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Factors associated with self-management behaviors among Chinese adults with ischemic stroke: A cross-sectional study

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Xiaoxiao Chen[1,2], Niphawan Samartkit[3]*, and Khemaradee Masingboon[3]

[1]Master of Nursing Science Program Adult Nursing (International Program), Faculty of Nursing, Burapha University, Chonburi, Thailand
[2]The Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University, Wenzhou, China
[3]Faculty of Nursing, Burapha University, Chonburi, Thailand

Abstract

Background: In China, adults with ischemic stroke are getting younger. Additionally, following a stroke, they often neglect self-management (SM), which significantly impacts the rehabilitation process and treatment outcomes.

Objective: This study aimed to describe SM behavior and examine the relationship between stroke prevention knowledge, life stress, family relationships, and SM behavior among adults with ischemic stroke.

Methods: A total of 125 participants were recruited between October 2022 and March 2023 based on defined inclusion criteria. Research instruments included a demographic questionnaire, the Stroke Self-management Behavior Scale for Young Adults, the Stroke Prevention Knowledge Questionnaire, the Perceived Stress Scale, and the Brief Family Relationship Scale. Data were analyzed using descriptive statistics and Pearson's product-moment correlation.

Results: The mean score of SM behavior was 88.1 out of 130 (SD = 16.5). Stroke prevention knowledge and family relationships showed a moderate positive significant relationship with SM behavior (r = 0.39, r = 0.34, p <0.001, respectively). Life stress had a significant negative relationship with SM behavior (r = -0.33, p <0.001).

Conclusion: The findings offer insights for nurses to develop nursing interventions to promote SM behavior among adults with stroke. Furthermore, they can assist hospitals in transitioning care to the community by emphasizing holistic nursing practices that educate about stroke prevention knowledge, encourage family support, and provide stress management strategies to enhance the SM abilities of adults with stroke.

Keywords

China; family support; hospital; ischemic stroke; psychological stress; self-management; stroke; young adult

***Corresponding author:**
Assoc. Prof. Dr. Niphawan Samartkit
Faculty of Nursing, Burapha University,
169 Long Had Bangsaen Rd, Saen Suk,
Chon Buri 20131 Thailand
Email: niphawan@buu.ac.th

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Background

Stroke is the second-leading cause of death globally and also the third-leading cause of death and disability combined in 2019 (Feigin et al., 2022; Feigin et al., 2021). Approximately 11% of all ischemic strokes occur in individuals aged between 15 and 49 years, with a survival rate of around 19% (Feigin et al., 2022). Several countries, including the United States, Denmark, and France, have studied age trends related to stroke onset. The results indicate that there has been an increase in the incidence of ischemic stroke among adults (Béjot et al., 2016; Cabral et al., 2017; Magwood et al., 2017).

China faces the greatest challenge from a stroke in the world. In the past, stroke mostly occurred in older persons. However, at present, patients with stroke are getting younger and younger. From 1992 to 2015, the incidence of ischemic stroke among low-income people aged 35-65 years old in rural Tianjin showed an increasing trend (1/100,000) (National Center for Cardiovascular Diseases, 2020). Moreover, the proportion of ischemic stroke patients under age 50 years increased from 8.8% in 2010 to 16.1% in 2013 (Zhou & Tang, 2019). An analysis examining the epidemic trend of stroke in China between 2010 and 2017 found that strokes are occurring at younger ages (Lin et al., 2020).

The incidence of stroke is a leading cause of long-term disability and mortality, imposing a substantial financial burden on both families and nations (Kim et al., 2020). Disability affects stroke patients' lifestyle and quality of life as a major factor (Bello et al., 2021). Compared with older persons, most adults with stroke bear essential social and family responsibilities, so they are more likely to experience psychological burdens and negative emotions after a stroke, affecting the physical and mental health of patients (Boot et al., 2020). Furthermore, stroke survivors face numerous obstacles when trying to return to their normal lives, particularly those who are of working age with dependents such as children or older parents (Yahya et al., 2020). Although strokes are less common among working-age adults

compared to older individuals, they have a more profound impact due to their longer life expectancy (Kim et al., 2020).

