A Study of Risk Factors and Predictors of Anxiety and Depression in Stroke Patients

Yirong Xu[1,2], Nur Afiqah Mohamad[3,4]*, Faridah Mohd Said[5]

[1]Faculty of Nursing, Lincoln University College, 47301, Petaling Jaya, Selangor, Malaysia.
[2]School of Nursing,Jiangsu Vocational College of Medicine, 224005, Yancheng, Jiangsu, China.
ORCID iD: https://orcid.org/0009-0006-3221-8460.
Email: yirong@lincoln.edu.my
[3]Centre for Foundation Studies, Lincoln University College, 47301, Petaling Jaya, Selangor, Malaysia.
[4]Faculty of Pharmacy, University College of MAIWP International, 68100, Batu Caves, Malaysia.
ORCID iD: https://orcid.org/0000-0002-9015-0525.
Email: nurafiqah@lincoln.edu.my
[5]Faculty of Nursing, Lincoln University College, 47301, Petaling Jaya, Selangor, Malaysia.
ORCID iD: https://orcid.org/0000-0002-0790-9626.
Email: faridah.msaid@lincoln.edu.my

Abstract

Objective: Exploring risk factors and predictors of anxiety and depression in stroke patients. **Method:** 336 cases of stroke patients who received treatment in the ward of Yancheng Hospital and underwent rehabilitation in the rehabilitation center from April 2024 to July 2024 were selected. The researchers administered a questionnaire to the included patients, which consisted of the General Information Questionnaire (basic information), the Barthel Index Scale (ability of daily life activities), the Collaborative Social Support Scale (social support), and the Hospital Anxiety and Depression Scale. The correlation between each of the studied factors and post-stroke anxiety/depression was analyzed by applying Pearson's correlation analysis, and multiple regression was used to analyze the factors influencing post-stroke depression/anxiety. **Results:** Of the 336 stroke patients 34.6% were depressed and 41.1% were anxious. Univariate correlation analyzes the ability of daily life activities and social support was significantly negatively correlated with post-stroke anxiety/depression ($P<0.05$); being married and care by immediate family members were significantly positively correlated with lower post-stroke anxiety/depression levels ($P<0.05$); and higher family financial income and knowledge of the disease were significantly positively correlated with lower post-stroke anxiety/depression levels ($P<0.05$). The results of multifactorial regression analyses showed that marriage, caregiving style, economic status, knowledge of the disease, ability to daily life activities, and social support were the factors influencing post-stroke depression/ anxiety. **Conclusion:** The frequency of post-stroke anxiety/depression in the Yancheng area was slightly higher than the level in other areas. The absence of a spouse, absence of immediate family care, low family economic income, and lack of knowledge about the disease are the main risk factors for PSA/PSD. The ability of daily life activities and social support were the predictors of post-stroke anxiety/depression.

Keywords: Post-stroke Depression, Ability of Daily Life Activities, Post-stroke Anxiety, Social Support.

Introduction

Stroke, caused by cerebral hemorrhage or cerebral ischemia, is a serious cerebrovascular problem that is the main cause of permanent disability in adults and has become a serious threat to public health worldwide.[1] People who have suffered a stroke, in addition to experiencing physical disability and pain, also experience short- or long-term mental health disorders, the most common of which are post-stroke depression (PSD) and post-stroke anxiety (PSA).[2] SPA refers to a type of uncomfortable physical sensation that occurs after a stroke, manifesting as worry or trouble, and in severe cases, as fear, depression, and despair. Studies revealed that one-third of stroke patients exhibit anxiety and worry.[3] PSD is a form of psychosis, characterized primarily by a decrease in interest, emotional expression disorders, and a series of physical symptoms, with an incidence rate of 30% to 46%[4] Compared to PSD,

Access This Article Online

Quick Response Code:

Website: www.jnsbm.org

DOI: https://doi.org/10.4103/jnsbm.JNSBM_16_1_13

Address for Correspondence: Centre for Foundation Studies, Lincoln University College, 47301, Petaling Jaya, Selangor, Malaysia
Email: nurafiqah@lincoln.edu.my

Submitted: 16th January, 2025 **Received:** 26th February, 2025
Accepted: 02nd March, 2025 **Published:** 08th March, 2025

How to Cite This Article: Xu Y, Mohamad N A, Said F M. A Study of Risk Factors and Predictors of Anxiety and Depression in Stroke Patients. J Nat Sc Biol Med 2025;16:119-126

PSA has received significantly less attention from scholars. The harm caused by PSA and PSD to patients has been seriously underestimated. Abnormalities in mental health have a greater damage on the lives of stroke patients than the impact of physical disability.

