WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES
SJIF Impact Factor 7.421
Volume 8, Issue 1, 1-11 Research Article ISSN 2278 – 4357

FACTORS PREDICTING PNEUMONIA IN THE FIRST WEEK POST STROKE

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Article Received on
24 October 2018,
Revised on 14 Nov. 2018,
Accepted on 04 Dec. 2018,
DOI: 10.20959/wjpps20191-12867

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ABSTRACT

Background: Post stroke infections (PSI) are a significant clinical problem with poor short and long term outcomes, The increased susceptibility to infections after stroke has been linked to a diverse set of factors that may predispose an individual to chest infection early in the course of stroke. **Objective:** This study aimed to provide evidence on factors associated with respiratory infections in the very acute stroke period in Baqubah city, Diyala province. **Patients and Methods:** this study involved 152 stroke patients admitted to Baqubah Teaching Hospitals from 22th of August 2017 to 10th of February 2018. Data were collected on 11 clinical and demographic parameters. The Chi-square- x2 test was performed. **Results:** The percentage of respiratory infection was15.78%. the infected patients who required full assistance with mobility[OR2.442, 95% CI0.785-7.598] During the first week post stroke nasogastric tubes(NGT) [OR5.694, 95% CI2.258-14.360] and Nil By Mouth (NBM) [OR5.694, 95% CI2.258-14.360] were associated with respiratory infections. **Conclusion:** This study highlights the critical period of susceptibility to infection in early stroke and the importance of identifying and minimizing risk factors associated with after stroke pneumonia to improve patient outcomes. Increased age, Dysphagia, NGT feeding, NBM, severe GCS are significantly associated with chest infections developing in the first week post stroke. Future studies are needed to determine the impact of protective measures in reducing the burden of infection in the acute stroke.

KEYWORDS: Stroke, Pneumonia, NGT feeding, Dysphagia, respiratory infections.

INTRODUCTION

Stroke is defined as a disturbance in the blood supply to the brain, causing loss or impairment of the respective functions in the cerebral region affected. It may be ischemic, caused by blood vessel obstruction or reduction in the systemic blood flow, or hemorrhagic, caused by the rupture of a weakened blood vessel. Recent studies show that the cerebrovascular disease is considered among the main causes of death in worldwide.[1] Post stroke infections (PSI) are a significant clinical problem with poor short and long term outcomes.[2] Infection during the first days after stroke occurs in 25-65% of patients. Pneumonia and urinary tract infection are the most common infectious complications, causing a significant increase in the duration of hospitalization.[3] The increased susceptibility to infections after stroke has been linked to aspiration, immobilization and usage of invasive catheters.[4]

Every year in the United States, 795,000 people suffer a new or recurrent stroke, of which 60% are females and 40% males (Centers for Disease Control & Prevention [CDC], 2014). Of all strokes, ischemic attacks accounted for 87%, 10% were intracerebral hemorrhagic, and 3% were subarachnoid hemorrhage.[5] Strokes cause approximately 5.7 million deaths, with 85% occurring in underdeveloped or developing countries, where death rates are 3.5 times higher than in developed countries. In Brazil, stroke is considered the main cause of death, with 10% of deaths occurring in the first 30 days.[6] Stroke-associated pneumonia which is occurring in around 32% of acute stroke patients, is the leading cause of death in the post-acute phase accounting for approximately 30% of 30-day mortality.[7,8]

Pneumonia can be classified as (a) community-acquired pneumonia(CAP), (b) nosocomial pneumonia(hospital-acquired pneumonia or ventilator-associated pneumonia), and (c) healthcare-associated pneumonia. Hospital-acquired pneumonia is a pneumonia occurring in the hospital after more than 48 h of admission. Ventilator associated pneumonia is defined as pneumonia developing 48 h after intubation.[8]

