Research article

Independent predictors of family resilience in patients with ischemic stroke: A cross-sectional survey

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A B S T R A C T

Background: Globally, China bears the highest stroke burden, emphasizing the paramount importance of comprehending the influencing factors on family resilience among patients with ischemic stroke to promote their physical and mental well-being, as well as enhance the quality of their life. This understanding can concurrently assist healthcare professionals in formulating interventions aimed at fostering healthy family functioning.
Objective: To investigate the level of family resilience in patients with ischemic stroke and its predictive factors.
Methods: A total of 310 inpatients with ischemic stroke were recruited from three tertiary general hospitals in China between May and November 2021. The study employed a range of instruments for data collection, including the General data questionnaire, Family Resilience Rating Scale, Simplified Coping Style Questionnaire, Perceived Social Support Scale and Connor-Davidson Resilience Scale. Data analysis was conducted using SPSS 22.0 statistical software. Non-parametric tests, Spearman analysis, and multiple stepwise regression were employed to investigate the predictive variables of family resilience.
Results: A total of 303 patients successfully completed the investigation, yielding an efficacy rate of 97.74 %. The total scores for family resilience spanned from 87 to 245, with a median (P_{25}, P_{75}) of 187 (160, 200). The highest scores were observed in the dimension of dilemma interpretation, while the lowest scores were recorded in the dimension of social support. Family relationship (β = 0.459, $P < 0.001$), positive coping (β = 0.182, $P < 0.001$), out-of-family support(β = 0.156, $P < 0.001$), in-family support (β = 0.147, $P = 0.002$), and optimism (β = 0.108, $P = 0.013$) were found to be predictive factors of family resilience.
Conclusion: Patients with high family resilience demonstrated superior family relationship, effective positive coping strategies, increased support within and outside the family, and a more optimistic attitude; these factors independently predict family resilience.

1. Introduction

Stroke is known as the third major killer after heart disease and tumors and is also the leading cause of death and disability among Chinese residents, with death/disability rates of 33.4 % and 33.8 %, respectively [1]. After a stroke, patients may exhibit varying degrees of cognitive, linguistic, physical, and other disorders, which often predispose them to anxiety, depression, panic, and other negative emotions. Consequently, this may lead to a decline in self-esteem and self-confidence and significantly impact their physical

and mental health as well as their quality of life [2,3]. Ischemic stroke not only constitutes a traumatic stress event for the patient but also poses a considerable crisis and challenge for the family [4]. The family function is intricately linked to the psychological rehabilitation of patients with ischemic stroke, and any maladjustment within the family can exert a detrimental impact on patient prognosis. Hence, researchers underscore the significance of adopting a family-centered care approach for chronic conditions like ischemic stroke [5].

In recent years, the rapid advancement of positive psychology and the deepening exploration of family stress research have led to the emergence of novel concepts aimed at ameliorating patients' negative emotions and enhancing their prognostic rehabilitation. The concept of family resilience, which refers to the capacity or trait of adapting continuously and thriving in the face of adversity, has been introduced [6]. Studies have demonstrated that family resilience can augment patients' positive emotions, optimize family functionality and quality of life, facilitate the resolution of family challenges, and aid in the transition to a normal life [7]. Furthermore, research has indicated that when confronted with uncontrollable stressors, adopting a positive coping style is beneficial for mitigating negative emotions, moderating stress responses, and promoting family cohesion [8,9]. The findings of another study highlight that enhancing patients' psychological resilience and providing comprehensive support from both within and outside the family context are conducive to fostering a positive outlook among patients, rebuilding confidence in rehabilitation, maintaining normal family functioning, and promoting overall familial well-being [10].

