

Symptom clusters of early-stage poststroke depression: A mixed-methods study

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Abstract

Aim: To identify the symptom clusters of early-stage poststroke depression (PSD) and provide an in-depth understanding of the symptoms.

Design: A mixed-methods study with a convenient sampling method was used.

Methods: A cross-sectional questionnaire survey in 231 stroke patients and semi-structured interviews in 14 stroke patients were conducted in the neurological department of a comprehensive hospital in Southeast China. Data from the questionnaire survey were analysed through descriptive and exploratory factor analyses; data from the semi-structured interview were transcribed verbatim and analysed through inductive content analysis. This study adheres to the GRAMMS checklist.

Results: Exploratory factor analysis revealed six symptom clusters of early-stage PSD that accounted for an ideal variance in PSD: nervous, wakefulness, emotional, dull, guilt and low mood. Further, inductive content analysis revealed five themes that were like the above symptom clusters, except for the dull symptom cluster.

KEYWORDS

exploratory factor analysis, inductive content analysis, mixed methods, poststroke depression, symptom cluster

1 | INTRODUCTION

Poststroke depression (PSD) is a common and serious complication that affects almost 1/3 of patients at different stages poststroke (Kapoor et al., 2019; Towfighi et al., 2017; Volz et al., 2019). PSD

symptoms include low mood, decreased interest, insomnia, emotional distress and suicide (Bovim et al., 2019). PSD hinders the rehabilitation of stroke patients and leads to worse functional outcomes, greater disability and increased mortality (Blochl et al., 2019; Cai et al., 2019; Nickel & Thomalla, 2017; Stein et al., 2018). Specifically,

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PSD has been reported to increase the prevalence of disability and mortality rate among stroke patients to 70% to 90% (Lewin-Richter et al., 2015). Stroke patients are at a risk of developing PSD during their recovery process, including the early (within 1 month of stroke), rehabilitation (within 2–6 months of stroke) and sequelae (after 6 months of stroke) stages. However, the symptom clusters of PSD at different stages of stroke might vary significantly because of the evolution of stroke. Further, the symptom clusters of early-stage PSD exert adverse effects on the prognosis and quality of life of stroke patients (Kim et al., 2018; Metoki et al., 2016). Therefore, clear recognition of the symptom clusters of early-stage PSD can facilitate the formulation of effective management strategies. This might, in turn, reduce stroke recurrence and the mortality rate, promote physical and psychological recovery, improve functional outcomes and reduce the medical and economic burden of the family and society.

2 | BACKGROUND

Symptom clusters of PSD refer to the phenomenological cluster of symptoms in stroke patients suffering from PSD (Quaranta et al., 2012), which might be caused by acute ischaemic brain damage (neurofunction deficit) and psychological responses to the disease (sensation of loss) (Dwyer Hollender, 2014; Farner et al., 2009). They are a group of specific symptoms exhibited by stroke patients with PSD. Symptom clusters of early-stage PSD have been reported by several researchers as follows: low, guilt, wakefulness, dull, emotional and nervous (Li et al., 2016); being trapped by illness and losing oneself (Kouwenhoven et al., 2012); working inhibition, indecisiveness, fatigability, sadness, crying, pessimism and irritability (Altieri et al., 2012); and apathy, loss of interest, symptoms of anxiety, worries about disease deterioration, bodily pain and discomfort (Kouwenhoven et al., 2011). Symptom clusters of early-stage PSD need to be further explored because of the limited existing knowledge and inconsistency in the results reported by different researchers.

Symptom clusters of early-stage PSD impede recovery of speech and motor function, and reduce the ability and desire to undergo rehabilitation and to socialize and “re-join” society (Dwyer Hollender, 2014). Further, they increase the stroke recurrence risk; depressed patients with stroke have been reported to have a 49% increased stroke recurrence risk after 1 year; even antidepressants do not reduce the stroke recurrence risk (Yuan et al., 2012). Symptom clusters of early-stage PSD also greatly increase the stroke patients' risk of chronic PSD (Altieri et al., 2012), and 68.7% of stroke patients with chronic PSD have exhibited symptom clusters of early-stage PSD (Shi et al., 2016). Moreover, symptom clusters of early-stage PSD have been reported to be associated with PSD at 6 and 12 months after stroke and with mortality at 12 and 24 months after stroke (Lewin-Richter et al., 2015). A previous qualitative study reported that stroke survivors with symptom clusters of early-stage PSD suffer from persistent depression, worse functional outcomes, more

