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Incidence and Influencing Factors of Anxiety and Depression in Individuals with Acute Ischemic Stroke: A Retrospective Study

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Abstract

Background: Acute ischemic stroke (AIS) is the most common type of stroke in clinical practice, and individuals with stroke are more prone to psychological disorders than healthy individuals. This study aims to explore the incidence of anxiety and depression and related influencing factors in individuals with AIS.

Methods: In brief, 680 individuals with AIS admitted to Chun'an County First People's Hospital from January 2021 to January 2023 were selected as the research subjects, and their clinical data were retrospectively analyzed. All patients were evaluated with the Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) to observe the occurrence of anxiety and depression, and single-factor and multi-factor logistic regression were used to analyze the influencing factors of anxiety and depression.

Results: Among the 680 individuals with AIS, there were 63 cases of mild anxiety (9.26%), 25 cases of moderate anxiety (3.68%), and 8 cases of severe anxiety (1.18%), with a total of 96 cases (14.12%) with anxiety symptoms. Additionally, there were 74 cases of mild depression (10.88%), 28 cases of moderate depression (4.12%), and 10 cases of severe depression (1.47%), with a total of 112 cases with depression (16.47%). The results of univariate analysis showed that there was a weak correlation between age, body mass index, disease duration, marital status, and the development of anxiety and depression in individuals with AIS ($p > 0.05$). Educational level, underlying diseases, family income, and place of residence were found to influence the development of anxiety and depression in in-

dividuals with AIS ($p < 0.05$). The results of multivariate logistic regression analysis showed that educational level (no higher education), underlying diseases (with), family income ($<50,000$ yuan/year, the average exchange rate of RMB to USD was 6.7261), and place of residence (rural area) were influencing factors for the development of anxiety and depression in individuals with AIS ($p < 0.05$).

Conclusion: Depression and anxiety are common psychological disorders in patients with AIS. The level of education (no higher education), underlying diseases (with), family income ($<50,000$ yuan/year), and place of residence (rural area) were risk factors that may lead to anxiety and depression in individuals with AIS. For those with risk factors for anxiety and depression, reasonable intervention should be continually provided to guide early disease prediction and treatment of anxiety and depression in individuals with AIS.

Keywords

acute ischemic stroke; anxiety; depression; influencing factors; correlation

Introduction

Acute ischemic stroke (AIS) is the most common type of stroke in clinical practice, accounting for 70% of stroke in China [1]. AIS is caused by atherosclerosis or thrombosis and other factors, leading to brain tissue hypoxia and ischemia and resulting in brain tissue necrosis and symptoms such as headache, dizziness, tinnitus, and hemiplegia [2]. Clinical data show that approximately 67% of patients will have some degree of functional impairment such as hemiplegia, aphasia, anxiety, depression, cognitive decline, and sleep disturbance [3,4]. Psychological disorders are one of the common complications of individuals with stroke [5]. After the onset of the disease, individuals often suffer from

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psychological disorders due to the impacts on life skills and the causes of physical dysfunction [6]. Numerous clinical studies have shown that individuals with stroke are more likely to develop psychological disorders than healthy individuals. Psychological disorders can even increase the risk of stroke by modifying cerebrovascular disease risk factors, and there is a mutually reinforcing relationship between the two [7–9]. The dual effects of physiology and psychology can seriously affect the prognosis and quality of life of patients, and the risks of stroke recurrence and death also increase accordingly [10]. Therefore, early detection of possible risk factors for the occurrence of anxiety and depression in patients with AIS, along with reasonable intervention, are of great significance for reducing the incidence of anxiety and depression and promoting the recovery of patients.

The main factors affecting the development of anxiety and depression involve psychological, physiological, and social aspects. Individuals often present with persistent mental stress, low mood, slow thinking, and other signs of depression and anxiety [11]. Unfortunately, the clinical treatment of individuals with AIS centers on the clinical treatment effect, and it does not pay enough attention to the nursing needs of patients. For instance, individuals with AIS often receive psychological guidance after the disorder develops, which negatively affects their recovery because the best treatment window is missed [12,13]. The prevalence of depression in China is 2.10%, the prevalence of anxiety disorders is 4.98%, and the prevalence of depression and anxiety disorders is nearly 7% [14]. Anxiety and depression, which are recognized mental disorders that develop after AIS, continue to increase in prevalence. Anxiety and depression occur in approximately 40% of patients with AIS [15]. In view of this, we examine the incidence of anxiety and depression in individuals with AIS and analyze the influencing factors. Our results provide reference for the prevention and treatment of anxiety and depression in individuals with AIS.

