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RELATION BETWEEN TRUNK CONTROL AND BALANCE OF CHILDREN WITH CEREBRAL PALSY ATTENDED AT CENTRE FOR THE REHABILITATION OF THE PARALYSED

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RELATION BETWEEN TRUNK CONTROL AND BALANCE OF CHILDREN WITH CEREBRAL PALSY ATTENDED AT CENTRE FOR THE REHABILITATION OF THE PARALYSED

Submitted by **Md. Moshiwor Rahman**, for the partial fulfilment of the requirement for the degree of Bachelor of Science in Physiotherapy (B.Sc. PT).

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Declaration

I declare that the work presented here is my own. All sources used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of information of the study. I would be bound to take written consent from Department of Physiotherapy of Bangladesh Health Professions Institute (BHPI).

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Acronyms

ADL - Activities of Daily Living

AUC - Area Under the Curve

BCPR- Bangladesh CP Register

BHPI - Bangladesh Health Professions Institute

BPF - Bangladesh Protibondhi Foundation

CP - Cerebral Palsy

CRP - Center for the Rehabilitation of the Paralysed

GLM-CPR - Global Low-and Middle-Income Country CP Register

GMFCS - Gross Motor Function Classification System

GMFCS-E&R - Gross Motor Function Classification System-Expanded and Revised

HICs - High-Income Countries

ICC - Intraclass Correlation Coefficient

ICF- International Classification of Functioning, Disability and Health

IRB - Institutional Review Board

LMICs - Low-and Middle-Income Countries

NGO - Non-Governmental Organization

PBS- Pediatric Balance Scale

SATCo - Segmental Assessment of Trunk Control

SDD - Smallest Detectable Difference

SPSS - Statistical Package for the Social Sciences

SWIDB - Society for the Welfare of the Intellectually Disabled Bangladesh

TCMS- Trunk Control Measurement Scale

WeeFIM - Functional Independence Measure for children

WHO - World Health Organization

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Abstract

Purpose: To find out the relation between trunk control and balance of cerebral palsy children attended at Centre for the Rehabilitation. ***Objectives:*** To explore socio-demographic (age, gender, types of Cerebral Palsy, GMFCS level) information of the participants, to find out relation between trunk control and balance of cerebral palsy children, to see the association between age and GMFCS of the participants, to see the association between gender and GMFCS, to see the association between gender and types of cerebral palsy. ***Methods:*** The study design was cross-sectional. Total 55 samples were selected. The study was conducted in pediatric unit of Center for the Rehabilitation of the Paralyzed (CRP). Data was collected by using a self-developed questionnaire. Descriptive statistic was used for data analysis which focused through table, pie chart and bar chart. ***Results:*** Among 55 participants, 92.7% (n=51) were Spastic type of Cerebral Palsy, 1.8% (n=01) were Quadriplegia, 1.8% (n=01) were Diplegia, 3.6% (n=02) were Hemiplegia, 87% (n=48) were between 1-5 years age range, 12.7% (n=07) were 6-10 years range, 0% (n=0) were 11-14 years range. The mean age is 1.13. The standard deviation is 0.336. 30.9% (n=17) were GMFCS type-I, 34.5% (n=19) were GMFCS type-II, 34.5% (n=19) were GMFCS type-III. 1.8% (n=1) came from Ashulia, 1.8% (n=1) came from Bagherhat, 3.6% (n=2) came from Barishal, 1.8% (n=1) came from Bogura, 3.6% (n=2) came from Comilla, 3.6% (n=2) came from Dhaka, 1.8% (n=1) came from Gaibandha, 14.5% (n=8) came from Gazipur, 1.8% (n=1) came from Gopalganj, 1.8% (n=1) came from Hemayetpur, 3.6% (n=2) came from Jamalpur, 5.5% (n=3) came from Khulna, 1.8% (n=1) came from Kustia, 5.5% (n=3) came from Manikganj etc. Among 55 participants, there is strong correlation between TCMS and PBS. For TCMS, Spearman's rho (r) of PBS is .754. For PBS, Spearman's rho of TCMS is .754 and for both significance value is 0.004. We know correlation is significant at the 0.01 level, when r>0.7, it proves that correlation is strong. So, there is strong association between TCMS and PBS. For this, we can say there is strong relation between trunk control and balance.

