

Original Article

Effect of comprehensive nursing care on elderly patients with post-stroke depression and analysis of risk factors for this disease

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Abstract: Objective: We aimed to investigate the effect of comprehensive nursing care on elderly patients with post-stroke depression (PSD) and the risk factors for this disease. Methods: A total of 168 elderly patients who were treated for stroke in Tongde Hospital of Zhejiang Province and Wenzhou Central Hospital between Aug 2017 and Oct 2019 were selected as subjects. The risk factors for PSD were analyzed using one-way analysis of variance and multivariate logistic regression. Ninety-eight patients with PSD were randomized to a study group or a control group of 49 cases each (63 cases were from Wenzhou Central Hospital and 35 cases were from Tongde Hospital of Zhejiang Province). Patients in the two groups received the same medications for stroke and antidepressants. Meanwhile, routine nursing care was given to the two groups, whereas patients in the study group also received comprehensive nursing. Hamilton Depression Rating Scale (HAM-D), Montreal Cognitive Assessment (MoCA), Stroke Specific Quality of Life Scale (SS-QOL), and Modified Barthel Index (MBI) were employed to assess the severity of depression and cognitive impairment, quality of life, and activities of daily living (ADL) before and after the intervention. Results: The results showed that the female gender, time course of stroke longer than 2 years, lesions in the brain stem, cerebellum, and frontal lobe, and absence of a spouse were factors positively correlated with PSD ($P=0.021$, 0.039 , 0.020 , 0.031). Three months after intervention, the HAM-D score reduced and the MoCA, SS-QOL, and MBI scores increased in both groups (all $P<0.05$), and the magnitude of decrease in the HAM-D score and increases in the MoCA, SS-QOL, and MBI scores was greater in the study group than in the control group ($P<0.001$, $P=0.012$, $P<0.001$, $P=0.009$). Conclusion: Female gender, time course of stroke over 2 years, lesions in brain stem, cerebellum, and frontal lobe, and absence of spouse can be risk factors for PSD in elderly stroke patients. Moreover, comprehensive nursing care can markedly alleviate depression and improve cognitive function, quality of life, and ADL in elderly patients with PSD.

Keywords: Elderly stroke, post-stroke depression, risk factor, comprehensive nursing care

Introduction

Post-stroke depression (PSD) is a common complication after stroke. Clinical manifestations of PSD include feeling a loss of interest, sadness, anxiety, sleep disorders, and irritability. Unlike other types of depression, PSD is associated with stroke-induced brain injury [1]. According to the *Canadian Stroke Best Practice Recommendations: Mood, Cognition and Fatigue Following Stroke practice guidelines, update 2015*, people are prone to depression after stroke, especially within the first year post-stroke (30%-60%) [2]. Gyagenda et al.

examined 73 stroke survivors, of whom 31.5% had PSD; they reported that PSD was closely associated with patients' inability to perform daily activities and there is an urgent need to integrate screening for and management of PSD for stroke survivors [3].

So far, there is no well-established method for the prevention and treatment of this disease. Some scholars suggested that reducing the risk factors for PSD may serve as a way to decrease the occurrence of this disease [4, 5]. Compared to young people, PSD has a higher prevalence in elderly people, and can cause greater impact

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on their physical bodies [6]. Therefore, how to provide effective psychological care for senile PSD patients has been gaining attention in healthcare workers. The comprehensive nursing program refers to a set of active practices performed by nurses in holistic nursing of the patients. This type of care covers multiple aspects including systematization of the nursing program, standardization of the nursing plan, targeted psychological counseling, and quality control of the nursing. Hefei et al. reported that early comprehensive psychological nursing can markedly alleviate depression in patients with PSD and improve their quality of life [7]. Other scholars also demonstrated that comprehensive nursing can lead to remission of depression in PSD patients and speed up their recovery [8]. Unlike the nursing care mentioned in previous studies which is comprised of psychological intervention, health education, and rehabilitation, the nursing program established in our study is based on six aspects: activation of social and family support, building up a good health worker-patient relationship, meeting the normal needs of patients, paying attention to patients' behavior and speech, conducting rehabilitation exercise, and providing targeted psychological counseling. The effect of this comprehensive nursing care on the severity of depression, cognitive function, and quality of life in patients was examined, and the risk factors for elderly PSD were analyzed in our study in order to provide some clinical guidance for an effective prevention and treatment of PSD.