Materials and Methods

Research Subjects

In brief, 680 individuals with AIS admitted to Chun'an County First People's Hospital from January 2021 to January 2023 were selected as the research subjects, and their clinical data were retrospectively analyzed. Among them, 349 were male and 331 were female; age ranged from 35 to 77 years old, with an average age of 57.03 ± 6.17 years; duration of disease ranged from 5 to 20 hours, with an average of 16.54 ± 2.38 hours; body mass index ranged from 18.31

to 28.92 kg/m^2 , with an average of $23.70 \pm 3.26 \text{ kg/m}^2$; education levels were 134 cases of junior high school and below, 54 cases of high school or technical secondary school, 83 cases of junior college, and 409 cases of undergraduate degree and above; with underlying diseases were 127 cases of hypertension, 102 cases of diabetes, 58 cases of hyperlipidemia, and 49 cases of coronary heart disease. This study was approved by the Chun'an County First People's Hospital Medical Ethics Committee (2023-04-12-21), and written informed consent was provided by the patients or their families. The study design adhered to the Declaration of Helsinki.

The inclusion criteria were as follows: (1) Patients met the diagnostic criteria for AIS as outlined in the "Guidelines for the Diagnosis and Treatment of AIS in China (2010)" [16]; (2) AIS was diagnosed by head computed tomography and magnetic resonance imaging. (3) Patients were aged >18 years old; and (4) There were no missing clinical data.

The exclusion criteria were as follows: (1) Individuals with other mental illnesses; (2) Individuals with serious lesions of other important organs such as heart, liver, kidney, lung; (3) Individuals with severe infectious diseases, systemic immune diseases, and malignant tumors; (4) Individuals with severe vision, hearing, and language impairments who could not complete the various assessments; and (5) Individuals with a previous medical history of massive cerebral infarction, cerebral hemorrhage, brain trauma, subdural hematoma or effusion, and subarachnoid hemorrhage.

Methods

First, we observed and recorded the occurrence of mental disorders in 680 individuals with AIS, and used the Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) to evaluate the mental health of the individuals. Under the guidance of professionals, individuals filled in the SAS and the SDS correctly, and the scales were collected immediately. If an individual was unable to complete the assessments by himself/herself, the investigator could complete the questionnaire after forming questions based on the content of the scale and record and analyze the patient's answers. The SAS scale contains 20 items and uses a 4-level scoring system. The relationship between score and anxiety level is as follows: mild anxiety is 50 to 69 points, severe anxiety is 60 to 69 points, and severe anxiety is 70 points or above. The SDS scale contains 20 items and uses a 4-level scoring system. The relationship between the score and depression degree is as follows: mild depression is 53 to 62 points, severe depression is 63 to 72 points, and severe depression is 73 points or above. The two scales

cover many aspects such as somatization, compulsion, interpersonal relationship, depression, anxiety, hostility, terror, paranoia, and psychosis. The higher the score of the individual, the worse the mental state of the individual.

Second, we developed a baseline information questionnaire, reviewed each patient's medical records, and recorded the patient's baseline information, including age (divided into ≥ 55 years old and < 55 years old), body mass index (divided into ≥ 23 kg/m² and < 23 kg/m²), educational level (high school or technical secondary school and below is considered to have received no higher education, college and above is considered to have received higher education), disease duration (divided into ≥ 10 h and < 10 h), with underlying diseases (hypertension, diabetes, hyperlipidemia, and coronary heart disease are considered "present", and those without underlying diseases are considered "absent"), family income ($\geq 50,000$ yuan/year is considered ideal, $< 50,000$ yuan/year is considered poor, the average exchange rate of RMB to USD was 6.7261), marital status (divided into married, single, or divorced), and place of residence (divided into urban areas and rural areas). Factors with statistical significance were further screened out for multiple stepwise logistic regression analysis. The variable selection standard was $p < 0.05$, and the exclusion standard was $p > 0.1$.

