

Stroke Related Pneumonia Incidence and Possible Risk Factors

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ABSTRACT:

BACKGROUND:

The stroke patient is at risk of developing hospital acquired infection, with the lungs being especially vulnerable. Stroke associated pneumonia (SAP) occurring after two days of admission and is the most nosocomial infection seen in the medical wards , pneumonia is the major cause of morbidity and mortality after stroke .The establishment of an accurate diagnosis of stroke associated pneumonia remains problematic and yet there is still no accepted "gold standard" for diagnosis.

OBJECTIVE:

To determine the incidence and risk factors of stroke associated pneumonia.

METHODS:

This is prospective cohort study for 82 stroke patients admitted to medical wards .The study conduct from the 1st July 2009 to the 10th January 2010. Initially stroke diagnosed clinically and by CT scan. Theses cases are assessed after 48 hours after admission, full history, physical examination and investigations were done using clinical criteria (body temperature, WBC count and chest radiography) for diagnosis of pneumonia.

RESULTS:

11(13.4%) patients developed stroke associated pneumonia from 82 stroke patients admitted to medical wards. Most patients who were developed pneumonia were older than patients who did not developed pneumonia . The incidence is higher in patient with infarction and older age groups than patients with hemorrhagic stroke and younger age groups, and there is no association between the disease and gender .The incidence of late onset is more common than early onset pneumonia. Presence of dysphagia was present in (81.8%) nasogastric tube in (72.7%),unconsciousness(54.5%),tobacco ,vomiting (36.6%) and fit (27.2%) were found as an important risk factors .The mortality more in hemorrhagic(75%) than thrombotic stroke (14.3%).

CONCLUSION:

stroke associated pneumonia is an important cause of mortality. It is associated with older age, dysphagia , NG intubation ,coma ,vomiting and fit .Simple assessment of these variables could be used to identify patients at high risk of developing pneumonia after stroke.

KEYWORDS: Pneumonia, stroke, risk factors.

INTRODUCTION:

Pneumonia is one of the most common respiratory complications of acute stroke, occurring in about 10-15 percent of patients . The incidence of stroke-associated pneumonia appears to be much higher in patients with acute ischemic stroke admitted to a neurologic intensive care unit and in those who require nasogastric tube feeding⁽¹⁾. Pneumonia is the most common cause of fever within the first 48 hours of acute stroke, and it is the most common

medical complication two to four weeks after a supratentorial ischemic infarction. Aspiration is the cause of about 60 percent of post-stroke pneumonia .Aspiration pneumonia refers to the pulmonary consequences resulting from the abnormal entry of fluid, particulate exogenous substances, or endogenous secretions into the lower airways. Most pneumonia arises following the "aspiration" of microorganisms from the oral cavity or nasopharynx. The dependent pulmonary segments are usually affected in aspiration pneumonia. The most common sites of involvement are the posterior segments of the upper lobes or apical segments of the lower lobes

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STROKE RELATED PNEUMONIA

if aspiration occurs while recumbent, and the lower lobes if the patient aspirates while upright or semi-upright. Patients with stroke-related pneumonia have a higher mortality and a poorer long-term outcome when compared to patients without pneumonia⁽²⁾. Potential etiologic agents of SAP include both multiple drug resistant (MDR) and non-MDR bacterial pathogens. The onset of SAP can be divided into 2 types:

1-Eary onset SAP occurs 48 to 96 hours after admission and is associated with antibiotic-susceptible organism.

2- Late onset SAP occurs more then 96 hours after admission and is associated with antibiotic-resistant organisms. Interventions to prevent SAP should begin at the time of admission to the hospital . The risk factors for SAP can be divided into 3 categories:

1-Host-related risk factors: - include preexisting conditions such as immune suppression as chronic renal failure, diabetes mellitus, ischemic heart diseases, hypertension, smoking, steroid, chronic obstructive lung disease, and acute respiratory distress syndrome ,patient's body positioning, level of consciousness and medication including sedative agents and antibiotics dysphagia , vomiting and fit. Disorders of the upper gastrointestinal tract including esophageal disease(GERD)⁽³⁾.

