DOI: 10.7860/JCDR/2019/39766.12655

Original Article

Psychiatry/Mental Health Section

Functional Recovery after Stroke: Role of Irrational Beliefs

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ABSTRACT

Introduction: Stroke is a disabling condition that affects the physical as well as cognitive areas of functioning. Recovery from a stroke can be interrupted by many factors including psychological. Our beliefs play an important role in determining our perceptions and behaviour and may thereby affect the recovery process. Presence of irrational beliefs can act as a detrimental factor to recovery.

Aim: To understand the functional recovery process of brain stroke patients and to examine the effect of irrational beliefs on physical and cognitive functional recovery.

Materials and Methods: The present study was conducted on 85 first-ever right-hemispheric patients with 53 males and 32 females. The assessment was done in two phases i.e., Phase I-within 3-10 days of stroke and Phase II- after three months of stroke. Barthel Index (BI), Mini-Mental State Examination (MMSE) and Irrational Beliefs Scale (IBS) were used to assess the patients. Paired t-test and Wilcoxon Signed Rank test were used to find out Phase I and Phase II differences in scores of irrational beliefs, BI, and MMSE variables. Kruskal-Wallis Test was used to find out differences between the functional recovery scores of low, moderate and high groups according to irrational beliefs. Post-hoc analysis with pairwise comparison was done to find out intergroup differences.

Results: Significant differences were found in Phase I and Phase II scores of BI ($p<0.001$) and MMSE areas namely; Orientation ($p<0.001$), Attention and calculation ($p<0.001$), Language ($p<0.001$) and Construction/praxis ($p<0.001$). According to the level of irrational beliefs, significant differences were found in BI ($p<0.001$) and Recall ($p=0.016$). Low-moderate-high group differences of BI were found significant ($p<0.001$) and on Recall only high-low group difference was found significant ($p=0.013$).

Conclusion: The study highlights the impact of irrational beliefs on the recovery process of stroke patients. The findings indicate the crucial part that psychologists can play in the rehabilitation process of stroke patients.

Keywords: Barthel index, Mini-mental state examination, Recovery of function, Rehabilitation

INTRODUCTION

'Belief' being an assumed truth alters our response to the events around us. Rational beliefs are flexible, consistent with reality and logical and irrational beliefs are rigid, inconsistent with reality and illogical. Irrational beliefs influence and are associated with emotional and behavioural outcomes.

Despite the advancements in technology the role of psychological processes in recovery after stroke cannot be undermined. According to the WHO, stroke is, "rapidly developing clinical signs of focal (at times global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than of vascular origin" [1]. In different parts of India, the crude prevalence of stroke ranged from 44.29 to 559/100,000 persons and the cumulative incidence of stroke ranged from 105 to 152/100,000 [2]. With only 35 stroke units that too in the private hospitals of cities [3], stroke rehabilitation is not very well developed in India. Functional recovery being the prime focus of any rehabilitation can be defined as, "the restoration of function with resumption of the previous activity with characteristics comparable to those of pre-stroke. This recovery can be appreciated at different levels: as improvement of motor deficit, as improvement of motor control, as improvement in functional Activities of Daily Living (ADLs) and as improvement in participation in the community" [4]. Functional recovery depends on the age at onset, the severity of symptoms and the way people perceive the trauma. According to Dryden and Ellis, 1988 [5], factors including cognitive, emotional, behavioural and environmental determinants affect the physical and psychological well-being of individuals.

There are four specific types of irrational beliefs, a primary belief of demandingness ("I absolutely must do well") and three secondary beliefs of awfulizing ("It is awful and catastrophic when things are not the way I would very much like them to be"), low frustration tolerance ("Emotional misery comes from external pressures, and I have little ability to control or change my sorrows and disturbances") and self/other depreciation ("I am worthless unless I am thoroughly competent, adequate and achieving at all times"). Individuals holding irrational beliefs interpret desires and preferences in absolutist terms (e.g., needs or demands) and this extreme nature may result in psychological distress if the demands are not met [6]. Attitude, negative beliefs, fatalism, helplessness/hopelessness are associated with poor functional recovery and decreased survival [7]. Irrational statements derived from rigid and absolutistic thinking lead to a rise in systolic blood pressure, psychological and physical malfunctioning [8], emotional problems [9], dysfunctional behaviours and lack of self-acceptance [10].