Key words: Relation, Trunk control, Balance, Cerebral Palsy.

Word count: 11210

CHAPTER-I	INTRODUCTION

1.1 Background

Cerebral palsy is a collection of conditions that impact a person's movement, posture, and balance, according to the Centers for Disease Control and Prevention (Vitrikas et al., 2020). Clinical findings are permanent and nonprogressive, although they can change over time due to a lesion to the developing brain (Nelson et al., 2020). Cerebral palsy is the most prevalent physical disability in children, affecting one out of every 323 children in the United States, a number that has remained largely steady throughout time (Trisnowiyanto et al., 2020).

Cerebral palsy is caused by a variety of etiologies that damage distinct areas of the brain, resulting in a wide range of clinical symptoms (Bambang et al., 2020). Cerebral palsy is linked to the perinatal stage in about 92 percent of cases. Preterm birth, perinatal infection (especially chorioamnionitis), intrauterine growth restriction, preterm antibiotic usage before membrane rupture, acidosis or hypoxia, and multiple gestation are all risk factors for brain injury (Levitt et al., 2018). Intrapartum hypoxia is responsible for less than 10% of occurrences. In roughly 8% of individuals, cerebral palsy develops later in life as a result of a brain injury or infection (Moreno-De-Luca et al., 2013). Despite the presence of risk factors, 80 percent of cases are classified as idiopathic, meaning they have no known cause. (Vitrikas et al., 2020).

Cerebral palsy (CP) is a collection of non-progressive, early-onset neurodevelopmental diseases caused by brain damage. Cerebral palsy is a common cause of impairment in children, with a frequency of roughly 2 per 1000 live births (Khandaker et al., 2019). There are an estimated 17 million persons living with CP worldwide (Novak et al., 2020). In high-income countries, the epidemiology of CP has been widely researched (HICs). LMICs and HICs may have different clinical characteristics and risk factors for CP (Velde et al., 2019). Preterm delivery is a major risk factor in HICs. According to a survey of rehabilitation clinic patients, the rate of children with CP born preterm in Bangladesh is significantly lower than in Australia (18.5 percent vs 42.9 percent) (Speyer et al., 2019).

CP is still extensively associated with a number of prenatal and birth-related causes, including as birth hypoxia, among LMICs (Morgan et al., 2021). Furthermore, the role of infections in the etiology of CP and appropriate preventative approaches are being studied more extensively, which is especially essential in low-resource areas where infections are still prevalent (Morgan et al., 2021).

A recent study found that newborn encephalopathy was more frequent in infants with CP in Bangladesh than in Australia. Similarly, a hospital-based study in Nigeria found that the main causes of CP were birth hypoxia, bilirubin encephalopathy, and postinfectious brain injury (Power et al., 2019). Access to specialist care for children with CP in LMICs is limited, clinical sample studies may not be typical of all children with CP. It is possible that there are systematic inequalities between people who can and cannot afford rehabilitative therapies (Nuri et al., 2020).

Large population-based studies are therefore required to study the clinical features and risk factors for children with CP in LMICs. General population-based registers and surveillance programs have aided extensive studies into the epidemiology of CP throughout the last 30 years (Jackman et al., 2022). The major goals of these programs are to track the incidence and prevalence of CP, as well as to learn about comorbidities and risk factors, develop and evaluate preventative methods, and track service delivery (Hadders-Algra et al., 2021). There are currently 38 established CP registers/surveillance systems globally, none of which are in LMICs, to the best of our knowledge (Khandaker et al., 2019).

The vast majority of studies on mortality and causes of death in children with cerebral palsy originate from high-income countries (HICs) (Jahan et al., 2019). Childhood CP mortality is greater than in the overall child population; yet, the majority of children with CP survive to maturity in HICs (Badawi et al., 2021). According to HIC research, children with more severe motor kinds of CP are at a higher chance of dying prematurely (Shengyi et al., 2021).

