

Theoretical and Review Articles // Artículos teóricos y de revisión

- Indah Mulia Sari 5-16 AI Induced Technostress: A Systematic Review of Risks and Opportunities.
A. Malek Mohd Dahlan Hj
Fachry Arsyad
Gumgum Gumelar Fajar Rakhman
Selfiyani Lestari
Siti Vania Khoerunnisa
- CI Onyemaechi 17-37 The Paradox of Pleasure and Protection: A Theoretical Exploration of Sex, Condom Use and Human Flourishing.
RC Ibekwe
CJ Isreal
PO Philip
LA Chibueze
- Danilo Andrés Rodríguez Lizana 39-53 Qualitative Research on the psychotic experience within the Schizophrenia Spectrum from the Perspective of Phenomenological Psychopathology: A Systematic Review.
Diego Francisco Moreno Cortez
Mauro Senatore
Félix Mario Cova Solar

Research Articles // Artículos de investigación

- Fabián O. Olaz 55-77 Aproximación desde el análisis discriminante al rol de la fusión, la evitación experiencial, el pensamiento negativo repetitivo y los valores en la predicción de problemas clínicos. [An Approach from Discriminant Analysis to the Role of Fusion, Experiential Avoidance, Repetitive Negative Thinking, and Values in Predicting Clinical Problems.]
Valeria E. Morán
María E. Caruso
Martín R. Palma
- Jaime Yáñez Lizana 79-92 The Mediating Role of Psychological Inflexibility between Psychotic Experiences and Mental Well-being in University Students.
Reiner Fuentes Ferrada
Daniel Núñez
Vania Martínez
Jorge Gaete
Scarlett Mac-Ginty
Alvaro I. Langer
- Nisrine El Kabbaj 93-103 Post-stroke Depression, Anxiety, and Adjustment Disorder: One-Year Follow-Up Study.
Loubna El Ghalib
Aicha Raoui
Intissar Fikri
Rayaane Likram
Asmae Sikkal
Zineb Serhier
Mohammed Abdoh Rafai
Mohamed Agoub
- Öznur Çınar 105-118 Psychometric Validation Turkish Version Personalized Psychological Flexibility Index (T-PPFI) in Disaster Search and Rescue Volunteers.
Ekrem Cengiz
- Veronika Duci 119-128 Stress, Anxiety and Depression in Adolescents and School Climate.
- María M. Montoya Rodríguez 129-141 Promoting Perspective-Taking in Adults with Intellectual Disabilities through Naturalistic Conditional Discrimination Training.
Vanessa A. de Souza Franco
Beatriz Harana Lahera
Eduardo Polín
David Lobato
Francisco J. Molina Cobos

Notes and Editorial Information // Avisos e información editorial

- Editorial Office 145-148 Normas de publicación-Instructions to Authors.
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Post-stroke Depression, Anxiety, and Adjustment Disorder: One-Year Follow-Up Study

Nisrine El Kabbaj*, Loubna El Ghalib, Aicha Raoui, Intissar Fikri, Rayaane Likram,
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ABSTRACT

Stroke is a major cause of morbidity and mortality, often resulting in long-term complications. Post-stroke depression, anxiety, and adjustment disorder are common psychiatric conditions that affect recovery and quality of life. This prospective study examined the incidence of depression and anxiety during the first year after stroke, with attention to demographic, functional, and stroke-related risk factors. A total of 69 stroke patients were followed at Ibn Rochd University Hospital in Casablanca at 1-, 3-, 6-, and 12-months post-stroke. Depression and adjustment disorders were diagnosed using the Mini International Neuropsychiatric Interview (MINI), and anxiety was assessed with the Hamilton Anxiety Scale. Functional and cognitive outcomes were evaluated using the National Institutes of Health Stroke Scale, Modified Rankin Scale, Instrumental Activities of Daily Living scale, and Mini-Mental State Examination. Depression affected 13% of patients at one month, decreasing over time. Anxiety was observed in 14.5% of patients at one month and was associated with cognitive decline ($p < .001$). Adjustment disorder was diagnosed in 11.6% of patients, particularly among those with major functional dependency ($p = .005$). These findings underscore the burden of psychological complications following stroke and emphasize the importance of early screening and psychological/psychiatric intervention to enhance recovery and quality of life.

Key words: stroke, post-stroke depression, anxiety, adjustment disorder, mental health complications.

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Novelty and Significance

What is already known about the topic?

- Poststroke depression and anxiety occur frequently and slow functional recovery.
- Higher levels of physical disability predict a greater risk of poststroke depression.
- Adjustment disorder and anxiety are under-detected, especially in resource-constrained settings.

What this paper adds?

- A twelve-month prospective follow-up of sixty-nine stroke survivors shows the early onset and the persistence of poststroke depression and anxiety.
- A strong association between early cognitive decline and anxiety, and between loss of autonomy and adjustment disorder.
- Supports the convenience of systematic psychiatric screening and integrated multidisciplinary post-stroke care to improve long-term outcomes.

