

Effect of Early Mobilization and Bed Positioning on Mobility among Patients with Traumatic Brain Injury

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ABSTRACT

Objective: To validate and evaluate the effect of early mobilization and bed positioning on mobility among patients with traumatic brain injury.

Methodology: This quasi-experimental study included 28 TBI patients. This study was conducted at general hospital, Lahore, and Jinnah hospital Lahore. Early mobilization and bed positioning therapies protocol were performed for 6 weeks. There were three sessions per week. Each session was 30 minutes. Mobilization scale and Norton scale were used as evaluation parameters before and after 6 weeks.

Results: After an initial evaluation, twenty-eight participants were selected according to inclusion and exclusion criteria. The mean age of participants observed was 35.820±12.605 years of sexes, with 13 male and 15 female. The normality of data was checked by Shapiro Wilks test by which it was found that the mobilization and Norton scale score are normally distributed with p-value < 0.05. The scores on early mobilization and Norton scales differ significantly.

Conclusion: The results suggested that early mobilization and bed positioning therapies has improved mobility in TBI patients. This therapy protocol has also improved the TBI patients' quality of life.

Keywords: Bed positioning, Mobilization, Mobility, Physical Therapy, Traumatic brain injury.

Authors' Contribution:

^{1,2}Conception; Literature research; manuscript design and drafting; ^{3,4}Critical analysis and manuscript review; ⁵Data analysis; Manuscript Editing.

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Introduction

Traumatic Brain injury (TBI) is a central worldwide community healthiness trouble. Traumatic brain injury is defined as the disturbance in the function of the brain, or indication of pathology of brain, by the application of an exterior bodily force. The annual occurrence of TBI is about 50 million cases universally¹. Traumatic brain injury is a process not an experience. TBI has been explained as "the most multifaceted ailment of the most multifaceted organ of human body." In many underdeveloped

countries, traumatic brain injury is an unbalanced load of disability and death². After severe traumatic brain injury (TBI) an escalating number of patients have been surviving during last few years. The patients of traumatic brain injury show neurological impairments such as neuromuscular, neurobehavioral, cognitive, communication and swallowing impairments related to the brain damage. TBI patients are also having difficulty in performing functional activities with long-lasting periods of recovery. In TBI patients psychosocial, cognitive, physical, and functional outcomes are

improving because of physical therapy rehabilitation. There is great focus on effectiveness of rehabilitation in returning the TBI patients back to their normal activities of daily living³. Among many causes of traumatic brain injury, the most important causes are falls 32%, motor vehicle crashes or road traffic accidents 19%, struck by or against events 18%, and assaults 10%, respectively. Significant source of TBI among normal population are blasts and road traffic accidents⁴. TBI is one of the most important cause of morbidity and mortality in the entire world⁵. There are two types of traumatic brain injury. Primary in which direct damage to the brain occur and secondary, in which indirect damage to the brain parenchyma occur. It may occur due to cell damage⁶. TBI is classified as mild with GCS less than 8, moderate with GCS 9 to 13, and severe with GCS between 13 and 15⁷.

Because of the injury, there are considerable number of secondary complications that began to develop among the patients of TBI. These complications include deep venous thrombosis, pressure ulcers, fever, joint contracture, pneumonia, chronic pain, decreased endurance, muscle atrophy, fracture, and peripheral nerve damage. All these secondary complications can lead to severe functional disability and death⁸. TBI patients admitted to the hospital for rehabilitation may develop some other complications that includes urinary tract infections (UTI), respiratory tract infections, pressure sores and pneumonia, etc. that need medical diagnosis. Pressure sores are defined as soreness that develop on the pressure area⁸. One of the most important step in prevention of pressure sores is to change the position of the body of patient at regular intervals⁹.

