



# A STUDY TO DETERMINE HOW ACTIVE ARE STROKE PATIENTS DURING PHYSIOTHERAPY SESSIONS AND IT'S ASSOCIATION WITH COGNITIVE ABILITIES AND DEPRESSION

## PROSPECTIVE COHORT STUDY

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**Abstract:** The aim of the study was to investigate how active are the stroke patients during physiotherapy sessions and its correlation with cognitive abilities and depression. The results of the study showed that Scores of Pittsburg Rehabilitation participation Scale (PRPS) with scores of Montreal Cognitive Assessment Scale (MoCA) were significant with r- value of 0.301 and p- value of 0.002. Also the scores of Pittsburg Rehabilitation Participation Scale (PRPS) with scores of Becks Depression Inventory (BDI-II), the correlation was found to be significant with the r-value of 0.379 and p-value of 0.000. The current study concluded that the correlation between Scores of Pittsburg Rehabilitation Participation Scale (PRPS) with scores of Montreal Cognitive Assessment Scale (MoCA) and correlation between scores of Pittsburg Rehabilitation Participation Scale (PRPS) with scores of Becks Depression Inventory (BDI-II) were found to be significant as both the variables affect the active participation among the stroke survivors.

**Index Terms - Stroke, Cognitive Abilities, Depression, Pittsburgh Rehabilitation Participation Scale, Montreal Cognitive Assessment Scale, Beck Depression Inventory.**

## I. INTRODUCTION

"Rapidly developing clinical signs of localised (or global) impairment of brain function that lasts more than 24 hours or results in death and has no apparent cause" is how stroke is described other than vascular origin<sup>1,2</sup>. "A cessation of blood flow to the brain causes an abrupt loss of neurological functions<sup>3</sup>. Stroke is the fourth leading cause of death. In general, roughly 20% of patients who have their first stroke die within a month, and about a third of those who survive 6 months are reliant on others for activities of daily living (ADLs). Stroke has affected an estimated 7,000,000 Americans over the age of 20. A stroke affects roughly 795,000 people each year. Approximately 610,000 people are victims of first attacks, whereas 185,000 are victims of second attacks. The annual rate of stroke recurrence is around 5%, but it is higher in the initial few weeks and months, especially if the stroke was caused by significant carotid stenosis. There are about 80% of ischemic stroke cases and there are about 20% of haemorrhagic stroke cases present worldwide<sup>2</sup>. Arteries involved are Anterior Cerebral Artery, Middle Cerebral Artery, Posterior Cerebral Artery, vertebrobasilar Artery<sup>4</sup>. One of the important aspects that is often missed while treating stroke survivors is looking forward on cognitive and perceptual aspects affecting the improvement in the deficits exhibited by the patient working on cognitive, perceptual and psychological issues are of utmost importance while treating stroke patients apart from the physical impairments they encountered. In the light of this knowledge and in order to have better clinical insights involved in rehabilitation process, the present study aims to observe the participation of the stroke survivors during rehabilitation process and its correlation to various cognitive aspects and depression among stroke patients.

## II. AIM OF THE STUDY

The aim of the study was to investigate how active are the stroke patients during physiotherapy sessions and its correlation with cognitive abilities and depression.

## III. OBJECTIVES OF THE STUDY

To evaluate the participation of stroke patients during physiotherapy sessions, to evaluate the correlation of stroke patient's participation during physiotherapy sessions to cognitive abilities and to evaluate the correlation of stroke patient's participation during physiotherapy sessions to depression.

