

# Relationships Between Care Burden, Resilience, and Depressive Symptoms Among the Main Family Caregivers of Stroke Patients: a Cross-sectional Study

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## Research Article

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# Abstract

## Background

Although studies indicate that resilience is related to care burden, and depressive symptoms, the underlying mechanism between those variables remains unknown. Thus, the present study aimed to explore the potential mediating role of resilience between care burden and depressive symptoms.

## Methods

A cross-sectional study was conducted with a convenience sample of 245 main family caregivers of stroke patients recruited from the neurology department of Tertiary A hospital of China. The self-designed demographic characteristics for patients and caregivers—Barthel Daily Living Activities Index (BDLAI)—Zarit Caregiver Burden Interview (ZBI)—Connor-Davidson Resilience Scale (CD-RISC), and Center for Epidemiological Studies Depression Scale (CES-D) were used for investigation. Structural equation modeling (SEM) was conducted to explore the relationships between care burden, resilience, and depressive symptoms among the main family caregivers of stroke patients

## Results

The average scores of care burden, resilience, and depressive symptoms for caregivers were  $43.89 \pm 13.40$ ,  $55.68 \pm 11.01$ , and  $22.33 \pm 9.85$ , respectively. Pearson correlation analysis results showed that the care burden was positively related to depressive symptoms ( $r = 0.578$ ,  $p < 0.01$ ), resilience was significantly negatively related to both care burden ( $r = -0.264$ ,  $p < 0.01$ ) and depressive symptoms ( $r = -0.697$ ,  $p < 0.01$ ). Structural equation models (SEM) analysis indicated that resilience partially mediated the relationship between care burden and depressive symptoms with the mediation effect ratio of 23.8%.

## Conclusions

Our study signifies that resilience plays a mediating role between care burden and depressive symptoms among the main family caregivers of stroke patients. This finding shows us that resilience can be a critical source to alleviate depressive symptoms.

## 1. Background

Stroke is recognized as one of the leading causes of adult disability and mortality worldwide<sup>[1, 2]</sup>, particularly in China<sup>[3]</sup>. Stroke survivors currently cope with significant physical, cognitive, and emotional impairments, and more than two-thirds of these survivors require help with normal daily activities<sup>[4]</sup>. However, due to the insufficient health care and economic burden of sports specialists (such as physical

therapists), most stroke survivors are cared for and assisted by their families after hospital discharge<sup>[5]</sup>. Family caregivers subsequently have reported experiencing difficulties in maintaining employment, financial, sleep, leisure activities<sup>[6]</sup> and socialization<sup>[7]</sup>, which can be detrimental to carers' quality of life, fatigue level, physical and mental health<sup>[8, 9]</sup>. The care burden is the physical, psychological, and social disruption related to the negative caring experience that was divided into objective and subjective components<sup>[10]</sup>. Studies have reported that 68.4% of the caregivers in China had a moderate burden and above<sup>[11]</sup>, rates that are higher than those reported among stroke patients<sup>[12, 13]</sup>. Previous research has shown that care burden in caregivers of stroke patients will increase over time<sup>[14]</sup> and even contribute to depression if the proper intervention is not provided<sup>[11]</sup>.

It reported that 53.9% of the caregivers of stroke patients in China have varying degrees of depressive symptoms<sup>[11]</sup>, which might be related to the care burden of family caregivers of stroke patients. Family caregivers are facing a tremendous financial burden, social pressure, and mental distress<sup>[15]</sup>. A study has shown that a high incidence of caregivers' negative emotions, including low satisfaction with leisure time<sup>[16]</sup>, loss of happiness, loneliness, frustration, and feelings of being prisoners in their own homes<sup>[17]</sup>. What is more, a heavy burden not only leads to caregivers' emotional exhaustion but also reduces the enthusiasm of caregivers and affects the quality of care provided<sup>[18]</sup>. However, not every caregiver who has care burden will experience depression, which emphasizes the importance of some protective factors, such as resilience. Resilience is defined as the ability to adapt well in the face of trauma or adversity<sup>[19]</sup>. Studies have shown that people with higher resilience would actively cope with adversity and quickly adapt to changes<sup>[20]</sup>. Some recent researches have also found that resilience partially serves as a mediator between negative life events and depressive symptoms<sup>[21, 22]</sup>. However, there is a dearth of evidence on mediating the care burden and depressive symptoms among family caregivers of stroke patients.

Based on the above literature studies, it can be seen that there is a correlation between care burden and depressive symptoms, and this relationship may be regulated by resilience. Therefore, we assume that the resilience of family caregivers of stroke patients is negatively correlated with both care burden and depressive symptoms, the care burden positively associated with depressive symptoms, and resilience mediated the relationship between care burden and depressive symptoms.

## 2. Methods

### 2.1 Study design and participants

The present study used a cross-sectional study, and a convenient sampling method. The participants were recruited from the Neurology department ward of a tertiary hospital in Shenyang, China from November 2020 to July 2021. Ethical counsel permit (Approval number: 2020-402) was approved by the Medical Ethical Committee of the First Affiliated Hospital of China Medical University, and informed

consent was received from each participant. Informed consent was also obtained from the participants under the Helsinki Accords.

Inclusion criteria were: 1) diagnosed as stroke by brain computed tomography angiography scan or magnetic resonance imaging; 2) the score of The Barthel Daily Living Activities Index  $\leq 95$ ; 3) caregivers were 18 years old and above; 4) the main caregiver was a family member of the patient; 5) who spent the longest time with patients per day; 6) unpaid care; 7) the care time was 3 months or more; 8) who voluntary participation in the study. The exclusion criteria were as follows: 1) The caregivers suffered from one or more stressful life events within 2 weeks (such as divorce, widowhood and loss of employment); 2) the caregiver had a serious physical illness, such as malignancy or intellectual-psychiatric problems; 3) incomplete investigation due to communication or reading and writing obstacles.