The aim of the present study was to understand the functional recovery process of brain stroke patients and to examine the effect of irrational beliefs on physical and cognitive functional recovery.

MATERIALS AND METHODS

A prospective observational study was carried on patients with first-ever right-hemispheric ischemic stroke admitted to the private hospitals of neuro-physicians of Central and West Nagpur between March 2006 and October 2007. Permission was taken from the hospitals for data collection. Purposive sampling technique was used for the selection of participants. Written informed consent was taken from the participants before the study.

Inclusion Criteria

Diagnosis of stroke based on the clinical examination of the patient by the neuro-physician and defined according to the WHO (1989)

[1]. Only patients with first-ever right-hemispheric ischemic stroke between age of 40 to 70 years and who were alert and responsive were included in the study.

Exclusion Criteria

History of stroke, severe comprehension deficits, history of psychiatric treatment, and other life-threatening medical condition.

After screening for inclusion criteria, a case record form was filled in which the demographic variables, history of present illness, family history and habits were recorded. Most of the information in case record form was collected from the care givers of the patients. When the examiner was sure that the patient was in a condition to give responses, the instructions for assessments were given. The first test to be administered on the patients was MMSE [11]. Only patients with MMSE scores >24 were included in the study. The BI and IBS were administered in consecutive sessions. Complete assessment usually took two to three sessions but it was made sure that one assessment is finished in one session.

Out of the 103 patients who met the inclusion criteria, 100 patients/or the closest relative gave the written informed consent to participate in the study. The patients were assessed at two phases. Phase I assessment was carried out within 3-10 days of stroke onset and phase II at three months of stroke onset. At three months follow-up 85 patients (53 males and 32 females) remained. Patients could not follow-up due to mortality (five patients), failure to come up for the follow-up at a specified time (six patients), and due to the second episode of stroke (four patients).

Tools Used

Original version of Barthel Index (BI) by Mahoney FI et al., was used for assessment of physical functioning and disability in Activities of Daily Living (ADL) [12]. BI measures the functional disability in personal care, mobility and sphincter control. The scores range from 0 to 100, in the steps of 5, with higher scores indicating greater independence. BI has internal consistency coefficients of 0.87 to 0.92 and validity correlations between 0.73 and 0.77 [13,14].

The MMSE was used to examine the cognitive functions of the patients. MMSE assesses cognitive abilities such as Orientation, Registration, Attention and calculation, Recall, Language and Construction/Praxis. Scores on MMSE range from 0 to 30 with lower scores indicating greater cognitive impairment.

The IBS was used to measure the irrational beliefs in the patients. The 13 items in the scale are based upon the basic irrational beliefs given by Albert Ellis [6]. The IBS is a 5-point Likert scale with scores ranging from 13-65. Higher scores on the scale indicate high irrational beliefs.

STATISTICAL ANALYSIS

Statistical Package SPSS 21 was used for statistical analysis. Both, parametric as well as non-parametric tests were used to analyse the sample. Paired t-test and Wilcoxon Signed Rank test were used to find out differences between Phase I and Phase II scores of irrational beliefs, BI, and MMSE variables. Independent Samples, Kruskal-Wallis Test was used to find out differences between the physical and cognitive functional recovery scores of low, moderate and high groups.

The patients were divided into three groups: low, moderate and high on the basis of their scores of irrational beliefs in Phase I. Score of 13-25 on IBS was considered as low, 26-40 as moderate and 41-65 as high. Recovery Score (RS) was calculated using the formula:

RS=Phase II score-Phase I score.

