

UNDERSTANDING POST-STROKE DEPRESSION AMONG PATIENTS VISITING OPD  
AT IGMC AND AIMSS SHIMLADr. Mayank<sup>1\*</sup>, Dr. Kanika Khamb<sup>2</sup> and Dr. Kriti Sahore<sup>3</sup><sup>1</sup>Junior Resident, Department of Medicine, IGMC Shimla.<sup>2</sup>Medical Officer, Department of Neurology, AIMSS Shimla.<sup>3</sup>Junior Resident, Department of Psychiatry, IGMC Shimla.

\*Corresponding Author: Dr. Mayank

Junior Resident, Department of Medicine, IGMC Shimla.

Article Received on 21/03/2025

Article Revised on 11/04/2025

Article Published on 02/05/2025

## ABSTRACT

**Background:** Post-stroke depression (PSD) is a common neuropsychiatric complication that significantly hampers recovery, reduces quality of life, and increases mortality among stroke survivors. Data regarding the prevalence of PSD in North Indian hill states like Himachal Pradesh is scarce. **Objective:** To determine the prevalence of depression among stroke patients attending the outpatient department (OPD) at Indira Gandhi Medical College (IGMC) and Atal Institute of Medical Super Specialties (AIMSS) Shimla and to study associated factors. **Methods:** A cross-sectional study was conducted among 180 stroke patients attending Medicine and Neurology OPDs at IGMC and AIMSS Shimla respectively over six months. Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9). Data on socio-demographic and clinical variables were collected. Statistical analysis was performed to determine the prevalence and associated risk factors for PSD. **Results:** The prevalence of depression among stroke patients was found to be 58.3%. Moderate to severe depression was seen in 32.7% of the patients. Factors significantly associated with depression included female gender ( $p=0.02$ ), higher stroke severity ( $p=0.001$ ), lower socioeconomic status ( $p=0.01$ ), and presence of cognitive impairment ( $p=0.003$ ). **Conclusion:** Depression was highly prevalent among stroke survivors attending OPD at IGMC Shimla. Early identification and management of PSD are essential for improving functional outcomes and quality of life in stroke patients.

**KEYWORDS:** Depression, stroke, ischemic, hemorrhagic, IGMC, AIMSS.

## INTRODUCTION

Post-stroke depression (PSD) is one of the most common neuropsychiatric sequelae following a stroke, affecting a significant proportion of stroke survivors. Depression can occur in patients who have experienced either ischemic or hemorrhagic strokes and may result in long-term impairment of quality of life, functional recovery, and rehabilitation outcomes.<sup>[1]</sup> It is a leading cause of disability worldwide and is associated with an increased risk of morbidity, mortality, and reduced functional recovery post-stroke.<sup>[2]</sup> Studies have consistently reported that depression is prevalent in 30% to 50% of stroke patients<sup>[3]</sup>, and the rates may vary depending on the population, assessment tools, and follow-up duration. In India, the prevalence of PSD has been reported to be higher than the global average, ranging from 45% to 60% depending on regional variations, healthcare access, and socio-economic factors.<sup>[4]</sup> The high burden of depression among stroke survivors is a significant public health concern in resource-limited settings like India, where mental health services remain underutilized. Although depression has been associated with factors such as stroke severity, disability, cognitive impairment,

and gender, few studies have specifically addressed the prevalence and risk factors of post-stroke depression in the population of Himachal Pradesh, where the health infrastructure is limited, and stroke incidence is increasing due to an aging population. This study aims to assess the prevalence of depression among stroke patients attending the outpatient department (OPD) at Indira Gandhi Medical College (IGMC), AIMSS Shimla. Additionally, it seeks to explore potential associations between depression and various sociodemographic and clinical factors, such as stroke type, severity, cognitive impairment, and socio-economic status, in order to provide data to inform public health policies and stroke rehabilitation strategies in this region.

## MATERIALS AND METHODS

*Study Design and Setting*

This study was a hospital-based cross-sectional observational study conducted at the Medicine and Neurology outpatient departments (OPD) of Indira Gandhi Medical College (IGMC) and AIMSS Shimla respectively, which is a premier tertiary care center catering to the healthcare needs of the people of

Himachal Pradesh and neighboring regions.

### Study Duration

The study was conducted over a period of six months, from January 2023 to June 2023.

### Study Population

The study population included all patients diagnosed with stroke (both ischemic and hemorrhagic) attending the Medicine and Neurology OPDs at IGMC, AIMSS Shimla during the study period.

### Inclusion Criteria

- Patients aged 18 years and above.
- Patients diagnosed with ischemic or hemorrhagic stroke (confirmed by CT or MRI imaging).
- Stroke patients attending OPD at least one month after stroke onset (to exclude acute phase emotional changes).
- Patients willing to give written informed consent for participation.