## 2.2 Data collection

From November 2020 to July 2021, all 250 questionnaires were collected with 245 questionnaires included in data analyses. Five questionnaires were missing data and excluded (valid response rate = 98%). Data collection was done by one trained researcher using self-reported questionnaires. The researcher explained the aims of the study to participants and informed them that the collected data will be kept confidential, and they had the right to refuse participation. If they agree to participate, they will sign a written informed consent. Questionnaires were completed independently and collected immediately, which took approximately 20-25 min to complete. Those who wished to terminate participation midway through the study were allowed to do so to avoid answering deviations related to forced participation.

## 2.3 Measurements

### 2.3.1 Demographic characteristics

The demographic data collected from the patients included gender, age, onset times, chronic disease, insurance, stroke subtypes, side of hemiplegia, and ability of self-care. The demographic data collected from the caregivers were gender, age, education status, monthly income, working status, relationship with the patient, chronic disease, living with patients, care time per day, and duration of care time.

### 2.3.2 Barthel Daily Living Activities Index (BDLAI)

The BDLAI was developed by Mahoney in 1965, has been used to assess self-care activities including eating, bathing, grooming, dressing, toilet use, transferring from bed to chair, walking, stair climbing, bowel continence, and urinary continence<sup>[23]</sup>. The scale has a total of 10 items and is scored based on a five-point Likert. The total scores ranges from 0 (total dependence) to 100 (total independence), with 0-20 points defining total dependence, 21-60 advanced level of dependence, 61-90 intermediate level of dependence, 91-95 mild level of dependence, and 95-100 total independence<sup>[23]</sup>. The validity and

reliability of this tool for use in the Chinese population of older people have been well-established<sup>[24]</sup>. In this study, Cronbach's alpha value was 0.869.

### **2.3.3 Zarit Caregiver Burden Interview (ZBI)**

We used the Chinese version of the ZBI scale<sup>[25]</sup>, which was designed to assess the stress experienced by family caregivers of older people<sup>[26]</sup>. The scale can be divided into two dimensions: role strain and personal strain<sup>[27]</sup>, is a 5-point Likert-type scale with scores from "0" to "4", never (0), seldom (1), sometimes (2) often (3), or almost always (4)<sup>[26]</sup>. The total score is from 0 to 88. The higher the total score, the higher the load. If the load is between 0 and 20 points, it implies little or no load; between 21 and 40, intermediate level of load; between 41 and 60, high level of load, and between 61 to 88 is rated as excessive load<sup>[26]</sup>. The Chinese version of ZBI has satisfactory psychometric properties<sup>[28]</sup>. In this study, Cronbach's alpha value was 0.934.

### **2.3.4 Connor-Davidson Resiliangence Scale (CD-RISC)**

The CD-RISC scale was originally developed by Connor and Davidson<sup>[29]</sup> and translated into Chinese by Yu and Zhang<sup>[30]</sup>, is one of the most widely used scales to measure resilience. The scale consists of 25-items, categorized into three factors-tenacity, strength, and optimism<sup>[31]</sup>, a 5-point Likert-type scale where 0 indicated "not true at all" and 4 "true nearly all the time" was designed to collect the data<sup>[29]</sup>. The total scores range from 0 to 100, a higher score indicated a higher level of resilience<sup>[29]</sup>. The Chinese version of CD-RISC showed good reliability and validity<sup>[31]</sup>. In this study, Cronbach's alpha value was 0.935.

### **2.3.5 Center for Epidemiological Survey Depression Scale (CES-D)**

We used the Chinese version of the CES-D scale, which was designed to evaluate the depressive symptoms and risk of having a disorder of a (non-psychiatric population) person<sup>[32]</sup>. It is a 20-items self-reported questionnaire, assesses four factors-depressed feelings, somatic complaints, positive feelings, and international relationships, takes a 4-point Likert scale, ranging from "rarely or none of the time" with 0 points to "most of the time" with 3 points<sup>[32]</sup>. The total score ranges from 0 to 60, those with scores  $\geq 16$  were considered to have an elevated level of depressive symptoms<sup>[32]</sup>. Furthermore, those who scored 16-23 and those who scored  $\geq 24$  were classified as "moderate" and "severe" cases of depressive symptomatology<sup>[33]</sup>. The Chinese version of CES-D has been widely used in China and has good reliability and validity<sup>[34]</sup>. In this study, Cronbach's alpha value was 0.945.

## **2.4 Statistical analysis**

Statistical analyses were conducted utilizing SPSS version 26.0. Normal distribution tests were verified by using Kolmogorov-Smirnov and Shapiro-Wilk statistics. Continuous variables were presented as mean and standard deviation (SD), whereas categorical variables were presented as frequency and percentages (%). Independent sample t-test or single-factor variance to identify differences in depression concerning

the characteristics of caregivers and stroke survivors. Pearson correlation analysis was used to explore the relationship between care burden, resilience, and depression. The structural equation modeling was used to determine the hypothetical mediation model and the relationship between variables was determined by using AMOS 26.0. A two-sided  $p < 0.05$  was considered statistically significant.

### 3. Results

#### 3.1 Participant characteristics and the relationship with depressive symptoms

As shown in Table 1, of stroke survivors, patients' ages ranged from 34 to 89 years (mean = 64.09, SD = 9.66), 66.53% were males and 90.20% needed help for daily activities. Of the caregivers, the ages ranged from 27 to 80 years (mean = 59.05, SD = 1.00), 78.78% were females and 75.10% were spouse. The Total Scores (BDLAI) was  $\geq 80$  (55.92%), 60-80 (24.49%), 40-60 (13.88%) and  $\leq 40$  (5.71%).