Materials and methods

Participants

A total of 168 senile patients who were treated for stroke in Tongde Hospital of Zhejiang Province and Wenzhou Central Hospital between Aug 2017 and Oct 2019 were selected for the study. The diagnosis of stroke was confirmed in all patients using a CT scan or MRI of the head.

Inclusion criteria: 1) patients aged no less than 60 years; 2) patients who had clear consciousness and were able to complete the questionnaire; 3) patients who had no history of depression or treatment with antidepressants prior to the onset of stroke.

Exclusion criteria: 1) patients with aphasia, deafness, or comprehension disorders; 2) patients who had dementia and were unable to complete the survey; 3) patients who had history or family history of mental illness; 4) patients who had brain lesions and peripheral neuropathy including cerebral palsy, amyotrophic lateral sclerosis, Parkinson's disease, brain tumor, spinocerebellar ataxia, and multiple sclerosis; 5) patients who had serious illness such as heart failure, myocardial infarction, persistent atrial fibrillation, and severe liver and kidney dysfunctions within two months before the study.

The participants were assigned to a PSD group (n=98, patients with PSD) or a non-PSD group (n=70, patients without PSD) to investigate the risk factors for PSD in senile stroke survivors. Afterward, patients with PSD were further divided into a study group and a control group (both n=49) according to a random number table (63 cases were from Wenzhou Central Hospital and 35 cases were from Tongde Hospital of Zhejiang Province). The two groups were treated with the same medications for stroke and antidepressants but received different nursing care. The study was approved by the Ethics Committee of Tongde Hospital of Zhejiang Province and informed consent was obtained from all participants.

Methods

Ninety-eight patients with PSD, after being admitted to the hospital, were given medications for stroke and antidepressants, including anti-infective and neurotrophic agents, tricyclic antidepressants, and medicines for improving cerebral circulation.

In the control group, patients received the following nursing care: orientation after hospital admission, hygiene care at the bedside, medication guide, complication prevention, psychological counseling, proper positioning, and health guidance after hospital discharge.

Meanwhile, patients in the study group underwent comprehensive nursing care in addition to the aforementioned routine nursing. The comprehensive nursing program was comprised of the following parts: activation of family and social support, building up a good health worker-patient relationship, meeting the normal

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needs of patients, paying attention to patients' behavior and speech, conducting a step-by-step rehabilitation training, and providing targeted psychological counseling. Details are described as follows.

Activating family and social support: The rehabilitation and recovery of PSD can be a lengthy process, and some people can have this disease for a lifetime. Therefore, it is essential to obtain family and social support to improve patients' self-esteem and make them feel cared about and respected. The company and meticulous care by the family members were required to bring patients a sense of recognition and support. Family members were encouraged to communicate with patients and to provide support physically and emotionally.

Building up a good relationship between healthcare workers and patients: Patients were encouraged to communicate their emotional and personal needs, and the healthcare workers were good listeners to make them feel secure and build their trust. The workers interacted patiently and gently with patients even when patients were nagging or being forgetful.

Meeting the normal needs of patients: Patients with PSD usually have high dependency and more demands. In order to minimize their negative emotions, we tried our best to meet their normal needs.

Paying close attention to patients' behavior and speech: Nursing staff paid close attention to patients' behavior and speech to build their trust and to observe for any signs of abnormal condition. In case of patients presenting with abnormal behavior or speech, appropriate measures were taken by staff after determining the causes of patients' negative emotions. A dynamic assessment was performed on the effect of the actions, and the actions would be adjusted in a timely manner if they were not working.

Conducting a step-by-step rehabilitation training plan: It takes time for patients who can only have passive movements to be able to have some movements at the bedside or active movement out of bed. Patients were instructed not to hurry. To avoid accidental injury, the nursing staff were with the patients guiding them when they tried to make some movements at the bedside or get out of bed for the first time.