Based on an analysis of past studies involving diverse populations, such as those with cerebral palsy, breast and rectal cancer, COVID-19, etc, the determinants of family resilience encompass individual, familial, and societal factors [11–14]. Individual coping abilities, social support, and psychological resilience levels serve as crucial protective elements for family resilience, however, few studies have investigated the predictive role of patient characteristics on family resilience. For instance, the patient's coping style, which represents "an individual's attitude after facing stress and shock" [15], A study of patients with chronic heart failure showed that positive coping strategies were positively correlated with family resilience [16]. Understanding of social support, which is "the satisfaction of the individual with support, respect, acceptance, and recognition in interpersonal relationships and social engagement" [17],Shi [18] discovered that family and social support, the level of post-traumatic growth, and economic status were significant predictors of familial resilience in patients diagnosed with acute leukemia. The level of patient resilience, which encompasses "the individual's adaptive process and resilience in the face of various injuries and major events" [19], Studies have demonstrated that individuals exhibiting high levels of mental resilience exhibit enhanced adaptability in the face of significant adversity, such as severe traumatic brain injury or spinal cord injury, and actively engage in developing diverse pathways towards recovery [20]. Moreover, gender, marital status, education level, and family income, among other demographic variables, were found to be associated with family resilience [21,22]. However, there is a dearth of evidence regarding the role of these factors in predicting family resilience among patients with ischemic stroke. Therefore, further investigation is warranted to explore the relationship between these variables and family resilience as potential targets for intervention.

Therefore,the primary objective of this research was to examine the degree of family resilience in patients who have experienced ischemic stroke, along with its influencing factors. Following an ischemic stroke, both patients and their families endure significant psychological distress and stress, in addition to preparing for the subsequent recovery process. We hypothesized that the level of family resilience in patients with ischemic stroke could potentially be affected by various factors such as patient coping strategies, social support, psychological resilience, and demographic variables.

2. Methods

2.1. Study design and participants

A cross-sectional survey, conducted in the form of a questionnaire, was employed to gather patient data. Subjects were required to meet the following inclusion criteria: (a) fulfill the diagnostic and treatment criteria [23] and have ischemic stroke confirmed by CT or MRI; (b) be aged 18 years or older; (c) demonstrate a relatively stable condition and voluntarily participate in the survey. Participants were excluded if they presented with: (a) severe heart, liver, or kidney organ dysfunction; (b) language impairment; (c) cognitive or mental disabilities that precluded cooperation.

2.2. Sample size determination

According to the statistical method [24], the sample size is typically 10 to 20 times that of the study variables, with 17 variables (including demographic data and disease-related variables) in this study. Therefore, the sample size should range from 170 to 340 cases. Considering the practical circumstances and the presence of invalid questionnaires during the investigation process, a 10 % increase in the sample size is necessitated for distribution purposes. Consequently, the revised sample size spans from 187 to 374 cases, with 310 cases being included in this study.

2.3. Procedure

The convenience sampling method was employed to recruit 310 participants from May to November 2021, from three tertiary hospitals in Hengyang City, China, all of which are affiliated with Hunan Normal University. Prior to the interviews, participants were informed about the study's purpose and procedure, and their privacy was assured. Informed consent was obtained from each patient before conducting the face-to-face interviews. This study was ethically approved by the Biomedical Ethics Committee of Hunan Normal

Table 1
Participants' self-characteristics and family resilience (n = 303).

Variable	Classification	N(%)	Family resilience $M(P_{25}, P_{75})$	Z/H	P
Age(years)	≤60	130 (42.90)	187 (159.25 , 201)	0.102	0.950
	61~74	120 (39.60)	187.50 (161 , 199.75)		
	≥75	53 (17.50)	187 (158.50 , 196.50)		

Variable	Classification	N(%)	Family resilience $M(P_{25}, P_{75})$	Z/H	P
Gender	male	195 (64.36)	187 (160 , 200)	−0.156	0.876
	female	108 (35.64)	186.50 (160 , 199)		
Marital status	unmarried	19 (6.27)	205 (186 , 229)	26.996	0.000***
	married	231 (76.24)	188 (162 , 201)		
	other	53 (17.49)	163 (146 , 187.50)		
Education level	primary school and below	116 (38.28)	172.50 (142.25 , 189)	39.366	0.000***
	middle school	107 (35.31)	190 (168 , 201)		
	college degree and above	80 (26.41)	192 (183.25 , 209)		
Work status	on-the-job	60 (19.80)	189 (160.50 , 202.75)	11.129	0.011*
	departure	36 (11.88)	186.50 (152.75 , 201)		
	retired	82 (27.06)	190.50 (170.50 , 205)		
	other	125 (41.26)	180 (156 , 192.50)		
Family monthly income (¥ RMB)	< 2000	99 (32.67)	183 (148 , 193)	10.091	0.006**
	2000~4000	82 (27.06)	181.50 (158.75 , 203.25)		
	> 4000	122 (40.27)	190 (170.25 , 202)		

