



Predictive characteristics of pneumonia in stroke patients attending Nan hospital, Thailand.

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Abstract : Objective: To estimate incidence of pneumonia and its predictive characteristics among male stroke patients attending Nan Hospital, Thailand.

Methods: This retrospective cohort study analyzed data of 291 male stroke patients attending Nan Hospital, Thailand, during January 1, 2013 to January 31, 2016 (4 years). Predictive characteristics were determined using generalized linear model for risk ratio regression.

Results: Among 291 male stroke patients, 51 developed pneumonia (17.53%). Factors predicting pneumonia in this group of patients included impaired cough reflex (RR=5.35, 95%CI=2.38-12.00, p<0.001), duration of nasogastric tube use more than 7 days (RR=3.80, 95%CI=1.52-9.50, p=0.004), and previous aspiration (RR=1.81, 95%CI=1.11-2.94, p=0.017).

Conclusions: Impaired cough reflex, duration of nasogastric tube use more than 7 days, and aspiration were stronger predictive characteristics of pneumonia among male stroke patients attending at Nan hospital. Preventive measures for pneumonia should be intensely provided in male stroke patients with these predictive characteristics.

Keywords: Stroke, Pneumonia, Cough, Respiratory aspiration, Epidemiology

I. INTRODUCTION

Prevalence of stroke in Thailand was estimated to be 1.88% in population aged 45 years and older and average age of stroke onset was 65 years old. Stroke was more prevalent in men [1]. This finding of stroke prevalence was similar to those found in many other countries [2]. Mortality rate from stroke in Thailand was 31.7 cases per 100,000 persons [1]. Dysphagia and aspiration could be found in 80% of stroke patients [3] and these conditions could be developed since stroke onset [4] and later [5]. Up to 25% of all patients died after initial stroke treatment from aspiration and pneumonia [6]. In the context of Nan hospital, 78.35% of

all cases had ischemic stroke and the rest had hemorrhagic stroke. The mortality rate was 10.44 case per 100,000 persons. The prevalence of pneumonia in stroke patients attending Nan hospital was 7.46%.

From review of previous literature, clinical risk characteristics were associated with pneumonia in stroke patients include male [7-8], advanced age [8-12], hypertension [8,13], diabetes mellitus [11,13], chronic obstructive pulmonary disease [8,10,13], smoking [8,10,13], ischemic stroke [10,13], brainstem infarct [9,15], decreased level of consciousness [14], long duration on nasogastric tubes [14], impaired cough reflex [15-17], dysphagia [8-10,12], aspiration [13], facial palsy [14], hemiparesis [14], dysarthria [10,12], aphasia [10,12,14], longer length of stay in hospital [7-9].

However, there was a lack of information related to predictive characteristics of pneumonia among male stroke patients in Thailand. Thus, this study was conducted to estimate incidence of pneumonia and its predictive characteristics among male stroke patients attending Nan Hospital, Thailand.

Methods

Study setting and patients

This study was carried out in Occupational Therapy Department of Nan Hospital in Nan, Thailand. Retrospective cohort data collection approach was applied to collect data from medical record of 291 male stroke patients attending at Nan hospital during January 1, 2013 to January 31, 2016. Independent variables were characteristics at the start of current admission and dependent variable was pneumonia.

Statistical analysis

Patients' characteristics were summarized using descriptive statistics. Two-sample Wilcoxon rank-sum test and independent sample t-test were applied to assess difference in continuous variables. Exact probability test was used to analyze categorical variables. Univariable analysis for crude risk ratio was undertaken using generalized linear model for risk ratio regression.

Predictive model was also estimated using forward stepwise method.

Ethical consideration

This study protocol was approved by Ethical Review Committee for Human Research, Faculty of Public Health, Mahidol University.

