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Correlational Study Of Gross Motor Function And Balance In Traumatic Brain Injury Individuals

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ABSTRACT

Background: TBI is relatively common issue that costs society and individuals a great deal of money. every year around 500,000 people are admitted to hospitals due to TBI. About 70,000 of them experience physical, behavioural or intellectual impairments that make it impossible for them to lead independent lives again. Nearly 2/3 of people with prospects make up TBI are younger than 36, roughly 1/3 are between the ages of 16 and 25 at the time of injury. Roughly 78 percent of these individuals are men. As a result, young men with employment prospects make up the majority of this group. Nevertheless, employment results following injuries are unsatisfactory.

Aim: The main aim of this study is to correlational study of gross motor function and balance in traumatic brain injury individuals.

Methodology: A total of 20 participants with traumatic brain injury were satisfied the selection criteria and they were included. After obtaining the consent from the legally authorized representative (LAR)of the participant and the participant information sheet (PIS) was also explained to the LAR . The participants were assumed in a single group to correlate the gross motor function with balance. Results were compared and analysed statistically.

Result: The results of the study indicated that there was a significant positive correlation between Gross motor function and Balance**.** Its rho value is +1.

Conclusion: The results of the study indicated that there was a significant positive correlation between Gross motor function and Balance.

Keywords: *Traumatic brain injury, Gross motor function and balance.*

1. INTRODUCTION

With the developed world, the main cause of death and disability among young adults is traumatic brain injury (TBI). Every year, over 1.4 million people in the UK get brain injuries. Despite the fact that most injuries are minor, 10.9% are categorized as moderate or severe, and many patients suffer from serious disabilities[1]. According to the World Health Organization, traffic accidents and traumatic brain injury (TBI) will rank third globally in terms of sickness and damage by 2020, and the prevalence is rising in lower-income nations. There are two types of TBI: primary and secondary. The original physical insult is the cause of the primary damage. The type, severity, and length of the impact will determine the pattern and degree of damage. Diffuse brain damage, cerebral oedema, intracranial hemorrhage, contusions, and skull fractures can all be caused by compression and shearing pressures. A window for therapeutic interventions is provided by the subsequent secondary brain injuries, which frequently develop gradually over months to years, whereas the initial brain insult causes rapid and irreversible primary damage to the parenchyma. Wallerian degeneration of axons, mitochondrial malfunction, excitotoxicity, oxidative stress, and apoptotic cell death of neurons and glia are still recognized hallmarks of delayed secondary CNS injury[2].

The identification of druggable targets linked to these processes has been the focus of much research. Three types of TBI can be distinguished based on the distinct physical mechanisms of insult: (i) closed head; (ii) piercing; and (iii) explosive blast TBI. Prolonged coma, headache, nausea, aphasia, seizures, forgetfulness, and behavioural abnormalities like aggression and anxiety are among the clinical signs of traumatic brain injury (TBI). These symptoms usually appear seconds to minutes after the injury, although some can last for months or even years. Blunt impact from motor vehicle accidents, falls, and sports activities is the most common cause of closed head TBI. The civilian population has the highest incidence rate of this type of TBI[3]. The powerful blunt and compression contact force immediately damages brain vasculature and neuronal cells by interfering with normal brain function just beneath the impact site. When a foreign body enters the skull and passes past the dura into the brain parenchyma, it causes penetrating traumatic brain injury. Similar to closed head TBI, localized injury, intracranial bleeding, cerebral edema, and ischemia are the main symptoms of brain tissue laceration. One of the factors contributing to the rise in TBI cases is the expanding population and growing reliance on motorized vehicles and machinery[4].

One of the factors that contributes to TBI is stress. A person who suffers from severe anxiety may eventually get a traumatic brain injury. Traumatic brain damage can result from an abrupt impact to the head. Traumatic brain injury can result from direct brain damage caused by a gunshot or any other object that enters the skull or brain. Traumatic brain damage can also be brought on by an abrupt drop from a height. It covers falls from stairs, ladders, etc. Gunshot wounds, marital violence, and child abuse are examples of aggressive behaviors that can cause traumatic brain damage. Penetrating wounds and forceful hits to the head from debris or splinters can also cause it. Auto accidents can also cause traumatic brain injury. TBI is commonly caused by collisions with automobiles, motorbikes, or bicycles, as well as any pedestrians hurt in these situations[5]. Traumatic brain damage can have far-reaching neurological and physical effects. While some signs or symptoms may appear right away, others may take a week or longer to appear. Symptoms and indicators of mild traumatic brain damage might be mental, behavioral, cognitive, sensory, or physical.