Post-hoc analysis with Dunn's pairwise tests was carried out to find out inter-group differences if any. Level of significance was considered as 0.05 for the present study.

RESULTS

Eighty-five patients with right hemispheric ischemic stroke who met the inclusion criteria were finally included in this study. The socio-demographic characteristics of the sample are described in [Table/Fig-1].

Demographic factors	Males (n=53, 62.35%)		Females (n=32, 37.64%)		Total (n=85)
Age	40-55 years (n=36)	56-70 years (n=17)	40-55 years (n=21)	56-70 years (n=11)	
Family					
Nuclear	21 (58.33%)	2 (11.76%)	10 (47.61%)	7 (63.63%)	47.05%
Extended	15 (41.66%)	15 (88.23%)	11 (52.38%)	4 (%)	52.94%
Area of residence					
Rural	2 (5.55%)	5 (29.41%)	2 (9.52%)	7 (63.63%)	18.82%
Urban	20 (55.55%)	1 (5.88%)	8 (38.09%)	1 (9.09%)	35.29%
Sub-urban	14 (38.88%)	11 (4.70%)	11 (52.38%)	3 (27.27%)	45.88%
History of present illness					
Hypertension	17 (47.22%)	6 (35.29%)	13 (61.90%)	4 (36.36%)	47.05%
Diabetes Mellitus	7 (19.44%)	2 (11.76%)	1 (4.76%)	2 (18.18%)	14.00%
High cholesterol	2 (5.55%)	0 (0%)	0 (0%)	2 (18.18%)	4.70%
Habits					
Tobacco	10 (27.77%)	11 (64.70%)	3 (14.28%)	8 (72.72%)	37.64%
Alcohol	3 (8.33%)	4 (23.52%)	0 (0%)	0 (0%)	8.23%
Snuff	0 (0%)	0 (0%)	2 (9.52%)	1 (9.09%)	3.52%
Smoking	4 (11.11%)	6 (35.29%)	1 (4.76%)	2 (18.18%)	15.29%
Family history					
Stroke	13 (36.11%)	5 (29.41%)	7 (33.33%)	5 (45.45%)	35.29%
Hypertension	20 (55.55%)	8 (47.05%)	10 (47.61%)	2 (18.18%)	47.05%
Diabetes Mellitus	14 (38.33%)	7 (41.17%)	6 (28.57%)	1 (9.09%)	32.94%
Heart Disease	7 (19.44%)	3 (17.64%)	3 (14.28%)	3 (27.27%)	18.82%

[Table/Fig-1]: Demographic and medical characteristics of the sample.
% indicates frequency

Phase I and Phase II Differences

Wilcoxon signed rank test indicated that the median Phase II ranks of BI were statistically significantly higher than the median Phase I ranks (Z=-8.040, p<.001). Same findings have been found with the Orientation (Z=-7.696, p<.001), Attention and calculation (Z=-7.940, p<.001), Language (Z=-6.481, p<.001) and Construction/praxis scores (Z=-3.873, p<.001). There was no statistically significant difference between the phase I and phase II scores of Registration (Z= 0.00, p=1.00). The Paired t-test indicated that the mean score of Phase I of irrational beliefs was not statistically significant than the mean score of phase II (t=0.234, p=0.816) [Table/Fig-2].

Recovery Scores and Differences between Low, Moderate and High Groups

Out of 85 patients 17 were in low IB group, 50 were in moderate IB group and 18 were in high IB group. Recovery scores of low, moderate and high groups were compared. Independent samples Kruskal-Wallis Test was conducted to examine the differences in recovery scores of BI and six Cognitive areas namely Orientation, Registration, Attention and calculation, Recall, Language and Construction/Praxis according to the level of irrational beliefs. Significant differences between low, moderate and high groups were found only on BI (p<.001) and Recall (p=.016). No significant differences were observed between the low, moderate and high groups on Orientation, Registration, Attention and calculation, Language and Construction/Praxis [Table/Fig-3].