Statistical Analysis

SPSS 23.0 software (IBM, Armonk, NY, USA) was used for statistical analysis of the data. The measurement data were tested for normality and normally distributed and expressed as mean \pm standard deviation ($\bar{x} \pm s$). The independent sample t test was used for data comparisons. Count data are expressed as [n (%)], and χ^2 test was used for data comparisons. The influencing factors of anxiety and depression in individuals with AIS were analyzed using multifactor logistic regression analysis. p -values less than 0.05 were considered to represent statistically significant differences.

Results

SAS Grading Score in Individuals with AIS

The results showed that 96 (14.12%) of 680 individuals with AIS suffered from anxiety symptoms, including 63 (9.26%) cases of mild anxiety, 25 (3.68%) cases of moderate anxiety, and 8 cases (1.18%) of severe anxiety. The specific grades and the average scores are shown in Table 1.

SDS Grading Score in Individuals with AIS

The results showed that 112 of 680 (16.47%) patients with AIS suffered from depressive symptoms, including 74 (10.88%) cases of mild depression, 28 (4.12%) cases of moderate depression, and 10 (1.47%) cases of severe depression. The specific grades and the average scores are shown in Table 2.

Univariate Analysis of the Occurrence of Anxiety and Depression in Individuals with AIS

The results of univariate analysis showed that there was a weak correlation between age, body mass index, disease duration, marital status, and the development of anxiety and depression in individuals with AIS ($p > 0.05$). Educational level, underlying diseases, family income, and place of residence were influencing factors for the development of anxiety and depression in individuals with AIS ($p < 0.05$). The results of univariate analysis are shown in Table 3.

Multivariate Analysis of Anxiety and Depression in Individuals with AIS

The dichotomous variables (underlying diseases, family income, marital status, and place of residence) obtained through single-factor analysis were used as the independent variables [The two-category variables are assigned values as follows: education level: no higher education = 1, higher education = 0; with underlying diseases: yes = 1, no = 0; family income (10,000 yuan/year): $< 5 = 1$, $\geq 5 = 0$; place of residence: rural area = 1, urban area = 0]. Taking the occurrence of mental disorders as the dependent variable (anxiety and depression = 1, no anxiety and depression = 2), multivariate logistic regression analysis was performed. The results of multivariate logistic regression analysis showed that educational level (no higher education), underlying diseases (with), family income ($< 50,000$ yuan/year), and place of residence (rural) were associated with individuals with AIS ($p < 0.05$). The factors influencing the development of anxiety and depression are shown in Table 4.

Discussion

Stroke can lead to a variety of complications, thereby affecting the quality of life of patients. Approximately one-third of patients will experience post-stroke cognitive impairment, and some patients will experience post-stroke psychological impairment [17]. A prospective cohort study

Table 1. SAS classification scores of individuals with AIS.

Items	Number of cases (n)	Percentage (%) / Fraction (score)
Mild anxiety	63	9.26
Moderate anxiety	25	3.68
Severe anxiety	8	1.18
SAS score		58.13 ± 8.64

Note: SAS, Self-Rating Anxiety Scale; AIS, acute ischemic stroke.

Table 2. SDS grading scores of individuals with AIS.

Items	Number of cases (n)	Percentage (%) / Fraction (score)
Mild depression	74	10.88
Moderate depression	28	4.12
Severe depression	10	1.47
SDS score		56.78 ± 9.57

Note: SDS, Self-Rating Depression Scale.

Table 3. Univariate analysis of the incidence of anxiety and depression in individuals with AIS.

Survey item	Anxiety and depression	No anxiety and depression	χ^2 value	<i>p</i> -value
Age (year)				
≥55	59 (52.68)	339 (59.68)	1.891	0.169
<55	53 (47.32)	229 (40.32)		
Body mass index (kg/m ²)				
≥23	60 (53.57)	312 (54.93)	0.070	0.792
<23	52 (46.43)	256 (45.07)		
Education level				
Higher education	39 (34.82)	370 (65.14)	35.878	<0.001
No higher education	73 (65.18)	198 (34.86)		
Course of disease (h)				
≥10	58 (51.79)	308 (54.23)	0.224	0.636
<10	54 (48.21)	260 (45.77)		
Underlying diseases				
With	83 (74.18)	253 (44.09)	32.714	<0.001
Without	29 (25.82)	315 (55.91)		
Family income				
Ideal	35 (31.25)	408 (71.83)	67.853	<0.001
Poor	77 (68.75)	160 (28.17)		
Marital status				
Married	76 (67.86)	415 (73.06)	1.264	0.261
Single or divorced	36 (32.14)	153 (26.94)		
Place of residence				
City	35 (31.25)	341 (60.04)	31.358	<0.001
Countryside	77 (68.75)	227 (39.96)		

