confirmed by CT Scan brain showing hypo or hyper dense lesion) and were subjected to NG feeding due to dysphagia and presented to this institute's out-patient department (OPD) or Accident and emergency department. The study only included patients who met the inclusion criteria. History was used to rule out confounders and bias in the study's findings. Patients or their relatives were asked to sign an informed written permission form.

A simple chest X-ray was performed on all patients. All radiographic investigations were performed at the same hospital radiology department by the same radiologist with at least 5 years of experience. All of this information, as well as other demographic data such as name, age, and gender, were recorded in a proforma. SPSS version 20 was used to analyze the data. The data was analyzed using descriptive statistics. For quantitative data such as age and time since beginning of symptoms, mean + SD was determined. For categorical factors such as gender and aspiration pneumonia, frequency/percentages were determined. Aspiration pneumonia was classified based on age, gender, duration of symptoms, and stroke type. Post stratification chi square test with a p value of 0.05 considered significant. All the result was presented as tables and charts.

RESULTS

The mean age of the sample was 58.7 $\pm$ 9.1 years. The patients were distributed in 3 age groups. (45-55, 56-65, 66-75).A total number of 230 patients who presented with stroke there were 64.3% males and 35.7% females. The mean duration of symptoms at presentation was 35.6 $\pm$ 7.6 hours. On CT brain, 56.2% patients had ischemic stroke and 43.9% had hemorrhagic stroke. On examination, aspiration pneumonia was recorded in 20.4%. Subsequent tables elaborate age groups, gender, duration of symptoms and type of stroke wise stratification of aspiration pneumonia.

Table 01. Age Groups Wise Stratification of Aspiration Pneumonia

Age Groups	Aspiration Pneumonia		P- value
	Yes	No	
45-55 years	19(18.6%)	83(81.4)	0.392
> 55 to 65 years	19(25.7%)	55(74.3%)	
> 65 to 75 years	9(16.7%)	45(83.3%)	
Total	**47(20.4%)**	**183(79.6%)**	

Table 02. Gender Wise Stratification of Aspiration Pneumonia

Gender of the Patient	Aspiration Pneumonia		P- value
	Yes	No	
Male	25(16.9%)	123(83.1%)	0.073
Female	22(26.8%)	60(73.2%)	
Total	**47(20.4%)**	**183(79.6%)**	

Table 03. Duration of Symptoms Wise Stratification of Aspiration Pneumonia

Duration of symptoms	Aspiration Pneumonia		P- value
	Yes	No	
24-36 Hours	21(16.9%)	103(83.1%)	0.155
> 36-48 Hours	26(24.5%)	80(75.5%)	
Total	47(20.4%)	183(79.6%)	

Table 04. Type of Stroke Wise Stratification of Aspiration Pneumonia

Type of Stroke	Aspiration Pneumonia		P- value
	Yes	No	
Ischemic	28(21.7%)	101(78.3%)	0.589
Hemorrhagic	19(18.8%)	82(81.2%)	
Total	47(20.4%)	183(79.6%)	

DISCUSSION

One of the leading causes of illness and mortality in the US is stroke.[18] It has been established that medical and neurological complications, notably pneumonia, are the main causes of death after a stroke.[19] The financial strain on the healthcare system is also increased by post-stroke pneumonia. Based on an average marginal hospitalization cost of USD 27,633, this issue is anticipated to cost almost USD 459 million each year.[20] These details highlight how important it is to stop this problem. Understanding the pathophysiological mechanisms causing stroke-associated pneumonia (SAP), particularly the immune-depression brought on by a stroke, has advanced significantly.[21] Furthermore, as more patients with significant ischemic stroke are now being treated in specialized neurological intensive care units (NICUs) than in the past, the number of neurological intensive care units (NICUs) has been quickly growing in recent years. Regarding the incidence and results of problems associated to stroke, this may be advantageous.[22]

In the past, aspiration has been thought to be more significant than SAP.[23] Aspiration and its associated risk factors, such as reduced awareness and dysphagia, have been shown in several clinical investigations to be important risk factors for SAP.[23] Oral content aspiration while sleeping, which is common in stroke patients with impaired swallowing mechanisms, may be related to abnormal dopamine transmission.[24] The reduction of the swallowing reflex and a decrease in substance P in the end organs of guinea pigs when D1 dopamine receptors are blocked give experimental evidence for this phenomenon.[25] Low quantities of substance P were also discovered in the sputum of elderly patients suffering from aspiration pneumonia.[26] Angiotensin-converting enzyme inhibitor therapy for stroke patients resulted in a rise in serum substance P levels and an associated resolution of aspiration, according to a clinical trial, suggesting that aspiration may be influenced by low substance P levels.[27] Despite this, the prevalence of infection during the acute stroke

phase, when the risk of infection is highest, and the increased likelihood of pneumonia in stroke patients compared to those with dysphagia or a lower level of consciousness[28]suggest that another mechanism is involved in SAP pathogenesis inducing an immunological change.[29] The bulk of ICU studies discovered a SAP prevalence between 9.5 and 56.6 percent with the exception of one study that discovered a prevalence of 4.1 percent.[30]