2-Device-related risk factors: - as endotracheal tube, nasogastric tube and orogastric tube.

3-Personnel-related risk factors: - improper hand washing result in the cross-contamination of patients⁽⁴⁾.

The most important symptoms are fever or low body temperature, new purulent sputum, and cough⁽⁵⁾.

Diagnosis SAP remains difficult and controversial⁽⁶⁾. The diagnosis can be made on the basis of radiographic findings, clinical findings, results of microbiological tests of sputum, or invasive testing such as bronchoscopy⁽⁷⁾. Treatment of SAP should be matched to known causative bacteria .when SAP is first suspected the bacteria causing infection is typically not known and broad-spectrum antibiotics are given (empiric therapy) until the particular bacterium and its sensitivities are determined^(8,9).

PATIENTS AND METHODS:

The present study is prospective cohort study.it was carried out from the 1st July 2009 to the 10th January 2010, the sample of (82) patients who were admitted to the Baghdad Teaching Hospital in medical and neurological words due to strokes were diagnosed by clinical examination and by CT-scan

The follow up started after 48 hours after admission to the hospital with exclusion all patients who had have pneumonia at time of admission or who developed pneumonia after admission to the hospital till 48hours. Full history was taken from the relatives and doctors or from patients if they can talk. The history include development of cough and fever . Complete physical examination was done concentrating on body temperature measured in the axilla, new purulent sputum, level of consciousness, tachycardia, tachypnea .Full chest and neurological examination was done. Diagnosis of SAP was done depending on temperature, WBC count, and radiographical changes on CXR.

The following table shows the demographic features of the studding group:

Table 1: Demographic features of the sample.

No. of patients	82		
Gender	Male	50(60.9%)	
	Female	32(39.1%)	
Mean age (SD)	66.7 (8.5)		
Type of stroke	Infarction	55	32(58.2%) males
	Hemorrhagic	27	23(41.8%) females
		18(66.7%) males	9(33.3%) females

RESULTS:

This study showed that 11(13.4%) patients (of total of 82 admitted patients to our hospital developed pneumonia (SAP) , patients with thrombotic stroke were 55(67.07%) from those

7 patients developed pneumonia representing (12.7%) while patients with hemorrhagic stroke was 27(32.9%) patients from those 4 patients developed pneumonia representing (14.8%)as

STROKE RELATED PNEUMONIA

shown in table2 , also we found the relation between SAP with the age , in thrombotic stroke 7 patients (12.7%) with mean age 71.4 (8.1) SD developed pneumonia while 48 patients(87.2%) with mean age 65.1(7.5) SD did not developed pneumonia. In hemorrhagic stroke 4 patients(14.8%) with mean 67.6(9.4) SD developed pneumonia while 23(85.2%) patients with mean age 66.3(8.7) SD did not developed pneumonia as shown in table3.

Regarding the relation between SAP and gender ; in thrombotic stroke 4(12.5%)males developed pneumonia from 32 males while 3(13.05%) females developed pneumonia from 23 females. In hemorrhagic stroke 3(16.7%) males developed pneumonia from 18 males and 1(11.1%) female developed pneumonia from 9 females as shown in table 4.

This study showed the incidence of early onset pneumonia (pneumonia that occur 48-96 hr) is 18.18% (2 patients) all of them were hemorrhagic while the incidence of late onset pneumonia (pneumonia that occur >96 hr) is 81.82% (9 patients) , 7 patients with infarction and 2 patients with hemorrhagic stroke as shown in table 5 .

Also we found that the risk factors for aspiration pneumonia, chronic lung diseases (27.2%) , immunosuppressant (27.2%) , tobacco smoking (54.5%) , dysphagia (81.8%) , unconsciousness (54.5%) . vomiting (36.6%) , NG tube (72.7%) , and fit (27.2%) .

We depend on the clinical criteria for diagnosis of SAP with different clinical variables (body temperature , WBC count and evidence of infiltration on CXR) . The patient who had fever > 37.8 are 9 (81.8%) while the patients who were hypothermic 2(18.2%) , patients with leukocytosis > 11000 were 10(90.9%) while patient with leukocyte count <4000 was 1(9.09%) , bilateral infiltration was (54.5%) , patchy infiltrate (27.2%) and progression of infiltration was (18.2%) as shown in table7.