Moreover, there were significant differences in depressive symptoms according to patients' side of hemiplegia ( $F = 2.991, p = 0.032$ ), total score (BDLAI) ( $F = 10.175, p < 0.001$ ) and caregivers education status ( $F = 8.641, p < 0.001$ ), monthly income ( $F = 10.811, p < 0.001$ ), working status ( $F = 4.489, p = 0.012$ ), relationship with patients ( $F = 5.843, p < 0.001$ ), care time per day ( $F = 7.086, p < 0.001$ ), living with patients ( $F = 2.407, p = 0.017$ ).

#### 3.2 Correlations between care burden, resilience and depressive symptoms

Pearson's correlation analysis results (shown in Table 2) revealed that care burden was positively associated with depressive symptoms ( $r = 0.578, p < 0.01$ ), whereas resilience was negatively associated with care burden ( $r = -0.264, p < 0.01$ ) and depressive symptoms ( $r = -0.697, p < 0.01$ ).

#### 3.3 Multivariate linear regression analysis of the factors

Regression analyses indicated that in the first step, care burden positively predicted depressive symptoms ( $\beta = 0.578, p < 0.01$  Table 3). In the second step, care burden negatively predicted resilience ( $\beta = -0.264, p < 0.001$ ). In the third step, care burden ( $\beta = 0.424, p < 0.001$ ) and resilience ( $\beta = -0.585, p < 0.001$ ) positively predicted depressive symptoms. The results meant that resilience probably mediated the relation between care burden and depressive symptoms partially.

#### 3.4 Mediating effect of resilience

A structural equation model (SEM) was conducted to examine the mediating effect of resilience on care burden and depressive symptoms. A model was established with care burden as the independent variable, depressive symptoms as the dependent variable, and perceived resilience as the mediating variable. The path diagram and the path coefficient between the variables were shown in Figure 1. The model fitting index showed that  $\chi^2/df = 1.589$ , the RMSEA = 0.049, the SRMR = 0.036 and the CFI, GFI, NFI

and RFI values were higher than 0.900 (CFI = 0.990, GFI = 0.967, NFI = 0.975, RFI = 0.962). Indicating that the model had a good fit, as shown in Table 4. The path coefficients of care burden and depressive symptoms ( $\beta = 0.522, p < 0.001$ ), care burden and resilience ( $\beta = -0.341, p < 0.001$ ), and resilience and depressive symptoms ( $\beta = -0.478, p < 0.001$ ) were all statistically significant.

We used Bootstrap estimation procedures to explore the stability of the mediation variables. We adopted the method of random sampling to extract 5000 Bootstrap samples from the original data ( $N = 245$ ). The results showed that the total effect of care burden on depressive symptoms was 0.685 [95%CI (0.538-0.839,  $p < 0.001$ )], the direct effect was 0.522 [95%CI (0.399-0.651,  $p < 0.001$ )] and the indirect effect was 0.163 [95%CI (0.053-0.266,  $p < 0.01$ )], as shown in Table 5. The 95% confidence interval does not contain 0, indicating that resilience had a mediating role between care burden and depressive symptoms, and the mediating contribution rate was 23.80% (0.163/0.685).

## 4. Discussion

The study sought to explain the relationship between care burden and depressive symptoms based on Kumpfer's resilience model. Firstly, our findings showed that the mean score of depressive symptoms value was  $22.33 \pm 9.85$ , which was higher compared with the level of care burden reported in a study using the same tool among caregivers of patients with other diseases<sup>[35, 36]</sup>. The difference might be since a long disease duration and residual disability among stroke patients are likely more reliant on their family caregivers<sup>[37]</sup>.

In our sample of caregivers, depressive symptoms were related to patients, side of hemiplegia, BDIAI and caregivers' education status, monthly income, working status, relationship with patients, care time per day, and living with patients. Patients with hemiplegia are associated with self-care abilities<sup>[38]</sup>, which inevitably disrupt the normal life of the caregivers and further develop negative emotions<sup>[18]</sup>. Similar to the previous study<sup>[39]</sup>, we found that caregivers with a higher level of education tend to experience fewer depressive symptoms, which may be due to better ways to insight into illness and seek help, resulting in lesser depression<sup>[40]</sup>. Unemployed people and lower-income families experience more depressive symptoms. It is well known that limited economic resources increase the burden of maintaining daily life and paying for health services. In addition, family caregivers who spent a long time on caregiving were associated with higher depression. It was assumed that the longer time spent, the more disruptions they experience in their normal social routines, which in turn causes more stress<sup>[41]</sup>. In our study, there was a trend that the levels of depression declined, starting from parents, spouses, and moving on to offspring, siblings. Perhaps because those parents are disposed to make sacrifices in taking care of children, making them especially susceptible. Another reason may be that older people are more vulnerable to most kinds of chronic diseases. Contrary to this finding, some studies stated that spouses reported more depressive symptoms<sup>[42, 43]</sup>, which may be because those spouses are overwhelmed by conflicting demands such as work, children, and household chores<sup>[5]</sup>. Thus, early and ongoing assessment of

influencing factors mentioned above for caregivers could be helpful to meet caregivers' mental health needs.

Our findings demonstrate that the care burden had a direct effect on the depressive symptoms of main family caregivers. The direct effect can be explained by the features of the stroke itself. Specifically, due to the chronicity of stroke and the loss of limb function, family caregivers get insufficient time for sleep, socialization, and mental relaxation<sup>[44]</sup>, sometimes feel desperate and hopeless when caring for a relative living with stroke, which inevitably develops negative emotion and further suffers from depression<sup>[11]</sup>. Hence the more care burden, the heavier depressive symptoms family caregivers may perceive. Also, our findings showed that the mean score of care burden value was  $43.89 \pm 13.40$ , which was significantly higher than that of caregivers of patients with other diseases<sup>[45, 46]</sup>. The difference might be since that chronic course of and having some residual symptoms among stroke patients has a greater burden on caregivers<sup>[47]</sup>.