Providing targeted psychological counseling: Nursing staff were acting patiently when facing any negative emotions from the patients and provided targeted psychological counseling based on the causes of these emotions to reduce patients' nervousness, pessimism, and low self-esteem. When patients achieved any progress in recovery, no matter how much it was, encouragement and praises were given immediately to boost patients' confidence in overcoming this disease.

Outcome measures

One-way analysis of variance (ANOVA) and multivariate logistic regression were performed to determine whether the following eleven factors were risk factors for senile PSD: gender, age, occupation, income, educational background, time course of stroke, location and type of the lesion, presence of spouse, company and care by family members, and presence of chronic diseases such as high blood pressure, diabetes, and hyperlipidemia.

In order to investigate the effect of comprehensive nursing, the severity of the depression and cognitive impairment, quality of life, and activities of daily living (ADL) were evaluated before and after the intervention in both groups. All the assessments were performed by qualified physicians who had been trained in this area. The assessments were conducted twice and the average values were calculated.

Depression level

Hamilton Depression Rating Scale (HAM-D) was employed to assess the depression level in patients before and after the intervention [9]. The scoring system included 17 items covering five factors, which were somatic anxiety, loss of weight, cognitive impairment, sleep disorder, and retardation. Each item was scored on a scale of 0-4 points. A total score of <8 indicated no depression, 8-16 indicated mild depression, 17-24 indicated moderate depression, and >24 indicated severe depression.

Cognitive impairment

Montreal Cognitive Assessment (MoCA) was used to assess the severity of cognitive impairment in patients before and after the intervention [10]. The tool consisted of 11 items in eight areas, which were attention, executive func-

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tion, memory, language abilities visuospatial ability, abstraction, calculation, and orientation. The score ranged from 0-30 points; a score of <26 indicated cognitive impairment, and a score of <15 indicated dementia.

Quality of life

Stroke Specific Quality of Life Scale (SS-QQL) was used to evaluate patients' quality of life before and after the intervention [11]. The form consisted of 49 items in 12 areas, which were energy, family role, language, mobility, mood, personality, self-care, social role, thinking, upper extremity function, vision, and work (productivity). Each item was on a scale of 0-5; the total score was 245 points. A higher score represented better quality of life.

ADL

Modified Barthel Index (MBI) was used to assess the ADL of patients before and after the intervention [12]. The system consisted of the following 12 items: personal hygiene, dressing, bathing, feeding, bowel control, going to the toilet, bladder control, walking up the stairs, walking down the stairs, ambulation, propelling a wheelchair, and chair/bed transfers. The total score was 100; a score ≤ 20 reflected a severe dependence in ADL; a score of 100 reflected full independence in ADL.

Statistical analysis

SPSS 20.0 software was applied for statistical analysis. Count data are presented as percentage and were examined by χ^2 test. Measurement data are expressed as mean \pm sd. Comparison between the two groups was performed by independent t-test; comparison between pre- and post-intervention within a group was performed by paired t-test. The risk factors for PSD were analyzed using one-way ANOVA and multivariate logistic regression. $P < 0.05$ indicated a statistically significant difference.

Results

One-way ANOVA for PSD

The results of one-way ANOVA showed that factors including gender, time course of stroke, lesion location, and presence of spouse were

associated with the occurrence of PSD (all $P < 0.05$), whereas no correlation was observed between PSD and age, occupation, income, educational background, lesion type, company and care by family members, and presence of high blood pressure, diabetes, and hyperlipidemia (all $P > 0.05$). See **Table 1**.

Multivariate logistic regression analysis

PSD was set as a dependent variable, and gender, course of stroke, lesion location, and presence of spouse were set as independent variables. The results showed that female gender, time course of stroke over 2 years, lesions in brain stem, cerebellum, and frontal lobe, and absence of spouse were factors positively correlated with PSD ($P = 0.021, 0.039, 0.020, 0.031$), which could be considered as risk factors for PSD. See **Table 2**.