PSD and PSA have an insidious onset and are influenced by numerous factors. Currently, their pathogenesis is not fully understood. Some studies have confirmed that their occurrence is related to brain nerve damage. In addition to the disease itself, research also suggests that the interpersonal environment of post-stroke patients is an important factor in causing PSD and PSA. A meta-analysis[5] found that 55 % of patients who experience a stroke experience anxiety and depression at some point after the disease. Studies show that post-stroke anxiety and depression mostly occur within the first year, with the highest incidence rate. Additionally, 25.4% of stroke patients develop depression within the initial two years after sickness. Studies in China have shown that the frequency of anxiety and depression following a stroke ranges mostly between 30% and 46%.[4] A recent systematic review of PSD[6] showed that frequency rates vary from 17% to 73%. In a study conducted in Jordan,[7] the incidence of anxiety and depression was 78%, which is significantly higher than other reports.

Briefly, PSD and PSA are among the most common mental health problems after the onset of stroke. It has been found that female, married,[8] having a history of mental illness, having comorbidities (e.g., diabetes),[9] having a low income, and not being able to work[10] are risk factors for the development of SPD. PSA was significantly associated with gender, ability to daily life activities, severity of stroke, psychosocial functioning, and a history of mental illness. Taken together previous studies have shown that age and gender are two of the most controversial factors among the possible influences on PSD and PSA. In addition, the effects of marriage, education level, social support, and lifestyle on PSD and PSA are not uniform and require further study. The objective of this research was to find out risk factors of depression and anxiety and predictors in stroke patients.

Research Methods and Objects

Design and Research Objects

This was a cross-sectional study of stroke patients in the Yancheng area, and the Criteria for inclusion: (1) Over 18 years old; (2) Meets diagnostic criteria for cerebral hemorrhage and cerebral infarction-Chinese Guidelines for the Prevention and Treatment of Cerebrovascular Disease (2020) and confirmed by neuroimaging examinations such as CT or MRI); (3) clear and cooperative; (4) voluntary participation in the research project. The patient himself/herself signed or his/her immediate family members signed the informed consent form on his/her behalf. Exclusion Criteria: (1) Sequelae caused by other brain diseases, such as tumors, traumatic brain injury, cerebral parasitosis, etc.; (2) Those who are under investigation or consultation of other studies;(3) Patients with comprehension disorders or the presence of severe auditory or visual disorders; (4) Unstable medical condition, frail, intolerable, and other reasons for not being able to cooperate; (5) Informed consent was not given.

Data Collection

Four researchers who received uniform training from the principal investigator collected data from stroke patients admitted to Yancheng First People's Hospital and Yancheng Third People's Hospital in Jiangsu Province, China, from April 2024 to July 2024. Ultimately, 336 patients were enrolled in the study. Participants met in hospital wards and rehabilitation centers to collect data.

Research Tools

Researchers collected sociodemographic data and disease-related information from stroke patients. The ability of daily life activities was surveyed using the Chinese version of the Barthel Index (BI), translated by Chinese scholars. The Cronbach's Alpha coefficient is 0.942. The scale has good sensitivity and responds to the patient's ability of daily life activities. The Hospital Anxiety Depression Scale (HAD) assesses the variables anxiety and depression, which consists of 14 items, with 7 items for each of the two dimensions of anxiety and depression. A score of 8 or higher is considered positive, indicating more severe symptoms as the score increases. The Chinese translation of the scale has been well-validated, with an internal consistency Cronbach's Alpha coefficient of 0.869. The Perceived Social Support Scale (PSSS) was utilized to measure the variable of social support, which consists of 12 items and the scale is classified into three dimensions which are family support, friend support, and other people's support. The Cronbach's alpha for this questionnaire is 0.914. Higher total scores mean higher perceived social support.

Statistical Analysis

Data were tabulated using SPSS 24 software. Continuous variables in this article were tested for normality using the normality test. Normally distributed data were described by mean and standard deviation($\bar{x} \pm s$), and non-normally distributed data were described by median and interquartile spacing. $P<0.05$ represents the level of significance. The correlation between each of the studied factors and post-stroke anxiety/depression was analyzed by applying Pearson's correlation analysis, and regarding the predictors of anxiety/depression after stroke, this study was analyzed using multiple linear regression

Results

Frequency of PSD and PSA in Stroke Patients

This study investigated 336 patients. The overall mean score for anxiety was 8.25±6.018, and the total percentage of depression was 41.07% (n=138). The overall mean score for depression was 8.63±6.254. The percentage of patients with anxiety was 34.52% (n=116). Table 1 shows the percentages of patients with anxiety/depression after stroke (Table 1).