Below is a brief description of each symptom. Physical symptoms include headache, nausea or vomiting, fatigue or sleepiness, dizziness, trouble speaking, or problems with balance. These are a few of the typical physical signs of traumatic brain injury. While some of these impacts may manifest rapidly, others may take years to manifest, and yet others may develop into long-term issues. Long-term poor sensory processing is one of the persistent sensorimotor and cognitive abnormalities that can result from TBI[6].. A terrible taste on the tongue, difficulty smelling, visual anomalies, ringing in the ears, and decreased vision are examples of sensory issues. These symptoms typically manifest as sensory complaints in TBI patients. Additionally, mood swings and mood changes are possible in persons with traumatic brain injury. In addition to experiencing despair and anxiety, patients with traumatic brain injury may also have difficulty sleeping due to stress or trauma. TBI patients may sleep for longer periods of time than normal. However, by promoting neurogenesis, fostering spatial learning abilities, and reducing the danger of infection, acute inflammation can both be neuroprotective and prolong harmful, chronic, and persistent neuroinflammation [7]. Need of the study is that Recent studies shown that there are so many scales and questionnaire used to assess the gross motor function and balance in traumatic brain injury but very few studies done to find out the correlation between these Gross motor function measure and balance. To my knowledge there is no study done to correlate the Gross motor function measure – 88 and Berg Balance scale . so this current study will correlate the Berg balance scale and GMFM – 88 to assess the gross motor function and Balance in TBI patients.Aim of the study is that The aim of this study is to find out the relationship between Balance and Gross Motor function with Berg Balance scale and Gross motor function measure – 88 in TBI individuals[8].

2. GROSS MOTOR FUNCTION MEASURE

This questionnaire was used to assess the gross motor function. It has 5 domains such as A. lying and rolling, B. sitting, Crawling and kneeling. standing , E. walking,running,jumping.All these domains consists 0f various questions with maximum score of three.After answering all these questions the score is obtained and applied in the formula given in the questionnaire.

BERG BALANCE SCALE:

The balance of the participants with traumatic brain injury were assessed using berg balance scale . This questionnaire has 14 items each with grade of 0 to 4. The maximum score obtained is 56. The Materials used are yardstick , one standard chair with arm rest , one standard chair without arm , Foot stool or foot step , stopwatch and 15 foot walkway . The reliability of this scale is cronbach's Alphas greater than 0.83 for stroke patients and 0.97 for elderly residents.

3. MATERIALS AND METHODOLOGY

METHODOLOGY:

This study follows a correlation study design and focuses on individuals with traumatic brain injury as the study population.

The sampling method used is convenient sampling, with a sample size of 20 participants. The participants will be categorized into a single assessment group. The study will be conducted at Mahatma Gandhi Medical College and Hospital over a duration of 6 months**.** Its inclusion criteria are Participants included in the study were individuals with traumatic brain injury, aged between 40 to 80 years. They were required to have a score ranging from 1 to 2/4 on the Modified Ashworth Spasticity Scale. Both male and female participants were eligible. the exclusion criteria are Patients who are not willing to participate in the study, those with systemic illness, epilepsy following traumatic brain injury (TBI), any chronic systemic illness, or serious metabolic disorders will be excluded from the study.

PROCEDURE: Subjects were screened based on Inclusion and Exclusion Criteria and a written consent form was taken. All the selected subjects were explained about the procedure. After a thorough assessment of the patient the gross motor function is measured by GMFM – 88 and Balance is measured by Berg Balance scale .

OUTCOME MEASURES:

Gross motor function

Balance

OUTCOME TOOL:

Gross motor function measure (Gmfm-88)

Berg Balance scale

4. DATA ANALYSIS AND RESULT

The study was done on 20 participants with traumatic brain injury. A correlation was drawn between Gross motor function and Balance in Traumatic brain injury . The data analysis was done on SPSS-25 Software, Descriptive analysis was done (Mean, SD value , P value).

Karl Pearson test was used to find correlation between Gross motor function measure and balance.

The results of the study indicated that there was a significant positive correlation between Gross motor function and Balance.

TABLE 1: DESCRIPTIVE ANALYSIS OF BERG BALANCE SCALE

BERG BALANCE SCALE					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	45	2	10.0	10.0	10.0
	50	4	20.0	20.0	30.0
	30	4	20.0	20.0	50.0
	48	3	15.0	15.0	65.0
	52	2	10.0	10.0	75.0
	37	1	5.0	5.0	80.0
	43	2	10.0	10.0	90.0
	39	2	10.0	10.0	100.0
	Total	20	100.0	100.0	