#### IV. MATERIALS AND METHODOLOGY

*Study Design:* Prospective cohort study; *Study Setting:* Study was done in OPD (Out Patient Department) of D.A.V Institute of Physiotherapy and Rehabilitation, Jalandhar and its affiliated hospitals; *Duration Of The Study:* Total duration of the study was one and a half year; *Sample Size:* Power sampling was performed for the calculation of sample size and the indicative population for 97 sample size was obtained. According to sample size calculated, a minimum of 100 subjects were enrolled in the study; *Sampling:* Purposive sampling was done; *Selection Criteria:* All the subjects were selected on the basis of the following criteria: *Inclusion Criteria:* Only patients satisfying WHO's definition of stroke were included. Only stroke survivors between the age of 40 to 70 years were included. Both male and female were enrolled. Type of stroke (both Haemorrhagic and Ischemic). Patients following primary stroke. Stroke survivors classified as having Moderate to Severe Stroke severity (16-20) according to National Institutes of Health Stroke Scale (NIHSS). Patients classified as alert, according stage of consciousness. Patient receiving physiotherapy from minimum of 20 days up to a maximum of 30 days. Patients with no speech deficits. Patients able to comprehend with commands. *Exclusion Criteria:* Patients with seizures related conditions (Epilepsy or Stroke induced seizures). Patients classified as lethargic or obtunded according to stage of consciousness. All those patients with transient ischemic attacks were excluded. Patients receiving Physiotherapy treatment exceeding 45 days. Patients with recurrent stroke. Patients with visual deficits. Patients suffering from auditory pathology. Patients with dislocated or subluxed shoulder. Patients not compatible with reading. *Variables:* Scores of Pittsburgh Rehabilitation Participation Scale (PRPS). Scores of Montreal Cognitive Assessment Scale (MoCA). Scores of Beck Depression Inventory-II (BDI-II). *Tools and Instruments:* National Institute of Health Stroke Scale (NIHSS); Pittsburgh Rehabilitation Participation Scale (PRPS); Montreal Cognitive Assessment Scale (MoCA); Beck Depression Inventory-II (BDI-II).

#### V. PROCEDURE

The subjects were assessed and the data was undertaken keeping in lieu all the necessary precautions for COVID-19 during the study. All the patients who met the inclusion criterion were selected in the study. A minimum of 100 patients were enrolled in the study as per calculation of Sample Size through power sampling. The procedure for the data collection involved, explaining in detail the aims and objectives of the research to the attending therapist incharge for the Out Patient Department of Physiotherapy (at the affiliated hospitals) and obtaining an informed consent from each participating subject. Four survey outcome measures were administered to each participating subjects for investigation of patient participation, cognition and depression. The parameters to be assessed were divided as general information of the patient, Pittsburgh Rehabilitation Participation Scale (PRPS), Montreal Cognitive Assessment Scale (MoCA), Beck Depression Inventory-II (BDI-II), and National Institute of Health Stroke Scale (NIHSS). Prior to the administration of the outcome measures on the patients, the severity of the stroke was evaluated using National Institute of Health Stroke Scale (NIHSS) which quantifies stroke severity on weighted evaluation findings. During the entire procedure, no intercession with regards to the physiotherapeutic measures were encompassed.

#### VI. RESULTS

##### Data analysis

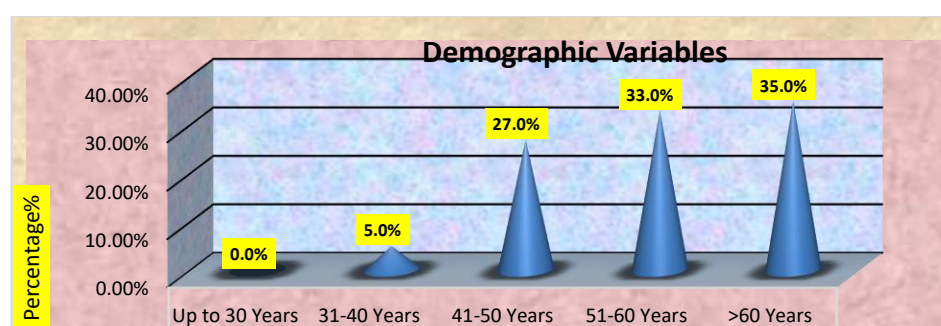
Data analysis was done by SPSS Software version 18. In this data was analyzed on the basis of mean and standard deviation of the variables used. Use of mean, standard deviation and Karl Pearson's coefficient of correlation also there for data analysis.

**TABLE: 5.1 Shows the Demographic profile of the subjects According to the Age**

Variables		Percentage	Frequency
Age	Up to 30 Years	0.0%	0
	31-40 Years	5.0%	5
	41-50 Years	27.0%	27
	51-60 Years	33.0%	33
	>60 Years	35.0%	35

**TABLE 5.2 Shows Mean and Standard Deviation of the Subjects According to their Age**

Variables		Mean	SD	N
Age	Up to 30 Years			0
	31-40 Years	25.20	3.77	5
	41-50 Years	23.33	3.42	27
	51-60 Years	22.00	4.25	33
	>60 Years	22.09	3.03	35



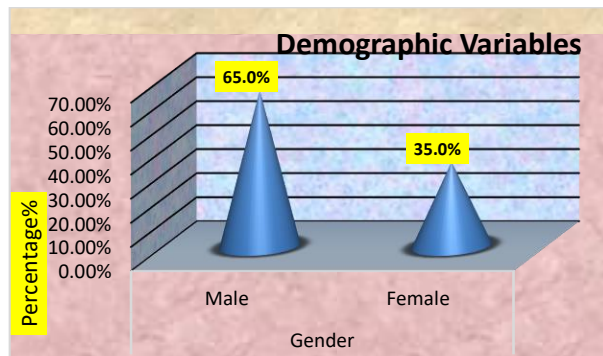
**Graph 5.1: Shows the percentage distribution of the subjects according to the Age.**

TABLE: 5.3 Shows the Demographic profile of the subjects According to Gender.

