

Prevalence and Potential Associated Factors of Poststroke Depression

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ABSTRACT

Objectives: To study the prevalence and potential associated factors of poststroke depression (PSD).

Study design: Cross-sectional study.

Setting: Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Bangkok, Thailand.

Subjects: First ever stroke patients age ≥ 45 years old with duration of stroke from 2 weeks to 2 years.

Methods: The included patients were assessed with the Barthel Index (BI) and the Modified Rankin Scale for Neurologic Disability (MRS). A psychiatric interview according to the diagnostic and statistical manual of mental disorders classification, fifth edition (DSM-5TM) criteria was performed by a psychiatrist. Prevalence was described and potential associated factors of PSD were analyzed with multivariate forward step-wise logistic regression.

Results: Of 115 patients, there were 63 males (54.8%). Mean age was 64 (SD 10) years old. Median duration of stroke was 59 days. The prevalence of PSD was 20%, 8 of them (6.9%) were diagnosed with major depressive disorder and 15 of them (13.1%) had other depressive disorder. The univariate analysis revealed those with PSD were more disabled according to the MRS ($p = 0.04$) and had more dependent grooming according to the BI ($p = 0.003$). With multivariate analysis, only grooming was associated with PSD (odd ratio 4.9; 95%CI 1.6-14.8).

Conclusion: The prevalence of poststroke depression within the first 2 years of those with the first stroke and aged 45 years or older was 20%. Dependence in grooming was the only factor significantly associated with poststroke depression.

Keywords: depression, disability, prevalence, stroke

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Introduction

Poststroke depression (PSD) is a common clinical consequence of stroke. It is ranked the most frequent mental disorder after stroke, and associated with poor functional and social outcomes, reduced quality of life, cognitive impairment, and

increased mortality.⁽¹⁾ Hackett and Pickles reported the pooled frequency of depression at any time up to five years poststroke was 31%.⁽²⁾ However, a review of prospective longitudinal research showed that there was a biphasic pattern in poststroke depression rates with a rise of depressive symptoms in the first 6 months, a slight drop around 12 months, and another rise within the second year after stroke.⁽³⁾

Regarding the diagnosis of PSD, many studies defined PSD based on different cut-off scores on depression rating scales.⁽²⁾ These scales provide information about frequency and severity of depressive symptoms, but their uses as a diagnostic instrument has rarely been validated. On the other hand, it has been clearly established that the existence of depression should be ascertained based on a structured mental state examination and should meet established diagnostic criteria for a specific depressive disorder.⁽⁴⁾ The prevalence of PSD was studied in our department in 1997, the reported prevalence was 38%.⁽⁵⁾ All patients were recruited regardless of the duration of stroke. The prevalence seems remarkable in the first two years. Currently, there has been no standard screening tool recommended for diagnosis of PSD. However, the DSM-V (the diagnostic and statistical manual of mental disorders classification, fifth edition (DSM-5TM) has been considered as a good standard as the diagnosis is made by a psychiatrist.⁽⁶⁾

According to our previous study of 50 stroke patients with different durations of stroke and aged 20-89 years old in 1997, the prevalence of PSD diagnosed with the CES-D (the center for epidemiologic studies-depression scale) was 38%.⁽⁵⁾ Therefore, in this study we aimed to determine the prevalence of PSD in a more specific group of patients with the first time stroke and within the first two years of stroke, and diagnosed with a psychiatric interview based on the DSM-5TM. In addition, associated factors of PSD were also explored. This would enable us to realize a magnitude of this emotional problem and consequently develop a proper rehabilitation management program.

Methods

The stroke patients attending either inpatient or outpatient services from November 2017 to December 2018 were consecu-

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tively recruited. As stroke in people under 45 years of age is less frequent than in older populations but has a major impact on the individual and society and this might influence the associated factors of PSD.⁽⁷⁾ Therefore, the inclusion criteria were age \geq 45 years old, having first time diagnosis of either ischemic or hemorrhagic stroke, having stable medical and neurological conditions, a duration of stroke from 2 weeks to 2 years, and being able to communicate and understand Thai language. The exclusion criteria were cognitive impairment measured by the Thai Mental State Examination (TMSE) $<$ 24,⁽⁸⁾ and having a previous diagnosis as dementia, a psychiatric disorder, and other neurological diseases.