Regarding the outcome of SAP , death occur 4 cases(36.6%) and 7 cases (63.4%) are still alive or discharge from hospital ,whereas 1 case(14.3%) from thrombotic stroke died and 6(85.7%) cases alive while 3(75%) cases from hemorrhagic stroke died and 1(25%) case alive as shown in table 8.

Table 2: Incidence of pneumonia in stroke

	Infarction	hemorrhage	Total	P-value
pneumonia	7(12.7%)	4(14.8%)	11(13.4%)	0.5213
No pneumonia	48(87.3%)	23(85.2%)	71(86.6%)	

Table 3 :Distribution of SAP cases by age

	Infarction		hemorrhage	
	No.	Mean age (SD)	No.	Mean age (SD)
pneumonia	7	71.4 (8.1)	4	67.6(9.4)
No pneumonia	48	65.1(7.5)	23	66.3(8.7)
P-value	0.04463		0.7870	

Table 4: Relation between SAP and gender

	Infarction		hemorrhage	
	Male	Female	Male	Female
Pneumonia	4(12.5%)	3(13%)	3(16.6%)	1(11%)
No pneumonia	28(87.5%)	20(87%)	15(83.4%)	8(89%)
P-value	0.6296		0.5928	

Table 5: Distribution of SAP cases by type .

Types of SAP	Number	Infarction	Hemorrhage
Early onset SAP (48 – 96 hr)	2 (18.18%)	0(0%)	2(50%)
Late onset SAP > 96hr	9 (81.82%)	7(100%)	2(50%)
Total	11 (100%)	7(100%)	4(100%)

STROKE RELATED PNEUMONIA

Table 6: Frequency of risk factors among pneumonia cases:

Risk factors	Stroke with pneumonia(SAP)	Stroke without pneumonia	P-value
dysphagia	9(81%)	31(43.6%)	P<0.05
NG	8(72%)	27(38%)	P<0.05
COMA	6(54.5%)	24(33%)	P<0.05
SMOKING	6(54.5%)	42(59%)	not significant
DELAY(>96hr)	9(81.8%)	32(45%)	P<0.05
Chroniclung diseases	3(27.2%)	24(59%)	not significant
vomiting	4(36.6%)	10(14%)	P<0.05
fit	3(27.2%)	5(7%)	P<0.05
immunosuppressant	3(27.2%)	25(35%)	not significant

Table 7: Distribution of SAP cases by clinical finding

Clinical findings	Number (%)
Fever	
>37.8	9(81.8%)
<36.6	2(18.2%)
Leukocyte count	
> 11.000	10(90.9%)
< 4000	1(9.09%)
Chest radiography	
Bilateral infiltration	6(54.5%)
Patchy infiltrate	3(27.3 %)
Progression of infiltrate	2(18.2%)

Table 8: The outcome of patients with SAP

	Infarction	Hemorrhage	Total no. (%)
Dead	1	3	4 (36.6)
alive	6	1	7(63.4)
Total	7	4	11(100)

DISCUSSION:

In this study ; the incidence of pneumonia in stroke patients was 13.4% while in study done by (Hilker et al .2003) the incidence was 21% , while study done by (Cameron Sellars et al.2007)⁽⁹⁾ the incidence was 19.9%.

The incidence was variable in the different studies which may be justified by the presence of different population with variable age, underlying diseases and risk factors.

This study shows that the rate of pneumonia was higher in older age group ; 7 patients with mean age of (71.4 (8.1) SD) in ischemic infarction in which there is significant statistical association the p-value was 0.04463 . while in hemorrhagic stroke the statistical association not significant

with age . Study done by (Cameron Sellars et al.2007)⁽⁹⁾ show that the age regarded as significant risk factor for pneumonia in stroke.

In this study ,the incidence of SAP in ischemic infarction was (12.7%) and in hemorrhagic stroke was (14.8%) this shows that the incidence was higher in hemorrhagic than ischemic stroke but this is not statistically significant P-value >0.05 . In study done by (Hassan A et al . 2006)⁽¹⁰⁾ shows that the incidence of SAP also high in hemorrhagic stroke.