Stroke is a serious disease defined as a sudden loss of blood supply to the brain leading to permanent tissue damage caused by thrombotic, embolic, or hemorrhagic events. It is one of the leading causes of morbidity and mortality worldwide (Mozaffarian *et alii*, 2015). In fact, it's the leading cause of permanent disability in adults, and the second leading cause of death after heart attack and cancer (Feigin, Norrving, & Mensah, 2017). However, post-stroke complications often have a more significant impact on patients' long-term well-being than the initial stroke event itself. Over time, the clinical consequences of stroke are complicated by a variety of medical, musculoskeletal and psychosocial

*Correspondence: Department of Psychiatry, Ibn Rochd Hospital, Hassan II University, Faculty of Medicine and Pharmacy, Casablanca, Morocco, 19 Rue Tarik Ibnou Ziad, B.P. 9154. Email: n.elkabbaj@hotmail.com *Availability of data and materials:* The datasets analysed during the current study are available from the corresponding author on reasonable request. Due to privacy concerns, individual patient data cannot be made publicly available. However, the minimal dataset necessary to replicate and interpret the findings of this study can be provided upon request.

difficulties (Chohan, Venkatesh, & How, 2019). Poststroke depression (PSD) is the most common psychiatric problem after stroke (Arwert *et alii*, 2018). Its prevalence varies between 20% and 65%, depending on the population studied, the definition of depression as well as assessment measures used and the assessment time interval. Approximately one in three stroke survivors suffers from depression, which heavily affects functional rehabilitation, quality of life, and is strongly associated with increased mortality (Guo, Wang, Sun, & Liu, 2021). Indeed, Chun, Ford, Kutlubaev, Almeida, and Mead (2022) reported that depression and anxiety each affect around 1 in 3 people during the first year after a stroke, and suicide causes the death of about 3 to 4/1000 stroke survivors during the first 5 years, highlighting the substantial burden of mental health complications following stroke. Given these variations in prevalence, it is crucial that PSD diagnosis relies on a structured mental state examination meeting clinical criteria, such as the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) or the 10th Revision of the International Classification of Diseases (ICD 10) for depression (Robinson, 2003; Spalletta & Robinson, 2010; De Ryck *et alii*, 2014). Although numerous studies have documented the high prevalence and multiple predictors of Post-Stroke Depression (PSD), it remains largely underdiagnosed and undertreated. Chaudhary *et alii* (2022) reported that PSD is more prevalent among women, patients with a history of stroke or myocardial infarction, and individuals with lower socioeconomic status, particularly those covered by *Medicaid*. Their findings underscore the multifactorial nature of PSD, involving both biological vulnerability and socioeconomic determinants.

PSD has been explained by a variety of biological, psychological and social factors that come into play at different stages after the stroke (Dong *et alii*, 2021). It is well documented that PSD is associated with higher mortality, poorer recovery, more pronounced cognitive deficits, and lower quality of life than is stroke without depression (Medeiros, Roy, Kontos, & Beach, 2020). Moreover, anxiety is a common symptom both in the acute phase, after months, and after years. It seems to affect a quarter of stroke patients (Broomfield, Quinn, Abdul-Rahim, Walters, & Evans, 2014). It often manifests as persistent ruminations and concerns about stroke recurrence, as well as its functional and physical consequences (Rafsten, Danielsson, & Sunnerhagen, 2018).

Most of studies, particularly those conducted in the Middle East and North Africa, that have examined depression and anxiety among stroke patients have been cross-sectional in nature. Longitudinal follow-up studies have been conducted in Jordan (Al Qawasmeh *et alii*, 2022) and Lebanon (Boutros *et alii*, 2025), revealing high incidences of these psychiatric conditions. In the Jordanian study, depression affected one in four patients one-month post-stroke, while in the Lebanese study, anxiety at three months post-stroke was reported in half of the patients, and depression exceeded three quarters. Our study represents a significant contribution to the limited body of longitudinal research on post-stroke mental health disorders in the North African context, providing additional data to complement existing findings from the Middle East and North Africa (MENA) region. Indeed, our study aimed to assess the incidence of depression, anxiety, and adjustment disorders during the first year of follow-up in stroke patients treated at the Neurology Department of Ibn Rochd University Hospital in Casablanca. The secondary objectives included examining the influence of demographic, functional, and stroke-related factors -such as clinical characteristics, treatment modalities, and post-stroke sequelae- on the development of comorbid anxiety and depression.

METHOD

Participants

The study included all patients aged over 16 years who were admitted to the neurology department for an ischemic or hemorrhagic stroke. The choice of 16 years as the minimum age was based on the neurology department's policy, which admits patients starting from this age. The diagnosis of stroke was based on clinical criteria and confirmed by radiological findings. The study excluded patients with severe aphasia or major cognitive impairment that precluded meaningful communication, as well as those who were already being treated for depression at the time of evaluation. Patients diagnosed with schizophrenia were also excluded.

Instruments and Measures

Survey was conducted using a questionnaire divided into three sections, designed based on an analysis of the literature: (a) *Sociodemographic data and Medical History*, which included data obtained through a questionnaire that collected demographic information of participants (age, sex, marital status, level of education, occupation, hometown, and laterality), and data concerning to medical and surgical history, mental health history, and substance use; (b) *Stroke Characteristics and Neurological Assessment*, which included data on stroke-related characteristics, including stroke type and location, post-stroke deficits, language disorders, management strategies, and date of occurrence; and (c) *Psychological Assessment*, which included data on the patients' psychiatric status (depressive episodes, adjustment disorders, and anxiety). Aspects evaluated through the application of the instruments are detailed below:

National Institutes of Health Stroke Scale (NIHS, Brott et alii, 1989): The NIHSS is a 15-item systematic assessment tool that provides a quantitative measure of stroke-related neurological deficit. It evaluates level of consciousness, visual fields, motor strength, sensation, ataxia, dysarthria, and language. Scores range from 0 (normal) to 42 (severe impairment).

Modified Ranking Scale (mRS, van Swieten et alii, 1988): The mRS is a 7-point scale used to measure the degree of disability or dependence in the daily activities of people who have suffered a stroke. It ranges from 0 (no symptoms) to 6 (dead).