Table 1: Percentages of Anxiety/Depression among Participants.

Factor	Categories	Number of Stroke Patients	Incidence (%)
Anxiety	8 points and above	198	58.93
	8 points and above	138	41.07
Depression	Below 8 points	220	65.48
	8 points and above	116	34.52

Correlation Analysis between Anxiety and Depression and Patient Characteristics

By correlating the basic characteristics of the study population with PSD and PSA, the results of the analyses showed that eight basic characteristics of the patients, namely gender, age, marital status, education level, residence status, type of care, family financial status, and knowledge of the disease, were significantly correlated with PSA and PSD (P<0.05), (Table 2).

Table 2: Correlation Analysis between Anxiety/Depression and Characteristics.

Characteristic		N	Anxiety	Depression
Gender	Male	191	7.95±5.84	7.68±5.38
	Female	145	9.53±6.67	9.01±6.71
	T		-2.31	-2.01
	P		0.021	0.045
Age	18-59year	124	7.02±5.42	6.77±4.81
	60 and above	212	9.58±6.52	9.12±6.48
	T		-3.69	-3.502
	P		0.00	0.001
Marital	Single	21	9.62±6.49	7.67±5.52
	Married	242	7.96±5.95	7.5±5.39
	Divorced	30	11.47±7.11	11.83±7.68
	Widowed	43	9.93±6.60	10.3±7.05
	F		3.87	6.891
	P		0.01	0.00
Education	Below junior high school	185	9.02±6.20	9.12±6.40
	High School	88	10.22±6.79	7.97±5.83
	Undergraduate	36	5.94±5.00	7±4.82
	Postgraduate and above	27	4.41±2.41	4.89±3.50
	F		9.05	4.85
	P		0.00	0.003
Place of residence	Rural	152	8.13±5.73	8.07±5.85
	Town	77	8.77±6.55	8.4±6.32
	Urban	107	9.24±6.73	8.4±6.07
	F		1.015	0.124
	P		0.363	0.883
Residence Status	Living alone	65	13.37±6.81	11.06±6.35
	Living with others	241	7.22±5.38	7.11±5.34
	Welfare homes	30	9.7±6.47	11.33±7.41
	F		29.525	16.787
	P		0.00	0.00
Type of care	Immediate family care	259	7.71±5.6	7.08±5.22
	Collateral or other care	30	12.47±7.35	12.57±6.80
	No one to care	47	11.28±7.30	11.96±6.93
	F		13.634	24.55
	P		0.00	0.00
Job status	Work	89	8.74±6.08	8.82±6.15
	Retired	122	8.79±6.39	7.54±5.53
	Non-worker	125	8.4±6.28	8.54±6.35
	F		0.136	1.399
	P		0.873	0.248
Family financial situation	<2000	102	9.5±6.52	9.26±6.17
	2000-4000	91	10.47±6.78	10.14±6.89
	4000-6000	64	7.8±6.02	7.41±4.80
	≥6000	79	6.06±4.27	5.46±4.33
	F		8.661	10.963
	P		0.00	0.00
Medical expenses	self-financed	49	7.47±5.94	8.43±5.91
	medical insurance	241	8.73±6.25	8.04±5.94
	public expense	46	9.35±6.55	9.2±6.54
	F		1.179	0.739
	P		0.309	0.478

Table 2: Correlation Analysis between Anxiety/Depression and Characteristics.

Characteristic		N	Anxiety	Depression
Knowledge of disease	Yes	185	6.9±5.16	6.93±5.04
	No	151	10.75±6.81	9.87±6.70
	T		-5.902	-4.593
	P		0.000	0.000
Type of stroke	Ischemic stroke	101	8.79±6.30	8.53±6.43
	Hemorrhagic stroke	235	8.56±6.24	8.13±5.84
	T		0.309	0.562
	P		0.757	0.575
Duration since onset	≤3months	132	8.24±5.67	8.12±5.92
	3–6 months	44	8.57±6.41	8.45±6.28
	6–12months	35	9.03±6.84	8.03±6.23
	>12months	125	8.95±6.65	8.38±6.03
	F		0.326	0.073
	P		0.806	0.974

Correlation Analysis of Ability of Daily Life Activities, Social Support and Post-stroke Anxiety / Depression

The results of Pearson's correlation analysis showed that ability of daily life activities (ADL) and social support and its dimensions were negatively correlated with anxiety/depression (HAD scale total score) and its dimensions ($P<0.05$) (Table 3).