functional dependence and even death (Kouwenhoven et al., 2012). In addition, symptom clusters of early-stage PSD are an independent predictor of acute and chronic dysfunction (Kang et al., 2018). Thus, a better understanding of the symptom clusters of early-stage PSD might be a basis to reduce its adverse effect on stroke patients. However, although symptom clusters of early-stage PSD exert adverse effects on stroke patients (Cai et al., 2019; Wilkins et al., 2018), they have not been well-studied and existing findings are inconsistent (Altieri et al., 2012; Kouwenhoven et al., 2011; Kouwenhoven et al., 2012; Li et al., 2016).

3 | METHODS

3.1 | Aim

To avoid the relative objectivity of quantitative studies and the relative subjectivity of qualitative studies, this study aimed to identify the main phenomenological symptom clusters of early-stage PSD and provide an in-depth understanding of the symptoms using both a questionnaire survey and a semi-structured interview (Guidelines for Good Reporting of a Mixed Methods Study: See Appendix S1).

3.2 | Design

This was a cross-sectional and mixed-methods study including a quantitative questionnaire survey and a qualitative semi-structured interview.

3.3 | Participants

Eligible participants of the questionnaire survey were recruited through convenient sampling from the neurological department of a hospital located in Southeast China. Patients aged ≥ 18 years, diagnosed with stroke evidenced by computed tomography and magnetic resonance imaging, had suffered from a stroke within 7–30 days and had a score ≥ 14.5 on the early symptom measurement of poststroke depression (ESMPSD) were included in this study. Patients with serious aphasia, severe attention disorder, cognitive impairment (a Mini-Mental State Examination score < 10), a mental disorder or with a first-degree relative confirmed as having a mental disorder, or serious illness and undergoing critical care were criteria for exclusion. Two main factors were considered to determine the sample size: the number of entries in the questionnaire and the statistical methods. The ESMPSD is a 26-item questionnaire, and the main statistical method for this study was exploratory factor analysis (EFA). It has been reported that the EFA sample size should be 5 to 10 times the number of measurement items (DeVellis, 2010); therefore, the sample size was calculated as 130–260. With an assumed 20% invalid rate of the questionnaire, the sample size was calculated to be 165–325. Finally, 231 participants completed the questionnaire, and their responses were eligible for data analysis. A

convenient sampling with similar inclusion and exclusion criteria as that used in the questionnaire survey was employed to include an entirely separate group of eligible participants for the semi-structured interview. There was no prior assumed sample size for the semi-structured interview; instead, the sample size was the number of participants included when the interview data reached saturation.

3.4 | Procedures

We identified potential participants through a chart review. Subsequently, we requested eligible participants to join the questionnaire survey, which took 30 min to complete. Questionnaires were administered to the participants by trained researchers. The participants were asked to independently complete the questionnaire; alternatively, for participants who could not, trained researchers read the questions aloud to the participants and they were asked to answer them, after which the researchers noted the answers. Similarly, we identified 14 additional potential participants of the semi-structured interview through a chart review. Participants were interviewed according to an outline developed by the researchers. Moreover, we radio-taped the interview sessions with the consent of the participants. We conducted the interviews until the data reached the saturation point. Finally, 14 stroke patients participated in the semi-structured interview, which took about an hour for each participant.

3.5 | Data collection

3.5.1 | Demographic questionnaire

Data on demographic characteristics were collected from both the questionnaire survey and semi-structured interviews. Specifically, we collected the participants' age, sex, marital status, monthly household income, employment status, place of residence, primary caregivers and education level.