Children with CP who have concomitant deficits (i.e., intellectual, epilepsy, visual, hearing, speech), respiratory infections, and other chronic conditions are also at an elevated risk of mortality. There is a scarcity of population-based data on CP mortality among children from low-income countries (Namaganda et al., 2020). Currently, only a few research from LMICs have been undertaken among highly selective institutional samples (e.g., hospital, rehabilitation centre attendees) (Imam et al., 2021).

The availability of administrative health databases, such as birth, death, and CP registrations, plays a significant role in generating such evidence in HICs, as well as precisely identifying the cause of death (CoD) and risk factors for mortality in children with CP. In contrast, many low-income environments do not have these facilities (e.g., death registers) (Andrews et al., 2019).

In the absence of such systems, LMICs typically employ verbal autopsies to determine the underlying and immediate CoD among specific groups of both children and adults (Mushta et al., 2021). However, in LMICs such as Bangladesh, population level mortality and/or verbal autopsy data for children with CP are not usually available (Jahan et al., 2019).

Cerebral palsy clinical findings are diverse and include a wide variety of disorders. They are mostly mobility disorders, although they can involve a range of abnormalities such as poor balance and sensory deficiencies (Vitrikas et al., 2020). Pain (75 percent), intellectual disability (50 percent), inability to walk (33 percent), hip displacement (33 percent), inability to speak (25 percent), epilepsy (25 percent), incontinence (25 percent), and behavioral or sleep disorders are among the comorbidities that occur in people with cerebral palsy (20 percent to 25 percent) (Bambang et al., 2020).

These clinical symptoms occur outside of the expected developmental stages based on age. Other research has revealed clinical outcomes such as hearing loss, blindness, and scoliosis advancement due to muscle spasm (Ikeudenta et al., 2020). Cerebral palsy is diagnosed clinically by identifying the diagnostic characteristics. The nature of the movement problem can be further characterized as tight muscles (spasticity), uncontrollable motions (dyskinesia), poor coordination (ataxia), or other/mixed (Amrulloh et al., 2021).

Spasticity is the most prevalent movement problem in children with cerebral palsy, affecting about 80% of them. Depending on which limbs are damaged, cerebral palsy can be classified as diplegia, hemiplegia, or quadriplegia (Vitrikas et al., 2020).
Deficient postural control is one of the most common characteristics of children with CP (Levitt et al., 2021). Because postural control is a complex, long-term process, it is prone to poor situations in childhood (Hadders et al., 2017). Because postural control is an essential component of all motor functions, postural issues can greatly disrupt

daily tasks (Zadniker et al., 2011).

The trunk, as the center of our body, is critical for postural control and the organization of balance reactions (Heyrmen et al., 2017). and, as a result, is critical for optimal functional activity execution. Trunk control, in particular, is required to provide a stable foundation of support for upper and lower limb motions, but it also includes active trunk engagement during reaching and walking (Zardo et al., 2016).

In order to guide and delineate therapy interventions in children with CP, knowledge of these many components of trunk control is required. Despite its clinical significance, there is currently no research into the precise aspects of poor trunk control in children with CP. Until now, trunk analysis has been incorporated into more general postural control studies that treated the entire trunk as a single unit (Heyrmen et al., 2017).

No previous study, has mapped the challenges with trunk control that child with CP face. This could be explained in part by the restricted number of clinical measures available to assess trunk control. Most clinical evaluation tools for children with CP are either overly broad assessments of functional activities (Russell et al., 2011) or focus on only a few aspects of trunk control (Levitt et al., 2021). We have designed a clinical scale measuring trunk control in sitting in children with CP, the Trunk Control Measurement Scale, to encompass both static and dynamic components of trunk control (TCMS). The scale's reliability and validity (construct validity and discriminant ability) have been validated and reported previously (Heyrman et al., 2011).

Trunk control, which is the starting point for postural control, entails trunk stabilization and selected motions (Seyyar et al., 2019). This stability is necessary for the head and extremities to move freely and selectively (Mu et al., 2021). Trunk control enables the development of gross motor skills, which are necessary for developing goal-directed activities and living independently at home or in the community (Bedla et al., 2021). By enhancing the child's orientation to himself and his environment, a stable trunk also enables for the development of social, cognitive, and communication skills (Park et al., 2022).