Instrumental Activities of Daily Living (IADL, Lawton & Brody, 1969): This scale assesses independent living skills across 8 domains (e.g., telephone use, shopping, food preparation). Scores range from 0 (low function) to 8 (high function) for women, and 0 to 5 for men in the original version, though often adapted.

Mini-Mental State Examination (MMSE, Folstein et alii, 1975): The MMSE is a 30-point questionnaire to measure cognitive impairment. It tests orientation, attention, memory, language, and visual-spatial skills. Scores below 24 are typically suggestive of cognitive decline.

Mini International Neuropsychiatric Interview (MINI, Sheehan et alii, 1998). Depressive episodes and adjustment disorders were diagnosed using the MINI, a structured diagnostic interview based on DSM-IV criteria. The MINI is a brief instrument (median completion time 15 minutes) and covers all major DSM-IV Axis I disorders, including depression and adjustment disorders. Each module corresponds to a diagnostic category. Items are coded as 'Yes' or 'No'. A diagnosis is confirmed if the specific pattern of symptoms required by the DSM-IV criteria is met. In this study the *Moroccan Colloquial Arabic* version (Kadri et alii, 2005), validated in 2005, demonstrated good psychometric properties. The Moroccan version showed high internal consistency (Cronbach's $\alpha = 0.85$) and strong inter-rater reliability. Sensitivity and specificity for major depressive episodes were found to be 0.88 and 0.92, respectively.

Hamilton Anxiety Rating Scale (HAM-A, Hamilton, 1959). Anxiety was assessed using the HAM-A a clinician-administered 14-item Scale evaluating psychological, cognitive, somatic, and sleep-related anxiety symptoms, including depressive mood. Items are rated on a Likert scale (0= not present to 4= very severe), yielding a total score of 0-56. Subscores for psychic anxiety (items 1-6 and 14) and somatic anxiety (items 7-13) can be calculated. Total scores above 17 indicate a mild level of anxiety, while scores of 25-30 reflect moderate to severe levels of anxiety (Hamilton, 1959; Hallit *et alii*, 2020). In this study, we used the validated Arabic version of HAM-A (Hallit *et alii*, 2020), which has shown high internal consistency (Cronbach's $\alpha = 0.92$) and is standard in North African clinical research (Hallit *et alii*, 2020).

Procedure

The study was conducted in the neurology department of Ibn Rochd University Hospital in Casablanca. Data collection followed a standardized protocol: participants first underwent a clinical interview for sociodemographic data, followed by neurological assessments (NIHSS, mRS), and finally the cognitive and mental health evaluations (MMSE, IADL, MINI, and HAM-A). This order was chosen to prioritize clinical data collection and minimize the impact of participant fatigue on the psychiatric interview results. All assessments were performed in a quiet, private room to ensure confidentiality.

To minimize potential sources of bias, several measures were taken. Selection bias was addressed by consecutively enrolling all patients who met the inclusion criteria. All eligible patients admitted to the neurology department were invited to participate in the study. Information bias was minimized by using well-established and validated diagnostic tools, such as the MINI and HAM-A, administered by trained evaluators. Attrition bias was reduced by maintaining regular follow-up visits at 1, 3, 6, and 12 months, and any missing data were handled using multiple imputation methods.

This study was approved by the National Committee for the Control of Personal Data. All participants provided written informed consent prior to inclusion in the study. The consent included permission for participation in the study as well as the collection and analysis of data. Participants were assured of their right to withdraw from the study at any time without consequence. All procedures were conducted in accordance with the Declaration of Helsinki.

Data Analysis

Data was transferred from the data sheet to Excel. Descriptive analyses were performed using version 20 of SPSS. Categorical variables were expressed as frequencies and percentages. Continuous variables were summarized using means and standard deviations (SD). For comparisons between categorical variables, chi-square (χ^2) tests were performed. A p -value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 76 patients were initially assessed for eligibility. Seven patients were excluded for not meeting the inclusion criteria, resulting in a final sample of 69 participants. During follow-up, three participants were lost at six months, and seven at twelve months, including one death. The mean age of participants was 61.2 years ($SD = 11.6$), with an equal sex ratio (1:1). Most participants were married (64.5%), while a quarter (24%) reported having no children. A majority of the sample (60.5%) were illiterate (see Table 1).

Table 1. Participants' socio-demographic characteristics.

Age <i>M (SD)</i>		61.21 (11.60)
		<i>n (%)</i>
Sex	Male	37 (54.3%)
	Female	32 (47.4%)
Marital Status	Married	44 (64.5%)
	Single/Widowed/Divorced	25 (35.7%)
Number of Children	None	16 (24.0%)
	1-2	22 (31.4%)
	>3	31 (44.3%)
Education Level	Illiterate	41 (60.5%)
	Primary School	14 (20.0%)
	Secondary or Higher	14 (19.5%)

Handedness was predominantly right sided (93.5%), and more than half of the participants (56.5%) had a history of prior stroke. Regarding medical comorbidities, 63.4% of patients had at least one condition, with hypertension in 35%, diabetes in 30.4%, and heart disease in 6%. Most participants reported no personal (88.4%) or family (93%) history of mental health disorders (see Table 2). Concerning substance use, tobacco was the most frequently used substance (56%), followed by cannabis (20.6%) and alcohol (20.6%).

Table 2. Participants' medical characteristics.