Variable	Classification	N(%)	Family resilience $M(P_{25}, P_{75})$	Z/H	P
Place of residence	rural	165 (54.46)	180 (153 , 194)	−3.408	0.001**
	city	138 (45.54)	190 (171.75 , 203)		
Knowledge of the disease	not knowing	92 (30.36)	178 (146 , 190)	21.933	0.000***
	section for	147 (48.52)	188 (161 , 203)		
	fully understand	64 (21.12)	191.50 (176.75 , 202.75)		
Forms of medical insurance payment	worker health	95 (31.35)	190 (165 , 202)	8.399	0.015*
	medical insurance for urban and rural residents	76 (25.08)	188.50 (161 , 202.75)		
	other	132 (43.57)	180.50 (151 , 192.75)		
Family economic	bad	92 (30.36)	178 (142.25 , 191)	17.090	0.000***
	general	108 (35.64)	188.50 (166.25 , 205)		
	good	103 (34.00)	190 (165 , 201)		
Family relationships	poor	38 (12.54)	126 (117 , 141.25)	152.888	0.000***
	general	72 (23.76)	160 (150 , 176.75)		
	fine	193 (63.70)	192 (186 , 205.50)		

Variable	Classification	N(%)	Family resilience $M(P_{25}, P_{75})$	Z/H	P
Duration of treatment (weeks)	< 1	116 (38.28)	187 (159 , 201)	2.172	0.337
	1~2	107 (35.31)	185 (160 , 193)		
	> 2	80 (26.41)	189.50 (162.75 , 201.75)		
Treatment	drug treatment	179 (59.08)	188 (160 , 199)	3.337	0.189
	fibrinolytic therapy	69 (22.77)	183 (150 , 196.50)		
	endovascular intervention	55 (18.15)	186 (170 , 201)		
Severity of illness	serious	116 (38.28)	183 (159 , 194)	2.476	0.290
	general	108 (35.64)	187.50 (161.50 , 201)		
	not serious	79 (26.08)	189 (160 , 204)		
Self-care abilities	mild dependence	125 (41.26)	189 (166 , 202.50)	7.964	0.047*
	moderate dependence	68 (22.44)	183 (154.25 , 199)		
	heavy dependence	42 (13.86)	188 (168 , 200)		
	totally dependence	68 (22.44)	180.50 (151.25 , 191.75)		

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$。 .

University (Approval number: 233(2021)).

2.4. Measurements

Personal Information Scale, Family Resilience Rating Scale, Simplified Coping Style Questionnaire (SCSQ), Perceived Social Support Scale (PSSS), and Connor-Davidson Re-Silience Scale (CD-RISC).

2.4.1. Personal Information Scale
The design of the study was executed in accordance with its purpose and content, encompassing: age, gender, educational attainment, disease comprehension, family economic status, family relationship, treatment duration, modality, disease severity, self-care abilities, and so forth.

2.4.2. Family Resilience Rating Scale
The scale was developed by Chinese scholar Dai [25], consisting of two subscales (Family Beliefs and Family Strength), encompassing 10 factors and 49 items. These include dilemma interpretation (7 items), positive forward thinking (6 items), life excellence (4 items), problem solving (6 items), intimacy harmony (4 items), social support (4 items), orderliness (3 items), emotional sharing (4 items), clear communication (5 items), and cooperation coordination (6 items). Scores range from 1 ("not applicable") to 5 ("applicabl"), with higher scores indicating better family resilience. The questionnaire possesses a Cronbach's α coefficient of 0.912.

2.4.3. Simplified Coping Style Questionnaire (SCSQ)
The scale was developed by Jie [15], consisting of two dimensions (positive coping and negative coping) and 20 items. It adopts a 3-point scoring method, with scores ranging from 0 (never adopted) to 3 (frequently adopted), indicating a wider range of coping strategies as the score increases. The Cronbach's α for negative coping is 0.78, while for positive coping it is 0.89. This scale demonstrates high reliability and validity.