Baseline data

No intergroup differences were observed in baseline data including gender, age, time course of a stroke, lesion type and location, and presence of chronic diseases (all $P > 0.05$, **Table 3**).

HAM-D and MoCA score

Compared to pre-intervention, the HAM-D score reduced and MoCA score increased in both groups three months after intervention (all $P < 0.05$); moreover, compared to the control group, the magnitude of decrease in HAM-D score and increase in MoCA score was higher in the study group ($P < 0.001, P = 0.012$). See **Table 4**.

SS-QOL and MBI score

Compared to pre-intervention, the SS-QOL and MBI score increased in both groups three months post-intervention (all $P < 0.05$), and the magnitude of increase in the two scores was higher in the study group than in the control group ($P < 0.001, P = 0.009$). See **Table 5** and **Figure 1**.

Discussion

Cardiovascular and cerebrovascular diseases are highly prevalent in elderly people, and stroke is one of the most common types of these diseases. Due to population aging, the

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Table 1. Results of one-way ANOVA

	PSD group (n=98)	Non-PSD group (n=70)	t/ χ^2	P
Gender (n)			6.014	0.014
Male	40	42		
Female	58	28		
Age (year)			0.275	0.600
>70 year	46	30		
≤70 year	52	40		
Occupation (n)			0.019	0.991
Farmer	23	16		
Retiree	34	24		
Unemployed	41	30		
Monthly income (RMB)			0.011	0.917
>2000	44	32		
≤2000	54	38		
Educational background (n)			0.185	0.667
High school qualification or above	36	28		
Below high school qualification	62	42		
Time course of stroke (year)			5.538	0.019
>2	60	30		
≤2	38	40		
Lesion location (n)			4.138	0.041
Basal ganglia	7	11	3.136	0.077
Brain stem	22	7	4.431	0.035
Cerebellum	20	6	4.374	0.037
Thalamus	11	15	3.250	0.071
Corona radiata	8	11	2.321	0.128
Frontal lobe	20	6	4.374	0.037
Temporal lobe	10	14	3.200	0.074
Lesion type (n)			0.175	0.676
Hemorrhagic stroke	50	38		
Ischemic stroke	48	32		
Presence of spouse			4.577	0.032
Yes	41	41		
No	57	29		
Company and care by family members (n)			0.350	0.554
Immediate relatives	87	60		
Non-immediate relatives	11	10		
Presence of high blood pressure/diabetes/hyperlipidemia (n)			0.388	0.533
Yes	82	61		
No	16	9		

Note: ANOVA, one-way analysis of variance; PSD, post-stroke depression.

incidence of stroke has been rising in China. PSD is a common complication of stroke. Some scholars reported that occurrence rate of depression is much higher in stroke patients than in non-stroke patients [13]. Although the

pathogenesis of PSD has not be elucidated, it is believed that this type of depression is related to structural and functional brain changes, social factors, and heredity [14]. Some studies revealed that the blood and oxygen supply is

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Table 2. Multivariate logistic regression analysis

Factor	Parameter estimate	Standard error	Wald	P	OR	95% CI
Female	0.543	0.113	5.496	0.021	1.847	1.147-3.586
Course of stroke >2 years	0.433	0.143	8.597	0.039	1.948	1.274-2.175
Lesions in brain stem, cerebellum, and frontal lobe	0.763	0.211	11.068	0.020	1.770	1.409-3.674
Absence of spouse	0.580	0.243	10.856	0.031	1.953	1.509-4.678

Table 3. Baseline data

	Study group (n=49)	Control group (n=49)	t/ χ^2	P
Gender (n)			0.676	0.411
Male	22	18		
Female	27	31		
Age (year)	70.10±3.28	69.83±5.10	0.312	0.756
Course of stroke (year)	1.78±1.01	1.93±1.13	0.693	0.490
Lesion location (n)			0.362	0.541
Basal ganglia	3	4		
Brain stem	10	12		
Cerebellum	11	9		
Thalamus	7	4		
Corona radiata	4	4		
Frontal lobe	8	12		
Temporal lobe	6	4		
Lesion type (n)			0.653	0.419
Hemorrhagic stroke	27	23		
Ischemic stroke	22	26		
Presence of high blood pressure/diabetes/hyperlipidemia (n)			1.195	0.274
Yes	43	39		
No	6	10		