The outcome measures were the DSM-5TM criteria for depressive disorders diagnosed by a psychiatrist.⁽⁹⁾ An individual interview was performed by a psychiatrist. The major depressive episode could occur in the following conditions; major depressive disorder (MDD), depressive disorder due to another medical condition with MDD, and MDD episode in bipolar disorder. The Barthel index (BI) was used to assess ten functional activities of daily living (ADL), and each function is usually classified as dependent and independent. Summed score ranges from 0-20 and can be divided into different levels of disability.⁽¹⁰⁾ According to Wade and Hewer, a score 0-4 is counted as very severely disabled, score 5-9 as severely disabled, score 10-14 as moderately disabled, score 15-19 as mildly disabled, and independent scored 20.⁽¹¹⁾ The Modified Rankin Scale for Neurologic disability (MRS) is a clinician-reported measure of global disability and has been widely applied for evaluating recovery from stroke.^(12, 13) It is an ordinal scale with seven categories ranging from zero (no symptoms) to six (death). The MRS assesses ability to ambulate and complete ADL from no limitations (0) to fatal stroke (6); MRS $>$ 3 is defined as poor outcome.⁽¹²⁾

After receiving the institute research board (IRB) approval, the recruitment process began according to the inclusion and exclusion criteria. The Thai Mental State Examination (TMSE) was administered to screen for cognitive impairment. Each patient was assessed with the BI and the MRC. A case record form of demographic data, the BI score, and the MRS scale, was completed. Then a psychiatrist interviewed each patient in a private area and gave diagnosis according to the DSM-5 criteria. For stroke patients in the inpatient rehabilitation service, the interview was usually performed within 72 hours of admission.

Statistical analysis

Demographic data, the MRS, and the BI score were analyzed with descriptive statistics. The quantitative variables such as age were analyzed with independent samples T test. The qualitative variables such as gender, education levels, risk factors, pathology of stroke, duration of stroke, side of weakness, levels of disability according to the BI score and the MRS scale were analyzed by Chi-square or Fisher's Exact test. The univariate analysis was performed to determine statistically significant difference of demographic characteristics, and the BI score between the normal and the depression groups. Then, associated factors of PSD were analyzed by the forward stepwise logistic regression. All analyses were significant at p value less than 0.05.

Results

There were 190 stroke patients during the study period. Seventy-five of them were excluded because 21 had a recurrent stroke, 17 had cognitive impairment, 17 had aphasia, 10 were younger than 45 years old, and 10 had the duration of stroke longer than 2 years. Of 115 stroke patients, there were 63 males (54.8%) and 52 females (45.2%), with mean age of 64 (SD 10) years old (min 45, max 88) enrolled to the study. The majority of them graduated primary school followed by secondary school and high school respectively. Comorbid diagnoses found in descending order were hypertension, dyslipidemia, diabetes mellitus, and heart disease. The median duration of stroke was 59 days. Most of them (81.7%) suffered from ischemic stroke. Left side weakness was dominant (61%). Most of the patients (65.2%) were recruited from inpatient rehabilitation. The mean BI score was 12.8 (SD 5.2) and the median MRS was 4.0 (IQR 25,75: 3,4).

The prevalence of PSD during the first two years was 20% (95%CI=13.7, 28.2). According to the DSM-5TM criteria; 8 of them (6.9%) were diagnosed with MDD, 15 of them (13.1%) with other depressive disorders; and 92 of them (80%) were normal. (Table 1)

The univariate analysis was performed to find the difference between normal and depression groups. According to the demographic characteristics, female was dominant in the PSD group. However, this difference was not statistically significant. Other factors such as age, educational level, risk factors of stroke, duration of stroke, pathology of stroke, side of weakness, setting, and five levels of disability according to the BI showed no significant differences between the two groups. The MRS 0-3 was defined as no disability meanwhile MRS $>$ 3 was defined as disability. However, according to the MRS, there were more patients with disability in the PSD group than in the normal group (Table 2).

Regarding the functional comparison between the two groups measured with the BI, the significant difference was found in the grooming. Dependent grooming was present more in the PSD group than in the normal group. However, there were no statistically significant differences in other activities between the two groups (Table 3). The factors that revealed statistically significant difference between normal and PSD groups from the univariate analysis were the MRS and the activity of grooming but the multivariate forward stepwise logistic regression analysis revealed that only grooming was associated with PSD (OR = 4.9; 95% CI:1.6-14.8) (Table 4).