Dysphagia after stroke is a common disabling problem and is estimated to occur in 22%–78% depending on the method used and timing after stroke. It is one of the significant risk factors for aspiration pneumonia in stroke patients and aspiration pneumonia increases mortality and the length of hospitalization.[9] A recent review reported pneumonia occurred in 19– 33% of dysphagic stroke patients within the 1st week.[10] Annually, the number of persons in the U.S. with stroke who experience dysphagia ranges between 160,000 and 573,000. Stroke patients have difficulty controlling the tongue and are unable to chew and swallow food particles as

both the oral and pharyngeal phases of swallowing are impaired.[11] A significant correlation exists between the presence of pathogenic bacteria in the oral cavity and the occurrence of pneumonia. Patients with stroke and dysphagia have an increased risk of aspiration of bacteria-saliva and, thus, for development of pneumonia.[12] The diagnosis of dysphagia may predict poor outcome in acute stroke patients.[13] Clinical features used for dysphagia risk stratification include items directly related to swallowing (voice change after swallow, cough after swallow, commonly assessed with a water-swallowing test) and also non-swallowing features such as voice and speech abnormalities (dysphonia, dysarthria), abnormal volitional cough and gag reflex.[14] A video fluoroscopic swallowing study (VFSS) is a standard diagnostic tool for detecting dysphagia.[15] Dysphagia may increase length of stay in hospital by 73 %, with only 14 % of patients without dysphagia requiring ongoing hospitalisation longer than 7 days. Current dysphagia management involves reducing aspiration risk through diet and fluid modification, compensatory manoeuvres and positional changes, and rehabilitation exercises.[16]

Those with severe dysphagia, especially due to acute stroke, nasogastric tube (NGT) is usually recommended as a safe way of supplying nutrition. Several studies have shown that persistent dysphagia is closely associated with poor outcome, including lower functional ability and increased mortality. Also, prolonged NGT insertion can lead to complications, such as lesions to the nasal wing, chronic sinusitis, gastro-esophageal reflux, and aspiration pneumonia. These complications can worsen the patient's outcome. Therefore, appropriate removal of NGT in stroke patient with dysphagia is critically important.[19]

Previous studies have identified a diverse set of factors that may predispose an individual to chest infection early in the course of stroke. These include greater severity of neurologic impairment, older age, and diabetes mellitus.[17] Infections are correlated with stroke severity, since, on the one hand, a severe neurological deficit may facilitate infection and on the other hand severe infections may trigger neurological worsening. Experimental and clinical studies have shown that a pronounced anti-inflammatory response may cause a state of stroke-induced immunodeficiency via mechanisms that include the hypothalamic pituitary adrenal axis, the sympathetic nervous system and the vagus nerve.[18]

Reduced conscious level usually indicates a large volume lesion in the cerebral hemisphere but may result from a lesion in the brainstem or complications such as obstructive hydrocephalus, hypoxia or severe systemic infection[22]

Langdon, Lee and Binns provided evidence of a critical period of susceptibility to infection in a cohort of 330 stroke survivors. They found patients demonstrated two clear peaks of infection, the first occurring in the first 48 hours post and the second 3–7 days post admission and that impaired mobility, incontinence and more than six medications on admission were significantly associated with the development of respiratory infection.[2]

Prophylactic antibiotics in patients with acute stroke and dysphagia did not reduce the development of post-stroke pneumonia and this treatment should not be used.[20]

Knowledge about the risk factors of post-stroke infections (RTI and UTI) are of obvious importance and will assist in the monitoring of patients and the prevention of stroke complications and could permit clinicians to provide the close surveillance and timely treatment of patients with stroke at a highest risk for infective complications, thereby optimizing the clinical outcomes.[21]

PATIENTS AND METHODS

152 patients were included in the current study, who were admitted to the third floor/medicine department in Baqubah Teaching Hospital, The patients were diagnosed with acute stroke.

Questionnaire was prepared by recording Information which were taken to explore the predicting factors for pneumonia during the period from 22th of August 2017 to 10th of February 2018.They include:

a) The name, age, gender, the date of admission, medical history.
b) The type of stroke.
c) Mobility, GCS.
d) Dysphagia.
e) NGT, NBM.
f) Number of medications on admission.