found that the incidence of dementia within one year after stroke ranged from 7.4% to 41.3%, and stroke increased the risk of dementia by at least 4 to 12 times [18]. Anxiety and depression after AIS are the most common mental health problems. Affective disorders are mainly manifested by depression, loss of interest, slow thinking, sleep disorders, and weight loss, which have a negative impact on motor and cognitive functions after stroke. They also have

a negative impact on recovery and prognosis, and significantly increase the risk of cerebrovascular disease recurrence [19–21]. Post-stroke dysfunction greatly affects the rehabilitation of patients and leads to the decline in quality of life. Therefore, it is important to start intervention as soon as possible after stroke to delay the progression of dysfunction and to improve the quality of life of patients.

Table 4. Multivariate analysis of anxiety and depression in individuals with AIS.

Item	B value	Standard error	Wald value	p-value	OR value	95% CI
Age (year)	0.387	0.301	1.653	0.199	1.473	0.816–2.656
Body mass index (kg/m ²)	0.136	0.302	0.203	0.652	1.146	0.634–2.071
Education level	1.251	0.320	15.283	0.000	3.494	1.866–6.542
Course of disease (h)	0.230	0.312	0.543	0.461	1.259	0.683–2.320
With underlying diseases	1.114	0.359	9.629	0.002	3.047	1.507–6.157
Family income	1.091	0.308	12.547	0.000	2.977	1.628–5.445
Marital status	0.379	0.315	1.448	0.229	1.461	0.788–2.709
Place of residence	1.147	0.322	12.689	0.000	3.149	1.675–5.919

Note: OR, odd ratio; CI, confidence interval.

Current research on AIS focuses on clinical efficacy, often ignoring the impact of emotional problems, along with anxiety and depression, on disease progression. An earlier study has shown that psychological disorders, such as anxiety and depression, are the main reasons why individuals with AIS develop dementia, which can be life-threatening in severe cases [21]. Therefore, this study mainly conducted statistical analysis on the influencing factors of anxiety and depression in individuals with AIS to provide reference values for the prevention and treatment of anxiety and depression in this population. This study found that depression and anxiety levels were negatively correlated with education level, underlying diseases, annual family income, and place of residence, that is, the individuals without higher education, with underlying diseases, annual family income <50,000/year, and residence in rural areas had more severe depression and anxiety symptoms. The results showed that 112 (16.47%) of 680 AIS patients had depressive symptoms, of which 74 (10.88%) were mild depression, 28 (4.12%) were moderate depression and 10 (1.47%) were severe depression. These findings suggest that some individuals with AIS may suffer from anxiety and depression due to inherent situations such as annual family income. Another study involving the Illness Perception Questionnaire, which was used to evaluate the psychological status of patients with AIS during hospitalization and post-recovery of the first stroke, and the results showed that psychological disorders occurred [22]. Previous studies have shown that higher psychological states and lower levels of depression and anxiety are closely related to optimal living conditions, better self-care abilities, and good communication skills, while lower psychological states generally predict poorer disease states [23,24]. Additionally, in this study, 96 cases (14.12%) of 680 AIS patients had anxiety, of which 63 cases (19.26%) were mild anxiety, 25 cases (3.68%) were moderate anxiety and 8 cases (1.18%) were severe anxiety. These findings confirm that the mental health problems of individuals with AIS cannot be ignored, and psychological guidance and emotional dredging should

be provided as soon as possible after AIS. This study found that the prevalence of anxiety and depression in patients with AIS was as high as 14.12% and 16.47%, respectively, and the incidence of anxiety and depression increased significantly compared with the general population. Study has shown that the more severe the neurological impairment, the greater the risk of anxiety and depression after AIS, and the identification of mental disorders in patients with AIS is conducive to the recovery of neurological function [25].