Results

There were 51 patients who developed pneumonia (17.53%). Characteristics which were significantly different between cases and non-cases of pneumonia included age, atrial fibrillation, smoking, levels of consciousness, using nasogastric tube, duration on nasogastric tube use, dysphagia, aspiration, impaired cough reflex, facial palsy, hemiplegia, dysarthria, aphasia and length of stay in hospital (Table 1).

Table 1. Characteristics of male stroke patients attending Nan Hospital, Thailand

| Characteristics | Pneumonia n (%) | Non-pneumonia n (%) | p-value |
|--|----------------------|------------------------|--------------------|
| Patient (Total: 291) | 51 (17.53) | 240 (82.47) | |
| Age (n = 291 patients), Overall Mean \pm SD = 65.33 (\pm 13.13) | | | |
| Mean \pm SD | 71.12 (\pm 11.74) | 64.18 (\pm 13.09) | 0.008 [‡] |
| Min. – Max. | 46-89 | 30-91 | |
| \leq 59 years | 9 (9.09) | 90 (90.91) | |
| \geq 60 years | 42 (21.88) | 150 (78.13) | |
| Body mass index (BMI) (n = 262 patients), Overall Mean \pm SD = 22.45 (\pm 4.32) | | | |
| Mean \pm SD | 21.36 (\pm 3.78) | 22.55 (\pm 4.15) | 0.371 [‡] |
| Min. – Max. | 13.32-27.68 | 15.43-43.28 | |
| Normal (18.50-24.99 kg/m ²) | 25 (15.82) | 133 (84.18) | |
| Overweight (\geq 25.00 kg/m ²) | 7 (11.11) | 56 (88.89) | |
| Underweight ($<$ 18.50 kg/m ²) | 9 (21.95) | 32 (78.05) | |
| Underlying disease: | | | |
| Cerebrovascular disease | | | |
| No | 37 (16.02) | 194 (83.98) | 0.187 [*] |
| Yes | 14 (23.33) | 46 (76.67) | |
| Hypertension | | | |
| No | 13 (14.77) | 75 (85.23) | 0.417 [*] |
| Yes | 38 (18.72) | 165 (81.28) | |
| Diabetismellitus | | | |
| No | 41 (16.47) | 208 (83.53) | 0.250 [*] |
| Yes | 10 (23.81) | 32 (76.19) | |
| Chronic kidney disease | | | |
| No | 47 (17.54) | 221 (82.46) | 0.939 [*] |
| Yes | 4 (18.18) | 18 (81.82) | |
| Dyslipidemia | | | |
| No | 38 (18.54) | 167 (81.46) | 0.485 [*] |
| Yes | 13 (15.12) | 73 (84.88) | |
| Atrial Fibrillation | | | |
| No | 34 (14.29) | 204 (85.71) | 0.003 [*] |
| Yes | 17 (32.08) | 36 (67.92) | |
| Gout | | | |
| No | 43 (17.99) | 196 (82.01) | 0.654 [*] |
| Yes | 8 (15.38) | 44 (84.62) | |
| Cancer | | | |
| No | 50 (17.42) | 237 (82.58) | 0.695 [*] |
| Yes | 1 (25.00) | 3 (75.00) | |
| Benign Prostate Hyperplasia | | | |
| No | 49 (17.13) | 237 (82.87) | 0.206 [*] |
| Yes | 2 (40.00) | 3 (60.00) | |
| Thyroid | | | |
| No | 50 (17.42) | 237 (82.58) | 0.695 [*] |
| Yes | 1 (25.00) | 3 (75.00) | |
| Osteoarthritis | | | |
| No | 50 (17.30) | 239 (82.70) | 0.272 [*] |
| Yes | 1 (50.00) | 1 (50.00) | |