Table 3: Correlation Analysis of Ability of Daily Life Activities, Social Support and Anxiety/ Depression.

Variables	Score (x ± s)	Relativity (r)		
		Anxiety	Depression	HAD Scale
Ability of daily life activities	72.44±32.23	-0.202*	-0.244*	-0.285*
Family support	19.94±3.73	-0.262*	-0.181*	-0.248*
Friend support	18.10±4.63	-0.246*	-0.203*	-0.287*
Other support	18.33±4.75	-0.305*	-0.266*	-0.365*
PSSS	56.37±11.88	-0.300*	-0.242*	-0.347*

Note.
* indicates significant at the 0.05 level

Multiple Regression Analysis of Factors Influencing Anxiety/ Depression

Using anxiety/depression as dependent variables, the univariate analysis revealed that the indicators with statistical significance were: gender, age, marital status, education, living conditions, type of care, family economic status, understanding of disease knowledge, daily living activity ability, and social support. Using the above indicators as independent variables for multivariate analysis, the results showed that marital status, type of care, family financial situation, knowledge of disease, social support, and ability of daily life activities had significant effects on the occurrence of anxiety/depression in stroke patients. The regression model in this study explained 38.4% of the variance in anxiety and depression symptoms ($R^2=0.384$, $F=20.980$, $p<0.001$), (Table 4,Table 5).

Table 4: Description of Variable Assignment.

Variable	Variable Name	Variable Assignment
Gender	X1	1=male; 2=female
Age (year)	X2	1=18-59 years;2=60 years above
Marital status	X3	1=Single;2=Married ;3=Divorced;4=widowed
Education level	X4	1=Junior high school and below; 2=High school/technical secondary school; 3=College and above 4=Postgraduate and above
Living situations	X5	1=Living alone; 2=Living with relatives; 3=Living with non-relatives
Caregiver type	X6	1=Relatives; 2=Non-relatives; 3=Professional caregiver
Monthly income	X7	1<2000Yuan;2=2000-4000Yuan; 3=4000-6000Yuan;4≥6000Yuan
Knowledge of stroke	X8	1=No ;2=Yes

Table 5: Multiple Regression Analysis of Factors Influencing Anxiety/Depression.

Variables	Regression Coefficient	Standard Error	t	p
(constant)	14.794	5.228	2.830	0.005
Marital	1.450	0.575	2.525	0.012
Type of care	2.622	0.638	4.110	0.000
Family financial situation	-0.974	0.469	-2.077	0.039
Knowledge of disease	3.865	0.966	4.000	0.000
Social support	-0.166	0.039	-4.256	0.000
Ability of daily life activities	-0.052	0.014	-3.770	0.000

Note.
$F=20.98$, $P<0.001$, $R^2=0.384$

Discussion

The frequency of anxiety and depression after stroke has severely impacted patients' rehabilitation and quality of life. In China, the frequency of anxiety and depression is higher than in developed countries. This may be related to the lower level of attention given to anxiety/depression after stroke in China, as well as the under diagnosis of depression. This study simultaneously assessed the frequency, associated factors, and predictive factors of anxiety/depression after stroke in China. The research found that Chinese stroke patients have a higher frequency of PSD/PSA, and identified their associated factors. Factors significantly associated with PSD/PSA include gender, marital status, type of care, and understanding of disease knowledge, type of stroke, disease course, social support, and daily living activity ability. This information plays an important role in developing prevention and management strategies.

The study results showed that 41.1% of patients had some degree of anxiety, and 34.6% of patients exhibited depressive symptoms. These findings are consistent with other studies conducted in China, which report a range of 20%-50%[11] A recent update on PSD published in 2021 reported that the frequency of PSD ranges from 11% to 41%.[12] A review has also reported that the frequency of post-stroke depression ranges between 22% and 40%.[4] However, one study measured the frequency and risk factors of depression in stroke patients, showing that more than three-quarters (76%) of patients suffered from depression,[7] which is higher than previously reported levels. In contrast, a study conducted in Taiwan reported a lower incidence of PSD (11%).[13] In studies[14-17] the frequency of PSA ranged from 9.4% to 36.7%. A meta-analysis on post-stroke anxiety reported a combined frequency of 29.3% ($I^2=97\%$, $P< 0.00001$).[15] Our study showed that the prevalence of PSA was 41.1 %, which was higher than the results of a study in China (28.7%),[18] and more studies reporting PSD in previous studies, but not both PSD and PSA (reported in our study).

