Original Article

Poststroke depression among stroke survivors in Sub-Himalayan region

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Abstract

Introduction: Stroke is a leading cause of long-term disability and loss of productive life in developing countries, including India. Ischemic stroke accounts for 85% of all types of stroke with a prevalence of 5%–15% among acute stroke incidents. The prevalence of poststroke depression among acute stroke survivors is varied from 5 to 54%. The study focused on depression among stroke survivors who actively involved in a home-based rehabilitation. **Materials and Methods:** A descriptive cross-sectional survey was conducted by enrolling 138 stroke survivors consecutively at tertiary care public hospital, North India. A sociodemographic and clinical profile sheet was used to seek information on personal and clinical variables. Information on disability, depression, performance in the activity of daily living, and degree of stroke severity was ascertained by using the Modified Rankin Scale (MRS), Physical Health Questionnaire (PHQ-9), Barthel Index, and National Institutes of Health Stroke (NIHSS). After binary logistic regression model, a multivariate logistic regression was applied to detect the independent predictor of depression. **Results:** Over 86% (119) of the stroke survivors had no symptoms of depression, and only 14% (19) were reported to have symptoms of depression. Poststroke depression found significant association with disability ($P = 0.029$) and functional independence ($P = 0.0001$). A significant difference was observed in the gender ($P = 0.018$), types of stroke ($P = 0.0001$), and location of lesion ($P = 0.0001$) with depression. Binary logistic regression model shows that disability (MRS) status of stroke survivor ($P < 0.0001$; 95% CI 1.998–2.638) and functional independence (BI) ($P < 0.0001$; 95% CI –0.034–0.020) are same as independent predictors for depression. **Conclusion:** Clinician should use the community reintegration, referral, and mandatory screening of the stroke survivors at follow-up visit to rule out the probability of occurrence of poststroke depression.

Keywords: Depression, follow-up, stroke, survivor

Introduction

Ischemic stroke is the most common form of stroke, accounting for approximately 85% of stroke.[1] The estimated adjusted prevalence rate of stroke ranged 84–262/100,000 in rural and 334–424/100,000 in urban areas in India. The incidence rate is 119–145/100,000 based on recent population-based studies.[2]

However, the prevalence of *early* poststroke depression (PSD) was found to be higher as compared to *late* PSD in survivors[3] and varied from 5 to 54%. In an Indian epidemiological study, 36.98% cases reported symptoms of major depression in a higher prevalence in patient with lower socioeconomic status,[4] left-sided hemisphere lesions,[5] functional dependence, female as gender, and nuclear family structure of the patient.[6]

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PSD is one of the most common neuropsychiatric negative consequences seen in stroke survivors.[7] Diagnosis of PSD is challenging considering the presence of somatic symptoms and neurological sensory deficit in patient and might need expert clinical orientation.[8] The development of PSD is multifactorial and has been found related to cellular, genetic, and environment of the patient. Depression is often caused by biochemical changes in the brain. When the brain is injured, the survivor may not be able to feel positive emotions. Depression can also be a normal psychological reaction to the losses from stroke[9] or appears to be triggered by or linked to the ischemic event in stroke survivors.[10] However, the exact etiology and pathophysiology of PSD remain unknown.[7]

Survivors with PSD show increased likelihood of recurrent stroke and depression, and subsequently increased mortality compared with nondepressed stroke survivors.[11] PSD found associated with poor functional outcomes, prognosis, and worse quality of life. Similarly, poor management and delay identification lead to worse rehabilitation outcome and functional loss in survivors.[12] Conversely, early identification and treatment of depression show a better sensory and functional outcome in survivors.[13]

Depression may make the rehabilitation process more challenging for survivors by addition more time in assisting the activities of daily living (ADL) of the patient.[9] Further, PSD was found to be associated with disturbed sleep pattern, irritability, social withdrawal, problem concentration, and increase vulnerability for suicide, which may further hamper the rehabilitation and delayed the recovery process.[14]

In spite of ample available literature and well-known negative consequences on recovery of stroke patient, need for early identification and treatment of depression among stroke survivors is always underestimated. Paucity of literature on PSD in region also limits to reach to decide intervention for the condition. Therefore, this study aimed to determine PSD and its association with sociodemographic and clinical variables of stroke survivors.

Materials and Methods

A cross-sectional study was conducted in a tertiary care public hospital. A sample size of 138 was calculated by considering the current prevalence of depression in ischemic stroke survivors in region.[15] Consecutive sampling technique was adopted to enroll the stroke survivors in the study at the outpatient department of neurology.