Postural control issues, including trunk control issues, are a major cause of motor dysfunction in children with CP. There is numerous research on postural control in the literature, but the majority of them focus on standing (Lisna et al., 2021). Many children with CP are unable to stand because to the limited support surface, which places a great demand on the postural control system (Deus et al., 2020).

Approximately one-third of these kids spend the majority of their time sitting. The sitting position of children with CP is gaining popularity, particularly in studies aimed at improving these children's functional abilities. Sitting is the ideal posture for assessing functional level and balancing ability because it is their primary posture for everyday activities (Ravizzotti et al., 2021). A review of research assessing postural control in children with CP found a correlation between postural control and functioning, although studies assessing postural control using scales and functional tests or during everyday functional activities were absent (Seyyar et al., 2019).

The main feature of cerebral palsy is a lack of control over one's posture (CP). Non-progressive brain damage and subsequent neurological impairments can affect the development of movement and posture (spasticity, muscle weakness, co-contractions and visual impairment) (Kranke et al., 2015). Postural deficits have been found in children and people with both mild and severe forms of CP, according to studies (Sah et al., 2019). The activities of daily living are hampered by dysfunctional posture control. The relationship between the various portions of the body, as well as the body and a reference frame, is referred to as posture (Evkaya et al., 2020).

Balance is achieved through keeping, achieving, or restoring the center of mass relative to the base of support, which can be described as the act of maintaining, accomplishing, or restoring the centre of mass relative to the base of support (Choi et al., 2019). Multiple body systems, including vestibular, visual, auditory, proprioceptive, and higher-level premotor systems, work together to produce balance (Acar et al., 2021).

The balance system's functional objective is to maintain a specific postural alignment, such as sitting or standing; to facilitate voluntary movement, such as transitions between postures; and to restore equilibrium following external disturbances, such as a trip, slip, or push (Dasoju et al., 2021). There is no unanimity on how balance should be systematically measured in people with CP in a regular clinical context. Because balance is such a complicated, task-dependent phenomenon, there is no single clinical balance test that can capture it (Kusumoto et al., 2021).

Appropriate assessment tools are critical in both research and clinical CP management. A good evaluation tool should address the domain of concern, be trustworthy in the population of current interest, have high internal validity, be simple to use, and be adaptable to change (Saether et al., 2019). Many assessment techniques used to evaluate people with CP do not meet some of these criteria. Furthermore, many of the tools available were created with children who did not have CP (Cankurtaran et al., 2021). Cerebral palsy (CP) is a neurological illness that develops as a result of a malfunction or injury to the developing brain (Tarakci et al., 2013).

It is one of the most prevalent causes of motor disability in children. CP refers to a collection of mobility and postural abnormalities that limit activities and are caused by nonprogressive disturbances in the developing fetus or infant brain (Patel et al., 2020). Children with CP have movement and cognitive difficulties, which necessitate a multi-faceted treatment strategy involving a variety of health specialists over a long period of time (AlSaif et al., 2015). Abnormal regulation of movement and/or posture, early onset, and no apparent underlying progressive pathology are all characteristics of CP. Damage to the motor cortex causes movement and postural problems (Lazzari et al., 2015).

Chronic muscular imbalance and the resulting abnormalities can lead to growing impairment as people get older. Defective postural control is one of the most serious issues that children with CP face (Kasse et al., 2015). Maintaining postural control, which is necessary for performing daily activities, is sometimes a big issue for children with CP (Bonnechere et al., 2017). Due to disruption to the central nervous system in the developing brain, children with CP have impaired motor control and a disordered gait pattern (Clutterbuck et al., 2019). Poor balance control is recognized to be a significant contributor to these children's gait issues (Tarakci et al., 2013).

One of the most common causes of childhood impairment is cerebral palsy (CP), a collection of lifelong but non-progressive movement abnormalities caused by problems in the developing brain (Jahan et al., 2021). Because low- and middle-income countries (LMICs) lack population-level epidemiological data, global estimates of CP prevalence have mostly reflected studies from high-income nations (HICs) (Saloojee et al., 2021).