The diagnosis of pnumonia by standardized criteria (Mann criteria pneumonia).Specifically, subjects were required to have 3 or more of the following characteristics: fever (>38°C), productive cough with purulent sputum, abnormal respiratory examination (tachypnea >22/min, tachycardia, inspiratory crackle, bronchial breathing), abnormal chest radiographic findings, arterial hypoxemia (PO2< 70mm Hg or SpO2<%94).[17][28]

Shape: the pulse oximetry measuring the peripheral oxygen saturation.

Statistical analysis

Statistical package for Social Sciences (Version 22 for windows, SPSS, Chicago, IL, USA, 2013) was used to show the influence of different factors in study parameters. The Chi-square- x2 test was used to compare between percentages. The level of accepted statistical significant difference is below or equal to ($p \leq 0.05$).

RESULTS

Respiratory infections developed in 24 (15.78%) patients, 128 (84.21%) were without infection. The infected patients were 11 (45.83%) male and 13 (54.16%) female, their ages ranged (1 (4.16%) less than 60 years, 5(20.83%) 60-69 years, 11 (45.83%) 70-79 years, 7 (29.16%) more than 80 years), the stroke types were 19 (79.16%) ischemic and 5 (20.83%) haemorrhagic, the proportion of individuals having an infection differed for mobility (83.33% requiring full assistance, 12.50%using aids and 4.16% being independent), dysphagia (95.83%), GCS (33.33% with severe, 62.50% with mild and 4.16% with normal), NGT (54.16%), and NBM (2154.16%).

Table1: Demographics and baseline characteristics of the stroke patient sample.

	Infection (24) 15.78%	No infection (128) 84.21%
Age		
<60 year	(1) 4.16%	(45) 35.15%
60-69 year	(5) 20.83%	(34) 26.56%
70-79 year	(11) 45.83%	(28) 21.87%
>80 year	(7) 29.16%	(21) 16.40
Gender		
Male	(11) 45.83%	(58) 45.31%
Female	(13) 54.16%	(70) 54.68%
Stroke type		
haemorrhagic	(5) 20.83%	(21) 16.40%
Ischemic	(19) 79.16%	(107) 83.59%
Drugs		

< 5	(2) 8.33%	(6) 4.68%
≥ 5	(22) 91.66%	(122) 95.31%
GCS		
Sever from 3-9	(8) 33.33%	(15) 11.71%
Mild from 10-14	(15) 62.50%	(68) 53.12%
Normal 15	(1) 4.16%	(45) 35.15%
Mobility		
Full assistance	(20) 83.33%	(86) 67.18%
With aids	(3) 12.50%	(27) 21.09%
independent	(1) 4.16%	(15) 11.71%
Dysphagia	(23) 95.83%	(76) 59.37%
NBM	(13) 54.16%	(22) 17.18%
NGT	(13) 54.16%	(22) 17.18%
Comorbidity		
(diabetes mellitus)	(6) 25%	(54) 42.18%
(hypertension)	(18) 75%	(82) 64.06%
(cardiac diseases)	(6) 25%	(15) 11.71%
(earlier stroke)	(9) 37.5%	(39) 30.46%

GCS = Glasgow Coma Scale, NBM = nil by mouth, NGT = nasogastric tube.

Statistical analysis showed that there were significant differences (P<0.05) in the increased age, severity of GCS, Dysphagia, NGT, NBM.

Table2: Explanatory variables for respiratory infections.