Table 1. The prevalence of poststroke depression according to the DSM-5 criteria

Psychological status	Frequency ¹
Poststroke depression	23 (20)
• Major depressive disorder	8 (6.9)
• Adjustment disorder with depress mood	12 (10.5)
• Depressive disorder not otherwise specified	2 (1.7)
• Other specified depressive disorder	1 (0.9)
Normal	92 (80)

¹Number (%)

Table 2. The baseline characteristic of the stroke patients

Variables	Normal (N=92) ²	PSD (N=23) ²	p-value
<i>Demographic-related</i>			
Age ¹	64.7 (9.5)	64.6 (12.2)	0.960
Gender ²			0.092
• Male	54 (58.7)	9 (39.1)	
• Female	38 (41.3)	14 (60.9)	
Education level ²			0.430
• Primary school	42 (45.7)	13 (56.6)	
• Secondary school	26 (28.3)	5 (21.7)	
• Bachelor degree and higher	24 (26.0)	5 (21.7)	
Comorbid illness ²			
• Hypertension	77 (83.7)	21 (91.3)	0.518
• Dyslipidemia	53 (57.6)	17 (73.9)	0.152
• Diabetes mellitus	37 (40.2)	12 (52.2)	0.300
• Smoking	21 (22.8)	4 (17.4)	0.572
• Heart disease	19 (20.7)	6 (26.1)	0.572
Duration of stroke ²			0.293
• <3 months	58 (63.0)	16 (69.6)	
• 3-6 months	14 (15.2)	5 (21.7)	
• >6 months	20 (21.7)	2 (8.7)	
Pathology of stroke ²			0.561
• Infarction	74 (80.4)	20 (87.0)	
• Hemorrhage	18 (19.6)	3 (13.0)	
Side of weakness ²			0.339
• Left	54 (58.7)	16 (69.6)	
• Right	38 (41.3)	7 (30.4)	
Setting ²			0.793
• Inpatient	60 (65.2)	15 (65.2)	
• Outpatient	32 (34.8)	8 (34.8)	
<i>Disability-related</i>			
Modified Rankin Scale ²			0.036*
• 1	7 (7.6)	2 (8.7)	
• 2	16 (17.4)	0 (0.0)	
• 3	18 (19.6)	3 (13.0)	
• 4	50 (54.3)	15 (65.2)	
• 5	1 (1.1)	3 (13.0)	
Barthel Index ²			0.145
• Very severe disability	6 (6.5)	3 (13.0)	
• Severe disability	13 (14.1)	5 (21.7)	
• Moderate disability	32 (34.8)	9 (39.1)	
• Mild disability	31 (33.7)	3 (13.0)	
• Independent	10 (10.9)	3 (13.0)	

¹Mean (SD), ²number (%); *significant at $p < 0.05$

Table 3. The comparison of function base on the Barthel index between stroke patients with and without depression

Function	Normal	PSD	p-value	Function	Normal	PSD	p-value
Feeding			0.22	Mobility			0.36
• Independent	78 (84.8)	17 (73.9)		• Independent	29 (31.5)	5 (21.7)	
• Dependent	14 (15.2)	6 (26.1)		• Dependent	63 (68.5)	18 (78.3)	
Grooming			0.003*	Transfer			0.07
• Independent	83 (90.2)	15 (65.2)		• Independent	39 (42.4)	5 (21.7)	
• Dependent	9 (9.8)	8 (34.8)		• Dependent	53 (57.6)	18 (78.3)	
Dressing			0.28	Stair			0.52
• Independent	35 (38.0)	6 (26.1)		• Independent	16 (17.4)	2 (8.7)	
• Dependent	57 (62.0)	17 (73.9)		• Dependent	76 (82.6)	21 (91.3)	
Bathing			0.08	Bladder			0.08
• Independent	38 (41.3)	5 (21.7)		• Independent	77 (83.7)	15 (65.2)	
• Dependent	54 (58.7)	18 (78.3)		• Dependent	15 (16.3)	8 (34.8)	
Toileting			0.07	Bowel			0.22
• Independent	44 (47.8)	6 (26.1)		• Independent	84 (91.3)	19 (82.6)	
• Dependent	48 (52.2)	17 (73.9)		• Dependent	8 (8.7)	4 (17.4)	