Stroke survivors with age group 18–70 years along with history of 1 month after acute stroke and clinically stable were evaluated in the study. However, stroke survivors who were suffering with neurological disorders such as migraine, Alzheimer's dementia, Parkinson's disease, aphasic, and stroke due to pregnancy, or a complication of surgery, were excluded from the study. Data were collected by using a structured sociodemographic datasheet, The National Institutes of Health Stroke Scale (NIHSS), Modified Ranking Scale (MRS), Patient Health Questionnaire (PHQ-9), and Barthel Index. The data sheet sought validation from experts in the field of neurology and nursing. Appropriate descriptive statistics was applied to compute mean and standard deviation, and Fisherexact test was used to find the association between depression and other sociodemographic and clinical variables. Binary logistic regression, which showed statistical significance on univariate comprised, was performed. A value of $P < 0.05$ was considered statistically significant for the findings.

Ethical consideration

Ethical permission was obtained from the Institutional Ethical Committee (IEC), All India Institute of Medical Sciences (AIIMS), Rishikesh, Uttarakhand, India (AIIMS/IEC/19/1301). Further, stroke survivors were ensured for maintaining confidentiality and privacy during and after data collection. Written informed consent was obtained after explaining the study objectives, and duration of involvement. Subjects were informed to withdraw their participation from the study at any given point of time without claiming any reason.

Sociodemographic and clinical profile sheet

It consists of information on age, gender, marital status, education, occupation, monthly family income (INR), habitat, and number of family members. Clinical variables such as body mass index (BMI), hypertension (HTN), diabetes mellitus (DM), history of heart disease, type and site of stroke, duration of stroke, recurrence of stroke, type of substance abuse, pattern, frequency, number of cigarettes/bidi/tobacco chews per day, amount per day, and drugs. It took approximately 2–5 min to fill and collect the information.

The national institutes of health stroke scale (NIH Stroke Scale)

It is a systematic assessment tool that provides quantitative information on stroke-related neurologic deficit.[16] It is widely used clinical assessment too to evaluate acuity of stroke survivors. It consists of 11 items on a scale ranging 0–4 with a maximum possible score of 42. The tool is reliable with a correlation coefficient of 0.92 and reported higher inter-rater reliability between the two examiners.[17] Investigator has obtained an online competency certificate to administer the tool for the study.

Modified Rankin scale (MRS)

The scale is used to measure the degree of disability among stroke survivors.[18] It consists of seven items with score ranges 0–6: 0 means *no symptoms at all* and 6 indicates *dead*. The tool has wide application and is frequently used for similar population and reported higher interclass correlation coefficient ($r = 0.94$).

The Barthel index

This index is used to measure level of independence in ADL.[19] It measures independence over 10 most common daily activities

of an individual with a maximum score of 100. Response categories of disability are rated in scale steps (0, 5), (0, 5, 10), and (0, 5, 10, 15) dependent on the items. Each item is rated based on the assistance required (0 = unable, 1 = need help, 2 = independent). A score of 0 shows totally dependent and 100 shows fully independent. The Barthel index has shown high inter-rater reliability (r = 0.95) and test–retest reliability (r = 0.89) as well as high correlations (r = 0.74-0.8) with other measures of physical disability.

Patient health questionnaire-9 (PHQ-9)

The self-administered, standardized tool is used in adult population to assess severity of depression.[20] Each item scored on a scale 0 (not at all) to 3 (nearly every day) with a total score range 0–27. The tool is widely used in similar population in earlier studies and have acceptable validity and reliability ($\alpha = 0.87$) to use. A standard category classification of PHQ-9 is used for distribution of depression.

Method of data collection

A formal permission was obtained from the concerned authority before proceeding to data collection. The stroke survivors were screened for inclusion criteria before obtaining written informed consent. Data were collected by using subject's datasheet, MRS, NIHSS, Barthel index, and the PHQ-9. It took approximately 10–15 min to collect the data. Data were analyzed by using Statistical Package for the Social Sciences (SPSS) software, version 22.0. Appropriate descriptive and inferential statistics was applied to analyze the data.

Results

Findings revealed that approximately 86.2% of the stroke survivors were reported symptoms of no depression; however, only 13.8% were severe enough to classify in depression on PHQ-9.

Further, 50.7% of the stroke survivors reported moderate–severe disability after stroke on MRS scale and remaining 26.8% found with moderate disability. Similarly, 58.7% of the stroke survivors were found reported very severe on NIHSS scale poststroke. Likewise, 62.3% stroke survivors reported moderate disability on Barthel Index [Table 1].

Further, stroke-related disability found a significant association with levels of depression ($P = 0.029$), and functional dependence ($P = 0.0001$) among ischemic stroke survivors. These findings reveal that patients with higher disability and functionally dependent have more symptoms or probability of depression in poststroke rehabilitation phase. Clinician can take these findings as precautionary to pay extra attention to those survivors at follow-up for early screening of depressive symptoms [Table 2].

