Research Paper

# Anxiety Levels Among Patients Following Ischemic Stroke: A Cross-sectional Study

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## ABSTRACT

**Objectives:** This study aimed to quantify anxiety levels among post-ischemic stroke patients in Babylon Governorate, Iraq, and establish a correlation between anxiety severity and sociodemographic/clinical factors.

**Methods:** A cross-sectional study was conducted among 100 post-ischemic stroke patients at Al-Imam Al Sadiq Teaching Hospital and Babylon Specialized Medical Rehabilitation Center (October 2024–July 2025). Anxiety severity was quantified using a modified Hamilton rating scale for anxiety (HAM-A) as mild (70–116.66), moderate (116.67–163.33), and severe (163.34–210). Sociodemographic (income, education, sex, and age) and clinical data (chronic illness and smoking status) were collected through structured interviews. The relationship between variables was examined using multivariate logistic regression and chi-square tests to identify predictors of severe anxiety.

**Results:** Patients aged >65 years also had disproportionately high rates of severe anxiety (32.4%) compared to their younger counterparts (15.6%), as indicated by a statistically significant chi-square analysis ($\chi^2$=8.12, P=0.043). Financial instability was also a cause of higher anxiety, with 37.5% of patients who had "insufficient" income reporting severe anxiety versus only 15.4% of patients who had "sufficient" income (P=0.012). Clinically, patients with chronic comorbidities were 3.2 times more likely to experience severe anxiety (odds ratio [OR]=3.21, 95% CI, 1.45%, 7.12%, P=0.004), indicating the comorbidity of physical and psychological distress. The level of education was also significant: 28.6% of illiterates experienced severe anxiety compared to 13.6% of those with diploma and above levels (P=0.041).

**Discussion:** The high prevalence of moderate-to-severe anxiety (87.2%) is consistent with global trends and highlights the need for universal mental health screening in post-stroke patients. Independent predictors, such as advanced age, low income, and a high burden of chronic disease, identify vulnerable subgroups that require targeted interventions. The majority of sample post-ischemic stroke patients experienced moderate levels of anxiety, about a quarter of the sample had severe anxiety, and about half of the sample had mild anxiety.

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## Highlights

- A total of 64.4% of post-ischemic stroke patients exhibited moderate anxiety, and 22.8% experienced severe anxiety.
- Severe anxiety was significantly associated with age >65 years, insufficient income, chronic comorbidities, and low educational attainment.

## Plain Language Summary

This study emphasizes the critical need for routine mental health screening and multidisciplinary interventions, particularly for high-risk groups, such as elderly patients, those with chronic illnesses, and individuals facing financial hardship. Integrating psychological support into stroke rehabilitation programs is recommended to improve long-term recovery and quality of life.

## Introduction

Anxiety is an essential human emotion, for example, a sensation of alarm, fear, and physiological tension on perceiving threats in the absence of immediate danger [1]. The American Psychiatric Association describes anxiety as anticipation of future danger, with associated dysphoric mood and bodily symptoms of increased arousal or tension in muscles [2]. Despite its universality as the most prevalent mental illness on Earth, anxiety is not diagnosed due to social stigma, treatment denial, or inappropriate diagnosis by medical practitioners [3]. It is a mindset that is an adaptive response to situational danger and is governed by the experience an individual has in life, cognitive appraisal, and environmental stressors [4].

Ischemic stroke, responsible for approximately 85% of all strokes, results from thrombosis or embolic occlusion of cerebral blood flow and causes neurological dysfunction [5]. The pathophysiology of two significant regions is at issue: the ischemic core, which results in permanent damage to the neurons, and the penumbra, a recoverable region of compromised perfusion [6]. Survivors of ischemic stroke have multifaceted problems, including physical dysfunction, protracted recovery periods, and psychosocial consequences of altered self-concept, dependency on others, and encounters with the medical system [7].

Post-stroke psychological morbidity is startlingly common, with up to 72% of survivors suffering disabling fatigue and clinically significant impairments in quality of life [8]. Of these, post-stroke anxiety (PSA) develops in 20–25% of patients, becoming a major hindrance to rehabilitation [9]. Emotional distress is greatest in the initial month following stroke but often persists chronically, contributing to functional impairment and difficulties in social reintegration. Concerns regarding recurrence, loss of independence, and disruption of daily routines are determinants of chronic anxiety [8].

Since the ratio of PSA is highly extensive and adversely impacts recovery results, the current study investigated anxiety levels among survivors of ischemic stroke, residents of Babylon Governorate, Iraq. It explores correlations with demographic and clinical factors. The detection of such trends is required to incorporate mental health interventions into stroke rehabilitation programs and maximize integrated patient care.