Variables		Percentage	Frequency
Gender	Male	65.0%	65
	Female	35.0%	35

TABLE 5.4 Shows Mean and Standard Deviation of the Subjects According to their Gender

Variables		Mean	SD	N
Gender	Male	27.86	14.44	65
	Female	25.91	14.43	35



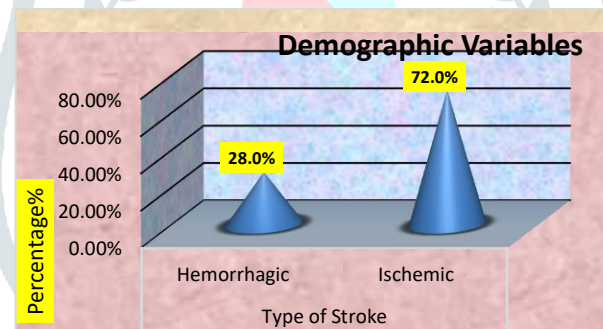
Graph 5.2: Shows the percentage distribution according to the Gender.

TABLE: 5.5 Shows the Demographic profile of the subjects According to Type of Stroke.

Variables		Percentage	Frequency
Type of Stroke	Haemorrhagic	28.0%	28
	Ischemic	72.0%	72

TABLE 5.6 Shows Mean and Standard Deviation of the Subjects According to their Type of Stroke.

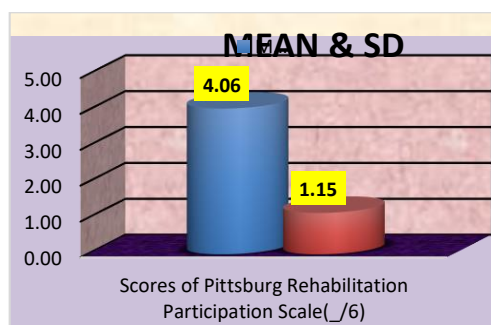
Variables		Mean	SD	N
Type of Stroke	Haemorrhagic	21.79	3.80	28
	Ischemic	22.85	3.57	72



Graph 5.3: Shows the percentage distribution according to the Type of Stroke.

TABLE 5.7: Shows Mean and Standard Deviation of the Scores of Pittsburgh Rehabilitation Participation Scales (PRPS).

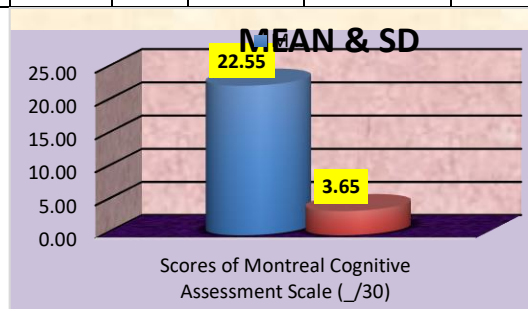
Descriptive Stats	Mean	SD	Median	Maximum	Minimum	Range
Scores of Pittsburgh Rehabilitation Participation Scale(_/6)	4.06	1.15	4.00	6.00	2.00	4.00



Graph 5.4: Shows Mean and Standard Deviation of Scores of Pittsburgh Rehabilitation Participation Scale (PRPS).

TABLE 5.8: Shows Mean and Standard Deviation of Scores of Montreal Cognitive Assessment Scale (MoCA).

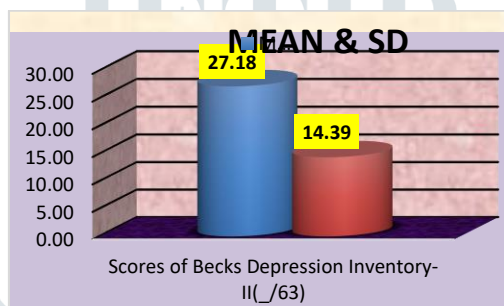
Descriptive Stats	Mean	SD	Median	Maximum	Minimum	Range
Scores of Montreal Cognitive Assessment Scale (/_/30)	22.550	3.65	23.00	29.00	15.00	14.00



Graph 5.5: Shows Mean and Standard Deviation of Scores of Montreal Cognitive Assessment Scale (MoCA).