In HICs, CP registers have made a significant contribution to the generation of population-level data on CP epidemiology over time. The formation of register networks has created new options for CP research as well as assessment of the needs of individuals with CP and their families, in addition to individual work and collaboration between registers (Furtado et al., 2021). Networks of registers that share a common data set make it possible to compare the epidemiology of CP across member regions over time and provide enough instances to investigate tiny subgroups (Imam et al., 2021). There has been an increase in the availability of population-based CP data from low-resource settings in recent years, thanks to the introduction of CP registries in LMICs. The findings of those population-based research revealed a higher frequency of CP in LMICs than in HICs, as well as differential epidemiological and clinical characteristics (King et al., 2022).

The Bangladesh CP Register (BCPR) was developed in 2015 as one of the first population-based CP registers in an LMIC. During its early years, the BCPR published the first population-based prevalence of cerebral palsy (3.4 per 1000 live births) and performed research in rural Bangladesh on the quality of life, nutritional status, oral health, and survival likelihood of children with CP (Lansdown et al., 2021). The BCPR experience has demonstrated how to develop and maintain population-based CP registries in LMICs. The Global Low- and Middle-Income Country CP Register (GLM-CPR), based on the Surveillance of CP in Europe and the Australian CP Register networks, was developed as an international multi-centre register of children with CP in LMICs, where epidemiological and clinical information about children with CP can be harmonized and shared in a common data repository (Andrews et al., 2021).

The GLM-goal CPR's is to collect data on CP epidemiology from LMICs and create a single platform for tracking trends, trialing, and testing new diagnostic assessments (Huang et al., 2022). It is intended that by collaborating, culturally acceptable and cost-effective prevention strategies and interventions will have a positive influence on the health, well-being, quality of life, and survival of children with CP in low- and middle-income countries (Smithers-Sheedy et al., 2022).

Demographic characteristics (e.g. age at registration, sex, monthly family income, water and sanitation practices, parental education and occupation); (2) prenatal and perinatal history (e.g. gestational age, birthweight, place of delivery, assistance at birth,

birth-related complications, signs of birth asphyxia); (3) motor impairment severity (e.g. Gross Motor Function Classification System [GMFCS] level, Manual Ability Classification System level); (4) predominant motor type and topography; (5) timing and causes of CP; (6) presence and severity of associated impairments; (7) immunization status; (8) anthropometric measurements; (9) educational and rehabilitation status; and (10) swallowing difficulties (Jahan et al., 2021).

Primary neuromuscular impairments, such as spasticity, muscle weakness, and impaired selective motor control, are evident in cerebral palsy, as are subsequent musculoskeletal abnormalities, such as bony deformities and contractures (Rayan et al., 2017). Although cerebral palsy is predominantly a movement disorder, it is frequently linked with sensory, perception, cognition, communication, and behavioral abnormalities. Limitations in activity that are thought to be caused by the combination of these variables (Suren et al., 2012).

Spasticity and contractures; eating difficulties, drooling, communication difficulties, osteopenia, osteoporosis, fractures, pain, and gastrointestinal function abnormalities that contribute to bowel blockage, vomiting, and constipation are all complications of cerebral palsy (Signore et al., 2011). Parasitic infections, malnutrition, and illnesses are key causes to disability in Bangladesh, according to estimates from the Bangladesh Bureau of the Census and the World Health Organization (Novak et al., 2020).

Physical disabilities, according to the majority of reports, are the most common (41.5 percent). Visual disability (19.7 percent), speech and hearing (19.6 percent), intellectual 5 difficulties (7.4 percent), cerebral palsy (7.0 percent), multiple disabilities (3.4 percent), and mental illness (3.4 percent) are the most common disabilities (1.4 percent) (Hoare et al., 2019). According to, the overall prevalence rate for preschool and primary aged children (ages 3-10) with disabilities is approximately 2.6 (2,559,222), or nearly 10 percent of the childhood population. There are also an estimated 2.6 million children with disabilities in Bangladesh, of whom less than 1,500 have admission to an education in special schools sponsored by the Government of Bangladesh (Ministry of Social Welfare) (Jahan et al., 2021).