| | | | |
|---|---------------------|--------------------|---------------------|
| Anemia | | | |
| No | 50 (17.36) | 238 (82.64) | 0.482* |
| Yes | 1 (33.33) | 2 (66.67) | |
| Alcohol Dependence | | | |
| No | 48 (16.96) | 235 (83.04) | 0.149* |
| Yes | 3 (37.50) | 5 (62.50) | |
| Schizophrenia | | | |
| No | 49 (17.01) | 239 (82.99) | 0.065* |
| Yes | 2 (66.67) | 1 (33.33) | |
| Chronic obstructive pulmonary disease | | | |
| No | 45 (16.67) | 225 (83.33) | 0.174* |
| Yes | 6 (28.57) | 15 (71.43) | |
| Tuberculosis | | | |
| No | 49 (17.19) | 236 (82.81) | 0.318* |
| Yes | 2 (33.33) | 4 (66.67) | |
| Smoking | | | |
| Non-smoke | 26 (15.03) | 147 (84.97) | 0.027* |
| Past-smoke | 4 (10.00) | 36 (90.00) | |
| Current-smoke | 21 (26.92) | 57 (73.08) | |
| Alcohol drinking | | | |
| Non-drink | 23 (17.56) | 108 (82.44) | 0.468* |
| Past-drink | 4 (8.51) | 43 (91.49) | |
| Current-drink | 24 (21.24) | 89 (78.76) | |
| Exercise | | | |
| No | 1 (14.29) | 6 (85.71) | 0.855* |
| Yes | 46 (16.91) | 226 (83.09) | |
| Type of stroke | | | |
| Other | 3 (6.82) | 41 (93.18) | 0.101* |
| Hemorrhagic stroke | 17 (26.15) | 48 (73.85) | |
| Ischemic stroke | 31 (17.03) | 151 (82.97) | |
| Lesion location of stroke: | | | |
| Infarction | | | |
| No | 15 (17.44) | 71 (82.56) | 0.555* |
| Yes | 28 (14.66) | 163 (85.34) | |
| Hemorrhage | | | |
| No | 30 (14.08) | 183 (85.92) | 0.230* |
| Yes | 13 (20.31) | 51 (79.69) | |
| Emboli | | | |
| No | 42 (15.44) | 230 (84.56) | 0.781* |
| Yes | 1 (20.00) | 4 (80.00) | |
| Atrophy | | | |
| No | 32 (15.31) | 177 (84.69) | 0.864* |
| Yes | 11 (16.18) | 57 (83.82) | |
| Level of consciousness | | | |
| Alert | 17 (8.21) | 190 (91.79) | <0.001* |
| Confuse | 10 (33.33) | 20 (66.67) | |
| Drowsy or Coma | 24 (44.44) | 30 (55.56) | |
| Using nasogastric tube | | | |
| No | 7 (3.72) | 181 (96.28) | <0.001* |
| Yes | 44 (42.72) | 59 (57.28) | |
| Duration on nasogastric tube use (n = 291 patients), Overall Mean \pm SD = 3.10 (\pm 6.02) | | | |
| Mean \pm SD | 10.37 (\pm 9.31) | 1.56 (\pm 3.51) | <0.001 [†] |
| Min. – Max. | 0-46 | 0-18 | |
| 0 day | 7 (3.72) | 181 (96.28) | |
| 1 to \leq 7 days | 16 (29.09) | 39 (70.91) | |
| > 7 days | 28 (58.33) | 20 (41.67) | |
| Impaired gag reflex | | | |
| No | 43 (19.03) | 183 (80.97) | 0.159* |
| Yes | 7 (11.29) | 55 (88.71) | |
| Impaired cough reflex | | | |