An analysis to compare depressive to nondepressive stroke survivors shows a significant difference between the groups in terms of gender ($P = 0.018$), types of stroke ($P = 0.0001$), and lesion of stroke ($P = 0.0001$) in survivors. These findings reveal that female survivors have more symptoms of depression in comparison to their counterparts. Likewise, left-side ischemic stroke survivors have more symptoms of no depression in comparison to their counterparts. However, other sociodemographic and clinical variables did not show any significant association with PHQ-9. However, the other variables did not show any significant group difference [Table 3].

Correlation coefficient was calculated to find the relationship between depression and stroke severity (NIHSS), functional independence (BI), and disability status (MRS) in stroke survivors. Depression reported a statistical negative relationship with functional dependence ($P < 0.0001$) and statistical significant positive relationship ($P < 0.0001$) with disability status in stroke survivors. Further, stroke severity (NIHSS) did show relationships with depression, but it was not significant ($P > 0.05$). It can be interpreted that increasing functional independence reduces the symptoms of

Table 1: Descriptive statistics of variables in stroke survivors

Variables	Levels	f (%)
Depression (PHQ-9)	Yes (5-9)	19 (13.8)
	No (0-4)	119 (86.2)
Degree of disability (MRS)	Slight disability (<2)	31 (22.5)
	Moderately disability (3)	37 (26.8)
	Moderately-severe disability (4)	70 (50.7)
	Mild impairment (<5)	24 (17.4)
Stroke severity (NIHSS)	Mild to adequately impairment (6-13)	33 (23.9)
	Very severe impairment (≥14)	81 (58.7)
Dependency level (Barthel Index)	Independent and slightly dependent (91-100)	13 (9.4)
	Moderately dependent (61-90)	86 (62.3)
	Severely dependent (21-60)	39 (28.3)

PHQ=Physical Health Questionnaire, MRS=Modified Rankin Scale, NIHSS=National Institute of Health Stroke Scale

Table 2: Distribution of disability, functional independence and stroke severity as per depression status in stroke survivors

Variables	Depression		*P*
	Yes (f)	No (f)	
NIHSS			
Mild impairment	3	21	0.461
Mild to adequately impairment	5	28	
Very severe impairment	11	70	
MRS			
Slight disability	0	31	0.029*
Moderate disability	8	29	
Moderate to severally disability	11	59	
Barthel index (BI)			
Independent or slight dependent	01	12	0.0001*
Moderately dependent	02	84	
Severe dependent	16	23	

*Chi-square test, * *P*-value significant as <0.05

Table 3: Distribution of depressive and nondepressive stroke survivors according to sociodemographic and comorbidities

Variables	Categories	PHQ-9 depression		*P*
		Yes	No	
Gender	Male	8	83	0.018*
	Female	11	36	
Education status	Informal	5	37	0.116
	Primary	14	50	
	Secondary school	0	32	
Occupation	Unemployment	16	49	0.214
	Private	3	60	
	Government	0	10	
Family income (INR)	5000-20000	19	90	0.172
	20000-35000	0	29	
BMI	Normal	19	84	0.135
	Obese	0	35	
DM	Yes	0	2	1.000
	No	19	117	
Heart diseases	Yes	0	5	1.000
	No	19	114	
Type of stroke	Ischemic	8	113	0.0001*
	Hemorrhagic	11	6	
Location of lesion	Left hemisphere	8	86	0.0001*
	Right hemisphere	11	33	

*Chi-square test, **P*-value significant as <0.05; BMI=body mass index, DM=diabetes mellitus

Table 4: Correlation of PHQ-9 with Barthel index, NIHSS, and MRS in stroke survivors

	PHQ9	Barthel index	MRS	NIHS score
PHQ-9	1	-0.542**	0.585**	0.130
Barthel index	-0.542**	1	-0.466**	-0.069
MRS	0.585**	-0.466**	1	0.158
NIHS score	0.130	-0.069	0.158	1

**Correlation is significant at the 0.01 level (2-tailed)

depression and vice versa. Similarly, higher disability was found to be related to higher depression in poststroke phase [Table 4].

The independent determinants of PHQ-9 analyzed by binary logistic regression are shown in Table 5. Determinants show a significant relationship with PHQ-9 included in the model. Finally, findings reported disability status (MRS) (*P*-0.0001; CI: 1.992–2.638) and functional independence (BI) ($P = 0.0001$; CI: –0.020–0.294) as an independent predictor of PHQ-9 in stroke survivors.