Table 4. HAM-D and MoCA scores before and after the intervention ($\bar{x}\pm sd$)

	HAM-D score				MoCA score			
	Before intervention	3 months after treatment	t	P	Before intervention	3 months after treatment	t	P
Study group (n=49)	19.27±2.11	15.09±2.70	8.539	<0.001	24.44±3.10	26.66±2.15	4.119	<0.001
Control group (n=49)	18.96±2.84	17.69±2.55	2.329	0.022	23.96±3.40	25.54±2.20	2.731	0.008
t	0.613	4.901			0.730	2.549		
P	0.541	<0.001			0.467	0.012		

Note: HAM-D, Hamilton Depression Rating Scale; MoCA, Montreal Cognitive Assessment.

decreased in stroke patients, causing a hypoxic condition in local brain tissue. The prolonged hypoxia in brain tissue can lead to cerebral atrophy or even infarction; meanwhile, it can also induce disorder in neurotransmitter secretion such as decreases in the release of dopamine, serotonin (5-HT), and norepinephrine, and the reduction in the levels of these neurotransmitters are closely correlated with occurrence of depression [15-17]. Moreover,

patients' lack of knowledge of PSD, believing that aphasia, paralysis, and cognitive impairment are incurable, is also one of the major causes of pessimism, despair, anxiety, or even depression [18].

Understanding the risk factors for senile PSD is of great significance in preventing and lowering the incidence of this disease. In the present study, PSD incidence was set as a dependent

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Table 5. SS-QOL and MBI scores before and after the intervention ($\bar{x} \pm s.d$)

	SS-QOL score				MBI score			
	Before intervention	3 months after treatment	t	P	Before intervention	3 months after treatment	t	P
Study group (n=49)	154.49±20.44	199.48±16.50	11.989	<0.001	54.49±7.04	64.50±8.47	6.362	<0.001
Control group (n=49)	161.70±17.90	170.48±20.08	2.285	0.025	55.66±8.29	60.45±6.37	3.207	0.002
t	1.858	7.811			0.753	2.675		
P	0.066	<0.001			0.453	0.009		

Note: SS-QOL, Stroke Specific Quality of Life Scale; MBI, Modified Barthel Index.