Notably, our results showed that resilience could partly mediate the relationship between care burden and depressive symptoms. One possible explanation may be that people with a lower level of resilience tend to negatively confront adversity in unhealthy ways, such as mood disturbances, persisting fatigue, sleep changes<sup>[48]</sup>. Specifically, the psychobiological mechanisms underlying resilience has shown that resilience had a relation to neurochemical, neuropeptide, and hormonal when the response to stressful things<sup>[49, 50]</sup>, people with higher resilience tend to reduce psychobiological allostatic load, balance neural systems, which could maintain normal psychological function and thus can confront stress actively<sup>[51]</sup>. Besides, individuals with higher resilience are better at coping with stressful events, they tend to make active attempts to adjust the relationship between the environment and individuals, make full use of various resources, and achieve a good state of adaptation<sup>[52, 53]</sup>. Therefore, resilience seemed to be one of the possible mechanisms to resist mental disorders who exposure to care burden, which confirmed Kumpfer's resilience model. Resilience is a dynamic phenomenon that can be altered at any moment<sup>[54]</sup>. Hence, it is possible to alleviate the depressive symptoms of caregivers via promoting the level of resilience. Specifically, social support is one of the important sources for the development of resilience, which may ultimately help lessen depressive symptoms<sup>[55]</sup>. Self-compassion and mindfulness training are also related to higher resilience<sup>[56]</sup>. Moreover, some research has shown that love for family, feeling responsible toward the family<sup>[57]</sup>, ability to analyze the current situation, and capability to establish relationships<sup>[58]</sup> are some of the motivations for resilience. Similarly, care burden is related to mental health. We should assess the situation of care burden of caregivers, screen for its main influencing factors, and take effective programs such as social and financial support<sup>[59]</sup>, increased post-traumatic, better patient-caregiver relationships, growth improvement in the competence and self-esteem of caregivers<sup>[60]</sup>. Overall, the sources of strength can provide intervention targets for promoting resilience and care burden, and thus alleviate the depressive symptoms .

## Limitations and future research

This study had several potential limitations. First, this study is a cross-sectional study, and it is difficult to determine the causal connections between the variables. Therefore, future studies can use longitudinal research to explore the causal relationship between variables. Second, we used a self-rating questionnaire for screening depression instead of a clinical diagnosis from psychiatrists. Irrespective, the instrument is a validated depression screening tool. Finally, our study focused only on the association between care burden, resilience, and depression. Further investigation needs to be taken into consideration to explore other social psychology and emotional predictors for the level of depression in caregivers of stroke survivors, such as society, family environment factors, and so on.

## **Conclusion**

This study explored the relationship between care burden, resilience, and depressive symptoms among the main family caregivers of stroke patients. The results showed that care burden was positively correlated with depressive symptoms, and caregivers with high care burden can alleviate depressive symptoms under the mediating influence of resilience. Thus, health professionals need to promptly assess the situation of caregivers' mental health, to alleviate the depressive symptoms through further strengthening resilience is critical.

## **Abbreviations**

BDLAI	Barthel Daily Living Activities Index
ZBI	Zarit Caregiver Burden Interview
CD-RISC	Connor-Davidson Resilience Scale
CES-D	Center for Epidemiological Studies Depression Scale
SEM	Structural Equation Modeling
SD	Standard Deviation
B	Non-Standardized Coefficient
SE	Standard Error
CI	Confidence Interval
DF	Degree of Freedom
RMSEA	Root-mean-square Error of Approximation
SRMR	Standardized root-mean-square Residual
GFI	Goodness-of-Fit Index
CFI	Comparative Fit Index
NFI	Normed Fit Index
RFI	Relative Fit Index

## Declarations

### Ethics approval and consent to participate

Ethical counsel permit (Approval number: 2020-402) was approved by the Medical Ethical Committee of the First Affiliated Hospital of China Medical University, and informed consent was received from each participant. All procedures performed in the study involving human participants were in accordance with the ethical standards of the hospital, national research committee, and the 1964 Helsinki declaration (as revised in Brazil 2013).

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### Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

### Competing interests

The authors declare that they have no competing interests.

### Consent for publication

Not applicable

### Authors' contributions

LLF and JZ conceptualized and designed the study. LLF collected the data. LLF and MYD analyzed the data and JZ reviewed the analyses. FLL prepared figure 1 and tables 1-5. FLL and MYD drafted the initial version of the manuscript. All authors contributed to revising, editing, and finalizing the manuscript. All authors read and approved the final manuscript.

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## References

1. RAJSIC S, GOTHE H, BORBA H H, et al. Economic burden of stroke: a systematic review on post-stroke care. *Eur J Health Econ.* 2019; 20(1): 107-34.<https://doi.org/10.1007/s10198-018-0984-0>.
2. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet.* 2020; 396(10258): 1204-22.[https://doi.org/10.1016/S0140-6736\(20\)30925-9](https://doi.org/10.1016/S0140-6736(20)30925-9).
3. KRISHNAMURTHI R V, IKEDA T, FEIGIN V L. Global, Regional and Country-Specific Burden of Ischaemic Stroke, Intracerebral Haemorrhage and Subarachnoid Haemorrhage: A Systematic Analysis of the Global Burden of Disease Study 2017. *Neuroepidemiology.* 2020; 54(2): 171-9.<https://doi.org/10.1159/000506396>.
4. WINSTEIN C J, STEIN J, ARENA R, et al. Guidelines for Adult Stroke Rehabilitation and Recovery: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke.* 2016; 47(6): e98-e169.<https://doi.org/10.1161/STR.0000000000000098>.
5. LU Q, MÅRTENSSON J, ZHAO Y, et al. Living on the edge: Family caregivers' experiences of caring for post-stroke family members in China: A qualitative study. *Int J Nurs Stud.* 2019; 94(1-8).<https://doi.org/10.1016/j.ijnurstu.2019.02.016>.

