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Original Article

Association of Depression with Rate of Recovery in Post-Stroke Patients; Analytical Cross-sectional Study

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ABSTRACT

Background: Stroke has been recognized as a medical condition in which the supply of blood to the brain diminishes suddenly. It then eventually leads to the damage of the tissues permanently which is caused by hemorrhagic and thrombotic events. The most observed mood disorders in the survivors of stroke are anxiety and depression. Depression in post-stroke patients not only causes delays in functional recovery but also leads to poor quality of life. **Objective:** The basic objective of our current study was to draw out the association of recovery from stroke with depression in post-stroke patients. **Methods:** This study is an analytical cross-sectional study in which a convenient sampling technique was used to recruit participants in this study. We used a 22.9% proportion and found out the condition sample size to be 116. The Stroke Impact Scale was employed to measure the recovery from stroke and "Depression Inventory Scale" was employed to measure depression. The patients who suffered from ischemic stroke, both males and females suffering from stroke with the visible suffering of depression were recruited in this study and depression was analyzed in this study. All the other patients who underwent recent surgeries were excluded from this study. Data was collected after informed consent which was signed by every participant and the collected data remained confidential and was used for research purposes only. The result analysis was based on percentages and numbers. Percentages and frequencies were used to evaluate the association of recovery from stroke with depression in stroke survivors. **Results:** This showed that an increase in the depression score decreases the stroke impact score in post-stroke patients. Pearson's Correlations between Stroke Impact Scale Score and Depression Inventory Scale Score show us that there is a significant negative correlation between the two outcome measures. **Conclusion:** This study concludes that an increase in depression in stroke patients decreases the recovery of stroke post-stroke patients. It also concludes that there is a significant negative correlation between the impact of stroke and depression.

INTRODUCTION

Stroke has been recognized as a condition in which the blood supply to the brain diminishes or is completely lost. This eventually leads to damage of the tissues permanently which is caused by hemorrhagic and thrombotic events.[1] The most commonly recognized disorders in stroke survivors are anxiety and depression.[2] Post-stroke depression is known to cause delay in functional recovery and it also leads to poor quality of life.[3] Post-stroke patients ranging almost from 12.3% to 73.2% suffer from depression.[4] Stroke has been recognized as the major cause of disability and death globally.[5] The occurrence of post-stroke depression has been recognized by an increasing body of evidence.[6] According to statistics, The American Heart Association gives us data that 700,000 strokes occurred in the United States and 1,63,000 deaths occurred due to stroke in the US.[7] Martin Roth is known as the 1st person who conducted an empirical study on stroke. He developed an association between depression and arteriosclerotic disease.[8] The most common impairment that develops after stroke is depression and its prevalence ranges from 18% to 61%. The post-stroke depression has been observed to be associated with a higher rate of mortality and poor functionality.[9]

Longitudinal studies were conducted that were related to the natural history of depression occurring post-stroke, it was found that depression does not occur immediately after the spell of stroke but it occurs between six to twenty-four months after stroke with a higher rate of prevalence. [10] The depression which is caused by the clinical appearance of the stroke, then leads to psychiatric complications and worsening of cerebrovascular lesions which is now called post-stroke depression.[11] Post-stroke depression has been recognized as one of the main negative elements which is also a hurdle for the process of stroke recovery.[12] Our current study is focusing on supporting this considering Pakistani stroke patients as target. The main aim of our current study was to draw out an association between recovery in post-stroke patients and depression. To establish a relationship between depression and the rate of recovery in post-stroke patients was our objective. Our study would aid in exploring how depression affects a patient's recovery from a stroke. The major significance of our current study was to focus on examining the effects of depression on recovering from stroke. How are both these variables influenced by each other? Depression has always been recognized as one of the most common issues post strokes. Our research focuses on various factors that cause depression which further need more authenticity and validity. Our current research also provides knowledge to future researchers that depression and the rate of recovery from stroke are inversely related to each other. They have a negative Pearson's correlation, increase in depression will cause a decrease in the rate of recovery.