3.5.2 | Early symptom measurement of poststroke depression

Early symptom measurement of poststroke depression is a 26-item questionnaire that was developed in a Chinese population, and it comprised six domains used to assess depressive symptoms associated with early-stage PSD (Li et al., 2016). The six ESMPD domains are low (5 items), dull (3 items), guilt (4 items), emotional (4 items), wakefulness (5 items) and nervous (5 items). Participants were asked to self-rate each item in the questionnaire. Each item had a 5-point Likert scale ranging from 0–4 with the following corresponding responses: "no," "rarely," "sometimes," "often" and "always." The total score is the sum of all items, whereas domain scores are the sums of all items in each domain. A total score ≥ 14.5 is considered to indicate early depressive symptoms (Li et al., 2020). The reliability of the total ESMPD is 0.925,

TABLE 1 Semi-structured interview outline

Outlines
1. Are you comfortable with the hospital environment? If not, please specify the reason.
2. Please talk about the impact of stroke on your life (personal life, family life, social life, etc.)
3. What do you think of the people around you (family members, nurses, doctors, etc.)
4. What is your family's attitude towards you when you are ill?
5. Please talk about your mood changes after illness? Under what circumstances does it get better or worse?
6. What do you mean when you say you are in a bad mood? Why are you in a bad mood? What do you do when you are in a bad mood?
7. How is your sleep since you fell ill?
8. Do you feel nervous and anxious during your stay at the hospital? If so, what is the reason?
9. Since you fell ill, do you feel that your thinking has changed? If so, how was it changed?

while that for each domain is 0.816 (low), 0.836 (dull), 0.831 (guilt), 0.889 (emotional), 0.897 (wakefulness) and 0.820 (nervous); moreover, the questionnaire has good validity as demonstrated by the stable factor structure and domain correlation coefficient (Li et al., 2016).

3.5.3 | Semi-structured interview outline

The outline for the semi-structured interview was formulated according to a literature review and a pilot clinical interview of the stroke patients with PSD, which included nine relevant questions (Table 1).

3.6 | Data analysis

IBM SPSS 25 was used to analyse the questionnaire survey data. The participants' demographic characteristics were analysed with descriptive statistics. Specifically, categorical variables were expressed as frequencies and percentages, whereas continuous variables were expressed as means and standard deviations. An EFA was run to explore the symptom clusters of early-stage PSD (Quaranta et al., 2012). The extraction method was principal component analysis, whereas the rotation method was varimax rotation for the EFA. An EFA factor loading greater than 0.40 was retained as a clue to identify the symptom clusters of early-stage PSD. The number of symptom clusters was determined by the eigenvalues and scree plot of all items (Quaranta et al., 2012).

The inductive content analysis (Elo & Kyngäs, 2008) with paper and pencil was used to analyse the semi-structured interview data. Three phases were involved in the content analysis: preparation (collecting data, making sense of the data and selecting suitable nodes), organizing (open coding, creating categories and abstraction) and reporting (description of the categories and themes). Specifically, the audio-recorded semi-structured interviews were transcribed into

text document verbatim. After further accuracy checking of the text document, one of the research team members repeatedly read the text document to obtain data immersion. Subsequently, the other two research team members independently organized the transcripts, which mainly include coding and naming of every line and segment of the data openly, creating categories, constantly comparing data and abstraction of subthemes and themes. Field records and memos in interviews are also important reference materials for data analysis. When the two researchers completed the independent data analysis procedures, they attempted discussing their respective themes and subthemes together. Subsequently, after comprehensive refinement, the thematic map was produced. Finally, a third researcher was invited to openly discuss the disagreements for consensus on the final series of themes and subthemes.

3.7 | Validity and reliability

The ESMPSD is a reliable and valid measurement questionnaire, as described under the Data collection section. Several strategies were adopted to ensure that the semi-structured interview was rigorous. First, two strategies were employed to strengthen the credibility of the semi-structured interview data. One was summarizing the interpretations and clarifying any doubts or misunderstanding during the interview, while the other was having two researchers independently analyse the data. Second, the recorded data were returned to the interviewee for accuracy confirmation. Third, to enhance dependability, all semi-structured interviews were carried out by one researcher. Fourth, the interviewee's demographics and verbatim extracts were included to facilitate transferability of the findings. Finally, one researcher kept a reflective diary on her thoughts during the semi-structured interview to ensure the confirmability of the findings.

3.8 | Ethics

This study was approved by the ethical review board of Wenzhou Medical University (Reference Number: 2018033). Further, before enrolment, all participants provided written consent, wherein they were informed that they could freely withdraw from the study. Data confidentiality was ensured by securing all the questionnaire and semi-structured interview data where only the researchers involved in this study had the right to access.