TABLE 5.9: Shows Mean and Standard Deviation of Scores of Becks Depression Inventory- II (BDI-II).

Descriptive Stats	Mean	SD	Median	Maximum	Minimum	Range
Scores of Becks Depression Inventory-II(/_/63)	27.18	14.39	27.00	56.00	0.00	56.00



Graph 5.6: Show Mean and Standard Deviation of Scores of Becks Depression Inventory- II (BDI-II).

**CORRELATION OF VARIABLES**

TABLE 5.10 Shows Correlation of Age with Scores of Pittsburgh Rehabilitation Participation Scale (PRPS).

Variable 1	VS	Variable 2	r value	P value	Result
Age.	vs	Scores of Pittsburgh Rehabilitation Participation Scale(/_/6)	-0.138	0.169	Not Significant

TABLE 5.11: Shows Correlation of Age with Scores of Montreal Cognitive Assessment Scale (MoCA).

Variable 1	VS	Variable 2	r value	P value	Result
Age.	vs	Scores of Montreal Cognitive Assessment Scale (/_/30)	-.202*	0.044	Significant

TABLE 5.12: Shows Correlation of Age with Scores of Becks Depression Inventory (BDI-II).

Variable 1	VS	Variable 2	r value	P value	Result
Age.	vs	Scores of Becks Depression Inventory-II(/_/63)	-0.111	0.271	Not Significant

**TABLE 5.13: Shows Correlation of Scores of Pittsburgh Rehabilitation Participation Scale (PRPS) with Scores of Montreal Cognitive Assessment Scale (MoCA).**

Variable 1	VS	Variable 2	r value	P value	Result
Scores of Pittsburgh Rehabilitation Participation Scale(_/6)	vs	Scores of Montreal Cognitive Assessment Scale (_/30)	.301**	0.002	Significant

**TABLE 5.14: Shows Correlation of Scores of Pittsburgh Rehabilitation Participation Scale (PRPS) with Scores of Becks Depression Inventory (BDI-II).**

Variable 1	VS	Variable 2	r value	P value	Result
Scores of Pittsburgh Rehabilitation Participation Scale(_/6)	vs	Scores of Becks Depression Inventory-II(_/63)	-.379**	0.000	Significant

**TABLE 5.15: Shows Correlation of Scores of Montreal Cognitive Assessment Scale (MoCA) with Scores of Becks Depression Inventory (BDI-II).**

Variable 1	VS	Variable 2	r value	P value	Result
Scores of Montreal Cognitive Assessment Scale (_/30)	vs	Scores of Becks Depression Inventory-II(_/63)	0.094	0.354	Not Significant