### Exclusion Criteria

- Patients with pre-existing psychiatric disorders (e.g., major depressive disorder, bipolar disorder) documented prior to the stroke event.
- Patients with severe aphasia, severe cognitive impairment, or altered sensorium preventing meaningful communication.
- Patients unwilling or unable to give consent.

### Sample Size

A total of 180 patients were enrolled in the study using a consecutive sampling method until the sample size was achieved.

### Sample Size Calculation

The sample size was calculated using the formula for cross-sectional studies:

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

Where:

- $Z=1.96$   $Z=1.96$   $Z=1.96$  for 95% confidence interval
- $p=55\%$   $p=55\%$   $p=55\%$  (anticipated prevalence of post-stroke depression based on previous Indian studies<sup>[4]</sup>)
- $d=7.5\%$   $d=7.5\%$   $d=7.5\%$  (absolute precision)

After adjusting for potential non-responders, the final sample size was fixed at 180.

### Data Collection

Data were collected using a structured interview schedule comprising

1. Sociodemographic Information: Age, gender, residence (rural/urban), marital status, education level, occupation, socioeconomic status.
2. Clinical Information:
  - Type of stroke (ischemic/hemorrhagic).
  - Duration since stroke.
  - History of comorbidities (e.g., hypertension, diabetes mellitus).
  - Severity of stroke measured by the Modified Rankin Scale (mRS).
  - Cognitive function assessed using the Mini-Mental State Examination (MMSE).

3. Assessment of Depression: Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9), a validated screening tool for depression in post-stroke populations. A PHQ-9 score of  $\geq 10$  was considered suggestive of clinically significant depression.

All interviews and assessments were conducted in the patient's preferred language (Hindi or English), ensuring full understanding and cooperation.

### Ethical Considerations

- Written informed consent was obtained from all participants after explaining the nature, purpose, and confidentiality of the study.
- Participants identified with moderate-to-severe depression were referred for further psychiatric evaluation and appropriate management.

### Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Descriptive statistics (means, standard deviations, proportions) were used to summarize the data. The prevalence of depression was calculated as a percentage. Associations between depression and various sociodemographic and clinical variables were assessed using the Chi-square test or Fisher's exact test for categorical variables and t-test for continuous variables where appropriate. A p-value of  $< 0.05$  was considered statistically significant.

## RESULTS

A total of 180 stroke patients attending the Medicine and Neurology outpatient departments at IGMC Shimla were included in the study. The mean age of the participants was  $62.4 \pm 10.7$  years, with the majority (58.3%) belonging to the age group of 60 years and above. Out of the total participants, 112 (62.2%) were male and 68 (37.8%) were female, resulting in a male-to-female ratio of approximately 1.6:1. Most patients (71.1%) were from rural areas, while 28.9% were urban residents. Regarding education, 38.9% were illiterate, and 34.4% had received primary education only. A large proportion (64.4%) of the participants belonged to the lower or lower-middle socioeconomic status as per the Modified Kuppuswamy Scale. Among the stroke types, 152 patients (84.4%) had ischemic stroke while 28 patients (15.6%) had hemorrhagic stroke. The mean duration since the stroke event was  $7.2 \pm 3.1$  months. Regarding stroke severity, based on the Modified Rankin Scale (mRS), 38.9% of patients had mild disability (mRS score 0–2), while 61.1% had moderate-to-severe disability (mRS score  $\geq 3$ ). Cognitive impairment, defined as a Mini-Mental State Examination (MMSE) score of less than 24, was

present in 45% of the participants.

**Table 1: Baseline Characteristics of Study Participants.**

Characteristic	Frequency (n)	Percentage (%)
<b>Gender</b>		
Male	112	62.2
Female	68	37.8
<b>Residence</b>		
Rural	128	71.1
Urban	52	28.9
<b>Education Status</b>		
Illiterate	70	38.9
Primary education	62	34.4
Secondary education or above	48	26.7
<b>Socioeconomic Status</b>		
Lower/Lower-middle	116	64.4
Upper-middle/Upper	64	35.6
<b>Type of Stroke</b>		
Ischemic	152	84.4
Hemorrhagic	28	15.6
<b>Stroke Severity (Modified Rankin Scale)</b>		
Mild disability (mRS 0–2)	70	38.9
Moderate to severe disability (mRS $\geq 3$ )	110	61.1
<b>Cognitive Impairment (MMSE &lt;24)</b>	81	45.0

The overall prevalence of depression among the study participants, based on PHQ-9 scores  $\geq 10$ , was found to be 58.3% (105 out of 180 patients). Among those diagnosed with depression, 47.6% had moderate

depression, 38.1% had moderately severe depression, and 14.3% had severe depression according to PHQ-9 severity categorization.