4 | RESULTS

4.1 | Demographic characteristics of the participants in the questionnaire survey and semi-structured interview

Most questionnaire survey participants were male, married, living in a rural area, had family caregivers and educated for at least 6 years.

TABLE 2 Demographic characteristics of the survey participants and semi-structured interviewees

Variables	Questionnaire survey participants (N = 231)		Qualitative interview participants (N = 14)	
	n	%	n	%
Age (M ± SD)	63.81	12.21	59.93	7.86
Sex				
Male	149	64.5	11	78.6
Female	82	35.5	3	21.4
Marital status				
Married	202	87.4	13	92.9
Widowed	29	12.6	1	7.1
Monthly household income				
Less than 1,000 RMB ^a	74	32.0	1	7.1
1,000–2,999 RMB	59	25.5	2	14.3
3,000–4,999 RMB	37	16.0	4	28.6
Higher than 5,000 RMB	55	23.8	7	50.0
Employment status				
Employed	60	26.0	2	14.3
Farmers	57	24.7	2	14.3
Retired	46	19.9	4	28.6
Self-employed	13	5.6	6	42.9
Migrant worker	55	23.8	0	0
Place of residence				
Urban	41	17.7	6	42.9
Rural	166	71.9	7	50.0
Suburban	24	10.4	1	7.1
Primary caregivers				
Paid caregivers	38	16.5	0	0.0
Family members	183	79.2	14	100
Self-care	8	3.5	0	0.0
Education level				
Primary school	105	45.5	8	57.1
Middle school	46	19.9	2	14.3
High school	15	6.5	3	21.4
University or higher	11	4.8	1	7.1
Illiteracy	52	22.5	0	0

^aChinese currency.

Moreover, nearly one fourth of the participants reported a high monthly household income (higher than 5,000 RMB equals 706 US dollars) and slightly higher than one fourth of them were employed. The majority of the interview participants were male and married,

half of them reported a high monthly household income, and lived in rural China, all of them had family caregivers and had received at least 6 years of education and only two were employed (Table 2).

4.2 | Symptom clusters of early-stage PSD explored by an EFA

An EFA was run using the 231 questionnaire survey participants who presented early depressive symptoms. Sample of the 231 stroke patients was suitable for factor analysis as indicated by the high Kaiser–Meyer–Olkin measure of sampling adequacy of 0.856 and the significant Bartlett's test of sphericity ($\chi^2 = 3,161.000$, $p < .001$). The rotated component matrix of EFA yielded six symptom clusters with eigenvalues > 1 ; further, the break point in the scree plot of the ESMPSD items confirmed the six symptom cluster model (Figure 1). The six symptom clusters obtained from the ESMPSD items were similar to the ESMPSD questionnaire domains (Li et al., 2016); therefore, we named them similarly to the ESMPSD domains, that is nervous, wakefulness, emotional, dull, guilt and low mood. The six symptom clusters explained 66.967% of the total PSD variance, indicating that the suggested symptom clusters were the main symptoms of patients with early-stage PSD. Furthermore, the variance explained by each symptom cluster was $> 5\%$, indicating that each symptom cluster contributed significantly to the early-stage PSD (Table 3).

4.3 | Symptom clusters of early-stage PSD obtained from the semi-structured interview

The inductive content analysis yielded five main themes: nervous, wakefulness, emotional, guilt and low mood. Specifically, two subthemes, worrying about dragging down family members and

worrying about bringing economic and care burden to their family members, formed the main theme of guilt. Four subthemes, namely despair, unwillingness to communicate, sensation of inferiority and sensation of loss formed the main theme of low mood. Table 4 presents the themes and subthemes that were extracted from the inductive content analysis; further, we presented the participants' representative statements for each theme and subtheme.

5 | DISCUSSION

5.1 | Interpretation of the symptom clusters of early-stage PSD

As a commonly used method for exploring symptom clusters of patients (Quaranta et al., 2012), the EFA yielded six symptom clusters of early-stage PSD: nervous, wakefulness, emotional, dull, guilt and low mood. Further, except for the symptom cluster of dull, the semi-structured interview yielded similar symptom clusters of early-stage PSD to those in the questionnaire survey. In addition, the themes and subthemes of the semi-structured interview could further help confirm and interpret the corresponding symptom clusters yielded by the questionnaire survey (Table 4).