However in this study, not only stroke patients but all neurovascular patients were included and they have mean age of 58.6 years. As shown by the incidence being significantly greater in febrile patients (40.2-70.8%) SAP is a relevant factor in post-stroke fever.[31] This incidence appears to be comparable to NICU research, ranging between 17 and 50% in MICU studies.[32] Stroke units or mixed acute settings have hosted the majority of SAP research. With the exception of one study where the incidence was 44 percent[26] the majority of investigations that were conducted exclusively in stroke units discovered that the incidence of SAP was between 3.9 and 12 percent.[33] This could be related to selection bias since all of the participants in this experiment had nasogastric tubes, had a higher percentage of artificial breathing (18%), and had more severe strokes (mean baseline NIHSS score = 13.4). In mixed acute settings it varied between 3.9 and 23.8 percent while the prevalence varied between 3.2 and 11% in some rehabilitative studies.[34]

These research, particularly those carried out in critical care settings, are so dissimilar from one another that it is challenging to compare them. In addition to acute ischemic stroke (AIS), intra-cerebral or subarachnoid hemorrhage was included in the majority of ICU studies.[24] Majority of studies were focused on acute general floor or stroke that only employed AIS.[34] In addition to the diverse geographic distribution of these studies, the methods for defining SAP (chart review, discharge diagnosis codes, or Centers for Disease Control and Prevention criteria) and the rates of mechanically ventilated patients vary. Compared to floor or stroke unit research, ICU research is both broader and more focused. Although greater than in acute general floors or stroke units, the SAP rate in NICUs and MICUs appears to be lower.[25] Comorbidities, mechanical respiration, and greater stroke severity among patients in critical care units are most likely causes. As a result of the stroke-induced immune-depression, these factors increase the likelihood of aspiration.

Most studies done in stroke units and acute hospital floors reveal SAP as an independent risk factor for mortality following AIS.[31] At 30 days or discharge, short-term mortality ranged from 10.1 to 37.3 percent,[32] whereas long-term mortality ranged from 49 to 60.1 percent.[35] In a number of investigations, SAP has been connected to subpar functional outcomes.[35] This was not the case in one research, though, even after adjusting for other independent factors, which can be attributed to the study's small sample size (n = 100), pre-selection of patients who required nasogastric tubes for feeding, and high rates of patients who were mechanically ventilated (18%).[24] On the other hand, there is a lack of consistency in the data on SAP's outcome in critical care units. According to Hilker et al.[37] there was a lower functional outcome at 14 months, a higher mortality rate at 14 months (35.3%), and a higher in-hospital mortality rate (26.9%). The other two ICU investigations[26] found no association between SAP and mortality. This could be due to the research's heterogeneity, the influence of selection bias, the use of small sample sizes[23] and the lack of long-term follow-up. Other independent risk factors for outcome, such as a high National institute of health stroke scale (NIHSS) score[27] a fever[38] and mechanical ventilation should be closely monitored in ICU research. These variables may all enhance the patient's chances of SAP, a poor functional outcome and death, confusing SAP results.

Other risk factors that have been mentioned in a number of papers include old age, dysphagia, and aspiration.[27] Mechanical ventilation[37] APACHE II score/status of organ failure, The risk factors mentioned in several research include male sex, left anterior cerebral artery stroke, brain stem infarction, multi-hemispheric infarction, non-lacunar basal ganglia infarction, atrial fibrillation, and nursing home admission.[38] Warning indications include dysarthria, changed level of consciousness, coma, and abnormal pupillary examination. A history of pneumonia, low albumin blood levels, diabetes or hyperglycemia, congestive heart failure, chronic obstructive pulmonary disease or smoking and infection, have all been connected to an increased risk of SAP.[34]

CONCLUSION

Aspiration pneumonia is a very common complication in our patients who have had strokes and are getting enteral nutrition through an NG tube. More multicenter studies with larger sample sizes should be carried out to find effect modifiers that can lead to aspiration pneumonia in NG tube patients. This will enable us to draw conclusions and offer suggestions for its prevention in the future.

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AUTHOR'S CONTRIBUTION
The following authors full fill authorship criteria as per ICMJE guidelines;

Ali I:	Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Bilal M:	Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.
Masood A:	Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.
Khan Y:	Analysis and interpretation of data, critical revision,final approval, agreed to be accountable for all the work.