Medical Characteristics <i>n (%)</i>	Right-Handed	64 (93.4%)
	Left-Handed	5 (6.6%)
	Previous Stroke	39 (56.5%)
Comorbid Conditions <i>n (%)</i>	At least one comorbidity	45 (63.4%)
	Hypertension	24 (34.8%)
	Diabetes	21 (30.4%)
	Heart Disease	4 (6.0%)
Family Psychiatric History <i>n (%)</i>	Depression	2 (2.9%)
	Psychotic Disorder	3 (4.3%)
Personal Psychiatric History <i>n (%)</i>	Depression	5 (7.3%)
	Anxiety Disorder	1 (1.5%)
	Psychotic Disorder	1 (1.5%)
	Psychoactive Substance use	39 (56%)
Substance Use <i>n (%)</i>	Tobacco	39 (56%)
	Cannabis	14 (20.6%)
	Alcohol	14 (20.6%)

Most strokes were ischemic (97%) (see Table 3). Stroke laterality involved the left hemisphere in 49% of cases, bilateral in 10%, and multiple strokes in 4.3%. Regarding treatment, 75.3% of patients received antiplatelet agents, 22% underwent thrombolysis, and among hemorrhagic strokes, only 3% received anticoagulants.

Table 3. Participants' stroke characteristics.

Stroke Characteristics		<i>n (%)</i>
Stroke type	Ischemic Stroke	67 (97.1%)
	Hemorrhagic Stroke	2 (2.9%)
	Bilateral Stroke	7 (10.0%)
Frequencies of Stroke Localization	Right Hemisphere	25 (36.2%)
	Left Hemisphere	34 (49.3%)
	Multiple Stroke	3 (4.3%)
	No Treatment	2 (2.9%)
Treatment for Ischemic Stroke	Antiplatelet Agents	52 (75.4%)
	Thrombolysis	15 (21.7%)
Treatment for Hemorrhagic Stroke	Anticoagulants	2 (3.0%)
	Antiepileptic Drugs	3 (4.4%)

Neurological assessment indicated that 59.4% of patients had a mild stroke, 27.5% moderate, and 13% severe. Functional outcomes assessed showed that 42% had no disability, while 1.45% had severe disability. Autonomy scale revealed that 80.6% of patients maintained full independence. Cognitive function showed that 31.8% had no impairment, while 41.9% had moderate impairment (see Table 4).

Table 4. Associations between Depression, Anxiety, Adaptation Disorder, Stroke and various criteria with statistical significance.

		Depression <i>n</i> (%)	<i>p</i>	Anxiety <i>n</i> (%)	<i>p</i>	Adjustment disorder <i>n</i> (%)	<i>p</i>
Gender	Male	9 (24.3)	.948	5 (13.5)	.075	5 (15.2)	.573
	Female	8 (25.0)		10 (31.3)		3 (10.3)	
	Minor	8 (20.5)		7 (18.0)		4 (10.3)	
NIHSS	Moderate	7 (41.2)	.265	6 (35.3)	.326	3 (17.7)	.719
	Severe	2 (33.3)		2 (33.3)		1 (16.7)	
	None	4 (14.8)		3 (11.1)		1 (3.7)	
mRS	Mild	3 (23.1)	.044	4 (30.8)	.064	1 (7.7)	.029
	Moderate	7 (58.3)		6 (50.0)		2 (16.7)	
	Severe	3 (30.0)		2 (20.0)		4 (40.0)	
IADL	Dependent	5 (45.5)	.163	3 (27.3)	.732	4 (36.4)	.005
	Independent	12 (24.5)		11 (22.5)		3 (6.1)	
	None	6 (28.6)		1 (4.8)		2 (9.5)	
MMSE	Mild	4 (23.5)	.914	2 (11.8)	<.001	0 (0.0)	.053
	Moderate	7 (29.2)		12 (50.0)		6 (25.0)	

The evolution of Mental Health disorders over the 12-month follow-up period, including adjustment disorder, depression, and anxiety, is illustrated in table 5 and Figure 1. One month post-stroke, the incidence of adjustment disorder was 11.6% (95% CI [6.0, 21.3]). No new cases were identified at three, six, or twelve months. Among those diagnosed initially, 87.5% showed favorable evolution by three months. The

Table 5. Incidence of Adjustment disorder, Depression, and Anxiety.

		1-Month Incidence % (95% CI)	3-Month Incidence % (95% CI)	6-Month Incidence % (95% CI)	1-Year Incidence % (95% CI)
Depression	Total	13.0 (7.0-23.0)	5.0 (1.7-13.7)	5.3 (1.8-14.4)	3.7 (1.0-12.5)
	Mild	14.5 (8.1-24.7)	1.7 (0.3-9.0)	5.2 (1.8-14.1)	1.8 (0.3-9.6)
Anxiety	Moderate	4.3 (1.5-12.0)	1.7 (3.0-9.0)	1.7 (0.3-9.1)	1.8 (0.3-9.6)
	Severe	7.3 (3.1-15.9)	0	3.4 (0.9-11.7)	0
Adjustment Disorder		2.9 (0.8-10.0)	0	0	0
		11.6 (6.0-21.3)	0	0	0

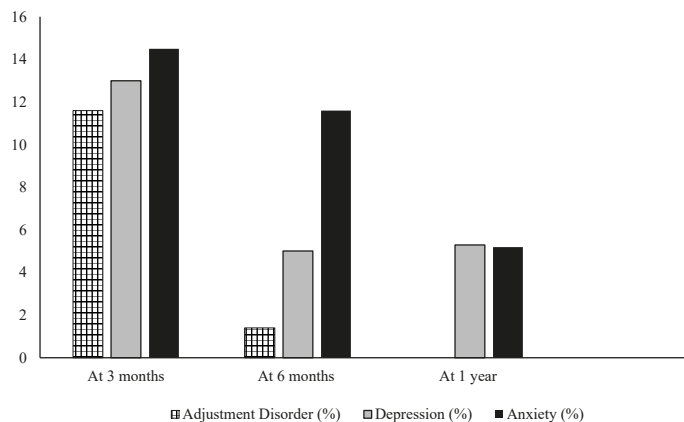


Figure 1. Evolution of Adaptation Disorder, Depression, and Anxiety at 3 months, 6 months, and 1 year.