Nervous refers to “uncertainty about the illness and future,” which was explained by the semi-structured interviewees as worrying about the illness (stroke), financial problems, physical conditions and illness recurrence. Stroke patients worry a lot about the aforementioned problems, which gives them a bad internal feeling and a feeling of uncertainty about their future. *Wakefulness* refers to “sleep disorders,” which was explained by the semi-structured interviewees as having difficulty falling asleep. This might be because they worried a lot about their illness, work and family, which greatly pressurized the patients, preventing them from

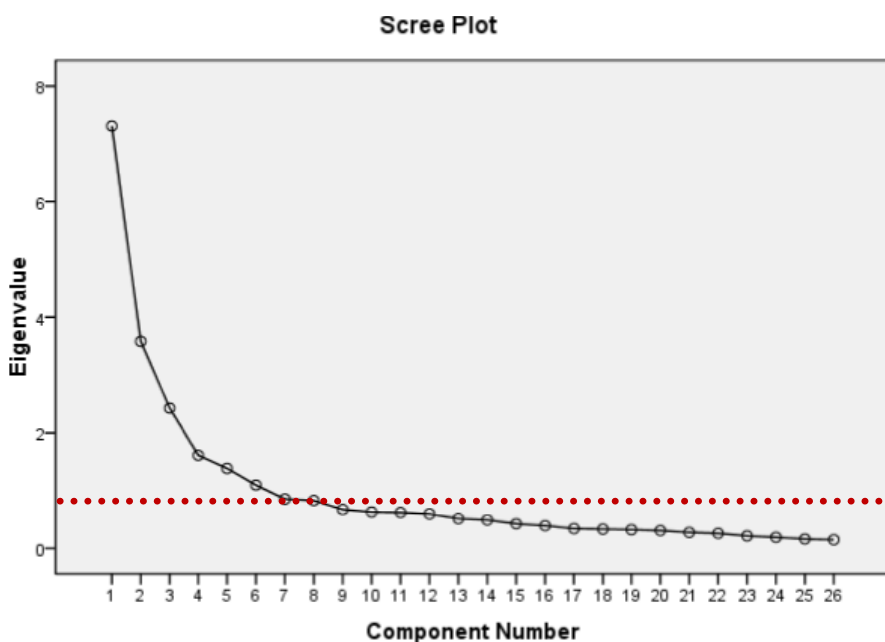


FIGURE 1 The scree plot of the exploratory factor analysis (EFA)

TABLE 3 Rotated component matrix of the symptom clusters of early-stage poststroke depression (N = 231)