Studies have indicated that the potential causes of the increased incidence of stroke in adults aged 15 to 59 may be lifestyle with poor health behavior such as smoking at an early age, insufficient physical activity, unhealthy diet, stressful lifestyle, and harmful use of alcohol (Chouhdari et al., 2021; Luo & Zhao, 2021). Research results show that enhancing the awareness of active treatment, actively controlling various risk factors, maintaining compliance with drug treatment, increasing exercise, reasonable control of diet, and actively changing the way of life is important in the prevention and control of stroke as well as improving the prognosis of patients and quality of life (Hong-li et al., 2018). It is worth mentioning that working-age adult stroke survivors are more likely to be affected by post-stroke psychosocial problems and require significant adjustments in their daily lives to achieve social reintegration than older stroke survivors (Rhudy et al., 2020).

Self-management (SM) behavior refers to the activities and behaviors of adults with stroke to prevent and reduce symptoms and exacerbation. It plays a crucial role in the prevention risk of stroke (Wang, 2017). To effectively promote rehabilitation and avoid recurrence, stroke survivors need to adhere to healthy SM practices after discharge. The optimal recovery period is within six months after the acute phase of stroke, making SM behavior particularly important during this timeframe for adult stroke patients (Sun et al., 2022). Engaging in SM activities during rehabilitation can greatly assist adults with stroke in returning to their normal lives. Self-management behavior is related to some factors, but most research has focused on older patients, while fewer studies are looking at stroke survivors of working age.

Based on the Individual and family self-management theory (IFSMT), SM is the process dimension composed of knowledge and belief, self-regulation skills and ability, and social facilitation, which can promote patients' participation in SM behavior. Knowledge serves as the foundation for behavior change, and successful changes in health behavior can be correlated with specific disease knowledge (Ryan & Sawin, 2009). In the context of SM behavior after a stroke, the level of stroke knowledge plays an important role (Guan et al., 2018). Stroke prevention knowledge refers to the comprehension of stroke and its management in adults with stroke, including warning symptoms, stroke risk factors, and health behaviors. However, it has been observed that first-ever stroke patients often possess lower levels of both knowledge and SM behavior, indicating a need for improvement (Yuan, 2018). Interestingly, younger individuals (aged less than 55 years) tend to exhibit greater improvement in their understanding of strokes (Kang et al., 2019). This suggests that stroke-related knowledge in adults with stroke may correlate with their SM behavior.

Life stress is associated with human health and disease outcomes (Slavich, 2016). It refers to the perception of adults with stroke about the negative affective state that individuals may attempt to relieve or cope with through unhealthy behaviors after stroke. For working-age adults who have experienced a stroke, life stressors may include education, employment status, housing conditions, financial concerns related to medical expenses or treatment costs, and family relationship management. Disability, the leading cause of returning to work, is a major consequence of stroke (Arwert et al., 2017). Meanwhile, physical dysfunction can further contribute to increased life stress. Due to life stress and financial burden, some adults with stroke must return to work with physical dysfunction as soon as possible, often ignoring the importance of SM behavior after stroke, which leads to the recurrence of stroke. This suggests that life stress may be related to SM behavior among adults with stroke.

Guided by the IFSMT, the family relationship is one of the main factors affecting SM behavior (Shu et al., 2019; Whitehead et al., 2018). In this study, family relationship refers to the perception of adults with stroke about cohesion, expressiveness, and conflict in the family. In China, stroke patients typically manage their illness at home when they have supporting family members. Families are crucial in providing assistance and promoting SM behavior (Whitehead et al., 2018). Patients with good family relationships are more likely to receive emotional support from family members to face disease difficulties positively and optimistically, promote physical and mental health, and engage in healthy SM behavior (Shu et al., 2019). Therefore, family relationships may be a factor associated with SM behavior.

