



# Prevalence and Factors Influencing Depression in Patients with Stroke Attending a Tertiary Care Teaching Hospital, a Cross Sectional Study

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## ABSTRACT

**Background:** Stroke is a major public health problem contributing to significant morbidity and mortality across the globe. In spite of many reviews documenting a strong association between stroke and depression, it is the most ignored aspect in many developing countries including India, due to paucity of studies on the subject. Hence the current study was conducted with an objective of assessing the prevalence of depression among the stroke patients and factors influencing it in a tertiary care teaching hospital

**Materials & Methods:** This cross sectional study was conducted in the department of Neurology and the department of Psychiatry in NRI General Hospital. The study had included 56 eligible stroke patients and evaluated them for depression using DSM-IV TR Diagnostic criteria and Hamilton Depression Rating Scale (HAM-D).

**Results:** The prevalence of depression in study population was 46.4%, out of which 21.4% had minor depression and 25% had major depression. The demographic factors which have shown increased risk of depression were female gender, primary school educational status, middle socioeconomic class and living in an extended nuclear family or joint family. But none of the associations had shown statistical significance. The disease related factors associated with increased risk of stroke were presence of aphasia, severe limitation of and presence of stressful life event. Out of these only severe limitation of ADL has shown statistically significant association.

**Conclusions:** The prevalence of depression is very high in patients affected by stroke. The major factors which were associated with increased risk of depression were female gender, presence of aphasia, severe limitation of ADL and presence of stressful life events.

**Key Words:** Depression, Stroke, Aphasia, Stressful life events

## INTRODUCTION

Stroke is a major public health problem accounting for 5.5 million deaths worldwide annually, with 44 million disability-adjusted life-years lost.<sup>1</sup> A systematic review of 56 population based studies found a 42% decrease in stroke incidence in high income countries while in low income countries, the stroke incidence more than doubled in recent years.<sup>2</sup> Stroke is one of the leading causes of death and disability in In-

dia. Currently, the stroke incidence in India is much higher than Western industrialized countries. The reported age adjusted prevalence rate of stroke ranges from, 84 to 262 per 100,000 among rural population. It ranges from 334 to 424 per 100,000 among urban population. The incidence rate is 119-145/100,000 based on the recent population based studies<sup>3-5</sup> In India, the overall morbidity as assessed by DALYs was 795.57 per 100,000 person-years.<sup>6</sup>

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Considering the devastating consequences of stroke at personal and family level, it is likely that stroke may have serious negative impact on psychological health of the affected person. Depression is reported to be one of the common sequelae of stroke. Recent systematic reviews have reported a pooled estimate of depression in stroke patients to be about 33%.<sup>7</sup> Though it was presumed that left hemisphere strokes increase the risk for post-stroke depression (PSD), a recent systematic reviews did not support the hypothesis.<sup>8,9</sup> The depression in stroke patients is reported to be the strong predictor of adherence to treatment, quality of life of the affected patients.<sup>10</sup> Hence, many of the recent studies have emphasized the importance of focusing on the psychological aspects apart from (neuro) biological factors, to achieve better treatment outcomes and quality of life in stroke affected patients.<sup>11,12</sup>

In India, post-stroke depression is an ignored or highly under-diagnosed condition, hence poorly addressed. Studies documenting the burden and factors influencing depression can draw the attention of all relevant stakeholders including patients, their family members, health care providers at different levels. Hence there is a strong need for studies on the subject.

#### Objectives:

1. To assess the prevalence of depression among the stroke patients presenting to a tertiary care teaching hospital in south India
2. To analyse factors associated with depression in the study population

## MATERIALS AND METHODS

**Study site:** This study was conducted in the department of Neurology and the department of Psychiatry in NRI General Hospital, which is a tertiary care teaching hospital located in the state of Andhra Pradesh, South India.

**Study population:** The study population included all the adult patients diagnosed with ischemic stroke by clinical examination and confirmed by appropriate imaging (CT scan/ MRI Brain) and were attending follow up visits in neurology OPD 3 to 12 months after stroke

**Sample size and sampling method:** A group of 56 eligible and consenting participants were included in the study sequentially by convenient sampling.

#### Data collection tools:

DSM-IV TR Diagnostic criteria was followed to screen for Depression. Hamilton Depression Rating Scale (HAM-D) was used to assess the severity of depression in the study group. Lawton scale of Instrumental Activities of Daily Liv-

ing (IADL) was applied to assess the degree of physical impairment. Mini Mental Status Examination (MMSE) was applied to assess cognitive impairment. Presumptive Stressful Life Event Scale (PSLES) was administered to find the role of stressful life events in post stroke depression.