2.4.4. Perceived Social Support Scale (PSSS)
The scale, initially developed by Huang [17] and later revised, consists of two dimensions (in-family support and out-of-family support) and twelve items. The scoring system ranges from 1 (strongly disagree) to 7 (strongly agree), with higher values indicating increased social support. The scale demonstrates a high degree of reliability and validity, as reflected by a Cronbach's α coefficient of 0.922.

2.4.5. Connor-davidsion Re-silience scale (CD-RISC)
The scale employed in this study was translated and revised by scholars Yu [19], this instrument is composed of three dimensions (tenacity, self-improvement, and optimism), encompassing 25 items, which are rated from 0 (never) to 4 (always). The total score ranges from 0 to 100, with higher scores indicating a higher level of mental resilience. The Cronbach's α coefficient for this scale was 0.91.

2.5. Data analysis

The analysis was conducted using SPSS 22.0 statistical software, incorporating descriptive statistics including frequency (n), proportion (%), and median M (P_{25}, P_{75}). Non-parametric tests, such as the Mann-Whitney U test and Kruskal-Wallis H test, were employed to examine the impact of demographic data on family resilience in patients with ischemic stroke. Spearman analysis was utilized to assess the correlation between variables and family resilience, while multiple stepwise regression analysis was employed to identify predictive factors for family resilience. A p-value less than 0.05 denotes statistical significance.

3. Results

3.1. Demographic characteristics

A total of 310 questionnaires were distributed, with 7 identified as containing errors, omissions, or losses. Of these, 303 valid questionnaires were collected, yielding an effective response rate of 97.74 %. The study participants consisted of 195 males (64.36 %), 108 females (35.64 %), 130 individuals aged≤60 (42.90 %), 120 aged 61–74 (39.60 %), 53 aged≥75 (17.50 %), and 54.46 % residing in rural areas. The educational attainment of the participants was primarily below primary school level (38.28 %), while the majority (38.28 %) reported a disease treatment duration of less than one week (Table 1).

3.2. Family resilience, SCSQ, PSSS and CD-RISC scores

The total score of the family resilience of 303 ischemic stroke patients varied between 87 and 245. The median (P_{25}, P_{75}) was 187 (160, 200), while the family belief score M(P_{25}, P_{75}) was 65 (56, 70) and the family strength score M(P_{25}, P_{75}) was 122 (103, 130). The highest scores were observed in the dimension of dilemma interpretation, while the lowest scores were recorded in the dimension of social support. The median(P_{25}, P_{75}) of the positive coping score was 19 (13, 24), and the median(P_{25}, P_{75}) of the negative coping score

was 7 (4, 9). Median (P_{25}, P_{75})values for in-family support and out-of-family support were 21 (20, 24) and 32 (24, 40), respectively. The median (P_{25}, P_{75}) values for resilience, self-reliance, and optimism were 23 (12, 32), 15 (8, 20), and 6 (4, 8), respectively (Table 2).

3.3. Correlation analysis

The findings revealed that patients with ischemic stroke exhibited significantly positive correlations among family resilience scores and dimensions associated with an simple coping style, positive coping, comprehension of social support, and psychological resilience ($P < 0.01$). However, no significant correlation was observed with negative coping ($P > 0.05$), See Table 3.

3.4. Predictors of family resilience

Based on a single-factor analysis, the independent variables significantly associated with family resilience include marital status, educational level, work status, family monthly income, place of residence, disease understanding, medical payment method, family economy, family relationship, and self-care abilities, as depicted in Table 1. Furthermore, the family resilience scores displayed a positive correlation with the SCSQ, PSSS, and CD-RISC scores, as illustrated in Table 3. Consequently, these variables were incorporated into a multiple stepwise regression model for family resilience. The results indicate that family relationship (β = 0.459, $P < 0.001$), active coping (β = 0.182, $P < 0.001$), out-of-family support (β = 0.156, $P < 0.001$), in-family support (β = 0.147, $P = 0.002$) and optimism (β = 0.108, $P = 0.013$) were significant predictors of family resilience (See Table 4).