Effective SM interventions have been shown to improve overall risk factor control, preventing recurrent stroke (Sakakibara et al., 2017). The stroke SM programs have been proven beneficial for recovery outcomes (Lo et al., 2018). However, existing literature in China indicates that the level of SM among adults with stroke is generally low or moderate, highlighting the need for improvement (Jin, 2019; Zhu, 2021). Furthermore, studies examining factors associated with SM behavior have primarily focused on stroke among older adult patients. The characteristics and SM needs of patients of working age often differ from those of older stroke patients. There are currently no targeted self-management models for stroke survivors of working age (Purvis et al., 2021). Despite increased attention from nurses and other healthcare professionals toward SM behavior, there is limited research on this topic, specifically among working-age adults with post-ischemic stroke. Therefore, this study explored the current status of SM behavior and investigated potential associations between stroke prevention knowledge, life stress, and family relationships with SM among adults with ischemic stroke.

Methods

Study Design

A descriptive, correlational, cross-sectional research design was used in this study.

Samples/Participants

The participants were adults with ischemic stroke who came for a check-up at the Neurology Outpatient Department of the Second Affiliated Hospital of Wenzhou Medical University. The inclusion criteria were follows: (1) Age between18 and 60 years; (2) History of first-ever ischemic stroke; (3) Conscious (GCS = 15); (4) Activities of daily living (ADL) score > 60 by the Barthel Index; (5) Living with family; (6) Able to communicate and write in Chinese; (7) Discharged from hospital between 1 and 6 months; (8) No history of mental disorder (from the medical record); (9) No history of other

severe disease or dysfunction of vital organs, such as malignant tumor, heart, liver, kidney dysfunction, etc.

The sample sizes were calculated using the G*Power 3.0.10 program for descriptive correlational design. According to a previous study, the researchers estimated a medium effect size = 0.30, a power of 0.90, and α = 0.05 for computing the sample size, which was prescribed to be at least 112 participants (Kang et al., 2015). Assuming 10% incomplete data collection, the final sample size was adjusted to 125.

Instruments

Five instruments were utilized and authorized by the authors of the original and Chinese versions. The demographic questionnaire was developed by the researcher, specifically for this study, and includes: 1) General information: gender, age, religion, education level, marital status, occupation (previous and current), family members, main caregiver, family income, living house, healthcare payment scheme; 2) Health information: weight, height, BMI, ADL (discharged from hospital, current), the day they were diagnosed of ischemic stroke, NIH Stroke Scale score (the level of disability), length of stay in the hospital, family history of stroke, smoking status, alcohol consumption, source of stroke education.

The Stroke Self-Management Behavior Scale for Young Adults（SSMBS-YA）was used to measure SM behavior in adults with stroke. This scale was developed by Xu et al. (2016) and consists of 26 items across five dimensions: symptom management, emotion management, daily life management, rehabilitation exercise management, and resource management. A Likert 5-level scoring method was employed, with a score of 5 indicating “strongly agree,” 4 “agree,” 3 “neutral,” 2 “disagree,” and 1 “strongly disagree.” The total potential score was 130. The higher the score, the better SM behavior. Scores below 78 were considered a low level of SM. Scores between 78 and 104 indicate a moderate level, while scores above 104 reflect a high level of SM. The standard score index was used to compare the various dimensions with varying quantities of elements. Less than 60% denotes weak SM, 60 to 80% suggests moderate SM, and more than 80% shows high SM. The standard score index was calculated as the actual score of each dimension/the maximum score of the dimension * 100%. The content validity index was 0.857. The Cronbach’s α coefficient for this scale was 0.923 (Xu et al., 2016). In this study, the internal consistency reliability of SSMBS-YA was 0.86.

The Stroke Prevention Knowledge Questionnaire (SPKQ) was used to measure the level of stroke knowledge in adults with stroke. This scale was designed and developed by Wan et al. (2010), and the latest version was revised and expanded by Wan et al. (2014). This questionnaire was composed of 25 items, including ten domains: physical activity, nutrition, a low-salt diet, quitting smoking, abstaining from alcohol abuse, medication adherence, blood pressure checks, stroke warning signs, stroke risk factors, and prehospital delay awareness. The total potential score was 100; a higher score indicates higher knowledge about stroke prevention. To describe the level of stroke prevention knowledge, participants with a score below 60 were considered to have a poor level of stroke knowledge. A score of 60-80 was considered to be a moderate level of stroke knowledge. A score over 80 was considered a high level of stroke knowledge. The content validity index was 0.89. The Cronbach’s α coefficient was 0.86. In this study, the internal consistency reliability of SPKQ was 0.90.