| | | | |
|---|----------------------|----------------------|---------------------|
| No | 9 (4.19) | 206 (95.81) | <0.001* |
| Yes | 41 (56.16) | 32 (43.84) | |
| Impaired physical mobility | | | |
| No | 5 (12.82) | 34 (87.18) | 0.423* |
| Yes | 45 (18.07) | 204 (81.93) | |
| Seizure | | | |
| No | 37 (17.87) | 170 (82.13) | 0.839* |
| Yes | 14 (16.87) | 69 (83.13) | |
| Dysphagia | | | |
| No | 18 (8.65) | 190 (91.35) | <0.001* |
| Yes | 32 (40.00) | 48 (60.00) | |
| Aspiration | | | |
| No | 14 (8.00) | 161 (92.00) | <0.001* |
| Yes | 36 (31.86) | 77 (68.14) | |
| Dysphonia | | | |
| No | 47 (16.67) | 235 (83.33) | 0.053* |
| Yes | 3 (50.00) | 3 (50.00) | |
| Dysarthria | | | |
| No | 32 (22.54) | 110 (77.46) | 0.024* |
| Yes | 18 (12.33) | 128 (87.67) | |
| Aphasia | | | |
| No | 34 (15.04) | 192 (84.96) | 0.050* |
| Yes | 16 (25.81) | 46 (74.19) | |
| Facial palsy | | | |
| No | 30 (22.22) | 105 (77.78) | 0.043* |
| Yes | 20 (13.07) | 133 (86.93) | |
| Paraplegia | | | |
| No | 48 (17.58) | 225 (82.42) | 0.674* |
| Yes | 2 (13.33) | 13 (86.67) | |
| Hemiparesis | | | |
| No | 23 (22.55) | 79 (77.45) | 0.087* |
| Yes | 27 (14.52) | 159 (85.48) | |
| Hemiplegia | | | |
| No | 24 (10.53) | 204 (89.47) | <0.001* |
| Yes | 26 (43.33) | 34 (56.67) | |
| Quadriplegia | | | |
| No | 46 (16.79) | 228 (83.21) | 0.264* |
| Yes | 4 (28.57) | 10 (71.43) | |
| Total time from onset to emergency room (n = 285 patients), Overall Mean \pm SD = 21.20 (\pm 40.35) | | | |
| Mean \pm SD | 19.23 (\pm 35.69) | 21.28 (\pm 41.08) | 0.582 [‡] |
| Min. – Max. | 0.2-192 | 0.12-336 | |
| \leq 4.49 hours or 269 minute | 27 (18.00) | 123 (82.00) | |
| \geq 4.50 hours or 270 minute | 21 (15.56) | 114 (84.44) | |
| Length of stay in hospital (n = 291 patients), Overall Mean \pm SD = 6.65 (\pm 6.16) | | | |
| Mean \pm SD | 13.76 (\pm 8.44) | 5.13 (\pm 4.26) | <0.001 [‡] |
| Min. – Max. | 1-46 | 1-40 | |
| < 14 days | 32 (12.21) | 230 (87.79) | |
| \geq 14 days | 19 (65.52) | 10 (34.48) | |

[‡]Independent sample t-test, *Exact probability test, [†]Two-sample Wilcoxon rank-sum test

Table 2 showed crude risk ratio estimated by univariable analysis using generalized linear model for risk ratio regression (Table 2).

Table 2. Univariable analysis of each covariate and pneumonia

| Predictive characteristics | Pneumonia n (%) | Crude risk ratio* | 95% CI | p-value |
|------------------------------|-----------------|-------------------|------------|---------|
| Age | | | | |
| \leq 59 years | 9 (9.09) | 1.00 | Reference | |
| \geq 60 years | 42 (21.88) | 2.41 | 1.22, 4.74 | 0.011 |
| Body mass index (BMI) | | | | |