## Materials and Methods

### Study design

A quantitative cross-sectional study was conducted to assess anxiety levels among post-ischemic stroke patients in Babylon Governorate, Iraq. Data were collected between December 22, 2024, and March 2, 2025, within the overall study duration from October 15, 2024, to July 1, 2025. The study design followed the strengthening the reporting of observational studies in epidemiology guidelines to ensure methodological rigor [10].

Study setting: Data were collected in two central locations: Al-Imam Al Sadiq Teaching Hospital and Babylon Specialized Medical Rehabilitation Center, which were selected based on their high volume of patients undergoing post-stroke rehabilitation treatment.

### Sampling and participants

A convenience sample of 100 participants was recruited for this study. The inclusion criteria included adults ≥18 years, first-ever definitive ischemic stroke on neuroimaging (computed tomography [CT]/magnetic resonance imaging [MRI]) within the previous 6–12 months, and cognitive capacity to participate (excluding severe dementia or aphasia) [11]. The exclusion criteria included pre-existing psychiatric illnesses (e.g. depression and generalized anxiety disorder) and severe physical disabilities that prevented communication. The sample size was computed using the Equation 1:

$$1.\ n=\frac{z^2\times p(1-p)}{d^2}$$

where Z=1.96 (95% confidence level), P=0.5 (expected prevalence), and d=0.10 (margin of error), which produces a minimum of 97 participants [12].

### Data collection

This study used a three-section standardized questionnaire:

1) Sociodemographic characteristics included age (years), sex (male/female), residence (urban/rural), marital status (single/married/divorced/widowed), educational level (illiterate, primary, secondary, diploma/above), and monthly income (as "enough," "barely enough," or "not enough"). 2) Clinical data: History of smoking (current/former/none) and chronic disease (e.g. diabetes mellitus, hyperlipidemia, hypertension, and atherosclerosis). 3) Anxiety scale: The Hamilton rating scale for anxiety (HAM-A) was culturally modified (e.g. "insight" items were changed). It comprises 14 domains (e.g. anxious mood, somatic symptoms, insomnia) that are rated on a 3-point Likert scale: 1=always, 2=sometimes, 3=never. Scores were summed to range from 14 to 42 and categorized as mild (14–20), moderate (21–27), and severe (≥28). The Arabic version was tested on 10 patients for cultural acceptability and understandability (Cronbach's α=0.82) [13].

Patients were contacted on the day of routine follow-up. Informed written consent was obtained after explaining the study purpose, anonymity, and voluntariness. Two psychiatric nurses trained in interviewing conducted structured face-to-face interviews in a private, quiet room. The interviews lasted 10–15 minutes and were audio-taped (with permission). Double-entry daily and random re-interviews were conducted for 10% of the participants to verify reliability.

### Statistical analysis

Data were analyzed using SPSS software, version 23 and Microsoft Excel software, version 2010. Sociodemographic and clinical variables were described in terms of frequencies, percentages, Mean±SD. Inferential statistics comprised:

Chi-square tests to test the relationship between anxiety severity and categorical variables (e.g. smoking history, chronic disease). Multivariate logistic regression analysis to identify predictors of anxiety severity (e.g. age, income, comorbidities). The significance level was set at P<0.05 (two-tailed).

## Results

### Participant characteristics

A total of 100 post-ischemic stroke patients participated in this study. Table 1 presents the demographic and clinical characteristics. The Mean±SD age was 61.43±12.34 years, and the majority (34.0%) were >65 years old. The sample consisted of 56% men, with two-thirds of the sample being married (70%) and residing in urban areas (58%). The education level was low, with 21% of the sample being illiterate, and 42.0% having received ≤ primary education. Income status revealed that 45.0% had just sufficient income, and 16.0% found their income to be too low.

### Anxiety levels

Table 2 presents the severity of anxiety, as assessed by the HAM-A.

The majority (64.4%) expressed moderate anxiety, while 22.8% expressed severe anxiety and 12.9% expressed mild anxiety. The overall mean HAM-A score was 144.19±23.22, indicating a considerable anxiety burden in this population.