onset of adjustment disorder was significantly associated with functional dependence, $\chi^2(3) = 12.84$, $p = .005$, and with the level of disability (mRS), $\chi^2(5) = 12.46$, $p = .029$. Depression occurred in 13% of patients at one month (95% CI [7.0, 23.0]), 5% at three

months, 5.3% at six months, and 3.7% at twelve months. Among those diagnosed at one month, 77.8% continued to meet criteria for major depression at three months. Post-stroke depression was significantly associated with the level of disability, $\chi^2(5)=11.39$, $p=.044$. Although patients with more severe strokes or greater dependency had higher rates of depression, these associations did not reach statistical significance.

Anxiety incidence was 14.5% at one month (95% CI[8.1, 24.7]). At three months, 1.7% developed new-onset anxiety. Among patients with anxiety at one month, 70% remained anxious at three months. Anxiety onset was significantly associated with cognitive impairment (MMSE), $\chi^2(2)=15.68$, $p<.001$, while no significant association was observed with physical disability despite higher frequencies among more dependent patients.

DISCUSSION

This longitudinal study aimed to examine the incidence and evolution of post-stroke depression, anxiety, and adjustment disorder over a one-year follow-up period. Our findings indicate that adjustment disorder is a common and early mental health complication following stroke, with an incidence of 11.6% at one month. Fortunately, most of these cases showed a favorable trajectory: by three months, only 12.5% still met diagnostic criteria, and no cases remained at six or twelve months. We observed a significant association between the onset of adjustment disorder and both the level of disability ($p=.029$) and functional dependence ($p=.005$), underscoring the psychological burden of reduced autonomy in the aftermath of stroke. Loss of autonomy is a well-established risk factor for mental illness. An increase in functional disability is often linked to a decline in mental health, as it impairs an individual's ability to engage in daily activities and participate in society according to societal norms. Additionally, barriers related to accessibility and functional limitations can further exacerbate psychological distress, contributing to poorer mental health outcomes (Xie, Tanner, Striley, & Marlow, 2022; Koenig, McLean, & Bishop, 2024). Although few studies have directly assessed adjustment disorder in stroke patients, existing literature suggests lower overall rates around 6.9% (Mitchell *et alii*, 2017). The higher incidence in our study may be explained by our early evaluation (at one month), which captures the acute stress reaction phase, and our use of structured diagnostic interviews, which are more sensitive to transient adjustment disorders at this stage.

The incidence of post-stroke anxiety was 14.5% at one month, with the majority of cases classified as mild or moderate. This frequency aligns with global observations where anxiety remains a prevalent post-stroke complication (Burton *et alii*, 2013). Over the follow-up period, the proportion of patients meeting criteria for anxiety progressively decreased: 70% at three months, 50% at six months, and 30% at one year, according to the Hamilton Anxiety Scale. Incident cases also declined over time, with rates of 1.7% at three months, 5.2% at six months, and 1.8% at one year. Most previous studies have focused on prevalence rather than incidence, which complicates direct comparisons. Moreover, prevalence estimates vary depending on the timing of assessment and the instruments used. In this study, the HAM-A was used to assess the severity of anxiety symptoms rather than to establish formal diagnoses (Rafsten *et alii*, 2018; Knapp *et alii*, 2020; Sagen-Vik, Finset, Moum, Vik, & Dammen, 2022). A meta-analysis using the HAM-A reported a pooled prevalence of 29.3% during the first year following stroke (Rafsten *et alii*, 2018). It should be noted, however, that prevalence data do not distinguish between pre-existing anxiety and anxiety emerging after stroke, limiting causal interpretations.

The development of post-stroke anxiety was significantly associated with cognitive impairment, which aligns with the literature suggesting that deficits in memory, attention, and executive function may increase psychological stress and reduce coping capacity (Williams & Demeyere, 2021). These emotional disturbances are often linked to complex neurobiological mechanisms following brain injury (Kim, 2016). These cognitive limitations can act as precipitating factors for both depression and anxiety. Similarly, Morrison, Pollard, Johnston, and MacWalter (2005) found that demographic and clinical factors, including advanced age, female sex, and greater functional disability, predicted persistent anxiety and depression up to three years after stroke. Compared to our findings, the magnitude of long-term persistence reported by Morrison *et alii* (2005) is higher, which may reflect differences in sample characteristics, follow-up duration, and assessment methods. While our study observed a progressive decrease in post-stroke anxiety over one year, the data from Morrison *et alii* (2005) suggest that certain subgroups remain at risk for long-term psychological sequelae, highlighting the need for continued monitoring and early intervention in vulnerable patients.

In the present study, the incidence of post-stroke depression was 13% at one month, 5% at three months, 5.3% at six months, and 3.7% at one year, indicating a declining trend in new cases over time. This temporal pattern is consistent with previous literature reporting that the majority of post-stroke depression cases develop within the first three months, followed by a gradual reduction in incidence (Jørgensen *et alii*, 2016; Kutlubaev & Hackett, 2014). Early identification and management remain critical to mitigate the long-term impact of depression on functional recovery.