| | | | | |
|--|------------|------|-------------|-------|
| Normal (18.50-24.99 kg/m ²) | 25 (15.82) | 1.00 | Reference | |
| Overweight (≥25.00 kg/m ²) | 7 (11.11) | 1.39 | 0.70, 2.74 | 0.345 |
| Underweight (<18.50 kg/m ²) | 9 (21.95) | 0.70 | 0.32, 1.54 | 0.378 |
| Underlying disease: | | | | |
| Cerebrovascular disease | | | | |
| No | 37 (16.02) | 1.00 | Reference | |
| Yes | 14 (23.33) | 1.46 | 0.84, 2.51 | 0.176 |
| Hypertension | | | | |
| No | 13 (14.77) | 1.00 | Reference | |
| Yes | 38 (18.72) | 1.27 | 0.71, 2.26 | 0.422 |
| Diabetesmellitus | | | | |
| No | 41 (16.47) | 1.00 | Reference | |
| Yes | 10 (23.81) | 1.45 | 0.79, 2.66 | 0.235 |
| Chronic kidney disease | | | | |
| No | 47 (17.54) | 1.00 | Reference | |
| Yes | 4 (18.18) | 1.04 | 0.41, 2.61 | 0.939 |
| Dyslipidemia | | | | |
| No | 38 (18.54) | 1.00 | Reference | |
| Yes | 13 (15.12) | 0.81 | 0.46, 1.45 | 0.489 |
| Atrial Fibrillation | | | | |
| No | 34 (14.29) | 1.00 | Reference | |
| Yes | 17 (32.08) | 2.24 | 1.36, 3.70 | 0.002 |
| Gout | | | | |
| No | 43 (17.99) | 1.00 | Reference | |
| Yes | 8 (15.38) | 0.85 | 0.43, 1.71 | 0.658 |
| Cancer | | | | |
| No | 50 (17.42) | 1.00 | Reference | |
| Yes | 1 (25.00) | 1.43 | 0.26, 7.98 | 0.680 |
| Benign Prostate Hyperplasia | | | | |
| No | 49 (17.13) | 1.00 | Reference | |
| Yes | 2 (40.00) | 2.33 | 0.77, 2.04 | 0.132 |
| Thyroid | | | | |
| No | 50 (17.42) | 1.00 | Reference | |
| Yes | 1 (25.00) | 1.43 | 0.26, 7.98 | 0.680 |
| Osteoarthritis | | | | |
| No | 50 (17.30) | 1.00 | Reference | |
| Yes | 1 (50.00) | 2.89 | 0.71, 11.82 | 0.140 |
| Anemia | | | | |
| No | 50 (17.36) | 1.00 | Reference | |
| Yes | 1 (33.33) | 1.92 | 0.38, 9.70 | 0.430 |
| Alcohol Dependence | | | | |
| No | 48 (16.96) | 1.00 | Reference | |
| Yes | 3 (37.50) | 2.21 | 0.87, 5.61 | 0.095 |
| Schizophrenia | | | | |
| No | 49 (17.01) | 1.00 | Reference | |
| Yes | 2 (66.67) | 3.92 | 1.69, 9.07 | 0.001 |
| Chronic obstructive pulmonary disease | | | | |
| No | 45 (16.67) | 1.00 | Reference | |
| Yes | 6 (28.57) | 1.71 | 0.83, 3.55 | 0.146 |
| Tuberculosis | | | | |
| No | 49 (17.19) | 1.00 | Reference | |
| Yes | 2 (33.33) | 1.94 | 0.61, 6.18 | 0.263 |
| Smoking | | | | |
| Non-smoke | 26 (15.03) | 1.00 | Reference | |
| Past-smoke | 4 (10.00) | 0.66 | 0.25, 1.80 | 0.422 |
| Current-smoke | 21 (26.92) | 1.80 | 1.08, 2.98 | 0.025 |
| Alcohol drinking | | | | |
| Non-drink | 23 (17.56) | 1.00 | Reference | |
| Past-drink | 4 (8.51) | 0.48 | 0.18, 1.33 | 0.159 |
| Current-drink | 24 (21.24) | 1.21 | 0.72, 2.02 | 0.468 |