Differences in the frequency of PSD and PSA between China and other countries may be due to cultural biases and the influence of different healthcare systems. In China, post-stroke patients pay more attention to physical rehabilitation and treatment, while psychological and spiritual treatment and care are often neglected. At the same time, due to cultural differences, there is a lack of awareness of mental disorders. In addition, the difference from studies in other parts of China may be due to differences in geographic location, e.g., the incidence in Taiwan was only 11%.[13] The difference from other studies may also be related to the different measurement tools. For the assessment of anxiety/depression, Almhdawi *et al.*[2] used the Depression Anxiety Stress Scale (DASS), whereas Khedr *et al.*[19] used the Hamilton depression rating scale (HAM-D). HAD was used to assess anxiety and depression in this study, and HAD was not the gold standard for the diagnosis of psychiatric disorders, which may have explained the discrepancy in frequency between our study and other locations.

This study showed that age and gender were correlated with PSD and PSA in univariate analysis, but were not correlated with PSD and PSA in multiple regression analysis. De Ryck et al. et al. are in agreement with our study, whereas, Ariful Islam *et al.*[20] reported that females had higher depression scores and higher frequency of depression of varying severity. Studies such as Barker-Collo's[21] showed a higher likelihood of major depression in older patients, but there was irrelevant between age and depression. Studies[22,23] have proved that women are more possible to experience PSA than men, but the onset of depression is not significantly different in terms of gender. Existing studies have shown that although there were significant differences in depression and anxiety scores across different age groups and genders, they cannot be considered risk factors for anxiety/depression. The findings of our study are consistent with those of previous studies.

Our study showed that marital status and type of care had a significant effect on anxiety and depression after stroke, and patients who were married (unmarried, divorced, and widowed) and cared for by immediate family members were less likely to experience anxiety/depression, our finding that is similar with some previous studies. As one study[24] showed marital status had a significant effect on mood symptoms in stroke patients, married patients showed less anxiety and depressive symptoms during the one-year recovery period, and married patients received more social and emotional support during recovery than divorced and widowed patients, which helped to reduce psychological stress and negative emotions. Single or divorced stroke patients have a higher chance of suffering from depression than married patients and depression increases the risk of death after stroke. A study[25] describes the problems faced by immediate family members in

caring for stroke survivors and highlights the important role of kinship care in reducing the psychological burden on patients. This study showed that married patients and those cared for by immediate family members had lower levels of anxiety and depression. The research also confirmed that marital status and type of care are significant influencing factors for PSD and PSA.

The results of our study showed that patients with better economic status had significantly lower scores for anxiety/depression than those with poorer economic status. The better the economic status, the more financial and material support patients receive, along with better psychological support, thereby reducing the occurrence of anxiety/depression, and the severity of PSD and PSA symptoms is related to patients' economic status.[26] It is noteworthy that numerous studies[19,27,28] have indicated that socioeconomic conditions are an important risk factor for depression.

Most studies have shown that patients with lower education levels have a higher frequency of depression. However, Jiang *et al*.[29] did not find similar relationships between PSD and education level. Our study results show that education level is negatively correlated with depression severity, meaning that patients with graduate-level education or higher have lower levels of depression. Higher education levels have a protective effect on PSA and PSD. This may be because patients with lower education evels may lack health knowledge, disease management skills, and access to resources, leading them to experience greater stress and helplessness in adjusting to life after a stroke. Conversely, patients with higher education levels typically have better problem-solving skills and social support networks, enabling them to cope more effectively with the psychological and physiological challenges posed by the illness. Similarly, this study also found that a better understanding of stroke knowledge is associated with lower rates of anxiety/depression in patients, making it an important influencing factor for PSD and PSA.