Despite the overall decline in incidence, the clinical trajectory among patients who developed depression in the early post-stroke period remains concerning. In our cohort, 77.8% of patients diagnosed at one month continued to meet criteria at three months, and 33.3% remained depressed at six and twelve months. Such persistence of early-onset symptoms throughout the first year has been documented in other longitudinal studies (Sit, Wong, Clinton, & Li, 2007). Such persistence aligns with prior findings indicating that early-onset depression often continues over time, especially among older adults (Liu *et alii*, 2023; Hosking & Marsh, 2013; Morrison *et alii*, 2005).

Similarly, the DEPRESS study reported a 24% prevalence of depression within six months after ischemic stroke, highlighting the high prevalence and persistence of post-stroke depression (Guiraud *et alii*, 2016). Additional systematic reviews have confirmed that both demographic factors (e.g., age, sex), pre-stroke cognition, and functional impairment are significant predictors of depression following stroke (Robinson & Jorge, 2016; Kang, 2021; Mayman *et alii*, 2021; Lavu *et alii*, 2022). These findings underscore the multifactorial nature of post-stroke depression and the importance of considering both clinical and psychosocial determinants.

Functional disability, measured by the mRS, was significantly associated with depression onset ($p = .044$), corroborating prior research that emphasizes the impact of physical dependence on depressive outcomes (Shi, Yang, Zeng, & Wu, 2017; Kumar, Kataria, Kumar, Kumar, & Bahurupi, 2020). Although higher rates of depression were observed among patients with more severe strokes, this association did not reach statistical significance, likely due to the limited sample size. Nevertheless, stroke severity has been consistently identified as a predictor of post-stroke depression, as more severe neurological impairment often leads to greater functional limitations and reduced quality of life, thereby increasing vulnerability to depression (Shi *et alii*, 2017; Kutlubaev & Hackett, 2014).

Our study provides valuable insights into the psychological consequences of stroke, including depression, anxiety, and adjustment disorder. However, several limitations should be acknowledged. First, the relatively small sample size may have limited

the statistical power to detect certain associations and restricts the generalizability of our findings. In addition, participants were recruited from a single center which may introduce selection bias.

Despite the strength of a longitudinal design with one-year follow-up, we did not systematically assess several post-stroke variables that could influence mental health trajectories, such as access to rehabilitation services, changes in social support, or use of psychological care during follow-up.

Depression and adjustment disorder were assessed using the MINI and anxiety symptoms were evaluated using the Hamilton Anxiety Rating Scale. Although this tool does not allow for formal diagnosis of anxiety disorders, its use was consistent with our objective of capturing the severity of anxiety symptoms from a dimensional perspective.

Lastly, certain potentially relevant factors -socioeconomic status, educational level, or the quality of post-stroke care- were not incorporated into the analyses and could have influenced mental health outcomes.

This study provides useful insights into the psychological consequences of stroke, particularly regarding depression, anxiety, and adjustment disorder. The findings align with previous research showing persistent depression post-stroke, with low remission rates, although the association between stroke severity and anxiety requires further investigation

The generalizability of the study is limited due to the small sample size and the specific setting of a single university hospital in Casablanca. These results may not fully reflect the experiences of stroke patients in other regions, particularly where healthcare and mental health services differ. Future studies with larger, more diverse populations are needed to assess the broader applicability of these findings.

Overall, these findings emphasize the high prevalence and dynamic course of depression, anxiety, and adjustment disorder after stroke. Post-stroke depression was closely linked to functional disability, anxiety to cognitive impairment, and adjustment disorder to loss of autonomy. These results underscore the multifactorial impact of stroke on mental health and the importance of addressing both neurological and psychosocial determinants in post-stroke care. Despite its limitations, this study reinforces the need for integrating mental health assessment into stroke rehabilitation programs and highlights the importance of early, targeted interventions. Future research should focus on identifying modifiable risk factors and evaluating multidisciplinary strategies combining neurology, psychology-psychiatry, and rehabilitation to optimize long-term outcomes for stroke survivors.

REFERENCES

- Al Qawasmeh M, Aldabbour B, Abuabada A, Abdelrahman K, Elamassie S, Khweileh M, Zahran M, & El-Salem K (2022). Prevalence, severity, and predictors of post-stroke depression in a prospective cohort of Jordanian patients. *Stroke Research and Treatment*, 6506326. Doi: 10.1155/2022/6506326
- Arwert HJ, Meesters JLL, Boiten J, Balk F, Wolterbeek R, & Vliet Vlieland TPM (2018). Poststroke depression: A long-term problem for stroke survivors. *American Journal of Physical Medicine & Rehabilitation*, 97(8), 565-571. Doi: 10.1097/PHM.0000000000000918
- Boutros CF, Khazaal W, Taliani M, Sadier NS, Salameh P, & Hosseini H (2025). Anxiety and depression one year after the first stroke among Lebanese survivors: Proportions, changes, and predictors. *BMC Psychiatry*, 25, 558. Doi: 10.1186/12888-025-06997-9
- Broomfield NM, Quinn TJ, Abdul-Rahim AH, Walters MR, & Evans JJ (2014). Depression and anxiety symptoms post-stroke/TIA: prevalence and associations in cross-sectional data from a regional stroke registry. *BMC Neurology*, 14, 198. Doi: 10.1186/12883-014-0198-8
- Brott, T., Adams, H. P., Jr, CP, P., Marler, J. R., Barsan, W. G., Reed, R. L., O'Donoghue, J. P., & Fedder, R. (1989). Measurements of acute cerebral infarction: a clinical examination scale. *Stroke*, 20, 7, 864-870. Doi: 10.1161/01.str.20.7.864