6. CARO C C, COSTA J D, DA CRUZ D M C. Burden and Quality of Life of Family Caregivers of Stroke Patients. *Occup Ther Health Care*. 2018; 32(2): 154-71.<https://doi.org/10.1080/07380577.2018.1449046>.
7. BATUECAS-CALETRÍO J, RODRÍGUEZ-MARTÍN B. Family and personal coping process after a haemorrhagic stroke, a life-history. *Current Psychology*. 2020; <https://doi.org/10.1007/s12144-020-01204-2>.
8. KRUIHOF W J, POST M W, VAN MIERLO M L, et al. Caregiver burden and emotional problems in partners of stroke patients at two months and one year post-stroke: Determinants and prediction. *Patient Educ Couns*. 2016; 99(10): 1632-40.<https://doi.org/10.1016/j.pec.2016.04.007>.
9. ALBAYRAK I, BIBER A, ÇALIŞKAN A, et al. Assessment of pain, care burden, depression level, sleep quality, fatigue and quality of life in the mothers of children with cerebral palsy. *J Child Health Care*. 2019; 23(3): 483-94.<https://doi.org/10.1177/1367493519864751>.
10. CASERTA M S, LUND D A, WRIGHT S D. Exploring the Caregiver Burden Inventory (CBI): further evidence for a multidimensional view of burden. *Int J Aging Hum Dev*. 1996; 43(1): 21-34.<https://doi.org/10.2190/2dkf-292p-a53w-w0a8>.
11. HU P, YANG Q, KONG L, et al. Relationship between the anxiety/depression and care burden of the major caregiver of stroke patients. *Medicine (Baltimore)*. 2018; 97(40): e12638.<https://doi.org/10.1097/md.00000000000012638>.
12. OGUNLADE A O, WILLIAMS S K, JOSEPH J, et al. Prevalence and correlates of depression among black and Latino stroke survivors with uncontrolled hypertension: a cross-sectional study. *BMJ Open*. 2020; 10(12): e040461.<https://doi.org/10.1136/bmjopen-2020-040461>.
13. TSEHAYNEH F, TAFESSE A. High Prevalence of Poststroke Depression in Ischemic Stroke Patients in Ethiopia. *Neurol Res Int*. 2020; 2020(8834299).<https://doi.org/10.1155/2020/8834299>.
14. KIM E Y, YEOM H E. Influence of home care services on caregivers' burden and satisfaction. *J Clin Nurs*. 2016; 25(11-12): 1683-92.<https://doi.org/10.1111/jocn.13188>.
15. ASHGHALI FARAHANI M, NAJAFI GHEZELJEH T, HAGHANI S, et al. The effect of a supportive home care program on caregiver burden with stroke patients in Iran: an experimental study. *BMC Health Serv Res*. 2021; 21(1): 346.<https://doi.org/10.1186/s12913-021-06340-4>.
16. PENDERGRASS A, HAUTZINGER M, ELLIOTT T R, et al. Family caregiver adjustment and stroke survivor impairment: A path analytic model. *Rehabil Psychol*. 2017; 62(2): 81-8.<https://doi.org/10.1037/rep0000118>.
17. SEAL K, MURRAY C D, SEDDON L. The experience of being an informal "carer" for a person with cancer: a meta-synthesis of qualitative studies. *Palliat Support Care*. 2015; 13(3): 493-504.<https://doi.org/10.1017/s1478951513001132>.
18. AN Y, FU G, YUAN G. Quality of Life in Patients With Breast Cancer: The Influence of Family Caregiver's Burden and the Mediation of Patient's Anxiety and Depression. *J Nerv Ment Dis*. 2019; 207(11): 921-6.<https://doi.org/10.1097/nmd.0000000000001040>.

19. LUTHA S S, CICCHETTI D. The construct of resilience: implications for interventions and social policies. *Dev Psychopathol.* 2000; 12(4): 857-85.<https://doi.org/10.1017/s0954579400004156>.
20. SHEERIN C M, LIND M J, BROWN E A, et al. The impact of resilience and subsequent stressful life events on MDD and GAD. *Depress Anxiety.* 2018; 35(2): 140-7.<https://doi.org/10.1002/da.22700>.
21. CATABAY C J, STOCKMAN J K, CAMPBELL J C, et al. Perceived stress and mental health: The mediating roles of social support and resilience among black women exposed to sexual violence. *J Affect Disord.* 2019; 259(143-9).<https://doi.org/10.1016/j.jad.2019.08.037>.
22. KOKOU-KPOLOU C K, JUMAGELDINOV A, PARK S, et al. Prevalence of Depressive Symptoms and Associated Psychosocial Risk Factors among French University Students: the Moderating and Mediating Effects of Resilience. *Psychiatr Q.* 2021; 92(2): 443-57.<https://doi.org/10.1007/s11126-020-09812-8>.
23. MAHONEY F I, BARTHEL D W. Functional evaluation: the Barthel index *Md State Med J.* 1965; 14(61-5).
24. LEUNG S O, CHAN C C, SHAH S. Development of a Chinese version of the Modified Barthel Index—validity and reliability. *Clin Rehabil.* 2007; 21(10): 912-22.<https://doi.org/10.1177/0269215507077286>.
25. WANG L, YANG X, HOU Z. Application and evaluation of Chinese version of zarit caregiver burden interview. *CHINESE JOURNAL OF PUBLIC HEALTH-SHENYANG-*. 2006; 22(8): 970.
26. ZARIT S H, REEVER K E, BACH-PETERSON J. Relatives of the impaired elderly: correlates of feelings of burden. *Gerontologist.* 1980; 20(6): 649-55.<https://doi.org/10.1093/geront/20.6.649>.
27. ZARIT S H, ZARIT J M. The memory and behavior problems checklist and the burden interview [M]. Gerontology Center, The Pennsylvania State University, 1990.
28. LIN C Y, WANG J D, PAI M C, et al. Measuring burden in dementia caregivers: Confirmatory factor analysis for short forms of the Zarit Burden Interview. *Arch Gerontol Geriatr.* 2017; 68(8-13).<https://doi.org/10.1016/j.archger.2016.08.005>.
29. CONNOR K M, DAVIDSON J R. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety.* 2003; 18(2): 76-82.<https://doi.org/10.1002/da.10113>.
30. YU X, ZHANG J. Factor analysis and psychometric evaluation of the Connor-Davidson Resilience Scale (CD-RISC) with Chinese people. *Social Behavior and Personality: an international journal.* 2007; 35(1): 19-30.
31. WU L, TAN Y, LIU Y. Factor structure and psychometric evaluation of the Connor-Davidson resilience scale in a new employee population of China. *BMC Psychiatry.* 2017; 17(1): 49.<https://doi.org/10.1186/s12888-017-1219-0>.
32. RADLOFF L S. The CES-D scale: A self-report depression scale for research in the general population. *Applied psychological measurement.* 1977; 1(3): 385-401.
33. RUSHTON J L, FORCIER M, SCHECTMAN R M. Epidemiology of depressive symptoms in the National Longitudinal Study of Adolescent Health. *J Am Acad Child Adolesc Psychiatry.* 2002; 41(2): 199-205.<https://doi.org/10.1097/00004583-200202000-00014>.