Children with intellectual disabilities and those with physical disabilities have been reported to be the most ostracized and neglected. Children with these and other disabilities, such as cerebral palsy, autism, physical disabilities, and multiple disabilities, have the right to an education, which is offered by NGOs, and many of these NGOs began and are still operating with international donor support (Nahm et al., 2018). NGOs play a significant role in Bangladesh. In Bangladesh, there are over 40,000 non-governmental organizations (NGOs), with over 400 of them claiming to work in the field of disability (Adams et al., 2012).

The major NGOs in the area of education for children with disabilities in Bangladesh are the Center for the Rehabilitation of the Paralyzed (CRP) in Savar, including children with cerebral palsy, the Bangladesh Protibhondi Foundation (BPF) for the children with intellectually disabled and children who are multiply disabled; the Society for the Welfare of the Intellectually Disabled Bangladesh (SWIDB); HI-CARE and the Society for support to Hearing Impaired Children (SAHIC) for the hearing impaired; Baptist Sangha School for Blind Girls (BSSBG); and the Autism Welfare Foundation (AWF) for children with autism spectrum disorders (Mallick et al., 2013).

Patients with cerebral palsy might get a variety of treatments, ranging from physiotherapy to medicine and surgery, depending on their unique symptoms. Physiotherapy (PT) is an important part of treating the illness since it focuses on movement, function, and making the best use of the child's abilities (Fonzo et al., 2020). Physical techniques are used by physiotherapists to promote, maintain, and recover psychological, physical, and social well-being (Collado-Garrido et al., 2019). Physiotherapists also provide guidance on mobility devices and train parents how to care for their children at home, including bathing, feeding, clothing, and other chores (Rayan et al., 2017).

1.2 Rationale:

Cerebral palsy is the commonest condition encountered by pediatric physiotherapists. All over the world physiotherapists treatment and rehabilitation about with the children with cerebral palsy their own method of treatment. Physiotherapy is a newly introduced health care profession in Bangladesh. In CRP pediatric unit, physiotherapist use different treatments for cerebral palsy children. A large number of children with Cerebral Palsy needs better physiotherapy treatment, for their survival in the community. In CRP Pediatric unit, physiotherapist use different treatment for improvement of upper extremity and lower extremity motor function in children with cerebral palsy. But there is no valuable research about relation between trunk control and balance of cerebral palsy children attended at Centre for the Rehabilitation of the Paralysed. This study was to investigate the relation between trunk control and balance of cerebral palsy children for the management of cerebral palsy children. Since physiotherapy is a new profession and vitally important to apply evidence-based treatment techniques to patient for better treatment. This will help the physiotherapist to modify red sign and continue the service of children with cerebral palsy. Moreover, to develop evidence to help stronger the physiotherapy profession in Bangladesh and for special interest researcher would like to do the study. It is very important to practice evidence-based practice to establish physiotherapy properly in Bangladesh. Also, the world is now turning to evidence-based practice from traditional treatment. So, it is our duty to create evidence on different branches of physiotherapy profession. This study will generate evidence for the physiotherapist and it will add evidence-based knowledge for physiotherapy profession. There is limited evidence on relation between trunk control and balance of cerebral palsy children attended at Centre for the Rehabilitation of the Paralysed. So, researcher would like to conduct this study.

1.3 Research Question:

What is the relationship between trunk control and balance of cerebral palsy children attended at Centre for the Rehabilitation of the Paralysed?