Variable	N	Minimum	Maximum	Mean		Median	Std. Deviation	Z*	p-value‖
		Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	
Barthel Index Phase I	85	20.00	60.00	37.706	0.827	40.000	7.620	-8.04†	<.001
Barthel Index Phase II	85	30.00	75.00	51.941	1.029	50.000	9.484		
Orientation Phase I	85	7.00	10.00	8.518	0.083	8.000	0.766	-7.696†	<.001
Orientation Phase II	85	9.00	10.00	9.824	0.042	10.000	0.383		
Registration Phase I	85	3.00	3.00	3.000	0.000	3.000	0.000	.000‡	1.00
Registration Phase II	85	3.00	3.00	3.000	0.000	3.000	0.000		
Attention and Calculation Phase I	85	3.00	5.00	3.624	0.069	4.000	0.636	-7.940†	<.001
Attention and Calculation Phase II	85	4.00	5.00	4.788	0.045	5.000	0.411		
Recall Phase I	85	2.00	3.00	2.518	0.055	3.000	0.503	-6.000†	<.001
Recall Phase II	85	2.00	3.00	2.941	0.026	3.000	0.237		
Language Phase I	85	7.00	8.00	7.424	0.054	7.000	0.497	-6.481†	<.001
Language Phase II	85	7.00	8.00	7.918	0.030	8.000	0.277		
Construction/Praxis Phase I	85	0.00	1.00	0.788	0.045	1.000	0.411	-3.873†	<.001
Construction/ Praxis Phase II	85	0.00	1.00	0.965	0.020	1.000	0.186		
								t§	p value‖
Irrational Beliefs Phase I	85	20.00	50.00	33.435	0.902	30.000	8.317	.234	.816
Irrational Beliefs Phase II	85	19.00	52.00	33.376	0.920	30.000	8.485		

[Table/Fig-2]: Statistical Properties of sample in Phase I and Phase II: Results of differences in means and medians.
*Wilcoxon Signed Ranks Test
†Based on negative ranks
‡The sum of negative ranks equals the sum of positive ranks
§Paired t-test
‖p-value for mean difference between Phase I and Phase II scores

Variable	Irrational Beliefs	N	Mean Rank	p-value
Barthel Index	Low	17	9.00	<.001
	Moderate	50	42.50	
	High	18	76.50	
	Total	85		
Orientation	Low	17	43.44	0.919
	Moderate	50	43.55	
	High	18	41.06	
	Total	85		
Registration	Low	17	43.00	1
	Moderate	50	43.00	
	High	18	43.00	
	Total	85		
Attention	Low	17	43.12	0.998
	Moderate	50	43.06	
	High	18	42.72	
	Total	85		
Recall	Low	17	52.50	0.016
	Moderate	50	43.70	
	High	18	32.08	
	Total	85		
Language	Low	17	49.50	0.081
	Moderate	50	44.10	
	High	18	33.81	
	Total	85		
Construction/Praxis	Low	17	43.00	0.296
	Moderate	50	44.85	
	High	18	37.86	
	Total	85		

[Table/Fig-3]: Independent-Samples Kruskal-Wallis Test comparison of groups with low, moderate and high irrational beliefs.

Post-hoc Analysis

Post-hoc analysis was applied only on BI and Recall scores for further analysis. Dunn's pairwise tests were carried out to find out differences between low-moderate-high groups. Pair wise comparison indicated that differences between low-moderate-high groups of BI and were significant (p<.001). No significant differences were found among high-moderate and moderate-low groups of Recall, whereas high-low group difference of Recall was found to be significant (p=0.013) [Table/Fig-4].