The Perceived Stress Scale (PSS) is the most widely utilized psychological instrument for evaluating the perception of stress (Cohen, 1994). The questions in this scale ask participants about their feelings and thoughts during the last month. The Chinese version of PSS-10 was translated by Yang and Huang (2003). PSS-10 is composed of 10 items: six items are negatively stated, so zero points were assigned for each “Never,” one point for each “Almost Never,” two points for each “Sometimes,” three points for each “Fairly Often,” and four points for “Very Often.” For four positively-stated items, the scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0). The final scores were then summed across all scale items with a total potential score of 40. The higher the score, the more stress the participants perceived. PSS-10 has been demonstrated to possess high reliability and validity across diverse populations, cultures, and institutions. The Cronbach’s α coefficient was 0.91. In this study, the internal consistency reliability of PSS was 0.82.

The Brief Family Relationship Scale (BFRS) was used to measure the participant’s perception of the quality of their family relationship functioning. The BFRS was designed and developed by Fok et al. (2011). The Chinese version of this scale was translated by Huang et al. (2018). The scale consists of cohesion, expression, and conflict subscales with a total potential score of 32, measuring support, expression of opinions, and angry conflict within a family. The higher the score, the better the family relationship. The internal consistency reliability BFRS in this study was 0.85.

Data Collection

The information was collected from the Neurology Outpatient Department (NOD). The nurse in the NOD searched the registration to find the participants who met the inclusion criteria and were interested in participating in the study. The outpatient nurse contacted the researchers if a patient was interested in this study. The researcher met each participant and their family and informed them about the aim of the study, ethical issues about the study, and human protections. Next, informed, voluntary, written consent to participate was obtained. The NOD has approximately 5 to 8 stroke cases aged 18-60 years every week. The researchers collected the data on weekdays between October 2022 and March 2023. It took about 30 minutes for each participant completed the self-reported questionnaire in a private room.

Data Analysis

Data were analyzed using IBM SPSS 26.0. Descriptive statistics were employed to delineate the demographic characteristics. Pearson’s correlation coefficient was employed to examine the relationships among variables. All assumptions regarding Pearson’s correlation were fulfilled.

Ethical Consideration

The Ethics Committee of Burapha University (G-HS035/2565) and the Second Affiliated Hospital of Wenzhou Medical University (2022-K-56-02) approved the study protocol. The researcher explained the objectives, procedures, and the right to withdraw until data analysis was begun without affecting the quality of service for each candidate. Confidentiality was

safeguarded throughout the study. Participants had to sign a consent form before collecting data. Data were collected in a private room out of consideration of COVID-19 prevention.

Results

Demographic Characteristics

As illustrated in **Table 1**, 70.4% of the participants were male (*n* = 88), and 29.6% were female (*n* = 37). The age range of the participants was 26–60 years, with an average age of 49.4 (SD = 8.30). Regarding religion, 72.0% of the sample had no religious belief, and 55.2% had junior to senior high school education. Most of the participants were married (86.4%). Two-thirds (67.2%) of the participants continued to work after their stroke, while 24% of the previously employed participants did not. More than half of the employed were laborers. The percentage of participants with two or three family members was 41.6%. Regarding the main caregiver, most of the participants were cared for by their spouse (71.2%), and 64.8% of the participants were living in a rural area.