Multivariate logistic regression analysis report showed that a functional dependence ($P < 0.0001$*, CI: –0.024–0.010) and disability ($P < 0.0001$*, CI: 0.198–0.404) have synergistic impact with a variance of $R^2 = 0.435$ on development of depression [Table 6]. None of the other factors were found to be significant to influence depression in poststroke survivors.

Discussion

This study finding reported that 13.8% of stroke survivors were having symptoms of depression. These findings are in

Table 5: Binary logistic regression model showing independent predictors for depression among stroke survivors

Variables	*B*	95% CI		Unadjusted *R* square	*P*
		Lower	Upper		
MRS	0.585	1.998	2.638	0.342	0.0001*
BI	-0.542	-0.034	-0.020	0.294	0.0001*

**P*-value significant < 0.05, PHQ-9=Physical Health Questionnaire, BI=the Barthel Index, MRS=Modified Rankin Scale

Table 6: Multivariate logistic regression for depression in stroke survivors

Characteristics	Variables	*B*	Beta	95% CI		*P*
				Lower	Upper	
PHQ-9	BI	-0.017	-0.345	-0.024	-0.010	0.0001*
	MRS	0.301	0.424	0.198	0.404	0.0001*

**P*-value significant<0.05, PHQ-9=Physical Health Questionnaire, BI=the Barthel Index, R square-0.435

line with the study conducted by Baccaro *et al.*,[21] who found that 19% of survivors had PSD 2 years after stroke. Similarly, a Chinese study reported depression as 25.4%, 17.6%, and 12.4% at 2 weeks, 3 months, and 12 months' poststroke, respectively.[22] Furthermore, it is also reported depression at 1, 3, 6, 12, and 18 months' poststroke in 24.5%, 27.1%, 28.3%, 19.8%, and 26.3% of the survivors, respectively.[23] Moreover, a study found depression as 36.98% among 241 survivors which was found to be consistent to our study findings.[5] Subsequently, another study reported depression at 2, 4, and 6 months and 5 years' poststroke and reported 33.3% PSD.[24] Similarly, a prospective study reported incidence of 27.47% depression 2 weeks' poststroke.[25]

Further, the findings of this study reported that depression is significantly associated with stroke disability and functional dependence poststroke. This finding are in concurrence with the work which reported that PSD is significantly higher in stroke survivors reported higher disability[13,26-28] and functional dependence[26,29] in poststroke period.

Further, depression is found significantly associated with gender, types of stroke, and location of stroke lesion. These findings supported by previous studies reported that women have higher probability of depression as compared to men.[27,30] It may be that female patients were more reserve and vulnerable to get more psychological and social problems resulting more psychological disorders. Literature shows that there is no specific difference for occurrence of depression in survivors with left hemisphere lesion[31-35] and right hemisphere lesion.[36,37] However, further study needed to reach on a specific conclusion for involvement and relationship of lesion to PSD. Similarly, PSD did not show any significant association with types of stroke (ischemic vs. hemorrhagic)[38]; however, hemorrhagic cases reported better neurological status and better mobility status at the time of hospital discharge.[39] The discrepancy in findings may be drawn because of use of different instruments for depression and selection of patient from a narrow region. Therefore, in future research, we expect a large sample and multicenter study to reach

on a specific conclusion and should do the comparison for stroke lesion and types of stroke with depression.

In this study, disability status and functional independence found an independent predictors of depression among stroke survivors. A Chinese report showed that stroke outcome and functional dependence are important determinants during the initial 2 weeks after acute stroke.[25] Similarly, findings reported that post stroke depression prevalence was higher among patients with reduced mobility, higher functional dependence and severe functional disability.[40,41] These findings shall be undertaken by the clinicians in practice for mandatory screening of the stroke patients in follow-up for depression and other psychological problems. This will further help to prevent the readmission rate and unnecessary economic burden on health-care system. Screening the patients for psychological patient at follow-up will help to strengthening the home rehabilitation for stroke survivors.

Conclusion and Recommendations

Prevalence of PSD is higher in stroke survivors. Further, findings reported that women, type of stroke, lesion of stroke, poststroke disability, and functional independence have a direct influence on development of depression. The study findings showed the need to clinicians for mandatory screen survivors for depressive symptoms at follow-up visits. This will help to suggest preventive, curative, or referral services for survivor and family members. Similarly, an interdepartmental collaboration with psychiatry services for counselling may benefit the survivors at home or hospital. Since depression is closely associated with prolonged duration of recovery and poor outcomes should be prioritized to encourage optimal physiological and psychological health.

Limitations

The study should be seen under many limitations. A descriptive one-time and self-report survey may hinder the generalization of the findings. Similarly, small sample size and restriction of sample selection to Himalayan region should be taken care before extrapolating the findings in another setting.

Ethical permission

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Conflicts of interest

There are no conflicts of interest.

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