Variable	Grouping Variable: Irrational Beliefs		Sample1-Sample 2	Test Statistic	Std. Error	Std. test statistic	p-value
	Groups	N					
Barthel Index	Low	17	Low-Moderate	-33.500	6.894	-4.859	<.001
	Moderate	50	Low-High	-67.500	8.305	-8.128	<.001
	High	18	Moderate-High	-34	6.75	5.037	<.001
Recall	Low	17	High-Moderate	11.61	5.807	2.001	0.136
	Moderate	50	High-Low	20.41	7.144	2.858	0.013
	High	18	Moderate-Low	8.8	5.931	1.484	0.414

[Table/Fig-4]: Pair-wise comparison of different groups.

DISCUSSION

Stroke is the illness affecting many areas of an individual's life. Stroke affects the physical as well as the cognitive and psychological functioning of the person. The reactions to stroke are varied. Psychological reactions may serve as a prominent obstacle to a patient's recovery and health. These reactions may be a direct manifestation of physiological damage to the brain, or they may result from ineffective thought processes and maladaptive coping mechanisms.

To determine whether a patient will benefit from psychological treatment or not required an analysis as to whether these processes have any effect on the recovery. Physical and cognitive function scores were significantly better in Phase II as compared to Phase I in all the areas except Registration where the Phase I and Phase II scores were same. The irrational beliefs too remained the same in both the phases.

Taking into consideration the interdependence of thinking processes, anxiety and depression on one another, it was hypothesised that the higher level of irrational beliefs would have a significant negative impact on physical and cognitive functional recovery. Though physical functional recovery was significantly affected by irrational beliefs, this could not be proved in the area of cognitive functional recovery. The only exception in the area of cognitive functional recovery was Recall. The Recall recovery scores of the group with high irrational beliefs were significantly lower than the group with low irrational beliefs.

The results strongly support that the irrational beliefs have a significant negative effect on physical functional recovery. This proves that maladaptive thinking processes lead to an appraisal of problems as unsolvable [15]. Any modifications made to our belief systems have a direct effect on how stressful an actual event is perceived. Irrational or unrealistic beliefs create reactions that go beyond an adaptive healthy response to the actual situation. In Roman times, Epectitus and Marcus Aurelius, the Stoics recognised that people's unrealistic beliefs made them anxious and miserable and that if their attitudes and belief systems could be changed, they could become serene and happy. The remarkable finding of the present study suggests that Rational Emotive Behaviour Therapy (REBT) may have a key role to play in the psychological management of stroke. Hence, the use of REBT approach to prevent negative effects of irrational beliefs does warrant more exploration and study.

Problem-solving therapy has already proved promising in this regard [16]. A 50% of the needs of stroke survivors are psychological in nature and they require assistance to deal with them [17]. The stroke unit has a multidisciplinary team that comprises of medical, nursing, physiotherapist, speech therapist and social worker [18] but not a psychologist. To overcome this gap, joint working and education with rehabilitation staff are recommended [19].

In the past, many studies have found a significant correlation between irrational beliefs and emotional distress such as anxiety, depression and low self-esteem [20,21]. It has been found that depression reduces the desire and capacity to participate in rehabilitation and that affected people are less inclined to socialize [22].

LIMITATION

MMSE being a small tool was insensitive to impairments in abstract reasoning, executive functions and visual perception. Future work may be focussed on establishing the psychometric properties of IBS.

CONCLUSION

The findings provide support for the view that functional status improves over time. The study infers that irrational beliefs have a significant negative effect on physical functional recovery and that cognitive functional recovery is not altered by irrational beliefs. Teaching individuals to respond healthily to adversities by holding flexible and logical views may help them deal with the situation in a better way. The study can be taken as a foundation to build up psychological intervention plans in the post-stroke management. Future research should focus on the use of tailor-made interventions including REBT.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the financial support received by UGC through Research Fellowship scheme.

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FINANCIAL OR OTHER COMPETING INTERESTS: As declared above.

Date of Submission: **Sep 26, 2018**
Date of Peer Review: **Oct 15, 2018**
Date of Acceptance: **Jan 23, 2019**
Date of Publishing: **Mar 01, 2019**