Items	Symptom clusters					
	Factor 1 Nervous	Factor 2 Wakefulness	Factor 3 Emotional	Factor 4 Dull	Factor 5 Guilt	Factor 6 Low mood
24. I feel nervous or scared.	0.778	0.113	0.175	0.108	-0.004	0.100
26. I worry about there will be bad results when receiving examinations.	0.744	0.222	0.111	0.075	0.218	0.091
23. I worry about my physical health excessively.	0.704	0.025	0.238	-0.021	0.249	0.222
22. I feel depressed with the thinking that I will never recover from the illness.	0.568	0.052	0.117	0.012	0.357	0.364
25. I worry about something that has no need to worry about.	0.543	0.015	0.098	0.047	0.381	0.122
5. I want to cry or have cried during my stay here.	0.483	-0.042	0.159	-0.032	0.243	0.377
19. I cannot rest easy in my bed.	0.047	0.897	0.057	0.049	-0.042	0.053
20. I am easy to wake up in the midnight.	-0.009	0.858	-0.003	0.018	-0.018	0.088
18. I wake up in the early morning and cannot fall asleep again.	0.091	0.839	0.078	0.101	0.128	-0.018
21. I feel that I am not sleep enough but cannot sleep well.	0.074	0.825	0.122	0.040	0.082	0.039
17. I need more time to fall asleep than before.	0.247	0.478	0.049	0.284	-0.115	-0.302
13. I am easy to get angry than usual.	0.104	0.029	0.845	0.157	0.172	0.045
14. I am irritable.	0.058	0.036	0.785	-0.017	0.096	0.349
15. I feel that I lose control of my fast change mood.	0.320	0.134	0.772	0.204	-0.014	-0.004
16. I cannot calm down.	0.390	0.204	0.695	0.290	0.075	0.001
8. I feel I am slow in speaking.	0.026	0.029	0.087	0.904	0.077	0.037
7. My memory is worse than before.	0.046	0.068	0.155	0.871	0.021	-0.004
6. My mind is not clear as usual.	0.040	0.163	0.157	0.789	0.016	0.157
10. I feel that it is my fate to have got stroke because I have done something wrong in my life.	0.078	0.145	0.130	0.239	0.750	-0.031
9. I feel myself be a burden of my family.	0.349	-0.040	-0.006	0.015	0.664	0.354
11. I feel I am useless.	0.391	0.007	0.028	-0.132	0.653	0.193
12. I always blame myself.	0.383	-0.046	0.305	0.010	0.580	0.196
3. I feel very low once I thought about my illness (stroke).	0.247	0.004	0.095	0.007	0.224	0.794
1. My mental state is not good.	0.228	-0.050	0.128	0.245	-0.220	0.657
2. I feel life is meaningless.	0.137	0.215	0.149	0.234	0.207	0.625
4. I feel a lot of personal loss in my life (such as family, work and economics, etc.)	0.130	-0.012	-0.011	-0.163	0.352	0.534
Variance explained by each factor (%)	13.196	13.039	10.764	10.306	9.853	9.809
Eigenvalues for each factor	3.431	3.390	2.799	2.679	2.562	2.550
Total variance explained by the 6 factors (%)	66.967					

Note: Extraction method: Principal component analysis.

Rotation method: Varimax with Kaiser normalization.

Original authors approved the usage of the questionnaire.

sleeping well. *Emotional* refers to “a state of irritability,” which was explained by the semi-structured interviewees as having unstable emotions and being irritable. Patients' irritability is mainly related to the sudden functional loss of their arms, legs, etc. Formerly easy tasks become difficult to complete, which makes the patients very irritable and angry. *Dull* refers to “not clear in thinking,” which means that the stroke patients have difficulty in concentrating on things and are indecisive. This could be attributed to poststroke brain damage. Furthermore, dull was the only symptom cluster that was not confirmed by semi-structured interviewees, which

may be attributed to selection bias. To obtain as much information as possible, stroke patients with good and clear thinking and language expression skills were chosen as the semi-structured interviewees. Therefore, they were free of the symptom “dull.” *Guilt* refers to “feeling of guilt towards the family,” which was described by the semi-structured interviewees as worrying about dragging down their family members and causing economic and care burdens among their family members. Most of the stroke patients (79.2% in the questionnaire survey and 100% in the semi-structured interview) were cared for by their family members, and they

TABLE 4 Themes obtained from the qualitative interview ($N = 14$)

Themes	Subthemes	Reasons	Representative narratives from the participants
Nervous	Nervous	Worry about the illness, worry about financial problems, worry about physical conditions, worry about recurrence of the illness	I worry very much about my illness and feel so scared that I cannot recover from the illness. I worry that I will spend a lot of money on my illness. Further, I worry about stroke recurrence.
Wakefulness	Wakefulness	Have difficulty falling asleep	I cannot fall asleep easily and I think a lot about my illness, work, and family, etc.
Emotional	Emotional	Emotional instability, irritability	Generally speaking, I do not speak much, and I feel a bit irritable. My mood is very unstable, and I often get angry easily.
Guilt	Worrying about dragging down family members	Worry about affecting the work of family members, worry about bringing trouble to family members	My son sent me to the hospital and takes care of me at the hospital; therefore, he resigned from his work. I am worried about my son's work and future.
	Worrying about bringing economic and care burden to the family members	Feel that family members spent a lot of time and money because of stroke	I feel guilty. I have to trouble others and I do not want to bother anyone. When I was in the hospital, my relatives and friends spent a lot of money and time.
Low mood	Despair	Unable to control the condition or do anything	I feel unable to control the condition of my illness, which makes me desperate. I am not in a good mood and I feel like I am suffering.
	Unwilling to communicate	Give very simple answers to questions, sighing; feel that others do not understand them, unwilling to express their feelings and communicate with others	I feel like others do not understand me; therefore, I am unwilling to express my feelings to them.
	Sensation of inferiority	Feel that others do not like them, feel like they are unable to do anything and feel like others look down on them	I feel that nobody likes me ever since I became ill. I feel that I cannot do anything and that others look down on me.
	Sensation of loss	Tasks that were simple previously are now difficult to complete	I used to take something easily at will and accomplishing things was very easy. However, after falling sick, I feel unable to complete anything. Therefore, I feel a personal big sense of loss.