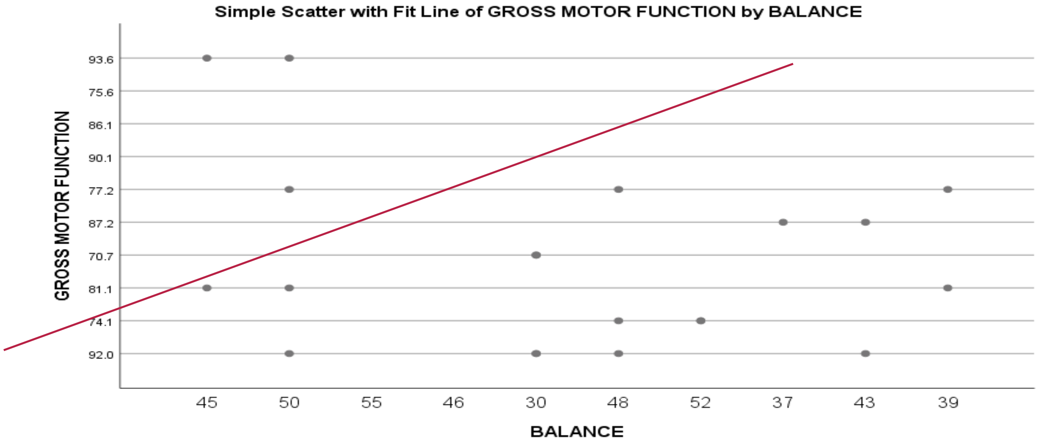
TABLE 2: CORREATION BETWEEN BERG BALANCE SCALE & GMFM-88:

Correlations			
		BERG BALANCE SCALE	**GMFR-88**
BERG BALANCE SCALE	Pearson Correlation	1	-.266
	Sig. (2-tailed)		.257
	N	20	20

GMFR-88	Pearson Correlation	-.266	1
	Sig. (2-tailed)	.257	
	N	20	20

This table shows positive correlation between gross motor function and balance

GRAPH 1 : CORRELATION GRAPH BETWEEN BALANCE AND GROSS MOTOR FUNCTION



This graph shows positive correlation between gross motor function and balance

5. DISCUSSION

The Berg Balance Scale (BBS) is a widely used clinical assessment tool designed to objectively measure a person's ability to maintain balance safely during a series of predetermined tasks. The BBS, originally designed for elderly patients, has shown high validity and reliability in various patient populations, including those with neurological conditions like TBI. It consists of 14 tasks, each scored on a scale from 0 to 4, yielding a maximum total score of 56. The BBS is useful in predicting the risk of falls, assessing outcomes, and determining the length of stay in inpatient rehabilitation. A score of 42 or less on the BBS indicates a high risk of falls. While the BBS has demonstrated excellent test-retest reliability in individuals with brain injury, high scores may suggest the potential for ceiling effects, thus limiting its utility in moderate-to-severe TBI.The Gross Motor Function Measure (GMFM) is an observational clinical tool used to evaluate changes in gross motor function. The GMFM includes two versions: the original 88-item measure (GMFM-88) and the 66-item GMFM (GMFM-66). Although primarily designed for children with cerebral palsy, the GMFM-88 has been validated for other populations, including children with Down Syndrome and acquired brain damage. The GMFM-88 assesses a range of gross motor activities across five dimensions: lying and rolling, sitting, crawling and kneeling, standing, and walking, running, and jumping. The GMFM has been utilized in the assessment of children with TBI and as an outcome measure in therapeutic trials. Studies suggest a positive correlation between the Pediatric Balance Scale (PBS), a modified version of the BBS, and the GMFM-88 in children with cerebral palsy and Down syndrome. One study investigated the relationship of the BBS to outcomes after acquired brain injury, including traumatic brain injury. In this study, lower discharge Functional Independence Measure (FIM) scores and longer lengths of stay were associated with low BBS scores. The GMFM-88 is utilized to assess gross motor function in children with TBI. Both the GMFM-66 and GMFM-88 have demonstrated responsiveness and validity as measures of gross motor function in children and adolescents with TBI. A stepwise approach to balance assessment, adaptable to the broad range of balance abilities in individuals with moderate-to-severe TBI, is supported by research. It is recommended to begin dynamic balance testing with the Functional Gait Assessment (FGA). The NIH-SBT can be utilized to assess postural stability. The Walking While Talking Test (WWTT) can be used to assess dual-task deficits. The Berg Balance Scale (BBS) has shown limited utility in cases of moderate-to-severe TBI.Individuals with chronic TBI may self-report less impaired balance compared to clinical measures. It is important to consider both self-report and clinical measures when assessing balance. The Balance Evaluation Systems Test (BESTest) may be more sensitive than the Community Balance and Mobility Scale (CB&M) in discerning between individuals at a higher fall risk due to a lack of insight and those who may be self-limiting due to fear. Factors such as the severity of the injury, age, and timing/intensity of rehabilitation can impact balance, potentially masking temporal relationships with balance performance.

CONCLUSION: The results of the study indicated that there was a significant positive correlation between Gross motor function and Balance .

AUTHOR CONTRIBUTION:

Data curation-yogiswari Gunasekaran , Formal analysis-Yogiswari Gunasekaran , Methodology-Mohamed shafiulla , Supervision-mohamed shafiulla , writing original draft , review and editing -Mohamed shafiulla ang yogiswari Gunasekaran.

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