This study shows that in univariate analysis, the ability of daily life activities is strongly correlated with anxiety and depression, and this relationship also persists in the multivariate regression model. The study of the link between Activities of Daily Living (ADL) and depression has been widely researched in older people and patients with chronic illnesses. The results of the studies have shown that people with high ADL scores have a lower risk of developing depression, noting that most of the study participants were not stroke patients who's ADLs were associated with depression. In the existing literature, there are few studies to research the similar direct correlation between post-stroke anxiety/depression and patients' ability of daily activities; researchers often study the relationship between the two indirectly. For example, a study by Park *et al*.[30] analyzed the correlation between grip strength and post-stroke anxiety/depression, showing that participants with weaker grip strength gained higher scores on anxiety/depression. Similarly, Bae et al. found a positive correlation between grip strength and the ability of daily life activities. It is therefore indirectly concluded that there was a possible relationship between the ability of daily life activities and anxiety/depression.[31] In a prospective study involving 1,104 stroke patients,[32] depression was independently associated with falls, advanced age, and disability, while another study confirmed an association between gait balance and PSD severity.[30] Fortunately, our study shows a significant correlation between the ability to daily life activities and anxiety/depression.

Social support is an important factor influencing the quality of life and rehabilitation in stroke patients, but little is known about the relationship between social support and anxiety and depression in stroke patients. Previous studies[33-35] indicated that the risk of PSD frequency in stroke patients is increased when there is a lack of social support and family support. Our study showed that stroke patients with higher social support had lower scores for depression/anxiety. Our findings showed that both univariate and multivariate regression analyses showed a significant correlation between social support and the occurrence of anxiety/depression, which is consistent with previous findings.

Strengths and Limitations of the Study

PSA/PSD is a long-standing problem that deepens the suffering of individuals and families of stroke patients. Most studies have investigated only anxiety or depression, and few studies have investigated both anxiety and depression. Our study investigated both the frequency and correlates of anxiety and depression, laying the foundation for further research on PSD and PSA in the future. Secondly, the present study examined the effect of clinical outcomes (daily routine mobility) on depression, which is often overlooked as few studies investigated the relationship between PSA/PSD and ADLs. Limitations of this study: firstly, this is a cross-sectional study, so the study was confined to a single period and the results obtained can only explain the incidence of the disease over that period. Secondly, this study applied the HAD to assess anxiety/depression, which is a scale to quantify anxiety/depression and is not a gold standard. Despite these limitations, the results of this study confirmed the frequency of anxiety and depression among stroke survivors in Yancheng and identified several correlates and predictors.

Conclusion

The main findings of this study were that the frequency of PSA/PSD (34.6% and 41.1% respectively) in the Yancheng area was slightly higher than the level of other areas, and secondly, the ability of daily life activities of stroke patients was the main influencing factor on PSA/PSD, and it was one of the predictors of the occurrence of PSA/PSD. This finding provides a basis for rehabilitation of stroke patients. To reduce the mental health disorders experienced by stroke patients, the rehabilitation process of stroke patients should focus on the recovery of physical fitness and the improvement of daily activity ability. Also, this

study confirms that social support is an influential factor in PSA/PSD, absence of spouse (widowed, divorced), absence of immediate family care (non-immediate family, no one to care for), low family economic income and lack of knowledge about the disease are the main risk factors for PSA/PSD.

Declaration of Interests

The authors report no potential conflicts of interest.