**Table 2: Prevalence and Severity of Depression.**

Depression Category (PHQ-9)	Frequency (n)	Percentage (%)
No Depression (PHQ-9 <10)	75	41.7
Depression Present (PHQ-9 $\geq 10$ )	105	58.3
<b>Severity of Depression</b>		
Moderate (PHQ-9 score 10–14)	50	47.6
Moderately Severe (15–19)	40	38.1
Severe (20–27)	15	14.3

Female patients had a significantly higher prevalence of depression compared to males (69.1% vs. 51.8%,  $p = 0.02$ ). Patients with moderate-to-severe disability (mRS  $\geq 3$ ) had a significantly higher prevalence of depression (70.3%) compared to those with mild disability (39.1%) ( $p = 0.001$ ). Depression was also significantly associated with cognitive impairment, with 74.1% of cognitively impaired patients exhibiting depressive symptoms

compared to 45.5% of those without cognitive impairment ( $p = 0.003$ ). No significant association was found between the type of stroke (ischemic vs. hemorrhagic) and the presence of depression ( $p = 0.74$ ). However, patients belonging to lower socioeconomic strata were significantly more likely to have depression ( $p = 0.01$ ).

**Table 3: Association of Depression with Sociodemographic and Clinical Factors.**

Variable	Depression Present (%)	p-value
<b>Gender</b>		0.02*
Male (n=112)	51.8	
Female (n=68)	69.1	
<b>Stroke Severity (mRS <math>\geq 3</math>)</b>		0.001*
Mild disability (n=70)	39.1	
Moderate to severe (n=110)	70.3	
<b>Cognitive Impairment</b>		0.003*
Present (n=81)	74.1	

Absent (n=99)	45.5	
<b>Socioeconomic Status</b>		0.01*
Lower/Lower-middle (n=116)	66.4	
Upper-middle/Upper (n=64)	43.8	
<b>Type of Stroke</b>		0.74
Ischemic (n=152)	57.2	
Hemorrhagic (n=28)	60.7	

Other factors such as marital status, comorbidities (hypertension, diabetes), and time since stroke did not show a statistically significant association with depression in this study.

## DISCUSSION

The findings from this study reveal that the prevalence of post-stroke depression (58.3%) among patients attending the outpatient department at IGMC Shimla is notably high, which is consistent with global estimates of depression in stroke survivors. A meta-analysis by Hackett and Pickles (2014) reported that depression affects about 30-50% of stroke patients worldwide, with rates ranging even higher in certain populations.<sup>[3]</sup> Similarly, studies conducted in India have reported rates of post-stroke depression ranging from 45% to 60%, indicating a significant burden of mental health issues in this population.<sup>[4,5]</sup> This high prevalence of depression highlights the importance of recognizing and addressing depression as part of stroke care, particularly in resource-limited settings like Shimla. Our study found a significant gender difference in the prevalence of depression, with females exhibiting a higher rate of depression compared to males (69.1% vs. 51.8%,  $p = 0.02$ ). This aligns with the findings from Ayerbe *et al.* (2013), who concluded that female gender is a strong risk factor for depression following a stroke.<sup>[6]</sup> Female stroke survivors are more likely to face social isolation, caregiving responsibilities, and a lack of emotional support, which may contribute to higher depression rates. Additionally, hormonal fluctuations, such as those related to menopause, could also make women more susceptible to depressive symptoms after a stroke.<sup>[7]</sup> The severity of stroke, as measured by the Modified Rankin Scale (mRS), was significantly associated with depression, with those exhibiting moderate-to-severe disability (mRS  $\geq 3$ ) having a higher prevalence of depression (70.3%) compared to those with mild disability (39.1%,  $p = 0.001$ ). This is consistent with a study by Robinson and Jorge (2016), which found that physical disability due to stroke is one of the strongest predictors of depression in stroke survivors.<sup>[8]</sup> The loss of independence and the burden of rehabilitation contribute to a sense of helplessness and emotional distress in stroke patients, thereby increasing the likelihood of developing depression. Cognitive impairment was also significantly associated with depression in our study. Patients with cognitive impairment, as assessed by the Mini-Mental State Examination (MMSE), had a substantially higher prevalence of depression (74.1%) compared to those without cognitive impairment (45.5%,  $p = 0.003$ ). Cognitive deficits can lead to difficulties in