| | | | | |
|---|------------|-------|-------------|--------|
| Exercise | | | | |
| No | 1 (14.29) | 1.00 | Reference | |
| Yes | 46 (16.91) | 1.18 | 0.19, 7.41 | 0.857 |
| Type of stroke | | | | |
| Other | 3 (6.82) | 1.00 | Reference | |
| Hemorrhagic stroke | 17 (26.15) | 3.84 | 1.19, 12.31 | 0.024 |
| Ischemic stroke | 31 (17.03) | 2.50 | 0.80, 7.80 | 0.115 |
| Lesion location of stroke: | | | | |
| Infarction | | | | |
| No | 15 (17.44) | 1.00 | Reference | |
| Yes | 28 (14.66) | 0.84 | 0.47, 1.49 | 0.552 |
| Hemorrhage | | | | |
| No | 30 (14.08) | 1.00 | Reference | |
| Yes | 13 (20.31) | 1.44 | 0.80, 2.60 | 0.222 |
| Emboli | | | | |
| No | 42 (15.44) | 1.00 | Reference | |
| Yes | 1 (20.00) | 1.29 | 0.22, 7.64 | 0.775 |
| Atrophy | | | | |
| No | 32 (15.31) | 1.00 | Reference | |
| Yes | 11 (16.18) | 1.06 | 0.56, 1.98 | 0.864 |
| Level of consciousness | | | | |
| Alert | 17 (8.21) | 1.00 | Reference | |
| Confuse | 10 (33.33) | 4.06 | 2.05, 8.02 | <0.001 |
| Drowsy or Coma | 24 (44.44) | 5.41 | 3.14, 9.33 | <0.001 |
| Using nasogastric tube | | | | |
| No | 7 (3.72) | 1.00 | Reference | |
| Yes | 44 (42.72) | 11.47 | 5.36, 24.54 | <0.001 |
| Duration on nasogastric tube use | | | | |
| 0 day | 7 (3.72) | 1.00 | Reference | |
| 1 to ≤ 7 days | 16 (29.09) | 7.81 | 3.39, 18.02 | <0.001 |
| > 7 days | 28 (58.33) | 15.67 | 7.29, 33.67 | <0.001 |
| Impaired gag reflex | | | | |
| No | 43 (19.03) | 1.00 | Reference | |
| Yes | 7 (11.29) | 0.59 | 0.28, 1.25 | 0.171 |
| Impaired cough reflex | | | | |
| No | 9 (4.19) | 1.00 | Reference | |
| Yes | 41 (56.16) | 13.42 | 6.86, 26.24 | <0.001 |
| Impaired physical mobility | | | | |
| No | 5 (12.82) | 1.00 | Reference | |
| Yes | 45 (18.07) | 1.41 | 0.60, 3.33 | 0.434 |
| Seizure | | | | |
| No | 37 (17.87) | 1.00 | Reference | |
| Yes | 14 (16.87) | 0.94 | 0.54, 1.65 | 0.839 |
| Dysphagia | | | | |
| No | 18 (8.65) | 1.00 | Reference | |
| Yes | 32 (40.00) | 4.62 | 2.76, 7.75 | <0.001 |
| Aspiration | | | | |
| No | 14 (8.00) | 1.00 | Reference | |
| Yes | 36 (31.86) | 3.98 | 2.25, 7.04 | <0.001 |
| Dysphonia | | | | |
| No | 47 (16.67) | 1.00 | Reference | |
| Yes | 3 (50.00) | 3.00 | 1.29, 6.96 | 0.011 |
| Dysarthria | | | | |
| No | 32 (22.54) | 1.00 | Reference | |
| Yes | 18 (12.33) | 0.55 | 0.32, 0.93 | 0.026 |
| Aphasia | | | | |
| No | 34 (15.04) | 1.00 | Reference | |
| Yes | 16 (25.81) | 1.71 | 1.02, 2.90 | 0.043 |
| Facial palsy | | | | |
| No | 30 (22.22) | 1.00 | Reference | |