Number (%), *Significant at $p < 0.05$

Table 4. Univariate analysis and multivariate stepwise logistic regression analysis of risk factors with poststroke depression

Variables	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Grooming function :dependent	4.9 (1.6-14.8)	0.0061 ¹	4.9 (1.6-14.8)	0.0053 ³
Modified Rankin Scale > 3	2.9 (1.0-8.5)	0.0462 ²	-----	-----

¹Fisher's exact test, ²Pearson Chi-square test, ³Wald test in Logistic Regression

Discussion

In this study, the psychiatric interview was performed in every stroke patient enrolled to the study. According to the DSM-5TM criteria, PSD was found in 23 patients (20%) and that was less than the previous studies. In Thailand, the reported prevalence of PSD varied in different settings. However, different depression screening tools were employed in those studies. Tantibhaedhyangkul et al. used the CES-D to diagnose PSD among the first ever stroke patients and reported prevalence of 38%, mean age was 60 years old and mostly occurred within a year after stroke.⁽⁶⁾ This study recruited both inpatient and outpatient rehabilitation patients. Masskulpan, et al. also studied the prevalence of PSD in consecutive stroke patients admitted to inpatient rehabilitation. They used the Hospital Anxiety Depression scale (HADS) and the prevalence of PSD was 37.8%.⁽¹⁴⁾ The mean age of their participants was 62 years old and the occurrence of depression was within 30 days of stroke onset. In the present study, the mean age of participants was 64 years old and the occurrence of depression was within 3 months of stroke onset. Therefore, age and duration of stroke in the present study were comparable to the previous studies. The low prevalence in this study was probably from the tool used for diagnosis of depression. The psychiatric interview performed by a psychiatrist according to the DSM-5TM criteria was accepted as a criterion standard for diagnosis depression. Hence, the validity was higher than other depression screening tools utilized in the previous studies.

Regarding potential associated factors, the univariate analysis revealed 2 variables, the MRS and the grooming function, with significant differences between the normal and the PSD groups. Other associated factors previously mentioned in other studies^(15, 16) such as female gender, low educational level and level of functional dependence measured with the BI were not found associated with depression. The other scale for measuring global disability after stroke in the present study was the MRS which has six ordinal levels of disability. The MRS 0-3 was defined as no disability and the key function is walking without assistance. In contrary, the patients who were unable to walk without assistance and bed ridden patients were defined as MRS 4 and 5 respectively.⁽¹²⁾ The ability of walking is very explicit to discriminate the presence of disability. This might be a reason why the MRS could reveal the significant difference of disability between the depression and the normal groups. As for the BI, most of the patients in the normal group had mild and moderate disability whereas moderate and severe disability were found more in the PSD group.⁽¹¹⁾ However, the difference between the two groups did not reach significant level. Regarding the functional comparison between stroke patients with and without PSD, more patients of stroke with PSD had dependent grooming. After multivariate forward stepwise regression analysis revealed that grooming function was associated with PSD. This finding has never been reported in other studies. According

to the BI, independent grooming means independent washing face, combing hair, shaving, and cleaning teeth. Those with PSD might feel depressed and ignored their body image as well as had no interest in making themselves appear good.

The strength of our study was using a psychiatric interview according to the DSM-5TM criteria which is considered a gold standard and the validity of the test is not in doubt. However, there were some limitations in our study. The participants recruited aged 45 years old and above which would not be able to generalize to the younger ones. Most of the patients (91.3%) had onset of stroke within 6 months. So, the biphasic pattern of PSD was not demonstrated in this study. In addition, some associated factors of PSD were not collected in this study such as lesion location, amount of social support and financial status.

Clinical implication from this study was to raise awareness among the rehabilitation team about grooming in stroke patients. For those who were dependent, they would be at risk of developing PSD, and depression should be assessed or closely monitored. In addition, healthcare personnel should pay more attention and select a valid screening tool for diagnosis of PSD.

In conclusion, the prevalence of PSD within the first two years was 20% and of major depression was 6.9% among the first stroke with aged 45 years or more. The dependence in grooming was associated with PSD.

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Disclosure

The authors have no conflict of interest to declare.

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