Table 1 Demographic characteristics of the adults with ischemic stroke (*N* = 125)

Characteristics	*n*	%
Gender		
Male	88	70.4
Female	37	29.6
Age (years)		
21-30	5	4.0
31-40	15	12.0
41-50	43	34.4
51-60	62	49.6
(M = 49.4, SD = 8.30, Min = 26, Max = 60)		
Religion		
Buddhism	27	21.6
Christianity	7	5.6
Catholicism	1	0.8
No religion	90	72.0
Education level		
Illiterate	9	7.2
Primary school	25	20.0
Lower-upper high school	69	55.2
Bachelor's Degree	22	17.6
Marital status		
Divorced	6	4.8
Married	108	86.4
Unmarried	6	4.8
Widowed	5	4.0
Occupation		
Before stroke		
Civil servant/government staff	15	12.0
Commercial staff	42	33.6
Laborer (e.g., builder, factory worker, sanitation worker, driver, farmer)	68	54.4
Post-stroke		
Return to the same work	84	67.2
Civil servant/government staff	7	5.6
Commercial staff	31	24.8
Labor (e.g., builder, factory worker, sanitation worker, driver, farmer)	46	36.8
Suspended work	30	24.0
Change working status	11	8.8
Number of family members		
1	17	13.6
2	52	41.6
3	52	41.6
≥4	4	3.2
(M = 2.4, SD =0.80, Min = 1, Max = 5)		
Main caregiver		
Spouse	89	71.2
Child	17	13.6
Parent(s)	9	7.2
Paid caregiver	8	6.4
Other relative(s)	2	1.6
Healthcare payment scheme		
Urban residents under the medical insurance system (90% paid by the government)	40	32.0
New rural cooperative medical care system (70% paid by the government)	76	60.8
Out-of-pocket medical	8	6.4
Others (e.g., Commercial insurance)	1	0.8

Table 2 Health information of the adults with ischemic stroke (*N* = 125)

Characteristics	*n*	%
BMI (Chinese standards)		
Normal weight (18.5-23.9)	56	44.8
Overweight (24-27.9)	56	44.8
Obese (≥28)	13	10.4
(M = 24.3, SD = 2.8, Min = 18.8, Max =32.1)		
NIHSS score (admission day)		
0 (Normal)	25	20.0
1-4 (Mild stroke)	80	64.0
5-15 (Moderate stroke)	20	16.0
(M = 2.3, SD = 1.9, Min = 0, Max = 8)		
NIHSS score (discharge day)		
0 (Normal)	46	36.8
1-4 (Mild stroke)	74	59.2
5-15 (Moderate stroke)	5	4.0
(M = 1.4, SD = 1.5, Min = 0, Max = 6)		
NIHSS score (The data collected day)		
0 (Normal)	47	37.6
1-4 (Mild stroke)	74	59.2
5-15 (Moderate stroke)	4	3.2
(M = 1.3, SD = 1.4, Min = 0, Max = 6)		
ADL score (admission day)		
0-40 (Severe dependence)	16	12.8
41-60 (Moderate dependence)	13	10.4
61-99 (Slight dependence)	55	44.0
100 (Independent)	41	32.8
(M = 78.8, SD = 23.6, Min = 20, Max = 100)		
ADL score (discharge day)		
41-60 (Moderate dependence)	10	8.0
61-99 (Slight dependence)	67	53.6
100 (Independent)	48	38.4
(M = 87.7, SD = 15.0, Min = 45, Max = 100)		
ADL score (day of data collection)		
61-99 (Slight dependence)	65	52.0
100 (Independent)	60	48.0
(M = 91.3, SD = 11.4, Min = 65, Max = 100)		
Duration of post-stroke		
1-2 months	62	49.6
2-3 months	34	27.2
3-6 months	29	23.2
Source of stroke education* (*n* = 158)		
Nurse in hospital (Both inpatient and outpatient)	125	79.1
Social media (e.g., Website, Newspaper, TV)	27	17.1
Others (e.g., friends, community center)	6	3.8
Smoking status		
Currently smoking	62	49.6
Quit smoking	2	1.6
Never smoked	61	48.8
Alcohol consumption (per day)		
No alcohol use	68	54.4
<150ml	22	17.6
150-300ml	19	15.2
>300ml	10	8.0
Quit drinking alcohol	6	4.8
Co-morbidities*		
Yes	99	79.2
Hypertension	65	52.0
Two or more co-morbidities (e.g., hypertension, diabetes, hyperlipidemia, cardiopathy)	23	18.4
Diabetes	6	4.8
Hyperlipidemia	3	2.4
Cardiopathy	2	1.6
None	26	20.8