Many diagnostic tests and technologies are accessible now a days on the road to recovery of the traumatic brain injury patients. These includes neurosurgery ICU with advanced conveniences as specialized trauma center, government economic support, computerized tomography (CT) scan, magnetic resonance imaging (MRI), EEG, intracranial

pressure monitors, and angiography etc. for TBI patients¹⁰. There are many advantages of early mobilization among TBI patients. Early mobilization exercises results in decrease in the length of the hospital and neurological ICU stay, decrease the risk of infection during hospital stay and less patient self-control days¹¹. If the patient body is immobilized then, it increases the chances of muscle or whole body weakness, irritability, confusion, delirium and increases negative effect on many organ systems¹². Early mobilization exercises are explained as physiotherapy exercises of altering degree that are clinically safe and accurate developmentally started within 2 to 3 days of admission in neurological ICU. Proper assessment, management of pain, disease prevention and early mobilization exercises helps in improving patients recovery¹³.

Methodology

The quasi-experimental study was conducted in General Hospital and Jinnah Hospital in Lahore from May 2022 to December 2022. The study included 28 Traumatic Brain Injury patients. Nonprobability sampling technique was used. Patients diagnosed as TBI with acute ischemic and hemorrhagic stroke (aneurismal and traumatic subarachnoid and parenchymal and subdural hemorrhage), patients with spinal stability and the TBI patients having spasticity were included in the study¹⁴. Patients having spasticity after traumatic brain injury¹⁵. Patients with something other than neurological event or condition and the patients with limb pathologies such as stress fractures¹¹ were excluded in the study. Mobility was examined using early mobilization scale and Norton scale on the first day (pre-intervention assessment) and the last day (post-intervention measurement). Mobilization scale consists of eight levels from 0 to 8, with zero is the lowest level representing no ambulation or passive range of motion and eight is the highest-level representing ambulation. Norton scale is a five point's scale each of which is scored

on a range of 1 to 4. These five points include Physical condition, mental condition, activity, mobility, and incontinence. The following activities were assigned to the TBI patients during the therapy procedure. Early mobilization and bed positioning exercises was conducted for 30 minutes, three times each week for six weeks. Total Five activities were done i.e., Range of motion activities (from Passive ROM, Active Assisted ROM, Active ROM exercises, then to assisted sitting, independent sitting, assisted standing, independent standing, assisted marching in place to ambulation) for 5 to 10 minutes, bed positioning in supine lying for 5 minutes, bed positioning in right side bending for 5 minutes, bed positioning in left side bending for 5 minutes and head elevation according to patient's condition for 5 minutes. The data was obtained initially, and then it was examined in Windows software version 25 (SPSS. 25). The Shapiro-Wilks Test was used to determine the data's normality. The paired T-test and the Wilcoxon signed rank test were used to compare pre- and post-intervention differences. For parametric variables, the paired T-test was employed, and for non-parametric variables, the Wilcoxon signed test was utilized.

Results

In current study, twenty-eight participants were selected according to inclusion and exclusion criteria. The mean age of participants observed was 35.820 ± 12.605 years of both sexes, with 13 male and 15 female. The normality of data was checked by Shapiro wilks test by which it was found that the mobilization and Norton scale score are normally distributed with p -value < 0.05 . It was observed that there is a significant difference between pre and post intervention mobilization scale values having p -value less than 0.05 and there is a significant difference between pre and post intervention Norton scale total score values having p -value less than 0.05 (Table II).

		Ranks			
Evaluation		N	Mean Rank	Sum of Ranks	Sig.
Pre-intervention and post-intervention Norton scale (physical condition)	Negative Ranks	0	.00	.00	0.000
	Positive Ranks	27	14.00	378.00	
	Ties	1			
Pre-intervention and post-intervention Norton scale (mental condition)	Negative Ranks	0	.00	.00	0.000
	Positive Ranks	27	14.00	378.00	
	Ties	1			
Pre-intervention and post-intervention Norton scale (Activity)	Negative Ranks	0	.00	.00	0.000
	Positive Ranks	25	13.00	325.00	
	Ties	3			
Pre-intervention and post-intervention Norton scale (Mobility)	Negative Ranks	0	0.00	0.00	0.000
	Positive Ranks	28	14.50	406.00	
	Ties	0			
Pre-intervention and post-intervention Norton scale (Urinary incontinence)	Negative Ranks	0	0.00	0.00	0.000
	Positive Ranks	28	14.50	406.00	
	Ties	0			

Norton scale total score values having p -value less than 0.05 (Table II). While it was observed that there is a significant difference between pre and post intervention Norton scale physical condition values having p -value less than 0.0 There is a significant difference between pre and post intervention Norton scale mental condition values having p -

value less than 0.05, there is a significant difference between pre and post intervention Norton scale mobility values having p-value less than 0.05 and there is a significant difference between pre and post intervention Norton scale incontinence values having p-value less than 0.05 (Table I).