| | | | | |
|---|------------|------|------------|--------|
| Yes | 20 (13.07) | 0.59 | 0.35, 0.99 | 0.044 |
| Paraplegia | | | | |
| No | 48 (17.58) | 1.00 | Reference | |
| Yes | 2 (13.33) | 0.76 | 0.20, 2.83 | 0.680 |
| Hemiparesis | | | | |
| No | 23 (22.55) | 1.00 | Reference | |
| Yes | 27 (14.52) | 0.64 | 0.39, 1.06 | 0.085 |
| Hemiplegia | | | | |
| No | 24 (10.53) | 1.00 | Reference | |
| Yes | 26 (43.33) | 4.12 | 2.56, 6.63 | <0.001 |
| Quadriplegia | | | | |
| No | 46 (16.79) | 1.00 | Reference | |
| Yes | 4 (28.57) | 1.70 | 0.71, 4.06 | 0.231 |
| Total time onset to emergency room | | | | |
| ≤ 4.49 hours or 269 minute | 27 (18.00) | 1.00 | Reference | |
| ≥ 4.50 hours or 270 minute | 21 (15.56) | 0.86 | 0.51, 1.45 | 0.583 |
| Length of stay in hospital | | | | |
| < 14 days | 32 (12.21) | 1.00 | Reference | |
| ≥ 14 days | 19 (65.52) | 5.36 | 3.53, 8.15 | <0.001 |

*Crude risk ratio estimated by generalized linear model for risk ratio regression

Predictive characteristics of pneumonia among male stroke patients included impaired cough reflex, duration on nasogastric tube use and aspiration (Table 3).

Table 3. Predictive characteristics of pneumonia among male stroke patients

| Predictive characteristics | Pneumonia n (%) | Risk ratio * | 95% CI | p-value |
|---|-----------------|--------------|-------------|---------|
| Impaired cough reflex | | | | |
| No | 9 (4.19) | 1.00 | Reference | |
| Yes | 41 (56.16) | 5.35 | 2.38, 12.00 | <0.001 |
| Duration on nasogastric tube use | | | | |
| 0 day | 7 (3.72) | 1.00 | Reference | |
| 1 to ≤ 7 days | 16 (29.09) | 3.06 | 1.22, 7.66 | 0.017 |
| > 7 days | 28 (58.33) | 3.80 | 1.52, 9.50 | 0.004 |
| Aspiration | | | | |
| No | 14 (8.00) | 1.00 | Reference | |
| Yes | 36 (31.86) | 1.81 | 1.11, 2.94 | 0.017 |

* Estimated by generalized linear model for risk ratio regression with forward stepwise method

DISCUSSION

Cumulative incidence of pneumonia among these 291 male stroke patients was 17.53%. Among 291 male stroke patients, 51 developed pneumonia (17.53%). Factors predicting pneumonia in this group of patients included impaired cough reflex, duration on nasogastric tube use more than 7 days and previous aspiration. Impaired cough reflex might increase the risk of pneumonia because cough reflex functions to prevent aspiration of food and fluid and reduces the risk of further respiratory complication. Other studies also have shown that the patients who had abnormal reflex cough test later developed pneumonia [15,17]. Normally stroke patients would require nasogastric tube feeding due to dysphagia. Previous study has shown that stroke patients who had duration on nasogastric tube use longer developed pneumonia [14] and this finding was confirmed in this study. Stroke patients who previously had aspiration could lead to pneumonia [13]. This might be due to the fact that aspiration is the inhalation of

either oropharyngeal or gastric contents into the lower airways taking foreign materials into the lungs leading to pneumonia occurrence.

CONCLUSIONS

Impaired cough reflex, duration on nasogastric tube use more than 7 days, and aspiration were stronger predictive characteristics of pneumonia among male stroke patients attending at Nan hospital. Preventive measures for pneumonia should be intensely provided in male patients with these predictive characteristics.

Conflict of interest

Nil

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