1.4 Study Objectives:

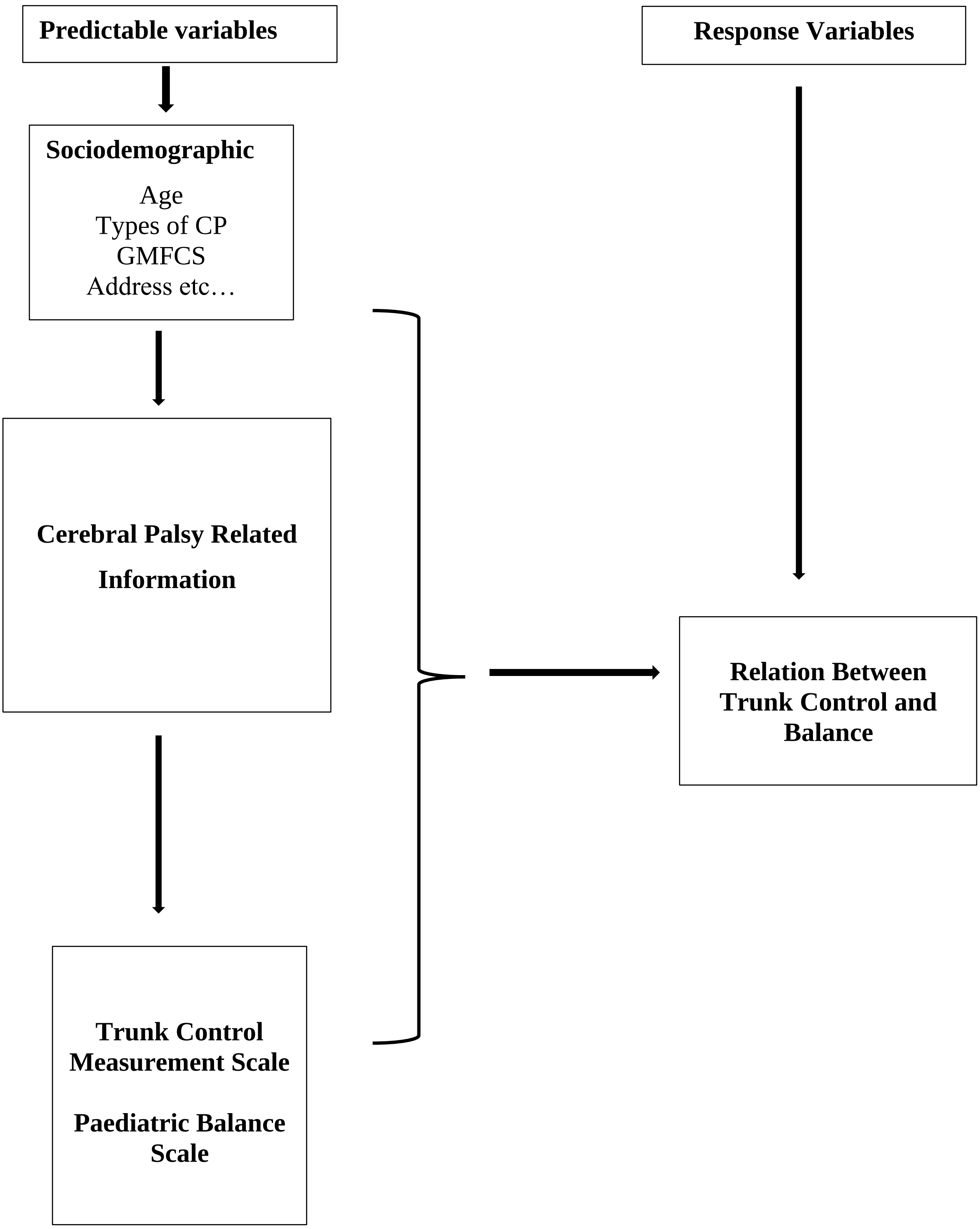
1.4.1 General objective

To determine the relation between trunk control and balance of cerebral palsy children attended at Centre for the Rehabilitation of the Paralysed.

1.4.2 Specific objectives

1. To find out socio-demographic (age, types of Cerebral Palsy, GMFCS level, Address) information of the participants.
2. To delineate association between age and GMFCS of the participants.
3. To identify the association between gender and GMFCS.
4. To find out relation between trunk control and balance of cerebral palsy children.