## VII. DISCUSSION

The age group for the subjects ranged from 40 to 70 years, in which 5% of patients aged between 31- 40 years, 27% between 41- 50 years, 33% aged from 51- 60 years, 35% of patients aged 60- 70 were there. The mean and standard deviation of age group between 31-40 years comes out to be  $25.20 \pm 3.77$ . The mean and standard deviation of age group between 41-50 years came out to be  $23.33 \pm 3.42$ . The mean and standard deviation of age group between 51-60 years is  $22.00 \pm 4.25$ . The mean and standard deviation of age group above 60 i.e. up-to 70 years is  $22.09 \pm 3.03$ . For gender distribution, the percentage of male patients was 65% whereas for female patients it was 35%. The mean and standard deviation of male population was found  $27.86 \pm 14.44$ , whereas for females it was  $25.91 \pm 14.43$ . In the present study, both the type of stroke i.e. haemorrhagic and ischemic were undertaken. The percentage of patients with haemorrhagic stroke was 28% whereas the percentage of the patients with ischemic stroke was found to be 72%. The mean and standard deviation for the patients with haemorrhagic stroke was found to be  $21.79 \pm 3.80$  whereas the mean and standard deviation for the patients with ischemic stroke was  $22.85 \pm 3.57$ . Descriptive statistics were used using SPSS version 18.0, where the data was analysed for the scores of Pittsburgh Rehabilitation Participation Scale (PRPS), Scores of Montreal Cognitive Assessment Scale (MoCA), and Scores of Becks Depression Inventory-II (BDI-II). The mean and standard deviation for the Scores of Pittsburgh Rehabilitation Participation Scale (PRPS) was found to be  $4.06 \pm 1.15$ . The mean and standard deviation for Scores of Montreal Cognitive Assessment Scale (MoCA) came out to be  $22.55 \pm 3.65$ . The mean and standard deviation for Scores of Becks Depression Inventory-II (BDI-II) was found to be  $27.18 \pm 14.39$ . The level of significance of 0.01 was used to determine the statistical significance. Karl Pearson's Coefficient of Correlation was used in order to test our hypothesis to determine the correlation between Age with Scores of Pittsburgh Rehabilitation Participation Scale (PRPS), correlation between Age with Scores of Montreal Cognitive Assessment Scale (MoCA), correlation between Age with Scores of Becks Depression Inventory (BDI-II), correlation between Scores of Pittsburgh Rehabilitation Participation Scale (PRPS) with Scores of Montreal Cognitive Assessment Scale (MoCA). After analysis, it was found that Scores of Pittsburg Rehabilitation participation Scale (PRPS) with scores of Montreal Cognitive Assessment Scale (MoCA) was significant with r- value of 0.301 and p- value of 0.002. While correlating the scores of Pittsburg Rehabilitation Participation Scale (PRPS) with scores of Becks Depression Inventory (BDI-II), the correlation was found to be significant with the r-value of 0.379 and p-value of 0.000. The results of our study have been supported by a study carried out by **James J, McGlinchey MP<sup>5</sup>** in 2021, which reported that studies done in the past looked on post-stroke patient activities. Many of them track activity both within and outside of physiotherapy sessions when patients are hospitalized for a whole day or longer. The study included 107 stroke rehabilitation sessions in a UK acute stroke hospital were the subject of a prospective observational research. Patient demographics (age, gender, time after stroke, and Barthel Index score) as well as session characteristics (planned and actual session length, time spent engaging in vigorous exercise, and treating therapist's grade) were recorded. Various studies have reported that the participation level of the patient varies with different type of stroke i.e. ischemic and haemorrhagic. **Barrett M et al<sup>6</sup>** in 2018, their study manifest that, the patients spent the majority of their time inactive and that the intensity and frequency of treatments provided did not meet prescribed levels by tracking activity and Heart Rate among newly admitted stroke rehabilitation inpatients. The mapping of inactive time showed that there were little possibilities for activity, other from physiotherapy and occupational therapy. Sedentary time was most likely related to institutional or program-related variables due to the lack of connection with patient-related factors like disability or other patient-related characteristics. Additionally, the average length of uninterrupted sedentary time was 5.3 hours during the week and 6.8 hours during the weekend, levels that are likely to result in deconditioning. Our research identifies three areas of inpatient rehabilitation that should be improved: breaking up lengthy periods of inactivity, stepping up the intensity of treatment sessions, and ensuring that patients receive the suggested dosages of therapy each week (15 sessions). The ACTi-heart unit and an activity journal may be helpful for tracking the success of process and