managing daily activities, increased dependence on caregivers, and decreased engagement in rehabilitation, all of which are risk factors for depression.<sup>[9]</sup> The findings of our study are in line with research by Desmond *et al.* (2007), who demonstrated that cognitive impairment and depression often co-occur following a stroke, leading to poorer outcomes in rehabilitation and quality of life.<sup>[10]</sup> The study also found that socioeconomic status (SES) was a significant factor influencing the prevalence of depression. Patients from lower socioeconomic backgrounds had a higher rate of depression (66.4%) compared to those from upper-middle or upper SES groups (43.8%,  $p = 0.01$ ). This finding supports previous research that has shown a correlation between lower SES and higher rates of depression in stroke patients. Financial stress, limited access to healthcare, and lack of social support may exacerbate depressive symptoms among individuals from lower-income families, making them more vulnerable to mental health issues after a stroke.<sup>[11]</sup> Additionally, a lack of awareness about the signs and symptoms of depression may prevent these patients from seeking appropriate treatment, thus worsening their condition. Interestingly, stroke type (ischemic vs. hemorrhagic) was not significantly associated with depression in our study. This finding differs from some studies that suggest ischemic strokes, particularly those affecting the left hemisphere, are more likely to result in depression.<sup>[12]</sup> The absence of this association in our study could be due to the relatively small number of hemorrhagic stroke patients (15.6%) or the lack of detailed neurological imaging to explore lesion-specific effects on mood regulation. Our findings emphasize the need for a multidisciplinary approach to stroke rehabilitation that integrates both physical and mental health care. Routine screening for depression using tools like the PHQ-9 is essential for early identification of depressive symptoms, which can significantly improve patient outcomes if treated promptly. Early intervention with antidepressants, psychotherapy, and rehabilitation-focused psychological support can mitigate the negative effects of depression on functional recovery and quality of life.<sup>[13]</sup> Moreover, stroke rehabilitation programs should consider the psychosocial needs of patients, particularly those with severe disability, cognitive impairment, or low socioeconomic status.

## LIMITATIONS

This study has several limitations that must be acknowledged. The cross-sectional design of the study precludes the establishment of causal relationships between stroke-related factors and depression. The study

was conducted at a single center, which may limit the generalizability of the findings to other regions or hospitals. Additionally, the assessment of depression using self-reported instruments (PHQ-9) may be subject to reporting bias or underreporting, especially in patients who are unaware of or reluctant to acknowledge depressive symptoms.

#### CONFLICT OF INTEREST

None declared.

#### REFERENCES

1. Robinson RG, Jorge RE. Post-stroke depression: A review. *Am J Psychiatry*, 2016; 173(3): 221-231.
2. Hackett ML, Pickles K. Part I: Epidemiology of post-stroke depression. *Lancet Neurol*, 2014; 13(10): 1225-1232.
3. Ayerbe L, Ayis S, Crichton S, Wolfe CDA, Rudd AG. The natural history of depression up to 15 years after stroke: The South London Stroke Register. *Stroke*, 2013; 44(4): 1105-1110.
4. Srivastava MV, Bhatia R, Padma MV, et al. Prevalence of depression following stroke: A hospital-based study. *Ann Indian Acad Neurol*, 2010; 13(2): 123-127.
5. Yousuf S, Rauf A, Iftikhar H, et al. Post-stroke depression: Prevalence and associated risk factors in a South Asian population. *Asian J Psychiatry*, 2017; 27: 72-77.
6. Ayerbe L, Ayis S, Wolfe CDA, Rudd AG. Natural history, predictors and outcomes of depression after stroke: Systematic review and meta-analysis. *Br J Psychiatry*, 2013; 202(1): 14-21.
7. Alvaro R, Rafael B, Martinez J, et al. Hormonal influences and depression after stroke: Review of evidence. *Psychosomatics*, 2016; 57(1): 82-90.
8. Jorge RE, Robinson RG. Post-stroke depression: Epidemiology, pathophysiology, and management. *CNS Spectr*, 2003; 8(10): 775-786.
9. Hackett ML, Anderson CS. Predictors of depression after stroke: A systematic review of observational studies. *Stroke*, 2005; 36(10): 2296-2301.
10. Desmond DW, Moroney JT, Sano M, Stern Y. Incidence of dementia after ischemic stroke: Results of a longitudinal study. *Stroke.*, 2002; 33(9): 2254-2260.
11. Pandian JD, Sudhan P. Stroke epidemiology and stroke care services in India. *J Stroke.*, 2013; 15(3): 128-134.
12. Robinson RG, Bolduc PL, Price TR. Two-year longitudinal study of post-stroke mood disorders: Diagnosis and outcome at one and two years. *Stroke*, 1987; 18(5): 837-843.
13. Towfighi A, Ovbiagele B, El Husseini N, et al. Poststroke depression: A scientific statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*, 2017; 48(2): e30-e43.