- Burton CAC, Murray J, Holmes J, Astin F, Greenwood D, & Knapp P (2013). Frequency of anxiety after stroke: a systematic review and meta-analysis of observational studies. *International Journal of Stroke*, *8*, 7, 545-559. Doi: 10.1111/j.1747-4949.2012.00906.x
- Chaudhary D, Friedenber I, Sharma V, Sharma P, Abedi V, Zand R, & Li J (2022). Predictors of Post-Stroke Depression: A Retrospective Cohort Study. *Brain Science*, *12*, 993. Doi: 10.3390/brainsci12080993
- Chohan SA, Venkatesh PK, & How CH (2019). Long-term complications of stroke and secondary prevention: an overview for primary care physicians. *Singapore Medical Journal*, *60*, 12, 616-620. Doi: 10.11622/smedj.2019158
- Chun HYY, Ford A, Kutlubaev M, Almeida O, & Mead G (2022). Depression, Anxiety, and Suicide After Stroke: A Narrative Review of the Best Available Evidence. *Stroke*, *53*, 1402-1410. Doi: 10.1161/STROKEAHA.121.035499.
- De Ryck A, Franssen E, Brouns R, Geurden M, Peij D, Mariën P, & De Deyn PP (2014). Poststroke depression and its multifactorial nature: Results from a prospective longitudinal study. *Journal of the Neurological Sciences*, *347*, 1-2, 159-166. Doi: 10.1016/j.jns.2014.09.038
- Dong L, Williams LS, Brown DL, Case E, Morgenstern LB, & Lisabeth LD (2021). Prevalence and course of depression during the first year after mild to moderate stroke. *Journal of the American Heart Association*, *10*, 13, e020494. Doi: 10.1161/JAHA.120.020494
- Feigin VL, Norrving B, & Mensah GA (2017). Global burden of stroke. *Circulation Research*, *120*, 3, 439-448. Doi: 10.1161/CIRCRESAHA.116.308413
- Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, *12*, 3, 189-198. doi: 10.1016/0022-3956(75)90026-6
- Guiraud V, Gallarda T, Calvet D, Turc G, Oppenheim C, Rouillon F, & Mas, J-L (2016). Depression predictors within six months of ischemic stroke: The DEPRESS Study. *International Journal of Stroke*, *11*, 519-525. Doi: 10.1177/1747493016632257
- Guo J, Wang J, Sun W, & Liu X (2021). The advances of post-stroke depression: 2021 update. *Journal of Neurology*, *269*, 1236-1249. doi: 10.1007/s00415-021-10597-4
- Hamilton M (1959). The assessment of anxiety states by rating. *British Journal of Medical Psychology*, *32*, 1, 50-55. Doi: 10.1111/j.2044-8341.1959.tb00467.x
- Hallit S, Haddad C, Hallit R, Akel M, Obeid S, Haddad G, Soufia M, Khansa W, Khoury R, Kheir N, Abi Elias Hallit C, & Salameh P (2020). Validation of the Hamilton Anxiety Rating Scale and State-Trait Anxiety Inventory A and B in Arabic among the Lebanese population. *Clinical Epidemiology and Global Health*, *8*, 4, 1104-1109. Doi: 10.1016/j.cegh.2020.03.028
- Hosking SG & Marsh NV (2013). Predictors of Depression at One Year Post-stroke in Older Adults. *Brain Impair*, *14*, 381-391. Doi:10.1017/BrImp.2013.30
- Jørgensen TSH, Wium-Andersen IK, Wium-Andersen MK, Jørgensen MB, Prescott E, Mårtensson S, Andersen PK, & Osler M (2016). Incidence of depression after stroke, and associated risk factors and mortality outcomes, in a large cohort of Danish patients. *JAMA Psychiatry*, *73*, 10, 1032-1040. Doi: 10.1001/jamapsychiatry.2016.1932
- Kadri N, Agoub M, El Gnaoui S, Alami KM, Hergueta T, & Moussaoui D (2005). Moroccan colloquial Arabic version of the Mini-International Neuropsychiatric Interview (MINI): Qualitative and quantitative validation. *European Psychiatry*, *20*, 2, 193-195. Doi: 10.1016/j.eurpsy.2004.11.007
- Kang C (2021). Predictors of Post-stroke Cognition Among Geriatric Patients: The Role of Demographics, pre-stroke Cognition, and Trajectories of Depression. *Frontiers in Psychology*, *12*, 717817. Doi: 10.3389/fpsyg.2021.717817
- Kim JS (2016). Post-stroke mood and emotional disturbances: pharmacological therapy based on mechanisms. *Journal of Stroke*, *18*, 3, 244-255. Doi: 10.5853/jos.2016.01144.
- Knapp P, Dunn-Roberts A, Sahib N, Cook L, Astin F, Kontou E, & Thomas SA (2020). Frequency of anxiety after stroke: an updated systematic review and meta-analysis of observational studies. *International Journal of Stroke*, *15*, 3, 244-255. Doi: 10.1177/1747493019896958
- Koenig J, McLean KJ, & Bishop L (2024). Psychological distress and mental health diagnoses in adults by disability and functional difficulty status: findings from the 2021 National Health Interview Survey. *Disability and Health Journal*, *17*, 4, 101641. Doi: 10.1016/j.dhjo.2024.101641
- Kumar R, Kataria N, Kumar N, Kumar M, & Bahurupi Y (2020). Poststroke depression among stroke survivors in Sub-Himalayan region. *Journal of Family Medicine & Primary Care*, *9*, 7, 3508-3513. Doi: 10.4103/jfmpe.jfmpe_444_20
- Kutlubaev MA & Hackett ML (2014). Part II: Predictors of Depression after Stroke and Impact of Depression on