The study shows that the pneumonia occur more commonly in males , 7 males developed SAN , while 4 females developed pneumonia. In our study There is no significant statistical

STROKE RELATED PNEUMONIA

association of pneumonia with gender in patient with ischemic nor in patient with hemorrhagic stroke (p-value >0.05).

The rate of early onset pneumonia that occur 48-96 hr after admission to the hospital is less than late onset pneumonia that occur > 96 hr after admission with % as (18.18%) and (81.82%) respectively . This mean that more staying in the hospital is a risk factor for SAP . The study done by(Hilker et al .2003) ⁽¹¹⁾ showed that the time is also risk factor for SAP. Early onset pneumonia is more in hemorrhagic and this is statistically significant while late onset pneumonia is more in infarction and also this is statistically significant .

In this study we found that 9 patients (81.8%)whom developed pneumonia had dysphagia while 31 patients (43.6%) with dysphagia did not developed pneumonia, probably due to aspiration of the food particles or fluid to the lungs ,this mean that dysphagia is significant risk factor for SAP p-value < 0.05.

Also we found that 8 patients (72.7%) developed pneumonia had NG tube while 27 patients (38%) did not developed pneumonia ,NG tube may impair the function of gastroesophageal sphincter ,increase the gastric distension ,colonization and aspiration pneumonia . , this regard that NG tube is significant risk factor p-value<0.05 . While in study done by R Dziewas et al. ⁽¹²⁾ showed that pneumonia occur in 44% of NG tube patients .

unconscious patients were 30 , 6 patients (54.5%)developed pneumonia while 24 unconscious patients (33%)did not developed pneumonia this is statistically significant p-value<0.05. In these patients, local defense mechanisms of the respiratory airway altered allowing the microorganism to colonize in the mucosal surfaces Pathophysiologically, this condition leads to (1) an attenuation of protective reflexes, (2) an impaired functioning of the lower esophageal sphincter and a delayed gastric emptying, and (3) a worsening of the coordination of breathing and swallowing, thereby predisposing the individual to aspiration independent of the underlying disease.

.In our study found comatose patients had increased the chance of SAP while the study done by (Ewing S et al. 1999) who said that depression of the level of consciousness increases significantly the chance of aspiration and the development of SAP. The study done by Rainer Dziewas, in 2003⁽¹²⁾ showed that coma is important risk factor for SAP .

We found that patients developed pneumonia after 96 hrs were 9(81.8%) while patients who stayed in the hospital after 96 hrs and did not developed pneumonia were 32(45%) this is statistically significant p-value <0.05 this mean that more staying in the hospital is risk factor. We found that patients who complain from vomiting were 14, 4 patients (36.6%) developed pneumonia while 10 patients (14%) did not developed pneumonia , this is statistically significant p-value <0.05, this mean that vomiting is a risk factor. We found that patients who complained from fit were 8 , 3 patients(27.2%) developed pneumonia while 5 patients (7%) did not developed pneumonia , this is statistically significant p-value <0.05 this mean that fit is significant risk factor.

We found that smoking ,chronic lung disease , immunosuppressant were of no statistical significance with patients who developed pneumonia and those who did not developed pneumonia as shown in table 6 .

In our study the criteria for diagnosis of SAP depend on three variables which are : temperature , WBC count and CXR findings.

We find that the temperature of 9 patients (81.8%) was >37.8 while the temperature of only 2 patients (18.2%) was <36.6 , while only 1 patient presented with WBC count < 4000.

The CXR finding vary between bilateral , patchy or progressive infiltration. The bilateral infiltration was more significant with (54.5%) . Regarding to the outcome of SAP There was significant statistical difference in mortality rate between patients with SAP secondary to hemorrhage compared to infarction.

CONCLUSION:

Stroke associated pneumonia is an important cause of mortality. It is associated with older age, dysphagia , NG intubation ,coma ,vomiting and fit .Simple assessment of these variables could be used to identify patients at high risk of developing pneumonia after stroke.

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STROKE RELATED PNEUMONIA

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