METHODS

This study is an analytical cross-sectional study. Data for this study was collected from Suraya Azeem Hospital, Social Security Teaching Hospital, Gosha e Shifa Hospital, Mumtaz Bakhtawar Hospital and Chaudhry Muhammad Akram Teaching Hospital, Punjab, Pakistan. The population under consideration for this study was stroke survivors suffering from depression. The sample size for this study was calculated using the following parameters and formula:[13]

n: $\dfrac{Z_{1-\alpha/2}{}^2 \, p\,(1\text{-}p)}{d^2}$

$Z_{1-\alpha/2}$= standard normal variate (at 5% type 1 error (p<0.05) it is 1.96 and 1% type 1 error (p<0.01) it is 0.28 (As in the majority of studies p-values are considered significant

below 0.05 hence, 1.96 is used in the formula) P value is the expected proportion in the population based on previous studies or pilot studies and d is the absolute error or precision that has to be decided by the researcher. Using 22.9% as a proportion the condition sample size of the study was calculated to be 116.[13] Convenient sampling technique was used to recruit patients in this study. The patients suffering from ischemic stroke were included in our study. Both male and female post-stroke patients suffering from depression were recruited in this study and were analyzed in our study. The Age range of patients was 18 to 80 years. Only those patients were recruited in this study whose depression inventory scale score was at least 32.9.[14,15] The patients who recently underwent any surgery were excluded from this study. The post-stroke survivors whose ages were under eighteen and more than eighty years were not recruited in this study. Transgender and children were not included in this study. Those patients were also excluded from this study who had their depression inventory scale less than three.[16] "Stroke Impact Scale"[17] was employed to measure the recovery of stroke and "Depression Inventory Scale"[18] was employed to measure depression.

Our current study was conducted after getting approval from CMARTH and the institutional research board. The data for our study was collected from stroke survivors who were undergoing the post-stroke retrieval process. An informed consent was taken from all the patients recruited in this study. Questionnaires which were in the form of self-report were handed over to each participant to evaluate the association of stroke recovery with depression. The collected results were then allocated through Beck's inventory scale and stroke impact scale. These questionnaires were filled in by interacting with patients in the hospitals. The data was then entered for result analysis in the statistical package for Social Sciences version 23. Our current study did not violate any research ethics. To keep the confidentiality and privacy of the patients recruited in this study was a priority. The recruited participants were assured that this study will not have any negative impact on the ethical principles of the patients as well as on the professional code of conduct and their information will be used for research purposes only. The analysis of the study was centered on percentages and numbers. Percentages and frequencies were employed to evaluate the association of stroke recovery with depression in post-stroke patients.

RESULTS

The results of our study showed that most of the patients recruited in this study were from the age group 65 to 74 years (33.6%) than from the age group 55 to 64 years (32.8%) and 21.6% from the age group 45 till 54 years (Table 1). Male and female participants recruited in this study were almost equal. The mean score of the Stroke impact scale of the participants was 154 out of a total of 295±41.3. The higher the score on the stroke impact scale the higher the rate of recovery. The mean score of participants for Beck's Depression Inventory scale was found to be 32.95 out of a total of 63±16.3. Higher scores on this scale indicate a higher level of depression. The Pearson's correlations between Beck's depression inventory scale and stroke impact scale show us that there is a significant correlation between the two outcomes. An increase in the score of depression is associated with a decrease in the stroke impact score in post-stroke patients. The mean score or stroke impact scale was 154 out of a total of 295. A high score on this scale indicates a higher rate of recovery. The mean score of Beck's Depression Inventory Scale of the participants was calculated to be 32.95 out of a total of 63. A higher score

Table 1: Gender Distribution

Gender	Frequency	Percentage
Male	60	51.7%
Female	56	48.3%
Total	116	100%

Table 2: Age of Participants

Age Group (years)	Frequency	Percentage
>18	2	1.7%
18-24	5	4.3%
25-34	2	1.7%
35-44	4	3.4%
45-54	25	21.6%
55-64	38	32.8%
65-74	39	33.6%
75<	1	0.9%
Total	116	100 %

Table 3: Mean Score of Stroke Impact Scale and Beck's Inventory Scale

	N	Mean	S.D
Stroke Impact Scale	116	153.42	41.33
Beck's Depression Inventory Scale	116	32.95	16.39

indicated a higher level of depression. Pearson's Correlations between the scores of the Stroke Impact Scale and Beck's Depression Inventory Scale showed us that there is a significant negative correlation between the two outcomes. This means an increase in the score of depression decreases the score of the stroke impact scale in post-stroke patients. An increase in depression decreases the rate of recovery from stroke (Table 3).