- Stroke Outcome: An Updated Systematic Review of Observational Studies. *International Journal of Stroke*, 9, 1026-1036. Doi: 10.1111/ijss.12356
- Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist*, 9 (3 Part 1), 179-186. Doi: 10.1093/geront/9.3_part_1.179
- Lavu VK, Mohamed RA, Huang R, Potla S, Bhalla S, Al Qabandi Y, Nandula SA, Boddepalli CS, Gutlapalli SD, & Mohammed L (2022). Evaluation and Treatment of Depression in Stroke Patients: A Systematic Review. *Cureus*, 14, e28137. Doi: 10.7759/cureus.28137
- Liu L, Xu M, Marshall IJ, Wolfe CD, Wang Y, & O'Connell MD (2023). Prevalence and natural history of depression after stroke: a systematic review and meta-analysis of observational studies. *PLOS Medicine*, 20, 3, e1004200. Doi: 10.1371/journal.pmed.1004200
- Mayman N, Stein LK, Erdman J, Kornspun A, Tuhim S, Jette N, & Dharmoon MS (2021). Risk and Predictors of Depression Following Acute Ischemic Stroke in the Elderly. *Neurology*, 96, e2184-e2191. Doi: 10.1212/WNL.00000000000011828
- Medeiros GC, Roy D, Kontos N, & Beach SR (2020). Post-stroke depression: A 2020 updated review. *General Hospital Psychiatry*, 66, 70-80. Doi: 10.1016/j.genhosppsych.2020.06.011.
- Mitchell AJ, Sheth B, Gill J, Yadegarfar M, Stubbs B, Yadegarfar M, & Meader N (2017). Prevalence and predictors of post-stroke mood disorders: a meta-analysis and meta-regression of depression, anxiety and adjustment disorder. *General Hospital Psychiatry*, 47, 48-60. Doi: 10.1016/j.genhosppsych.2017.04.001.
- Morrison V, Pollard B, Johnston M, & MacWalter R (2005). Anxiety and depression 3 years following stroke: Demographic, clinical, and psychological predictors. *Journal of Psychosomatic Research*, 59, 209-213. doi: 10.1016/j.jpsychores.2005.02.019
- Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, de Ferranti S, Després JP, Fullerton HJ, Howard VJ, Huffman MD, Judd SE, Kissela BM, Lackland DT, Lichtman JH, Lisabeth LD, Liu S, Mackey RH, Matchar DB, McGuire DK, Mohler ER 3rd, Moy CS, Muntner P, Mussolino ME, Nasir K, Neumar RW, Nichol G, Palaniappan L, Pandey DK, Reeves MJ, Rodríguez CJ, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Willey JZ, Woo D, Yeh RW, & Turner MB (2015). Heart disease and stroke statistics -2015 update: A report from the American Heart Association. *Circulation*, 131, 4, e29-e322. Doi: 10.1161/CIR.0000000000000152
- Rafsten L, Danielsson A, & Sunnerhagen KS (2018). Anxiety after stroke: a systematic review and meta-analysis. *Journal of Rehabilitation Medicine*, 50, 9, 769-778. Doi: 10.2340/16501977-2384
- Robinson RG (2003). Poststroke depression: prevalence, diagnosis, treatment, and disease progression. *Biological Psychiatry*, 54, 3, 376-387. Doi: 10.1016/S0006-3223(03)00423-2
- Robinson RG & Jorge RE (2016). Post-Stroke Depression: A Review. *American Journal of Psychiatry*, 173, 221-231. Doi: 10.1176/appi.ajp.2015.15030363
- Sagen-Vik U, Finset A, Moum T, Vik TG, & Dammen T (2022). The longitudinal course of anxiety, depression and apathy through two years after stroke. *Journal of Psychosomatic Research*, 162, 111016. Doi: 10.1016/j.jpsychores.2022.111016
- Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Hergueta T, Baker R, & Dunbar GC (1998). The Mini-International Neuropsychiatric Interview (MINI): development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry*, 59 (Suppl 20), 22-33.
- Shi Y, Yang D, Zeng Y, & Wu W (2017). Risk factors for post-stroke depression: a meta-analysis. *Frontiers in Aging Neuroscience*, 9, 218. Doi: 10.3389/fnagi.2017.00218.
- Sit JWH, Wong TKS, Clinton M, & Li LSW (2007). Associated factors of post-stroke depression among Hong Kong Chinese: A longitudinal study. *Psychology, Health & Medicine*, 12, 2, 117-125. Doi: 10.1080/14622200500358978.
- Spalletta G & Robinson RG (2010). How should depression be diagnosed in patients with stroke? *Acta Psychiatrica Scandinavica*, 121, 6, 401-403. Doi: 10.1111/j.1600-0447.2010.01569.x
- Van Swieten, J. C., Koudstaal, P. J., Visser, M. C., Schouten, H. J., & van Gijn, J. (1988). Interobserver agreement for the assessment of handicap in stroke patients. *Stroke*, 19, 5, 604-607. doi: 10.1161/01.str.19.5.604
- Williams OA & Demeyere N (2021). Association of depression and anxiety with cognitive impairment 6 months after stroke. *Neurology*, 96, 15, e1966-e1974. Doi: 10.1212/WNL.00000000000011748
- Xie Z, Tanner R, Striley CL, & Marlow NM (2022). Association of functional disability with mental health services use and perceived unmet needs for mental health care among adults with serious mental illness. *Journal of Affective Disorders*, 299, 449-455. Doi: 10.1016/j.jad.2021.12.040

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