#### Inclusion Criteria:

1. All adult patients with the diagnosis of Ischemic stroke made by a neurologist both clinically and with CT/ MRI scan belonging to both genders
2. Conscious and cooperative and accompanied by at least one informant.
3. The stroke should be of first episode.

#### Exclusion Criteria:

1. Patients with past history of psychiatric illness.
2. Patients with neuro radiological evidence of hemorrhage.
3. Patients with duration of less than 3 months and more than 12 months from the stroke episode.
4. Patients who could not communicate or severely aphasic.

**Study procedure:** After obtaining informed consent, special proforma was prepared for collecting the socio-demographic profile. This consisted of socio demographic data, history of present illness, history of past medical and psychiatric illness and detailed neurological examination, CT scan and other important investigations. Patients meeting the criteria for depressive disorder due to general medical condition based on DSM-IV TR criteria were administered the following tools. This study had cleared the institutional ethical committee requirements.

#### Statistical Methods

IBM SPSS statistical software version 21 was used for statistical analysis. Socio demographic variables like age and gender, religion, education, occupation, socioeconomic status, type of family etc. were taken as explanatory parameters. Presence of depression as assessed by HAM depression score was considered as primary outcome. Descriptive analysis of all the explanatory and outcome parameters was done. All the categorical variables were presented in frequencies and percentages. The numerical variables presented in means and standard deviations. The association between various explanatory variables and depression was assessed by univariate binary logistic regression in the first step. Unadjusted odds ratios along with 95% CI were presented. Variables showing statistically significant association in univariate analysis were included in the multivariate binary logistic regression analysis, to identify the independent predictors of depression. IBM SPSS statistical software version 21 was used for statistical analysis.<sup>13</sup>

## RESULTS

A total of 56 stroke patients, who satisfied inclusion criteria were included in the study.

Following Table 1 illustrates the distribution of sociodemographic parameters in the study population.

**Table 1: Distribution of Socio demographic parameters in study population (N=56)**

Parameter	Frequency	Percent
<b>I. Sex</b>		
Male	38	67.9
Female	18	32.1
<b>II. Religion</b>		
Hindu	45	80.4
Christian	8	14.3
Muslim	3	5.4
<b>III. Education</b>		
Illiterate	40	71.4
Primary	12	21.4
Secondary education anhigher	4	5.2
<b>IV. Socio economic status</b>		
Low	23	41.1
Middle	29	51.8
High	4	7.1
<b>V. Type of family</b>		
Nuclear	46	82.1
Extended nuclear	6	10.7
Joint	4	7.1

Out of total 56 participants, 38 (67.9%) were males. Hindus constituted 80.4% of participants and the proportion of Christians and Muslims was 14.3% and 5.4% respectively. Majority (71.4%) were illiterates and 21.4% completed primary education and only 5.2% completed secondary education and higher. Four (7.1%) belonged to high socio economic status. The proportion of low and middle socio economic status people was 41.1% and 51.8% respectively. Forty six (82.1%) of them belonged to nuclear family, 6 (10.7%) belonged to extended nuclear family and 4 (7.1%) belonged to joint family.

**Table 2: Distribution of disease related parameters in study population (n=56)**

History	Frequency	Percent
<b>I. Side of lesion</b>		
Left	32	57.1
Right	24	42.9
<b>II. Cranial nerve involvement</b>		
None	37	66.1
UMN facial palsy	19	33.9
<b>III. Speech defects</b>		
Normal	36	64.3
Aphasia	20	35.7
<b>IV. CT Findings</b>		
Fronto parietal infarct	19	33.9
Capsulo ganglionic infarct	15	26.8
Frontoparieto temporal infarct	8	14.3
Frontal infarct	6	10.7
Parieto temporal infarct	6	10.8
Occipital infarct	2	3.6
<b>V. Instrumental activities of daily living scale</b>		
Normal	19	33.9
Mild	19	33.9
Moderate	8	14.3
Severe	10	17.9
<b>VI. Presumptive stressful life score</b>		
Present	16	28.6
Absent	40	71.4

UMN –Upper Motor Neuron type of facial palsy

The lesion was on left side for 32 (57.1%) patients and was on right side for remaining 24 (42.9%) patients. UMN facial palsy was seen in 19 (33.9%) of patients and aphasia was seen in 20 (35.7%) of patients. The most common lesion in CT was fronto parietal infarct, which was seen in 19(33.9%) patients, followed by capsuloganglionic infarct, seen in 15 (26.8%) of patients. (Table 2)