There are currently two main hypotheses on the causes of psychological disorders in individuals with AIS: a biological hypothesis and a psychological hypothesis [26]. The biological hypothesis suggests that stroke lesion site, neurotransmitter concentration, inflammatory cytokines, and gene polymorphisms are the main influencing factors, while the psychological hypothesis holds that the social and psychological stress associated with stroke is the main cause of psychological disorders [27]. Anxiety and depression are affected by many factors, but they affect different individuals to varying degrees. Research shows that age, gender, marital status, education, income level, material deprivation, lack of maternal love, social support, and prevalence of chronic diseases, such as hypertension, myocardial infarction, and diabetes, are closely associated with different populations [28–30]. In this study, through single-factor analysis of the clinical data of 680 individuals with AIS, we found that age, body mass index, disease duration, marital status, and the development of anxiety and depression in individuals with AIS are associated with each other, and the correlation was weak. Education level, underlying diseases, family income, and place of residence had a greater impact on the development of anxiety and depression in this population. The more serious the neurological impairment, the more likely the individual is to experience emotional regulation disorders, and thus, anxiety and depression [31]. Furthermore, the worse the self-care ability, the more likely the individual is to experience feelings of inferiority and uselessness, which can also lead to anxiety and depres-

sion [32]. At the same time, neurological impairment and self-care ability may interact with each other. Individuals with higher education levels can better understand the treatment and prognosis of the disease, and have higher treatment compliance, so these criteria can effectively alleviate anxiety and depression and improve the quality of life. The results suggest that most individuals with AIS who have anxiety and depression lack higher education, have other chronic diseases, and have poor economic status. They also usually have low awareness of the disease, resulting in strong psychological pressure. For instance, individuals with low awareness of the disease are unable to acquire reliable disease-related information through multiple information channels to better understand the disease, have more negative emotions such as anxiety, and find it difficult to maintain stable and optimistic mental states. The risk of anxiety and depression is higher, and anxiety and depression can lead to reduced compliance of treatment, which is not conducive to the recovery of the disease. An earlier study has shown that mental illness reduces employment, which can reduce earnings. Similarly, economic shocks can lead to mental illness [33]. Individuals with low family income are prone to psychological disorders due to dual pressures of serious illness and low income. Shao *et al.* [34] found that those living in rural areas are more likely to suffer from anxiety, which aligns with the results of our study. This population also lives in poor economic conditions, confronts difficulties in seeking medical treatment, and lacks disease-related knowledge. They are likely to believe that the disease cannot be cured, and they become a burden on their family, resulting in further psychological barriers.

Stroke is a serious stressful event for patients and their families. Its sudden onset and irreversible damage can cause great psychological trauma to patients and can easily lead to post-stroke low mood [35]. Because the motor function of individuals with AIS is limited, their psychological emotions are easily affected by factors such as family economic status and place of residence. This shows that the degree of awareness of the disease can affect the mental health status of individuals with AIS [36]. At the same time, this population is more likely to develop psychological disorders such as anxiety and depression [37]. If the depression is not intervened and treated in a timely manner, the patient may be at increased risk of dying by suicide [38]. An earlier study reported that positive psychological guidance for AIS patients can effectively improve the occurrence of anxiety and depression in this population. The findings show that individuals with AIS are affected by pain, suffer great psychological and physical trauma, experience negative emotions, and have low quality of life, all of

which are not conducive to recovery [39]. Individuals may release negative emotions, thereby enhancing their positive emotional states. In view of the above influencing factors, we recommend that the public's and the patient's awareness of AIS be increased, the importance of maintaining a positive mental state and an optimistic perspective to face the disease be emphasized, and the benefits of treatment be stressed to promote recovery.

Conclusion

In conclusion, the most common psychological disorder in individuals with AIS is depression, followed by anxiety, and the level of education (no higher education), underlying diseases (with), family income (<50,000 yuan/year), and place of residence (rural areas) are risk factors that may lead to the development of anxiety and depression in this population. For those with risk factors for anxiety and depression, reasonable intervention should be provided to predict early risk and treat anxiety and depression in individuals with AIS.

Availability of Data and Materials

The data used to support the findings of this study are available from the corresponding author upon request.

Author Contributions

TZ and YS designed the research study. YFW and WWW performed the research. TZ analyzed the data. All authors contributed to the drafting or important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was approved by the Chun'an County First People's Hospital Medical Ethics Committee (2023-04-12-21), and the whole process of the experiment was informed consent of the patients or their families.

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Conflict of Interest

The authors declare no conflict of interest.

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