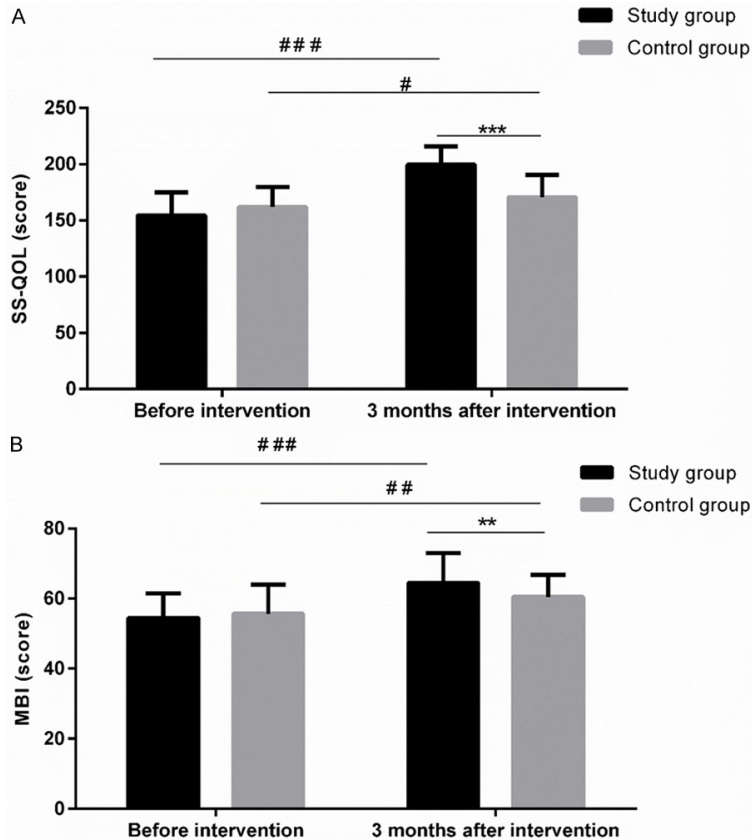


Figure 1. SS-QOL and MBI scores before and after the intervention. A. SS-QOL score before and after intervention in the two groups; B. MBI score before and after intervention in the two groups. ** $P < 0.01$ vs. the control group; *** $P < 0.001$ vs. the control group; * $P < 0.05$ vs. pre-intervention; ## $P < 0.01$ vs. pre-intervention; ### $P < 0.001$ vs. pre-intervention. SS-QOL, Stroke Specific Quality of Life Scale; MBI, Modified Barthel Index.

variable, and gender, time course of stroke, lesion location, and presence of spouse were screened out by one-way ANOVA and set as independent variables. Results of multivariate logistic regression showed that female gender, course of stroke over 2 years, and lesions in brain stem, cerebellum, and frontal lobe are factors correlated with PSD. The reason for the high prevalence of PSD in female elderly

patients may be related to the reduction of estrogen after menopause, as estrogen can up-regulate the gene expression of 5-HT receptor and promote synthesis and secretion of 5-HT, thereby increasing the content of 5-HT in brain [19]. In elderly women, levels of estrogen and 5-HT in brain decrease, which can weaken the regulation of emotion and lead to depression. Also, patients can have aphasia, paralysis, and cognitive impairment after stroke, causing them to lose working abilities and change their roles in the family, this suffering can make patients feel useless and a burden to the family. Moreover, the reduced opportunities for social interaction and monotonous life can make stroke survivors feel bored, lonely, and helpless, and this negative mood can be aggravated if patients have no spouse for company and care, thus increasing the incidence of PSD [20]. In the present study, we found that absence of spouse is a risk factor for PSD.

This can be explained by the fact that patients without spouse are usually lonely and have no one to turn to when having negative emotions. Besides, previous studies documented that the incidence rate of PSD increases as the course of stroke progresses, and the occurrence rate of PSD differs among stroke patients with different lesion locations [21, 22]. In this study, we found that course of stroke over 2 years and lesions in brain stem,

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cerebellum, and frontal lobe are risk factors for PSD, which is consistent with the results from Babkair [23].

For elderly PSD patients, stroke itself is already a severe stress event [24]; the declined quality of life can further aggravate depression, causing a vicious cycle and severely affecting the prognosis of patients [25]. Ojagbemi et al. revealed that cognitive impairment and functional limitations are correlated with the severity of depression [26]. Therefore, a proper targeted intervention is crucial for PSD patients to increase their compliance, alleviate depression, improve quality of life, and reduce cognitive impairment, and it is also indispensable in the treatment of stroke. In this study, we conducted comprehensive nursing care by fully activating family and social support, building a good relationship between healthcare workers and patients, meeting the normal needs of patients, paying close attention to patients' behavior and speech, conducting a step-by-step rehabilitation training, and providing a targeted psychological counseling. The assessment showed reduction in HAM-D score and increases in MoCA, SS-QOL, and MBI scores in both groups three months after intervention, while the magnitude of these changes was greater in the study group than in the control group, indicating that the comprehensive nursing care carried out in our study can markedly reduce depression, improve cognitive function, quality of life, and ADL in elderly patients with PSD.

However, there were still some limitations in the study. The sample size was small, and the number of factors analyzed for association with PSD was limited. Therefore, more risk factors need to be investigated, and a multicenter clinical trial with a larger sample size needs to be conducted in the future in order to bring more accurate reference for clinical application.

In conclusion, female gender, time course of stroke over 2 years, lesions in the brain stem, cerebellum, and frontal lobe, and absence of spouse are risk factors for PSD in elderly stroke survivors. Meanwhile, comprehensive nursing care can markedly alleviate depression and improve cognitive function, patients' quality of life, and ADL in elderly patients with PSD.

Disclosure of conflict of interest

None.

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