References

1. Feigin VL, Brainin M, Norrving B, et al. World Stroke Organization (WSO): Global Stroke Fact Sheet 2022. Int J Stroke. 2022; 17(1): 18-29. doi: https://doi.org/10.1177/17474930211065917.
2. Almhdawi KA, Alazrai A, Kanaan S, et al. Post-stroke depression, anxiety, and stress symptoms and their associated factors: A cross-sectional study. Neuropsychol Rehabil. 2021; 31(7): 1091-104. doi: https://doi.org/10.1080/09602011.2020.1760893.
3. Niles AN, Dour HJ, Stanton AL, et al. Anxiety and depressive symptoms and medical illness among adults with anxiety disorders. J Psychosom Res. 2015; 78(2): 109-15. doi: https://doi.org/10.1016/j.jpsychores.2014.11.018.
4. Castilla-Guerra L, Fernandez Moreno MDC, Esparrago-Llorca G, Colmenero-Camacho MA. Pharmacological management of post-stroke depression. Expert Rev Neurother. 2020; 20(2): 157-66. doi: https://doi.org/10.1080/14737175.2020.1707666.
5. Jørgensen TS, Wium-Andersen IK, Wium-Andersen MK, et al. Incidence of Depression After Stroke, and Associated Risk Factors and Mortality Outcomes, in a Large Cohort of Danish Patients. JAMA Psychiatry. 2016; 73(10): 1032-40. doi: https://doi.org/10.1001/jamapsychiatry.2016.1932.
6. Kaadan MI, Larson MJ. Management of post-stroke depression in the Middle East and North Africa: Too little is known. J Neurol Sci. 2017; 378: 220-24. doi: https://doi.org/10.1016/j.jns.2017.05.026.
7. Ayasrah SM, Ahmad MM, Basheti IA. Post-Stroke Depression in Jordan: Prevalence Correlates and Predictors. J Stroke Cerebrovasc Dis. 2018; 27(5): 1134-42. doi: https://doi.org/10.1016/j.jstrokecerebrovasdis.2017.11.027.
8. Park EY, Kim JH. An analysis of depressive symptoms in stroke survivors: verification of a moderating effect of demographic characteristics. BMC Psychiatry. 2017; 17(1): 132. doi: https://doi.org/10.1186/s12888-017-1292-4.
9. Zhang Y, He JR, Liang HB, et al. Diabetes mellitus is associated with late-onset post-stroke depression. J Affect Disord. 2017; 221: 222-26. doi: https://doi.org/10.1016/j.jad.2017.06.045.
10. van der Kemp J, Kruithof WJ, Nijboer TCW, van Bennekom CAM, van Heugten C, Visser-Meily JMA. Return to work after mild-to-moderate stroke: work satisfaction and predictive factors. Neuropsychol Rehabil. 2019; 29(4): 638-53. doi: https://doi.org/10.1080/09602011.2017.1313746.
11. Wang X, Wang Q, Hu W, Niu Y, Chen T. A Study on Chinese Medicine Evidence and Risk Factors of Post-stroke Depression. Western Journal of Traditional Chinese Medicine. 2021; 34(05): 107-11. doi: https://doi.org/10.12174/j.issn.2096-9600.2021.05.27.
12. Guo J, Wang J, Sun W, Liu X. The advances of post-stroke depression: 2021 update. J Neurol. 2022; 269(3): 1236-49. doi: https://doi.org/10.1007/s00415-021-10597-4.
13. Tsai CS, Wu CL, Hung TH, Chou SY, Su JA. Incidence and risk factors of poststroke depression in patients with acute ischemic stroke: A 1-year prospective study in Taiwan. Biomed J. 2016; 39(3): 195-200. doi: https://doi.org/10.1016/j.bj.2015.10.004.
14. Sanner Beauchamp JE, Casameni Montiel T, Cai C, et al. A Retrospective Study to Identify Novel Factors Associated with Post-stroke Anxiety. J Stroke Cerebrovasc Dis. 2020; 29(2): 104582. doi: https://doi.org/10.1016/j.jstrokecerebrovasdis.2019.104582.
15. Rafsten L, Danielsson A, Sunnerhagen KS. Anxiety after stroke: A systematic review and meta-analysis. J Rehabil Med. 2018; 50(9): 769-78. doi: https://doi.org/10.2340/16501977-2384.
16. Ojagbemi A, Owolabi M, Akinyemi R, et al. Prevalence and predictors of anxiety in an African sample of recent stroke survivors. Acta Neurol Scand. 2017; 136(6): 617-23. doi: https://doi.org/10.1111/ane.12766.
17. Schöttke H, Giabbiconi CM. Post-stroke depression and post-stroke anxiety: prevalence and predictors. Int Psychogeriatr. 2015; 27(11): 1805-12. doi: https://doi.org/10.1017/s1041610215000988.
18. Shibian Z, Xiaoyan, L, Junmei Z, Yu Z, Lina S, Ruijuan H, Ruiling L. Mediating effects of mutuality between anxiety and quanlity of life in stroke patients. Joint Service Military medicine, 2024 38(2): 120-24. doi:https://doi.org/10.13730/j.issn.2097-2148.2024.02.006
19. Khedr EM, Abdelrahman AA, Desoky T, Zaki AF, Gamea A. Post-stroke depression: frequency, risk factors, and impact on quality of life among 103 stroke patients—hospital-based study. Egypt J Neurol Psychiatr Neurosurg. 2020; 56(1): 66. doi: https://doi.org/10.1186/s41983-020-00199-8.
20. Ariful Islam M, Rahman A, Aleem MA, Islam SMS. Prevalence and Associated Factors of Depression Among Post-Stroke Patients in Bangladesh. Int J Ment Health Addict. 2016; 14(2): 154-66. doi: https://doi.org/10.1007/s11469-015-9582-x.
21. Barker-Collo SL. Depression and anxiety 3 months post stroke: prevalence and correlates. Arch Clin Neuropsychol. 2007; 22(4): 519-31. doi: https://doi.org/10.1016/j.acn.2007.03.002.
22. McLean CP, Asnaani A, Litz BT, Hofmann SG. Gender differences in anxiety disorders: prevalence, course of illness, comorbidity and burden of illness. J Psychiatr Res. 2011; 45(8): 1027-35. doi: https://doi.org/10.1016/j.jpsychires.2011.03.006.