Notes: *Multiple responses allowed

BMI (Chinese standards) (Zhou, 2002)

Health information

As shown in **Table 2**, 64.0% of the participants had a mild stroke on admission day, while 16.0% had a moderate stroke. On discharge day, the proportion of participants with moderate stroke dropped to 4.0% and rose to 36.8% for those with normal stroke. Two out of five participants (44.0%) had an ADL score between 61 and 99; 12.8% had ADL scores of 0-40; and 10.4% had ADL scores of 41-60. At discharge, all the participants had an ADL score of >40, while more than half (53.6%) had an ADL score of 61-90, and 38.4% had an ADL score of 100. In terms of source of stroke education, 81.6% acquired stroke knowledge from a hospital nurse.

As **Table 3** illustrates, 55.2% of the participants scored at a moderate level of SM (M = 92.6, SD = 8.6). Under one-third (31.2%) of the participants got a low level of SM (M = 69.1, SD = 6.5). Only 13.6% were at the high SM level (M = 113.2, SD = 7.3). Overall, the SM of the participants was at a moderate level (M = 88.1, SD = 16.5). In addition, the resource management dimension was at a low level (**Table 4**).

Table 3 Descriptive statistics of SM behavior (*N* = 125)

SM behavior	*n*	%	Mean (SD)	Level
>104	17	13.6	113.2 (7.3)	High
78-104	69	55.2	92.6 (8.6)	Moderate
<78	39	31.2	69.1 (6.5)	Low

Table 4 Descriptive statistics of the five dimensions of SM behavior (*N* = 125)

SM behavior	Range		Mean (SD)	Standard Score Index (%)	Meaning
	Possible score	Actual score			
Total score	26-130	52-126	88.1 (16.5)		Moderate
Dimensions					
Symptom management	8-40	14-40	27.8 (6.4)	69.6	Moderate
Emotion management	4-20	4-20	12.1 (2.9)	60.8	Moderate
Daily life management	7-35	8-35	24.8 (5.9)	70.9	Moderate
Rehabilitation management	4-20	4-20	14.7 (4.0)	73.5	Moderate
Resource management	3-15	3-15	8.5 (3.6)	56.9	Low

Table 5 shows that participants had a stroke prevention knowledge score at a moderate level (M = 68.2, SD = 24.3). The average score for life stress was 17.0 (SD = 6.1) and 22.8 for family relationships (SD = 5.7).

Table 6 shows that stroke prevention knowledge and family relationships had a positive moderate correlation with SM (r = 0.39, p <0.001; r = 0.34, p <0.001, respectively). Life stress had a negative correlation with SM (r = -0.33, p <0.001).

Table 5 Descriptive statistics of stroke prevention knowledge, life stress, and family relationship (*N* = 125)

Variables	Possible score	Actual score	Mean (SD)	Meaning
Stroke prevention knowledge	0-100	4-100	68.2 (24.3)	Moderate
Life stress	0-40	3-34	17.0 (6.1)	-
Family relationship	0-32	6-32	22.8 (5.7)	-

Table 6 Correlation coefficients between variables (*N* = 125)

	SM Behavior	*p*-value
Stroke prevention knowledge	0.39	＜0.001
Life stress	-0.33	＜0.001
Family relationship	0.34	＜0.001

Discussion

In this study, the mean score of SM behavior among adults with ischemic stroke aged 18 to 60 years was 88.1 (SD = 16.5), which was at a moderate level, surpassing the findings of Jin (2019) and Zhang (2020), who studied stroke patients age 18 to 45 years. The scores were 67.9 (SD = 19.26) and 85.4 (SD = 15.77). The mean age of the working-age adults in the present study was 49.4 years. Moreover, about half (49.6%) of the sample were aged between 51 and 60 years old, in contrast to the younger sample of the previous two studies cited (Jin, 2019; Zhang, 2020). According to IFSMT, SM across the developmental stages may differ (Ryan & Sawin, 2009). In a study of SM in kidney transplant patients, researchers found that SM increased with age (Xie et al., 2019). In addition, one study in China found that the SM of stroke patients tended to improve with age (Shuqi et al., 2023). Therefore, compared with the previous studies in China, the higher SM score in this study might be due to differences in the ages of the sample population.