DISCUSSION

The results of our current study showed a significant negative relationship between depression and the impact of stroke on them. Most of the patients recruited in this study were from the age group 65 to 74 years. 35.5% of patients were from the age group 65 to 74 years, 32.2% were from 55 to 64 years and 20.7% were from 45 to 54 years. Demographic data of our study showed that both males and females were almost equal in number, 52.1% and 49.7% respectively. Literature shows us that in Pakistan, the ratio of the rate of stroke has been five to ten times higher in middle-aged individuals.[19] Our study partially agrees with this fact. The main aim of our current study was to determine the association of recovery rate from stroke with depression in stroke survivors. The results of our study showed that most stroke patients had lower depression scores during their recovery phase. Shuo Wang and co-workers conducted a study on determining the association between post-stroke aphasia, depression and physical independence.[16] Their study concluded that greater post-stroke depression and stroke severity were independently associated with physical dependence. Both studies agree to the fact that early and effective screening of depression, treatment and stroke rehabilitation appears to be substantial in improving the physical outcomes and aid in reducing the burden of

Table 5: Pearson's Correlations between Stroke Impact Scale and Beck's Depression Inventory Scale

		Stroke Impact Scale Score	Back Depression Inventory Scale Score
Stroke Impact Scale Score	Pearson Correlation	1	-.813**
	Sig. (2-tailed)		.000
	N	116	116
Beck's Depression Inventory Scale Score	Pearson Correlation	-.813**	1
	Sig. (2-tailed)	.000	
	N	116	116
**. Correlation is significant at the 0.01 level (2-tailed).			

the post-stroke patients.[16] Pearson's Correlations between the scores of the Stroke Impact Scale and Beck's Depression Inventory Scale showed us that there is a significant negative correlation between the two outcomes. This means an increase in the score of depression decreases the score of the stroke impact scale in post-stroke patients. An increase in depression decreases the rate of recovery from stroke.

Stefano Paolucci and co-workers conducted a study on determining the depression in post-stroke patients and its role in the rehabilitation of stroke in patients.[20] They concluded that Post-stroke depression occurs in patients even if they are treated and this affects the results of the rehabilitation. Our study agrees with their conclusion. Luis Ayerbe and co-workers conducted a systematic review and meta–analysis to determine the natural history, predictors and outcomes of depression after stroke.[21] They concluded that it is the need of an hour to work on finding out interventions for depression and its potential outcomes. This current study also recommends this. The substantiation of the outcomes of depression post-stroke is still very limited. [21] The precise

explanation of the statistical work which is reported by the majority of the researchers makes it very difficult to evaluate and assess the validity of the results. Lacking information on all the variables including the models, it is impossible to distinguish between the outcomes of depression and outcomes of stroke. Information regarding the outcomes of other comorbidities that might come with this permutation of disorders is also lacking. Poor quality of life standards and mortality rate[22,23] were recognized as outcomes of depression. In an endeavor to scrutinize the fundamental conations between depression and its outcomes our current study would contribute to the literature. A previously conducted systematic review reported that there are numerous possible outcomes of depression in post-stroke patients, which include, higher mortality, higher disability rates, prolonged stay at the hospital, poor cognitive functioning and less involvement in a rehabilitation plan. However, in their review, the authors included only those studies that worked on depression and its potential outcomes.[24] That made it difficult to comprehend whether depression is a cause or a consequence of the variable invested as a potential outcome. There was no

or very weak evidence at all that some other variable apart from disability, mortality, poor quality of life might be the outcome of depression is stroke survivors. Our study agrees with these facts. Our current study might also fill these gaps to some extent. The major limitation of our current study was that the sequence of the onset of the depression and its alterations over a specific period course of recovery was not recorded. The design of the study didn't include that. On the other hand, the results of our study were not generalized to be implemented on other populations of other areas of Pakistan or other settings of the country as it only focused on the stroke patients of Punjab. One more limitation was that the patients hardly responded to all the questions.

The majority of the post-stroke patients were from the rural areas of Punjab, Pakistan and they were unable to give a satisfactory response to the questions. Depression in post-stroke patients has been considered a psychological reaction that has been recognized as a cause of stroke-related disability. Noticeable progress has been observed in this field and its risk factors and effects of post-stroke depression on cognitive and physical recovery. However, future researchers are recommended to conduct studies that talk about the mechanism of depression in post-stroke patients. It might be regarded as a therapeutic intervention.[25] There is also an urgent need to determine the association of the rate of mortality with depression in post-stroke patients. Future researchers are also recommended to conduct studies on determining the somatic symptoms that are associated with depression.

CONCLUSION
Our study concludes that depression in post-stroke patients has a great impact on their functional recovery, quality of life and health.

Our study concludes that there is a significant negative correlation between depression and the rate of recovery from stroke. An increase in the score of depression in post-stroke patients will show a decrease in stroke recovery scores. Our study also shows that during the process of recovery from a stroke, the score of depression eventually decreases.

DECLARATIONS
Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.
Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.
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