34. JIANG L, WANG Y, ZHANG Y, et al. The Reliability and Validity of the Center for Epidemiologic Studies Depression Scale (CES-D) for Chinese University Students. *Front Psychiatry*. 2019; 10(315).<https://doi.org/10.3389/fpsy.2019.00315>.
35. SEEHER K, LOW L F, REPPERMUND S, et al. Predictors and outcomes for caregivers of people with mild cognitive impairment: a systematic literature review. *Alzheimers Dement*. 2013; 9(3): 346-55.<https://doi.org/10.1016/j.jalz.2012.01.012>.
36. JUN W H, CHA K S, LEE K L. The Mediating Effect of Depression on the Relationship between Social Support, Spirituality and Burnout in Family Members of Patients with Cancer. *Int J Environ Res Public Health*. 2021; 18(4): <https://doi.org/10.3390/ijerph18041727>.
37. BAUMANN M, LURBE-PUERTO K, ALZAHOURI K, et al. Increased residual disability among poststroke survivors and the repercussions for the lives of informal caregivers. *Top Stroke Rehabil*. 2011; 18(2): 162-71.<https://doi.org/10.1310/tsr1802-162>.
38. FUJITA T, IOKAWA K, SONE T, et al. Effects of the Interaction among Motor Functions on Self-care in Individuals with Stroke. *J Stroke Cerebrovasc Dis*. 2019; 28(11): 104387.<https://doi.org/10.1016/j.jstrokecerebrovasdis.2019.104387>.
39. KHALIL A, FAHEEM M, FAHIM A, et al. Prevalence of Depression and Anxiety amongst Cancer Patients in a Hospital Setting: A Cross-Sectional Study. *Psychiatry J*. 2016; 2016(3964806).<https://doi.org/10.1155/2016/3964806>.
40. PUCCIARELLI G, LYONS K S, PETRIZZO A, et al. Protective Role of Caregiver Preparedness on the Relationship Between Depression and Quality of Life in Stroke Dyads. *Stroke*. 2021; Strokeaha120034029.<https://doi.org/10.1161/strokeaha.120.034029>.
41. LOPEZ V, COPP G, MOLASSIOTIS A. Male caregivers of patients with breast and gynecologic cancer: experiences from caring for their spouses and partners. *Cancer Nurs*. 2012; 35(6): 402-10.<https://doi.org/10.1097/NCC.0b013e318231daf0>.
42. LI Q, LIN Y, XU Y, et al. The impact of depression and anxiety on quality of life in Chinese cancer patient-family caregiver dyads, a cross-sectional study. *Health Qual Life Outcomes*. 2018; 16(1): 230.<https://doi.org/10.1186/s12955-018-1051-3>.
43. GÖTZE H, BRÄHLER E, GANSERA L, et al. Anxiety, depression and quality of life in family caregivers of palliative cancer patients during home care and after the patient's death. *Eur J Cancer Care (Engl)*. 2018; 27(2): e12606.<https://doi.org/10.1111/ecc.12606>.
44. GBIRI C A, OLAWALE O A, ISAAC S O. Stroke management: Informal caregivers' burdens and strains of caring for stroke survivors. *Ann Phys Rehabil Med*. 2015; 58(2): 98-103.<https://doi.org/10.1016/j.rehab.2014.09.017>.
45. ÖZMEN S, YURTTAŞ A. Determination of Care Burden of Caregivers of Patients with Multiple Sclerosis in Turkey. *Behav Neurol*. 2018; 2018(7205046).<https://doi.org/10.1155/2018/7205046>.
46. GÖRİŞ S, KLÇ Z, ELMAL F, et al. Care Burden and Social Support Levels of Caregivers of Patients with Chronic Obstructive Pulmonary Disease. *Holist Nurs Pract*. 2016; 30(4): 227-35.<https://doi.org/10.1097/hnp.000000000000153>.