Moreover, in our study, 86.4% of the participants were married, and 71.2% were cared for by their spouse as the main caregiver. In another study of the SM behavior of stroke patients in rehabilitation, married patients had better SM than unmarried /divorced /widowed patients (Sun et al., 2022). Spouse often plays a role in the development of SM in stroke patients (Satink et al., 2018). Spouses participate in SM programs and help monitor stroke survivors (their partners) to properly execute activities for better rehabilitation outcomes (Satink et al., 2018). This could be one explanation for the higher scores of SM behavior of participants in this study. Moreover, 83.2% of the participants had more than two family

members. By being adaptable and using strategies to maintain adaptation, family members were capable of helping individuals with chronic conditions in their effort to self-manage symptoms (Whitehead et al., 2018). Nearly all (92.8%) of the participants in this study had a healthcare payment scheme to support their rehabilitation after stroke, which greatly reduced the economic burden caused by stroke. Studies in China have shown that the smaller the financial burden, the better SM behavior (Jin, 2019; Zhang, 2020). All of the above are the reasons for the moderate level of SM behavior in this study.

However, when looking at the three levels of SM behavior in this study, it was observed that nearly one-third of the adults with ischemic stroke (31.2%) were at the low level (M=69.1, SD=6.5). The findings of this study indicate that 27.2% of the participants had no formal education (i.e., illiterate) or only primary school education. In IFSMT, self-efficacy is a behavior-specific concept that characterizes a person's degree of confidence in their ability to carry out an activity successfully in both ordinary and stressful situations (Ryan & Sawin, 2009). Patients with low educational attainment reported lower self-efficacy (Olsson et al., 2020). The higher the education level, the higher the SM behavior (Jin, 2019). This may also explain the finding that about one-third of participants had a low SM level. In addition, 67.2% of the participants in this study returned to work after a stroke. Work is one of the environmental factors affecting SM, according to IFSMT (Ryan & Sawin, 2009). Post-work fatigue affects health behavior, such as sedentary and less physical activity in working-age stroke survivors (Roaldsen et al., 2022). The younger age group, who were more likely to have contemplated resuming their pre-stroke livelihoods, encountered challenges in committing to long-term rehabilitation, as their peers were all engaged in work and juggling family obligations. About two-fifths (79.2%) of the participants had one or more comorbidity. Among them, the proportion with hypertension was the highest, accounting for 52.0%. Meanwhile, 18.4% of the participants had two or more comorbidities. The more comorbidities, the worse the SM behavior of stroke patients (Jin, 2019). This may explain the fact that some of the participants had low SM levels.

Among the five dimensions of SM behavior, symptom management, emotion management, daily life management, and rehabilitation management were moderate, and rehabilitation management scored the highest (73.5%) (Table 4). Rehabilitation management consists of physical exercise and daily activities. In the current study, on the day of admission, the mean ADL score was 78.8, which indicates slight dependence on ADL or some assistance required with self-care and mobility. The mean ADL score increased to 87.7 on discharge day, suggesting that cases with ischemic stroke in this study had better ADL because of their favorable SM behavior in rehabilitation.

Post-stroke resource management had the lowest standard score (56.9%). 79.1% of participants reported that they had received education on stroke from a nurse during hospitalization or at discharge. However, less stroke knowledge was obtained from other channels, including social media and community centers, which indicated that maybe most of the participants got once stroke education after stroke. This may cause the lowest score in resource management.

In this study, it was observed that stroke prevention knowledge was found to be positively correlated with SM behavior among adults with ischemic stroke (r = 0.385, p <0.001). This finding is consistent with the hypothesis of this study. Patients with greater stroke prevention knowledge were more likely to engage in health behavior that may prevent stroke (Wan et al., 2014). Knowledge may also have a favorable impact on the self-efficacy of individuals who have suffered a stroke. The relationship between knowledge and diabetes SM behavior was partially mediated by self-efficacy in one study (Jiang et al., 2019). Patients with high levels of disease-related knowledge were better able to deal with their health issues and improve their behavior to promote their health (Jang & Shin, 2019). That finding is consistent with the findings of the present study.