Variable	Risk Estimate		Chi-Square
	OR	95% CI	P value
Age			
≥70 vs <70	0.207	0.077-0.557	0.001*
Gender			
Male vs Female	1.021	0.426-2.450	0.962
Stroke			
Haemorrhagic vs Ischemic	1.341	0.451-3.990	0.597
Drugs			
≥5 vs <5	1.848	0.350-9.755	0.463
GCS			
Sever vs Mild	3.767	1.379-10.292	0.007*
Mobility			
Full assistance vs With aids	2.442	0.785-7.598	0.114
Dysphagia			
Yes vs No	15.737	2.061-120.176	0.001*
NBM			
Yes vs No	5.694	2.258-14.360	0.000*
NGT			
Yes vs No	5.694	2.258-14.360	0.000*
Comorbidity			
Yes vs No	0.926	0.286-2.998	0.898

***=Significant (p ≤ 0.05), CI = confidence interval, OR = odds ratio, vs = versus.**

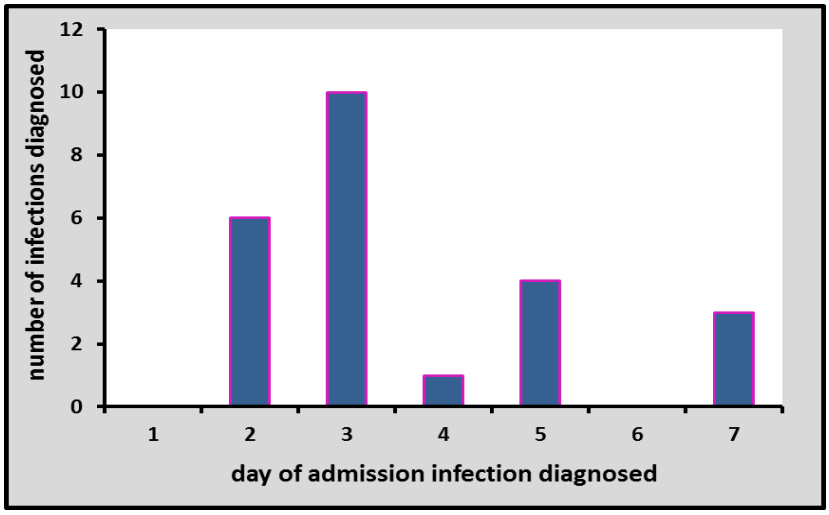

Fig: 1 time to infection.

DISCUSSION

In this study, we analysed factors associated with pneumonia from 152 acute stroke patients. pneumonia developed in 15.78% of stroke patients during the first week of admission. By comparsion with other studies, the percentage was less than the percentage of the study of Sellars et al. which was(18.9%)[17] while was more than the percentage of Brogan et al, which was (11.26%).[2]

In The current study, Age was reported as risk factors for stroke-associated Pneumonia, Several factors may account for the increased risk for pneumonia in the older age group, such as existing immune senescence and the relatively increased risk for aspiration in the elderly, on top of the immunosuppression brought about by stroke.[8]

NGT may promote colonisation of gram negative bacteria and harbour biofilms.[24] It also raises the possibility that patients are aspirating refluxed material from tube feedings, and/ or bacteria laden saliva.[25] Immune depression, increased rates of oral colonisation of aerobic gram negative bacilli that occur in the hospital environment and/or dysphagia are often considered the source of aspiration pneumonia in acute stroke patients[26] that accepted by Muscari et al.[27] Patients with dysphagia were significantly more likely to develop a respiratory infection than those who were not dysphagic.[8][7][23]

A substantial risk of respiratory infections was seen in those stroke patients who required full assistance with mobility that (83.33%) of infected patients in this study were immobile, when

compared with other studies it was less than the percentages of Brogan[a,b] et al. which was (85%).[2][7]

Decreased mobility may relate to decreased air entry and impaired drainage of secretions from the lungs, contributing to increased rates of pneumonia. Rotating immobile patients in bed has been proven to prevent and treat chest infections[18] The low GCS indicates the severe form of stroke, in this study the severe GCS was (33.33%).Stroke severity has been reported in several studies to be an important risk factor for post-stroke pneumonia Peak incidence of infection in acute stroke patients occurred 2days post admission supporting our hypothesis that the majority of PSI are diagnosed within 3 days of hospital admission[29] and previous research indicating patients are especially prone to infection during the first few days post stroke.[30]

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