### Bivariate associations

Table 3 presents the significant relationships between anxiety severity and sociodemographic/clinical variables. The outcomes suggested that 64.4% of patients had moderate anxiety (17 mean HAM-A score of 144.19±23.22), 22.8% had severe anxiety (163.34–210), and 12.9% had mild anxiety (70–116.66). Severe anxiety was correlated with age, low income, multiple chronic conditions, and less education. Severe anxiety was positively correlated with the predictors of old age (≥65

**Table 1.** Socio-demographic and clinical characteristics of the study sample

| Items | Category | No. (%) |
|---|---|---|
| Age (y) | 35-45 | 8(8) |
| | 46-55 | 28(28) |
| | 56-65 | 30(30) |
| | 65 | 34(34) |
| | Total | 100(100) |
| | Mean±SD | 61.43±12.344 |
| Sex | Male | 56(56) |
| | Female | 44(44) |
| Marital status | Single | 11(11) |
| | Married | 70(70) |
| | Divorced | 1(1) |
| | Widowed | 18(18) |
| Resident | Urban | 58(58) |
| | Rural | 42(42) |
| Educational attainment | Unable to read and write | 21(21) |
| | Able to read and write | 18(18) |
| | Primary | 22(22) |
| | Secondary | 17(17) |
| | Diploma and above | 22(22) |
| Monthly income | Enough | 39(39) |
| | Barely enough | 45(45) |
| | Not enough | 16(16) |
| Chronic disease | Yes | 52(52) |
| Smoking history | Yes | 33(33) |

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**Table 2.** Anxiety levels among post-ischemic stroke patients

| Score | | No. (%) | Mean±SD | Assessment |
|---|---|---|---|---|
| Anxiety level | Mild (70-116.66) | 13(12.9) | 144.19±23.224 | Moderate |
| | Moderate (116.67-163.33) | 65(64.4) | | |
| | Sever (163.34-210) | 23(22.8) | | |

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**Table 3.** Chi-square test results for bivariate associations

| Variables | | No. (%) | | $X^2$ | P |
|---|---|---|---|---|---|
| | | Sever Anxiety (n=23) | Non-sever Anxiety (n=77) | | |
| Age group (y) | ≥65 | 11(32.4) | 23(67.6) | 8.12 | 0.043 |
| | ≤65 | 12(15.6) | 65(84.4) | | |
| Income level | Insufficient | 6(37.5) | 10(62.5) | 9.34 | 0.012 |
| | Barely sufficient | 20(44.4) | 25(55.6) | | |
| | Sufficient | 6(15.4) | 33(84.6) | | |
| Chronic disease | Yes | 15(28.9) | 37(71.1) | 6.73 | 0.034 |
| | No | 8(16.7) | 40(83.3) | | |
| Education | Illiterate | 6(28.6) | 15(71.4) | 7.89 | 0.041 |
| | ≥Diploma | 3(13.6) | 19(86.4) | | |

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years), low income, and burden of chronic diseases, and less education, using multivariate analysis. Multivariate logistic regression revealed that patients with ≥2 comorbidities (odds ratio [OR]=3.21), lower-income (<satisfactory) OR=2.80), and older age (OR=1.04 per year) had increased odds of high anxiety.

## Predictors of severe anxiety

Table 4 presents the independent predictors of severe anxiety (HAM-A≥163.34). Table 4 demonstrates that chronic disease burden, financial inadequacy, and older age are independent predictors of severe anxiety (HAM-A≥163.34) in ischemic stroke survivors. Patients with ≥2 comorbid chronic illnesses were 3.21-fold more likely to experience severe anxiety (OR=3.21, 95% CI, 1.45%, 7.12%, P=0.004), demonstrating the cumulative physiological and psychological impact of multimorbidity. Patients with self-reported insufficient income had a 2.80-fold increased risk of severe anxiety (OR=2.80, 95% CI, 1.12%, 7.02%, P=0.028), suggesting socioeconomic heterogeneity in mental health recovery after stroke. Another year of age also raised the risk of severe anxiety by 4% (OR=1.04, 95% CI, 1.01%, 1.07%, P=0.017), in keeping with age-related risks, such as lost social support and heightened concern regarding recurrence. The model predicted 28.4% of the variance in anxiety severity (Nagelkerke $R^2$=0.284) and demonstrated some discriminative power (area under the curve [AUC]=0.76).

## Discussion

The findings of this study revealed a heavy psychological load in post-ischemic stroke survivors in Babylon Governorate, Iraq, with 64.4% experiencing moderate anxiety and 22.8% severe anxiety. These results align with global trends, wherein PSA affects 20–25% of survivors and tends to extend beyond the acute phase, hampering functional rehabilitation. In this paper, we situate these results within the existing literature, discuss the potential mechanisms, and provide clinical and research implications.