As per Lawton instrumental activities of daily living, 19 (33.9%) people were having normal scores, 19 (33.9%) had mild limitation, 8 (14.3%) had moderate limitation and 10(17.9%) had severe limitation of activities of daily living. (table 2)

The prevalence of depression in study population was 46.4%, as 26 subjects out of 56 had depression of various severities. Out of the 26, 12 (21.4%) had minor depression and 14 (25%) had major depression. (table 3)

**Table 3: Prevalence of depression in study group (n=56)**

Depression	Frequency	Percent
III. HAM depression score		
Normal	30	53.6
Depression	26	46.4%
• Minor depression	12	21.4
• Major depression	14	25.0

**Table 4: Univariate Logistic regression analysis of factors associated with depression in study population (n=56)**

Parameter	Unadjusted odds ratio	95% CI of odds ratio		p-value
		Lower	Upper	
Gender ( baseline=male)				
Female	2.410	.763	7.605	.134
<b>Religion (baseline= Muslim)</b>				
Christian	.833	.051	13.633	0.425
Hindu	.365	.031	4.330	.898
Education ( baseline=Illiterate)				
Primary	3.316	.317	34.654	.317
Secondary education and higher	1.500	.116	19.437	.756
Socioeconomic status (baseline=Low)				
Middle	3.900	.351	43.364	.268
High	2.118	.196	22.898	.537
Family type ( Baseline=Nuclear)				
Extended nuclear	2.750	.266	28.433	0.483
Joint	3.000	.188	47.963	0.723
Side of stroke ( Baseline= Right)				
Left	1.043	.361	3.014	0.938
Cranial nerve involvement ( baseline=None)				
UMN facial palsy	0.768	.252	2.343	0.642
Speech defects ( base line= Normal)				
Aphasia	1.711	.568	5.152	.340
Limitation of ADL ( Baseline= No limitation)				
Mild	.802	.218	2.952	.740
Moderate	.458	.073	2.890	.406
Severe	12.375	1.294	118.331	.029
Presumptive stressful life score ( baseline= No stressful event)				
Yes	1.667	.509	5.461	0.399

The demographic factors which have shown increased risk of depression were female gender (Odds ratio=2.410, 95% C.I. 0.763 to 7.605, P value 0.134), primary school educational status (OR=3.316, 95% CI 0.317 to 34.654, p value 0.317), middle socio-economic class. (OR=3.90, 95% CI 0.351 to 43.364, p value 0.268) and living in an extended nuclear family (OR=2.750 95% CI 0.266 to 28.433) or joint family (OR=3.0, 95% CI 0.266 to 28.433). But none of the associations had shown statistical significance.

The disease related factors associated with increased risk of stroke were presence of aphasia (OR=1.711, 95% CI 0.568 to 5.152, p value=0.340), Severe limitation of ADL (OR=12.375, 95% CI 1.294 to 118.331, P value 0.029) and presence of stressful life event (OR=.667, 95% CI 0.509 to 5.461, P value 0.399). Out of these only severe limitation of ADL has shown statistically significant association.

## DISCUSSION

Assessment of the epidemiology of stroke is a difficult but exciting challenge that is justified by the objectives of identifying vascular risk factors, establishment of needs for the implementation of dedicated services, and guiding and assessment of future preventive and therapeutic priorities.

As per a conservative estimate, one third of all people experience significant depressive symptoms at some time after the onset of stroke. Unfortunately, the potential of under-reporting or under-recognition of abnormal mood is common due to the inherent difficulties in assessing the mood changes among patients with neurological disabilities like dysphasia and/or dementia.<sup>7</sup> Traditionally it has been considered that the greatest risk of depression is during the first few months of stroke onset. Conversely, Hackett et al., observed a consistency in the overall frequency of depression in their systematic review.<sup>7</sup>

In our study there were 67.9 % Male patients. Comparatively the proportion of males was 53.2% in the study by Aben et al.,<sup>14</sup> and 55.4% in that of Carod Artal et al.,<sup>10</sup>. A 10 year follow-up study reported that though, strokes were marginally more common in males, it could be explained by confounding and that more research is needed to understand the gender disparity in stroke pathophysiology.<sup>15</sup>

Majority (71.4%) were illiterates and 21.4% completed primary education and only 5.2% completed secondary education and higher. Laborers (48.2%) and house wives (19.6%) were the most prevalent occupations, in the study group. Out of 56 participants, only 4 (7.1%) belonged to high socio economic status. The proportion of low and middle socio economic status people was 41.1% and 51.8% respectively. Forty six (82.1%) of them belonged to nuclear family, 6 (10.7%) belonged to extended nuclear family and 4 (7.1%) belonged to joint family.