The family relationship was also positively correlated with SM behavior. Individual and family capabilities and cohesion belong to individual and family factors in IFSMT (Ryan & Sawin, 2009). The existence of supportive family relationships was deemed crucial for the survival and recovery of stroke survivors (Choliq et al., 2020). The family plays a role in monitoring and assisting in the SM behavior of the participants, directly or indirectly affecting the recovery and health of stroke survivors (Zhang & Lee, 2019). Families were paramount in establishing an environment facilitating family involvement and support (Whitehead et al., 2018). A good family relationship was more conducive to the SM behavior of adult patients with ischemic stroke after discharge. Therefore, assisting patients and their families to establish a good family relationship can promote the SM behavior of adults with ischemic stroke.

The study's results revealed that life stress had a negative correlation with SM behavior in adults with ischemic stroke. This is consistent with previous research on stress and SM behavior in older adult patients with a chronic disease, both negatively correlated (Liu, 2022). Stress reduction is among the 12 tasks common to SM across chronic diseases (Ryan & Sawin, 2009). The INTERSTROKE study, which involved 32 countries, found that psychosocial stress, including a combination of family and work stress, life events, and depression, increased the risk of stroke, with the highest risk in China (Polivka Jr et al., 2019). A study of working adults suggested that life stress could contribute to disease through adverse effects on health behavior (Ng & Jeffery, 2003). It can be inferred that greater stress in adults with ischemic stroke is associated with worse SM behavior, consistent with the results of this study.

Implications for Nursing Practice

The study's findings provide a reference for nurses to carry out secondary prevention and formulate nursing interventions for adults with stroke. This information can help develop appropriate nursing interventions to promote SM behavior after discharge. Nursing staff can provide necessary SM support, strengthen stroke prevention knowledge and SM education for patients according to their condition, improve the confidence of patients to take the initiative to practice SM, guide patients to reduce pressure reasonably, help patients and their families to establish a good family relationship and learn how to manage the disease correctly. For nursing educators, it is helpful to strengthen nursing students' knowledge of the related factors of SM behavior among adults

with ischemic stroke. In addition, from the hospital to the community, stroke patients, family caregivers, and community health workers should be educated to provide holistic nursing for patients, including knowledge, psychological support, family support, and other aspects to improve the SM ability of patients to prevent stroke recurrence.

Limitations

This study was only conducted at the Second Affiliated Hospital of Wenzhou Medical University. Thus, the results might not be generalized to all Chinese populations. Further studies with bigger sample sizes are needed.

Conclusion

The study describes a moderate level of SM behavior among working-age adults with ischemic stroke in Wenzhou, China. Stroke prevention knowledge and family relationships were positively correlated with SM behavior, and life stress was negatively correlated with SM behavior. These research findings may help nursing staff to develop and refine interventions to promote SM behavior.

Declaration of Conflicting Interest

The authors declared that there are no conflicts of interest in this study.

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Authors' Contributions

All authors contributed substantially to the conception and design, acquisition of data, or analysis and interpretation of data. In addition, all drafted the manuscript or revised it critically for important intellectual content and provided approval of the final version.

Authors' Biographies

Ms. Xiaoxiao Chen is a Master's Student in the Nursing Science Program Adult Nursing (International Program), Faculty of Nursing, Burapha University, Thailand. She is also a Registered Nurse at the Department of Nursing, The Second Affiliated Hospital, and Yuying Children's Hospital of Wenzhou Medical University, Wenzhou, China.

Dr. Niphawan Samartkit, PhD, RN is an Associate Professor at the Faculty of Nursing, Burapha University, Thailand.

Dr. Khemaradee Masingboon, DSN, RN is an Assistant Professor at the Faculty of Nursing, Burapha University, Thailand.

Data Availability

The data sets generated during and analyzed during the current study are available from the corresponding author upon reasonable request.

Declaration of Use of AI in Scientific Writing

Nothing to declare.

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