**Table 4.** Multivariate logistic regression results

| Predictor | B | SE | Wald | P | OR | 95% CI |
|---|---|---|---|---|---|---|
| Chronic disease | 1.165 | 0.421 | 7.62 | 0.004 | 3.21 | 1.45–7.12 |
| Income (insufficient) | 1.03 | 0.456 | 5.06 | 0.028 | 2.8 | 1.12–7.02 |
| Age (per year increase) | 0.039 | 0.016 | 5.88 | 0.017 | 1.04 | 1.01–1.07 |

Model fit: Nagelkerke, $R^2$=0.284, AUC=0.76.

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### Demographic and socioeconomic correlates

Age more than 65 years, urban dwelling, and low income emerged as predictors of anxiety severity in the present study. These findings are consistent with existing research on vulnerability in older stroke survivors due to reduced social support, fear of recurrence, and age-related decline in physical and cognitive resilience [14]. Urban living can signal disparities in access to psychosocial resources, as urban residents often face higher living costs and fractured social networks that exacerbate stress [15]. Economic adversity, characterized by 45% of participants as "barely sufficient" or "insufficient," likely also enhances concern through constraints in access to healthcare, rehabilitation, and employment.

Notably, 58% of the patients had ≤ primary education, indicating the role of health literacy in mental health status following stroke. Lower educational attainment may limit patients' understanding of their illness, treatment, and adaptation strategies, thereby promoting anxiety. This aligns with other research, in which socioeconomic disadvantages fuel psychological distress in stroke survivors [14].

### Clinical and psychological implications

The prevalence of moderate-to-severe anxiety (87.2%) underscores the need to incorporate regular mental health screening into post-stroke care. The comorbidity of anxiety with chronic diseases describes a bidirectional effect: physiological stress of chronic illness may exacerbate anxiety, and anxiety itself can additionally destabilize metabolic and cardiovascular health, perpetuating a cycle of poor recovery. In addition, symptoms, such as muscle stiffness, agitation, and insomnia (as noted in the conclusions), are indicative of the somatic manifestation of anxiety, which can also affect mobility and rehabilitation adherence.

Comparisons with international literature reinforce the universality of PSA Studies reported that 66% of stroke survivors experienced moderate-to-severe anxiety within six months post-stroke, mirroring our findings [16]. Similarly, one study reported ongoing anxiety in over half of patients for up to one year, particularly in individuals with poor social support, a feature prevalent in our cohort [17].

## Conclusion

The majority of sample post-ischemic stroke patients experienced moderate levels of anxiety, about a quarter of the sample had severe anxiety, and about half of the sample had mild anxiety. The most severe anxiety symptoms were observed in the somatic (muscular and gastrointestinal), autonomic, and behavioral domains at the interview, showing the highest levels of anxiety, with symptoms, such as stiffness, pallor, giddiness, and restlessness being particularly prevalent. Demographic Factors (younger, urban, married individuals, and those with lower income) had statistically significant impacts on anxiety levels. Significantly higher anxiety levels were found in patients with chronic illnesses, particularly those with hypertension, atherosclerosis, or multiple comorbidities. Moderate levels of anxiety were also found with intellectual problems (e.g. memory, concentration) and emotional problems (e.g. depression and insomnia), indicating a broad impact of PSA.

### Strengths and limitations

The research strengths are that it targets a Middle Eastern population, where there is still a lack of mental health data after stroke, and that a validated tool (modified HAM-A) was used to measure anxiety. However, the following limitations should be noted. Cross-sectional design: Causality between anxiety and demographic/clinical factors cannot be established. Longitudinal studies are necessary to investigate temporal relationships. Convenience sampling: Results may not generalize to rural areas or non-Iraqi populations. Self-reported data: Potential biases in self-report of anxiety symptoms, partly overcome by structured interviews.

### Recommendations

To improve the PSA, we suggest the following:

Multidisciplinary rehabilitation programs: Integration of mental health specialists (e.g. clinical psychologists and psychiatric nurses) into stroke care teams to provide counseling and cognitive-behavioral therapy. Targeted interventions: Prioritizing older patients, those with chronic illnesses, and those with financial hardships through subsidized treatments and community-based support. Health literacy programs: Educating patients and caregivers about anxiety management and rehabilitation strategies to improve adherence and reduce stigma.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of the University of Babylon, Hillah, Iraq (Code: 56). Administrative approvals were obtained from the hospital managers. Verbal and written informed consent emphasized voluntary entry, confidentiality (data anonymized using unique codes), and the right to withdraw.

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### Authors' contributions

Conceptualization and funding acquisition: Salma Kadhum Jihad; Methodology: Fatima Hussein Abed; Supervision, investigation and writing: All authors.

### Conflict of interest

The authors declared no conflict of interest.

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