47. IFEJIKAN L, VAHIDY F, ARAMBURO-MALDONADO L A, et al. Acute Intravenous Tissue Plasminogen Activator Therapy does not Impact Community Discharge after Inpatient Rehabilitation. *Int J Neurorehabil.* 2015; 2(4):
48. DINI M, POLETTI B, TAGINI S, et al. Resilience, Psychological Well-Being and Daily Functioning Following Hospitalization for Respiratory Distress Due to SARS-CoV-2 Infection. *Healthcare (Basel).* 2021; 9(9): <https://doi.org/10.3390/healthcare9091161>.
49. CURTIS W J, CICCHETTI D. Emotion and resilience: a multilevel investigation of hemispheric electroencephalogram asymmetry and emotion regulation in maltreated and nonmaltreated children. *Dev Psychopathol.* 2007; 19(3): 811-40. <https://doi.org/10.1017/s0954579407000405>.
50. MASTEN A S. Ordinary magic. Resilience processes in development. *Am Psychol.* 2001; 56(3): 227-38. <https://doi.org/10.1037//0003-066x.56.3.227>.
51. CHARNEY D S. Psychobiological mechanisms of resilience and vulnerability: implications for successful adaptation to extreme stress. *Am J Psychiatry.* 2004; 161(2): 195-216. <https://doi.org/10.1176/appi.ajp.161.2.195>.
52. LI J, CHEN Y P, ZHANG J, et al. The Mediating Role of Resilience and Self-Esteem Between Life Events and Coping Styles Among Rural Left-Behind Adolescents in China: A Cross-Sectional Study. *Front Psychiatry.* 2020; 11(560556). <https://doi.org/10.3389/fpsy.2020.560556>.
53. MASTEN A S. Resilience in developing systems: progress and promise as the fourth wave rises. *Dev Psychopathol.* 2007; 19(3): 921-30. <https://doi.org/10.1017/s0954579407000442>.
54. WAUGH C E, KOSTER E H. A resilience framework for promoting stable remission from depression. *Clin Psychol Rev.* 2015; 41(49-60). <https://doi.org/10.1016/j.cpr.2014.05.004>.
55. MACKENZIE C, KELLY S, PATON G, et al. The Living with Dysarthria group for post-stroke dysarthria: the participant voice. *Int J Lang Commun Disord.* 2013; 48(4): 402-20. <https://doi.org/10.1111/1460-6984.12017>.
56. OLSON K, KEMPER K J, MAHAN J D. What factors promote resilience and protect against burnout in first-year pediatric and medicine-pediatric residents? *J Evid Based Complementary Altern Med.* 2015; 20(3): 192-8. <https://doi.org/10.1177/2156587214568894>.
57. HASSANI P, IZADI-AVANJI F S, RAKHSHAN M, et al. A phenomenological study on resilience of the elderly suffering from chronic disease: a qualitative study. *Psychol Res Behav Manag.* 2017; 10(59-67). <https://doi.org/10.2147/prbm.S121336>.
58. JANSSEN B M, VAN REGENMORTELT, ABMA T A. Identifying sources of strength: resilience from the perspective of older people receiving long-term community care. *Eur J Ageing.* 2011; 8(3): 145-56. <https://doi.org/10.1007/s10433-011-0190-8>.
59. CHULUUNBAATAR E, PU C, CHOU Y J. Changes in caregiver burden among informal caregivers of stroke patients in Mongolia. *Top Stroke Rehabil.* 2017; 24(4): 314-21. <https://doi.org/10.1080/10749357.2016.1277479>.
60. PETURSDOTTIR A B, SVAVARSDOTTIR E K. The effectiveness of a strengths-oriented therapeutic conversation intervention on perceived support, well-being and burden among family caregivers in

# Tables

**Table1 Descriptive statistics for demographic characteristics and differences in depressive symptoms (N=245)**

Variable	N	%	Depressive symptoms	
			<i>M±SD</i>	<i>F or t</i> [P]
<b>Patients</b>				
Gender				1.398 (0.163)
Male	163	66.53	22.96±10.21	
Female	82	33.47	21.10±9.01	
Age(years)				1.796 (0.149)
<55	45	18.37	23.71±11.45	
55-64	70	28.57	23.79±9.42	
65-74	105	42.86	21.46±9.71	
≥75	24	9.80	19.48±7.74	
Onset times				0.760 (0.518)
1	23	9.39	19.83±8.68	
2	169	68.98	22.53±9.85	
3	35	14.29	22.06±9.93	
>3	18	7.35	24.28±11.17	
Number of Chronic diseases				0.847 (0.469)
None	31	12.65	23.48±9.56	
1	115	46.94	22.34±9.17	
2	73	29.80	21.14±10.33	
≥3	26	10.61	24.31±11.64	
Health insurance				-0.781 (0.436)
Yes	232	94.69	22.22±9.94	
No	12	4.90	24.50±7.79	
Stroke subtypes				1.210 (0.300)
Ischemic stroke	204	83.33	22.40±10.14	
Hemorrhagic stroke	18	7.35	24.72±8.24	
Both	23	9.39	20.00±8.06	
Side of Hemiplegia				2.991 (0.032)

Variable	N	%	Depressive symptoms	
			<i>M</i> ± <i>SD</i>	<i>F</i> or <i>t</i> (P)
None	11	4.49	20.64±10.24	
Left	108	44.08	21.22±9.14	
Right	74	30.20	21.72±10.34	
Both	52	21.22	25.88±9.91	
Ability of self-care				0.504 (0.605)
Total independence	5	2.04	24.60±9.34	
Relative dependence	221	90.20	22.45±9.85	
Total dependence	19	7.76	20.42±10.19	
<b>Caregivers</b>				
Gender				-0.752 (0.453)
Males	52	21.22	21.42±8.82	
Females	193	78.78	22.58±10.11	
Age				0.231 (0.875)
<55	83	33.88	21.96±9.59	
55-64	77	31.43	22.36±9.50	
65-74	71	28.98	23.00±10.89	
≥75	14	5.71	21.00±8.21	
Education status				8.641 (<0.001)
Primary school at most	50	20.41	27.08±10.46	
Junior high school	80	32.65	23.63±9.42	
High school/Technical school	80	32.65	19.71±8.19	
College and above	35	14.29	18.60±10.42	
Monthly income				10.811 (<0.001)
≤2500	58	23.67	27.93±10.14	
2500-3500	93	37.96	21.72±8.76	
3500-4500	70	28.57	20.33±9.17	
>4500	24	9.80	17.04±9.61	