depended on their family members both physically and economically; therefore, it is easy to understand why they harboured a feeling of guilt towards their family members. *Low mood* refers to "in low spirits," which was explained by the semi-structured interviewees as feeling despair, unwillingness to communicate, sensation of inferiority and sensation of loss. Some reasons might explain the symptom cluster of low mood among the stroke patients. First, the feeling of being unable to recover from the illness made them feel despair. Second, they were unwilling to communicate as they felt that nobody could understand their situation. Third, they felt inferior by assuming they were disliked by the family members or other people because of their illness. Finally, they had a sensation of loss because they lost control of themselves, as

indicated by the difficulties encountered when trying to complete easy tasks.

5.2 | Comparison of this study with previous studies

The symptom clusters found in this study are like those reported by the study that developed the ESMPD (Li et al., 2016). These consistent findings further confirmed the validity of the ESMPD and its usefulness in exploring the symptom clusters of early-stage PSD.

Some of the symptom clusters found in this study are consistent with the findings from previous studies. For example, the subthemes "sensation of inferiority" and "sensation of loss" belonging to the

symptom cluster of low mood are consistent with “being trapped by illness” and “a sensation of loss” as reported by previous researchers (Kouwenhoven et al., 2012). The stroke patients in this study reported that they are “unable to do anything,” which makes them feel that they are trapped by stroke and that it makes them feel inferior. Further, it is difficult for patients with early-stage stroke to accept the sudden physical function loss, which renders them unable to perform tasks well; therefore, there is a physical and mental sensation of loss in stroke patients. Furthermore, the symptom cluster of nervous in the present study is consistent with the symptom clusters of anxiety and worries about disease deterioration reported by Kouwenhoven, Kirkevold, Engedal, Biong, et al. (2011). As stated by the interviewees in this study, the stroke patients became nervous because they were worrying about the illness (their physical condition and the recurrence of stroke) and the financial problem, which makes them anxious about their illness and future.

The six symptom clusters of early-stage PSD found in this study are different from those reported by Altieri et al., as stated before (Altieri et al., 2012). However, there are some similarities between the two studies. Specifically, the definitions of the symptom clusters of irritability and emotional in the previous and current study, respectively, were similar, which indicates irritability among stroke patients regardless of the cultural background. The sensation of loss in stroke patients due to the lack of control of their own body might be the main cause of irritability. Therefore, it is crucial to encourage early physical and psychological rehabilitation in stroke patients. Further, the symptom clusters of crying and pessimism reported by Altieri et al. (2012) were represented in the symptom clusters of low mood in this study. Specifically, crying and pessimism may be because of the feeling of despair, which was reported as a subtheme of low mood in the present study. Contrastingly, we did not find the previously reported working inhibition, indecisiveness, fatigability and sadness (Altieri et al., 2012) as the most frequent symptom clusters in this study. This could be mainly attributed to our patients with stroke being younger than those in the study by Altieri et al. Specifically, our patients' mean age was 63.81 years with the semi-structured interviewees being even younger (mean = 59.93); however, the percentage of patients in the study by Altieri et al. who were aged >65 years was 51.6%.