23. Li W, Xiao WM, Chen YK, et al. Anxiety in Patients With Acute Ischemic Stroke: Risk Factors and Effects on Functional Status. Front Psychiatry. 2019; 10: 257. doi: https://doi.org/10.3389/fpsyt.2019.00257.
24. Donnellan C, Hickey A, Hevey D, O'Neill D. Effect of mood symptoms on recovery one year after stroke. Int J Geriatr Psychiatry. 2010; 25(12): 1288-95. doi: https://doi.org/10.1002/gps.2482.
25. McGurk R, Kneebone II. The problems faced by informal carers to people with aphasia after stroke: A literature review. Aphasiology. 2013; 27(7): 765-83. doi: https://doi.org/10.1080/02687038.2013.772292.
26. Paprocka-Borowicz M, Wiatr M, Ciałowicz M, et al. Influence of Physical Activity and Socio-Economic Status on Depression and Anxiety Symptoms in Patients after Stroke. Int J Environ Res Public Health. 2021; 18(15): 8058. doi: https://doi.org/10.3390/ijerph18158058.
27. Mirolovics Á, Bokor M, Dobi B, Zsuga J, Bereczki D. Socioeconomic Factors Predicting Depression Differ in the Acute Stage and at 1 year After Ischemic Stroke or TIA. J Stroke Cerebrovasc Dis. 2020; 29(11): 105241. doi: https://doi.org/10.1016/j.jstrokecerebrovasdis.2020.105241.
28. López-Espuela F, Roncero-Martín R, Canal-Macías ML, et al. Depressed Mood after Stroke: Predictive Factors at Six Months Follow-Up. Int J Environ Res Public Health. 2020; 17(24): 9542. doi: https://doi.org/10.3390/ijerph17249542.
29. Jiang XG, Lin Y, Li YS. Correlative study on risk factors of depression among acute stroke patients. Eur Rev Med Pharmacol Sci. 2014; 18(9): 1315-23. Available from: https://www.europeanreview.org/wp/wp-content/uploads/1315-1323.pdf.
30. Park GY, Im S, Lee SJ, Pae CU. The Association between Post-Stroke Depression and the Activities of Daily Living/Gait Balance in Patients with First-Onset Stroke Patients. Psychiatry Investig. 2016; 13(6): 659-64. doi: https://doi.org/10.4306/pi.2016.13.6.659.
31. Bae JH, Kang SH, Seo KM, Kim DK, Shin HI, Shin HE. Relationship Between Grip and Pinch Strength and Activities of Daily Living in Stroke Patients. Ann Rehabil Med. 2015; 39(5): 752-62. doi: https://doi.org/10.5535/arm.2015.39.5.752.
32. Schmid AA, Van Puymbroeck M, Knies K, et al. Fear of falling among people who have sustained a stroke: a 6-month longitudinal pilot study. Am J Occup Ther. 2011; 65(2): 125-32. doi: https://doi.org/10.5014/ajot.2011.000737.
33. Zhao Y, Hu B, Liu Q, Wang Y, Zhao Y, Zhu X. Social support and sleep quality in patients with stroke: The mediating roles of depression and anxiety symptoms. Int J Nurs Pract. 2022; 28(3): e12939. doi: https://doi.org/10.1111/ijn.12939.
34. Zhou H, Kulick ER. Social Support and Depression among Stroke Patients: A Topical Review. Int J Environ Res Public Health. 2023; 20(24): 7157. doi: https://doi.org/10.3390/ijerph20247157.
35. Lin FH, Yih DN, Shih FM, Chu CM. Effect of social support and health education on depression scale scores of chronic stroke patients. Medicine (Baltimore). 2019; 98(44): e17667. doi: https://doi.org/10.1097/md.0000000000017667.