We found aphasia in 20 (35.7%) of our patients. Engelter et al.,<sup>16</sup> reported aphasia in 30% of ischemic stroke patients in a geographical defined population of 188,015. They concluded that individuals of advancing age and cardioembolism had higher risk for aphasia. Evidence also suggests that aphasia in stroke patients is associated with higher mortality<sup>17</sup>, decreased rates of functional recovery<sup>18,19</sup>, and reduced chances to return to work<sup>20</sup> compared with non-aphasic stroke patients.

The study found stroke lesions were more commonly on left hemisphere (57.1%) than right (42.9%). Similar findings (left:43% and right (37%) were found in the cohort study by Reid et al.,<sup>15</sup> However, Cardo-Artal et al.,<sup>10</sup> reported an equal preponderance, while Aben et al., found higher involvement of right hemisphere (53.2%).

As per Lawton instrumental activities of daily living, 14.3% had moderate limitation and 17.9% had severe limitation of activities of daily living. Evidence suggests that stroke survivors experience physical deconditioning and lead sedentary lifestyles and hence need to do exercise training (both aerobic and strength training).<sup>21</sup> Exercise training improves functional capacity, the capacity to perform activities of daily living and quality of life. It also reduces the risk for subsequent cardiovascular events. Hence physical activity goals and exercise prescription for stroke survivors need to be customized for the individual to maximize long-term adherence.<sup>21</sup>

In the current study, the prevalence of depression was 46.4%, with 21.4% cases of Minor depression and 25% Major depression. Carod-Artal *et al.*,<sup>10</sup> found 38% of their patients belonging to depressed range, while Astrom et al.,<sup>22</sup> reported 25% at acute stage and 31% after three months. A three year longitudinal study revealed that left anterior brain lesion, dysphasia and living were the important predictors of immediate major depression.<sup>22</sup>

The demographic factors which have shown increased risk of depression were female gender (Odds ratio=2.410, 95% C.I. 0.763 to 7.605, P value 0.134), primary school educational status (OR=3.316, 95% CI 0.317 to 34.654, p value 0.317), middle socioeconomic class. (OR=3.90, 95% CI 0.351 to 43.364, p value 0.268) and living in an extended nuclear family (OR=2.750 95% CI 0.266 to 28.433) or joint family (OR=3.0, 95% CI 0.266 to 28.433). But none of the associations had shown statistical significance. Females had higher proportion of depression compared to Males. Reid *et al.*,<sup>15</sup> highlight the rising proportion of elderly women hospitalized because of stroke. After adjusting for confounding variables, the authors found that women were more likely to have depression.

The disease related factors associated with increased risk of stroke were presence of aphasia (OR=1.711, 95% CI 0.568 to 5.152, p value=0.340), Severe limitation of ADL

(OR=12.375, 95% CI 1.294 to 118.331, P value 0.029) and presence of stressful life event (OR=.667, 95% CI 0.509 to 5.461, P value 0.399). Out of these, only severe limitation of ADL had shown statistically significant association. Many studies have reported major factors influencing depression on long term to be inability to work due to disability, dependence in activities of daily living, diminished social activity, being a housewife<sup>7, 10, 23</sup> and cerebral atrophy.<sup>22</sup> Usually by one year, patients with early depression recover, but those not recovered had a higher risk of developing chronic depression.<sup>7,24, 25</sup> There were statistically significant differences in the proportion of people with mild and severe depression in patients with different levels of activity in Lawton instrumental scale of daily living. Even though the proportion of Major depression was higher in people with more limitation of activity, there was no clear increasing or decreasing trend observed with increasing levels of activity limitation.

On the whole, depression after stroke is influenced by multifactorial interaction of biological, psychological and social aspects and their understanding would facilitate targeted preventive strategies and more effective and comprehensive preventive programs.<sup>22, 26, 27</sup>

## CONCLUSIONS

The prevalence of depression is very high in patients affected by stroke. The major factors which were associated with increased risk of depression were female gender, presence of aphasia, severe limitation of ADL and presence of stressful life event.

## RECOMMENDATIONS

1. Adequate attention has to be given to depression and other psychological consequences of stroke while managing patients with stroke.
2. There is strong need for large scale prospective studies and intervention studies to assess long term impact of depression on these patients and to provide guidance to clinicians on appropriate management.

## LIMITATIONS

1. Lack of statistical significance of many of the association could be attributed to smaller sample size. This also did not permit multivariate analysis to assess the confounding and interaction between the factors evaluated.

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