Symptom clusters of early-stage PSD found in this study might differ from those of rehabilitation and sequelae stage PSD. Previously reported symptom clusters of rehabilitation stage PSD include insomnia, general physical symptoms and sexual dysfunction (Gusev et al., 2001); depression and anxiety symptoms, having difficulty controlling emotions and lack of motivation (Quaranta et al., 2012); lack of pleasure (listlessness, loss of sensation, suicidal thoughts, loss of appetite), sadness (observed grief, self-reported sadness, pessimism) and anxiety (intrinsic tension, lack of attention, restless sleep) (Farner et al., 2009); anxiety, catastrophic reactions and hyper-emotionalism (Gainotti et al., 1997); and having negative emotions, nocturnal symptoms, low self-esteem, seeking spiritual help (depending on God, praying, going to spouse's grave every day, expressing contradictions about stroke, etc.) and changes in body

sensations. (Robinson-Smith, 2004). A previous study reported that the most common symptoms of rehabilitation stage PSD were lack of energy, loss of interest and self-deprecation (Verdelho et al., 2004). There are relatively fewer symptom clusters of sequelae stage PSD, which mainly include insomnia, irritability, feelings of recovery difficulty, fatigue, reduced sensory ability, reduced speech, suicidal thoughts and crying (Yue et al., 2015); depression, aggression and anger; and mood fluctuations and anxiety (Pappadis et al., 2019).

As aforementioned, sleeping problems, mood disorders (depression) and emotional problems (irritability) seem to occur persistently in stroke patients suffering from PSD throughout their recovery process. Stroke is a chronic illness that affects both the physical health and mental health of stroke patients, which subsequently increases disability and mortality. Consequently, stroke patients present with problems with persistent sleep, depression and emotional problems from worrying about their physical health and future life. Furthermore, guilt seems to be a specific symptom cluster of early-stage PSD; seeking spiritual help, lack of energy and lack of interest are specific symptom clusters of rehabilitation stage PSD; and recovery difficulty and easy fatigability are specific symptom clusters of sequelae stage PSD. It seems that with the evolution of PSD from the early stage to the sequelae stage, symptoms become increasingly serious and closer to those of major depression. This indicates that early-stage PSD might progress to late-onset PSD and then gradually to major depression if stroke patients with early-stage PSD do not receive timely intervention. This is consistent with the findings of previous reports that symptom clusters of early-stage PSD greatly increase chronic PSD risk in stroke patients (Altieri et al., 2012) and that 68.7% of stroke patients with chronic PSD have developed early-stage PSD (Shi et al., 2016). Therefore, it is crucial that healthcare professionals recognize and manage symptom clusters of early-stage PSD in a timely manner, which could, in turn, reduce the risk of late-onset PSD during the rehabilitation and sequelae stage and eventually improve the clinical outcomes of stroke patients.

6 | LIMITATIONS

This study has two main limitations. First, the generalizability of our findings is limited by the cross-sectional design and convenient sampling. Second, the findings of the semi-structured interviews are limited as they are self-reported by patients and could suffer social expectations bias. However, the combination of the questionnaire survey and the semi-structured interviews renders more credibility to the findings.

7 | CONCLUSIONS

Stroke patients with early-stage PSD exhibit a series of symptom clusters including nervous, wakefulness, emotional, dull, guilt and low mood. Furthermore, the questionnaire survey could identify more symptom clusters than the semi-structured interviews, which implies that for patients with depressive symptoms

not willing to communicate with others, the questionnaire survey might provide an effective alternative for understanding their inner thoughts. Conversely, the qualitative interview could provide more information about the details and reasons for the symptom clusters of early-stage PSD. Healthcare professionals should effectively address these symptom clusters to reduce the late-onset PSD risk and improve the prognosis and functional outcomes of stroke patients.

8 | RELEVANCE TO CLINICAL PRACTICE

This study has several implications for clinical practice. First, the symptom clusters found in this study could provide a comprehensive perspective on early-stage PSD and invoke the attention of clinical healthcare professionals. This could, in turn, enable them to find ways to improve the symptom clusters of early-stage PSD in stroke patients. Second, there is a need for future research on the symptom clusters of the rehabilitation and sequelae stage PSD, which still remain unclear.

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CONFLICT OF INTEREST

No conflict of interest has been declared by the author(s).

AUTHOR CONTRIBUTIONS

JC, JLI: Manuscript writing. YL, JLIU, YZHANG, YZENG, MC: Data collection. WD: Data analysis. ZL, HX, JLI: Study design.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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