Variable	N	%	Depressive symptoms	
			M±SD	F or t (P)
Working status				4.489 (0.012)
Employed	91	37.14	22.54±9.60	
Unemployed	60	24.49	25.10±10.87	
Retired	93	37.96	20.32±8.99	
Relationship with patient				5.843 (0.001)
Spouse	184	75.10	22.55±9.58	
Offspring	52	21.22	20.31±9.48	
Parents	5	2.04	38.60±10.90	
Sibling	4	1.63	18.50±7.94	
Duration of care time(month)				0.677 (0.567)
3-6	89	36.33	21.34±9.68	
6-12	45	18.37	22.58±8.50	
12-36	52	21.22	22.31±9.96	
≥36	59	24.08	23.68±10.96	
Care time per day(hours)				7.086 (<0.001)
≤4	102	41.63	19.30±7.54	
4-8	98	40.00	23.53±10.16	
8-16	34	13.88	26.21±11.79	
≥16	11	4.49	27.82±11.75	
Living with patients				2.407 (0.017)
Yes	232	94.69	22.69±9.78	
No	13	5.31	16.00±9.22	
Number of Chronic diseases				0.506 (0.679)
None	136	55.51	21.67±9.52	
1	89	36.33	23.03±10.17	
2	17	6.94	23.94±9.50	
≥3	3	1.22	22.67±19.14	

Variable	N	%	Depressive symptoms	
			M±SD	F or t [P]
Total Scores (BDLAI)				10.175 (<0.001)
≤40	14	5.71	26.71±7.27	
40-60	34	13.88	27.88±12.24	
60-80	60	24.49	24.52±11.10	
≥80	137	55.92	19.55±7.71	

Note: SD, standard deviation; BDLAI, The Barthel Daily Living Activities Index.

**Table2 Correlations between care burden, resilience, and depressive symptoms**

Variable	M±SD	1	2	3
1.care burden	43.89±13.40	-		
2.resilience	55.68±11.01	-0.264**	-	
3.depressive symptoms	22.33±9.85	0.578**	-0.697**	-

\*\*  $P < 0.01$ .

**Table3 The multiple linear regression models among relevant variables**

Variable	Step1		step2		step3	
	$\beta$	SE	$\beta$	SE	$\beta$	SE
Care burden	0.578***	0.052	-0.264***	0.062	0.424***	0.039
Resilience					-0.585***	0.046
$R^2$	0.335		0.070		0.653	
F	122.127***		18.152***		227.787***	

\*\*\*  $P < 0.001$ .

**Table4 Correlation matrix for care burden, resilience, and depressive symptoms (N=245)**

	$\chi^2$	df	$\chi^2/df$	RMSEA	SRMR	CFI	GFI	NFI	RFI
Model	38.135	24	1.589	0.049	0.036	0.990	0.967	0.975	0.962

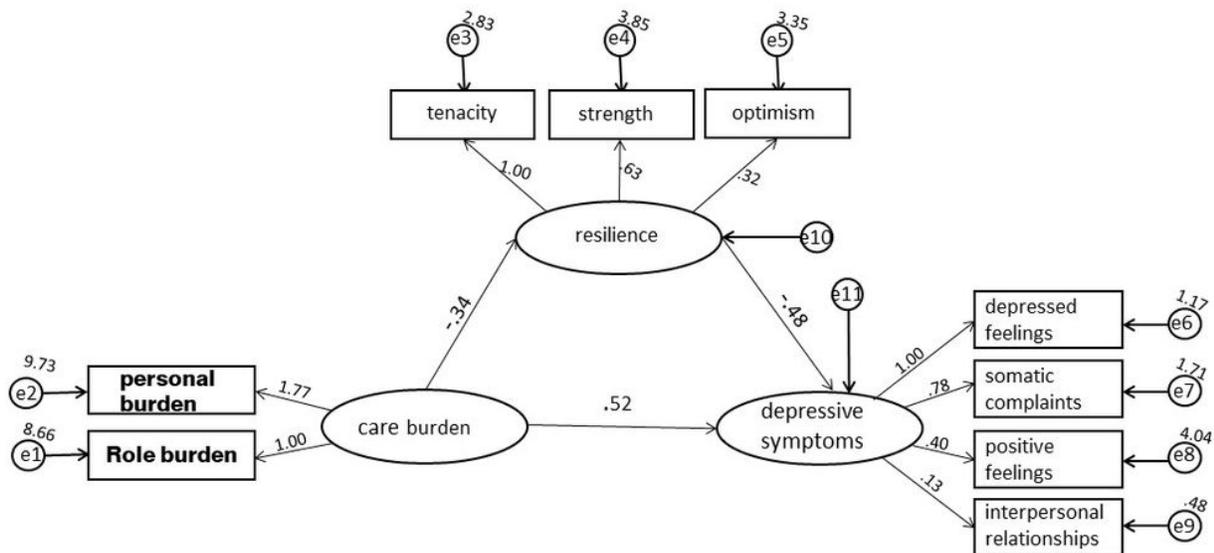
Note: DF, degree of freedom; RMSEA, root-mean-square error of approximation; SRMR, standardized root-mean-square residual; CFI, comparative fit index; GFI, goodness-of-fit index; NFI, normed Fit Index; RFI, relative fit index.

**Table 5 Bootstrap analysis of mediation effect significance test (N=245)**

Effect	<i>B</i>	<i>SE</i>	95% <i>CI</i>	<i>P</i>
<i>Indirect effect</i>	0.163	0.054	0.053-0.266	0.004
<i>Direct effect</i>	0.522	0.064	0.399-0.651	<0.001
<i>Total effect</i>	0.685	0.077	0.538-0.839	<0.001

Note: 5000 bootstrap samples; *B*, non-standardized coefficient; *SE*, standard error; *CI*, confidence interval.

## Figures



**Figure 1**

Mediating model of risk perception between care burden and depressive symptoms