4. Discussion

4.1. Principal findings

In this study, the family resilience score of patients with ischemic stroke was above the median level, consistent with the findings of Zhao [26]. Among the dimensions, dilemma interpretation scores highly. This may be attributed to the fact that when patients and their families encounter the traumatic event of an ischemic stroke, the experience tends to activate the family's resilience, mobilize its strengths, aid in reducing the psychological stress of patients, normalize the crisis, and facilitate the growth of the family. Consequently, the score for family dilemma interpretation in this study was relatively high. In contrast, the social support score ranked lowest, which differed from some previous results [27]. This may be attributed to the timing of our investigation, conducted within a few months following the onset of ischemic stroke, whereas Li's study was conducted within one year after diagnosing children with chronic kidney disease. It is important to note that family resilience is a dynamic process that can evolve as the disease progresses. Furthermore, post-stroke patients often experience limb dysfunction and significant changes in their familial and social roles, leading to impaired social skills and limited engagement in support networks, consequently resulting in lower scores for social support.

This study demonstrated a significant impact of family relationships on the level of family resilience in patients with ischemic stroke ($t = 11.745$, $P < 0.001$), which aligns with previous research conducted on families of individuals with spinal cord injury [28].

Table 2
Description of key variables in patients with ischemic stroke (n = 303).

Variable	Minimum	Maximum	M (P_{25} , P_{75})
Family resilience	87	245	187 (160 , 200)
Family belief	34	85	65 (56 , 70)
Dilemma interpretation	13	35	27 (24 , 29)
Positive forward looking	12	30	24 (21 , 26)
Life excellence	6	20	13 (11 , 16)
Family strength	53	160	122 (103 , 130)
Problem solving	10	30	24 (20 , 25)
Intimate harmony	6	20	16 (14 , 18)
Social support	4	20	12 (9 , 14)
Orderliness	5	15	12 (11 , 12)
Emotional sharing	4	20	15 (13 , 16)
Clear communication	7	25	19 (16 , 21)
Cooperation and coordination	9	30	24 (21 , 26)
Simple coping	4	60	25 (20 , 30)
Positive coping	1	36	19 (13 , 24)
Negative coping	0	24	7 (4 , 9)
Perceived social support	17	84	55 (45 , 64)
In- family support	8	28	21 (20 , 24)
Out-of-family support	8	56	32 (24 , 40)
Variable	Minimum	Maximum	M (P_{25} , P_{75})
psychological resilience	1	100	44 (26 , 60)
Tenacity	0	52	23 (12 , 32)
Self-improvement	1	32	15 (8 , 20)
Optimism	0	16	6 (4 , 8)

Table 3

Correlation between simple coping style, perceived social support, psychological resilience, and family resilience (n = 303) .

Variable	Family resilience	Family beliefs	Family strength
Simple coping	0.594**	0.580**	0.587**
Positive coping	0.645**	0.641**	0.626**
Negative coping	−0.042	−0.048	−0.032
Perceived social support	0.691**	0.655**	0.693**
In-family support	0.671**	0.637**	0.675**
Out-of-family support	0.634**	0.601**	0.636**
psychological resilience	0.613**	0.594**	0.597**
Tenacity	0.581**	0.567**	0.564**
Self-improvement	0.576**	0.561**	0.558**
Optimism	0.619**	0.586**	0.608**

*$P < 0.05$, **$P < 0.01$.

Table 4

Factors related to family resilience (n = 303) .

Variable	B	SE	β	t	P
Constant	71.000	4.806	–	14.773	0.000
Family relationship	19.934	1.697	0.459	11.745	0.000
Positive coping	0.757	0.194	0.182	3.906	0.000
Out-of-family support	0.494	0.138	0.156	3.575	0.000
In-family support	1.063	0.337	0.147	3.157	0.002
Optimism	1.000	0.399	0.108	2.505	0.013

$R^2 = 0.738$, adjusted$R^2 = 0.734$, $F = 167.513$, $P < 0.001$.