Table II: Comparison of pre and post intervention mobilization scale and Norton scale

Groups		Mean	N	Std. Deviation	Sig.
Mobilization Scale	Pre-intervention	1.357	28	.487	0.000
	Post-intervention	5.535	28	1.346	
Norton Scale	Pre-intervention	7.357	28	1.591	0.000
	Post-intervention	15.928	28	2.371	

Discussion

The purpose of present study is to evaluate the effect of early mobilization and bed positioning exercises on mobility. Traumatic brain injury patients participate in this study. Early mobilization and bed positioning exercises are performed on these patients. Mobilization scale and Norton scale were used to evaluate the variables. This study results shows increase in the mobility from bed ridden state to independent ambulation or independent walking as well as improvement in the physical condition of the traumatic brain injury patient. Previous study explains that increase in mobility of patient occur by only early mobilization exercises. Previous study does not show any improvement in physical condition of patient. This

study findings shows the improvement in the level of mobility as well as physical condition.¹¹

The results of this study of early mobilization and bed positioning on mobility of TBI patients indicate improvement in mental condition of the patient in addition to the increase in level of mobility in adults as well as children. Previous study shows that early mobilization exercises have reduced complications such as delirium and sedation of traumatic brain injury patients but does not showed any significant improvement in the mobility levels of the patients¹⁶. This study explain that early mobilization and bed positioning exercises are safe and feasible. It shows that these exercises maneuver can be used efficiently in traumatic brain injury patients both children and adults. Another study by Carlos in 2018 has not shown the efficacy of early mobilization exercises in children population¹⁷.

This study shows benefits of early mobilization and bed position exercises as improvement of physical condition, increase in mobility, improvement in mental condition, etc. Previous study conducted by Sean showed that early mobilization exercises can reduce hospital stay but potential benefits need to be determine¹². This study shows that these exercises decrease the hospital stay of the patient as well as increase in mobility level and significant improvement of not only physical and mental condition of the patient but also shows increase in activity and prevention of urinary incontinence in traumatic brain injury patients. One of the previous study conducted by Burnol explained that bed positioning in TBI patients can improve intracranial pressure¹⁸. This study of early mobilization and bed positioning exercises in traumatic brain injury explain increases in mobility, improvement of patient condition and helpful in prevention of bed sores or pressure ulcers. Previous study showed that bed positioning exercises have reduced spasticity and some pressure care but have not shown any effect on mobility of the patient¹⁹. Early mobilization and bed positioning exercises results in increasing the mobility level of TBI patients to ambulation

during their hospital stay. These exercises not only show increase in mobility level but also shows decrease the risk of pressure sores, improvement in physical condition, mental condition, activity, and incontinence in TBI patients. As a result of all these improvements decrease in patients stay in hospital occur. All these results shows that 6 weeks performance of these maneuvers on TBI patients are effective in increasing mobility and helps the patients to return to their activities of daily living as early as possible.

This study involves reduction of few complications of traumatic brain injury. Primary focus of this study was to improve mobility levels of TBI patients and secondary focus was on prevention of pressure ulcers. Differences of working places, attitude of staff and different methods choice in different units might have affected the results. It is recommended that further studies focus on other complications of traumatic brain injury. It is possible to prevent pressure ulcers as a major goal in TBI patients but first physicians, and clinicians need to give it priority as an important clinical outcome. Clinicians should also guide their patients and encourage them to perform exercise programed by themselves for their personal care and independent living.

Conclusion

The study concluded that early mobilization and bed positioning exercises produced significant effect in increasing mobility and decreasing the risk of pressure sores by improving general health condition in traumatic brain injury patients. Furthermore, the outcomes of the study demonstrated that early mobilization and bed positioning maneuvers improves social interactions and emotional well-being in traumatic brain injury patients.

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