organisational improvements. This concludes that participation decreases as the sedentary lifestyle of stroke patient increases. Various studies have reported that the cognition level of the patient varies with different type of stroke i.e. ischemic and haemorrhagic. **Kim K, Kim YM, Kim EK**<sup>7</sup> in 2014, evaluated the functional independence level and quality of life (QOL) of stroke patients as well as the relationship between their QOL and the FIM components. The objective was to give fundamental information for treatment planning and the creation of interventions for the rehabilitation of chronic stroke patients in a neighbourhood. As a result of central nervous system dysfunction, many stroke victim's struggle. The FIM items and the SS-QOL had a statistically significant connection in this research (p 0.01). All FIM items had a significant connection with SS-QOL. Various studies have reported that the depression level of the patient varies with different type of stroke i.e. ischemic and haemorrhagic. **Ezema CI, Akusoba PC, Nweke MC, Uchewoke CU, Agono J, Usoro G**<sup>8</sup> in 2019, their study indicates that in this study, functional independence in ADL was linked to post-stroke depression, and functional independence varied across stroke survivors with and without depression. This study was limited by the fact that participant age and stroke length were not standardised. This is anticipated to have an impact on each patient's degree of post-stroke depression and ADL. However, this limitation was overcome by adjusting for age and the impact of stroke duration on ADL functional recovery. It's important to note that after that, the result stayed the same. Since this study used a cross-sectional survey design, it was not possible to determine the severity of post-stroke depression or how the depression score changed over time. Another disadvantage of this study is the inability to conduct a retrospective assessment of stroke severity test. Participation is considered as multifaceted concept, consisting of a subjective and an objectives aspects. The present study showed that there was no association of patient's participation evaluated by Pittsburgh Rehabilitation Participation Scale (PRPS) with Age predicting a p- value of 0.169 and r- value of -0.138. The scores of Montreal Cognitive Assessment Scale (MoCA) were found to be significant with age with the significant value of 0.44. The scores of depression as per Becks Depression Inventory- II (BDI- II) were found to be non- significant with Age with a p- value of 0.271 and r- value of -0.111. The socio- demographic determinant of Age showed discordant and inclusive results. Our study showed that age was not a determining factor for patient participation during rehabilitation session. An important factor determining the participation in the therapy session is the patient's cognitive abilities. The cognitive abilities experience a decline with advancing age as supported by the correlation of age with Montreal Cognitive Assessment Scale (MoCA) score. From the patients' outlook, participation is a crucial consideration for quality of life. Numerous contextual factors both environmental and personal are potentially related with post stroke participation. Environmental factors such as support, association and positive attitudes towards the patient are found to be major promoters for patient's participation. Personal factors as specific to psychosocial and psychological determinants are majorly recognised with post stroke participation many of the factors are modifiable and should be inscribed to enhance the patient's participation. One of the core elements for patient centred care is the patient's participation. Patient centred care is an approach that focus on patient's individual demands, exigencies, and preferences and is considered as a fundamental to quality rehabilitation<sup>9,10,11</sup>. Stroke is considered to be as pertinent contributor for cognitive decline. As per literature approximately 30% of stroke patients develop dementia in less than 1 year of stroke onset<sup>12</sup>. Stroke affects the patient's cognition domain that includes memory, attention and executive function. Literature shows that post stroke memory pervasiveness varies from 23% to 55% 3 months after stroke and ending with a decrease from 11% to 31%, 1 year after onset<sup>13,14</sup>. The underlying mechanisms following post stroke cognitive loss are still not known in detail. However, various neuroanatomical lesions that are affected by stroke such as cerebral micro- bleeds due to small Cerebro- vascular diseases and lesions in Hippocampus and white Mater leads to pathogenesis of post stroke cognitive impairment. Cognitive decline with advancing age is a principal determinant for patient's participation in rehabilitation, personal and social aspects. The results of the current study also showed that patient participation is pretentious with the cognitive abilities. Likewise cognitive decline, depression is also a moderate predictor for patient's participation post stroke. Emotional facets of depression, anxiety, happiness, apathy but not in general emotion are prime patrons to participation post stroke. The results of our study showed that patient's scores of depression are significantly correlated with patient's participation post stroke. Various inferences have been documented for planned rehabilitation post stroke. It have been significantly noted that higher levels of severity with regard to disabilities and lack of functional capacities are a major contributing factor for less active exercises during rehabilitation. A structured evaluation for the factors determining the patient participation should be incorporated in clinical practice, thereby promoting patient's recovery.

## VIII. LIMITATIONS AND FUTURE SCOPE

Observation was not done for prolonged period. As the current study was one-time study, the patients were not observed for long sessions during assessment. Video recording was not performed for the assessment of the patient. The average total length for the therapeutic session was not taken into lieu. The study lacked generalization, since the study was limited to two centers from where most of the samples were assessed. The samples were not assessed/ observed across other hospitals across the city, since the practice of delivery for the rehabilitation protocol could be diversified from therapist to therapist treating the patients. The study could be carried out taking into consideration the comparison for patient's participation during rehabilitation sessions among surgical and non- surgical population following stroke. The studies considering the natural course of depression could be carried out, as it will be non- identical for different stroke survivors. Additional methods of observation for data collection could be implemented to measure the active exercise time as it might be possible that the attending therapist could have modified their protocol on being observed.

## IX. CONCLUSION

Based on the results for the current study, it is quite apparent that participation affects the cognition of the patients with stroke. It is also seen that depressed patients were not able to participate properly in the physiotherapy sessions. This shows that cognition and depression are associated with active participation of the patients with stroke. Successful rehabilitation strategies that are built on understanding individual priorities, goals and strategies should be planned during different stages of recovery and adaptation. Providing knowledge and supporting the use of important coping skills, rehabilitation can help patients to find a new accepted post stroke identity. Any discrepancies between the patient's planned therapy sessions and actual length of sessions post stroke should be ruled out. The therapist should be conscious in adapting their sessions to maximize the amount of activity undertaken and reflects the patient's need.

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