The concept of "human interaction" emphasizes the importance of fostering emotional bonds within the family during periods of mutual influence. According to research, the degree of intimacy in familial relationships significantly impacts the psychological resilience of individuals with traumatic brain injuries. The greater the level of intimacy within family relationships, the more robust an individual's psychological resilience becomes [29]. Following diagnosis, patients with ischemic stroke may experience short-term maladjustment, resulting in familial tension. It becomes imperative at this stage to mobilize the enthusiasm and support from family members by providing emotional, material, and informational assistance to alleviate patient helplessness and fear while promoting positive development within familial relations for achieving effective adjustment. Given that treatment and prognosis for ischemic stroke are long-term processes, it is recommended that medical professionals prioritize emotional guidance throughout treatment and actively leverage familial support to facilitate positive patient growth. Simultaneously, enhancing the self-healing capacity within families when faced with crises can be achieved through various means such as "multi-dimensional therapeutic care", "group family meetings", "family narrative co-construction", and "self-disclosure" [30], ultimately leading to an improved quality of life for patients.

Positive coping styles demonstrated a significant predictive effect on family resilience in multiple stepwise regression analysis ($t = 3.906$, $P < 0.001$). Notably, a higher propensity for patients with ischemic stroke to adopt positive coping styles corresponded to better family resilience, consistent with previous research on families of children with autism spectrum disorder [31]. Following an ischemic stroke, the patient's sense of self-efficacy is directly impacted. Employing a positive coping strategy to confront severe challenges can fortify family cohesion, facilitate patients and families in developing mindful thinking, guide family development in a positive trajectory, and enhance family resilience.

The findings indicate that social support (in-family and out-of-family support) significantly contribute to the resilience of patients with ischemic stroke, corroborating previous research [32]. Ischemic stroke represents a challenging situation for patients and their families, necessitating the activation of internal and external resources to effectively cope with the associated difficulties. The nature of family and social support is highly individualized, and the greater the sense of security in the face of an ischemic stroke, the more effectively the patient can manage the condition. Consequently, this support serves to mitigate individual and familial challenges, fostering adaptability and resilience.

To enhance stress adaptation, adopting an optimistic attitude aids individuals in effectively managing the threat posed by illness and regulating their physical and mental states promptly, thereby maintaining emotional stability. This study further validates a significant positive correlation between optimism and family resilience in ischemic stroke patients, with multiple stepwise regression analysis demonstrating that optimism serves as a crucial influencing factor of family resilience ($t = 2.505$, $P < 0.013$), consistent with the findings of Wang [33]. Our study reveals that certain patients embrace a positive and optimistic mindset towards their illness while exhibiting high confidence and expectations for disease recovery. This may be attributed to optimists perceiving the diagnosis of ischemic stroke as an opportunity for personal growth, actively seeking survival prospects, prioritizing emotional support from their families, fully mobilizing familial resources to provide psychological security and solace. Simultaneously, mutual positive affirmation among family members facing the disease together instills motivation within patients to progress forward and generates constructive emotions. These findings also prompt researchers to emphasize the perspective of "optimism" in patient psychological resilience; personal cognition can be adjusted through interventions such as "mindfulness-based stress reduction, psychological counseling, coping strategies" [34], alongside implementing suitable family support programs aimed at facilitating post-traumatic growth for both

patients and families.

4.2. Advantages

In this study, we observed a relatively high level of family resilience in patients with ischemic stroke, which contributes to a deeper understanding of the factors influencing family resilience. Furthermore, we examined the impact of psychological resilience on the family resilience of these patients. Our findings suggest that psychological interventions should be considered in future clinical research to enhance the resilience of patient families.

4.3. Limitations

This study presents several limitations. Firstly, it solely enrolled patients from three hospitals in a single region of Hunan Province, potentially limiting the generalizability of the sample. Secondly, the investigation was confined to the family resilience of ischemic stroke patients during hospitalization; however, this resilience may alter with the progression of treatment and the passage of time. Future longitudinal studies could be conducted to explore such changes in family resilience.

5. Conclusions

Patients with high family resilience demonstrated superior family relationship, effective positive coping strategies, increased support within and outside the family, and a more optimistic attitude; these factors independently predict family resilience.

Data avaiability statement

Data will be made available on request.

CRediT authorship contribution statement

Yanqiu Lu: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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