1.5 Conceptual Framework



Operational Definition

Cerebral Palsy: Cerebral palsy is the term used to refer to a non-progressive group of brain disorders resulting from a lesion or developmental abnormality in fetal life or early infancy. It is the diagnostic term used to describe a group of motor syndromes resulting from disorders of early brain development. It is caused by a broad group of developmental, genetic, metabolic, ischemic, infectious and other acquired etiologies that produced a common group of neurologic phenotypes. Cerebral palsy (CP) is one of the most common causes of physical disability in children.

Trunk control: Trunk control is the ability to control upper body. It affects how well an individual can hold his/her body upright when sitting or moving.

CHAPTER-II LITERATURE REVIEW

Cerebral palsy (CP) is a wide term for a group of nonprogressive posture and movement issues (Novak et al., 2013). CP is caused by a number of reasons, the majority of which are connected to events that occur early in brain development and result in life-long lesions and abnormalities (Steuri et al., 2017).

Secondary motor impairments may vary in severity from modest to severe, and lesions can influence sensation, cognition, communication, and/or behavior (Levitt et al., 2018). The most common signs are loss of muscular strength and decreased muscle tone. Motor impairments in the trunk and limbs create the inability to produce enough force to maintain antigravity postural control, resulting in a variety of atypical postures (Gulati et al., 2018). Posture control refers to the capacity to regulate the posture of the limbs or the complete body in space in order to attain stability and alignment (Morgan et al., 2016).

Postural control influences not just sitting and standing, but also the ability to sequence movement appropriately. Although there is a growing body of research on postural control in children with cerebral palsy, the bulk of it is observational and descriptive (Ryan et al., 2017). Adaptive seating, which involves making changes to seating equipment to enhance sitting posture and/or postural control in mobility-impaired people, is a common intervention for children with CP. Since its debut in the 1960s, adaptive seating systems have gone a long way (Tinderholt et al., 2017).

Previous research has demonstrated that adaptive sitting improves postural control in children with cerebral palsy (Novak et al., 2014). Postural control has been found to increase functional ability, including upper extremity (UE) function, occupational performance and satisfaction, and daily living task performance (ADL). When the intervention was removed, the advantages remained, showing that adaptive sitting may aid with physical function (Monbaliu et al., 2017). According to the International Classification of Functioning, Disability, and Health (ICF) model, there is a dynamic link between one's health condition and contextual circumstances. The components of functioning in the ICF paradigm include body structure/body function, activity, and participation (Schiariti et al., 2015).

Each component is interconnected to the point that changing one may have a nonlinear impact on the others. These components are affected by both environmental and human causes (Selb et al., 2015). Environmental changes, such as adaptive seating devices, are used in clinical settings to enhance postural control, and in certain cases, increases in the ICF model's activity and participation components might be predicted as a consequence (Dos et al., 2012).

During a search for systematic reviews of the influence of flexible seating on postural control results, three possibly relevant studies were discovered (Schiariti et al., 2014). From 1982 to 1994, Roxborough produced a systematic review (SR) that examined the research on the effects of adaptive sitting on children with CP. Only two of the eight studies looked at postural control outcomes in children under the age of three: trunk extension in 2- to 6-year-olds and head control in children under the age of three (Novak et al., 2013).

One of the most current and widely accepted definitions of cerebral palsy includes permanent deficits in movement and postural development (CP). This disturbance in the development of movement and posture causes a loss in mobility, self-care, and social function in children with CP (Curtis et al., 2018). Treatments aimed at enhancing a child's motor function with the hopes of boosting activity and involvement, and so improving the child's quality of life (Levitt et al., 2018). Therapists use a variety of training tactics to help children improve their motor function by diagnosing and treating motor system deficits (Santamaria et al., 2016). Several studies have linked motor function to a variety of impairments, including spasticity, movement quality, postural stability, involvement distribution, strength, range of motion restrictions, and diminished endurance (Saavedra et al., 2020). There was a definite relationship between postural control and functioning in children with CP, according to research, however studies measuring postural control using scales and functional tests or during normal functional tasks were insufficient (Barbado et al., 2019).

A research recently looked at the association between trunk control in sitting and gait in children with spastic diplegia, and discovered that trunk movements during walking were not only compensatory, but might also indicate underlying trunk control deficiency.

Another research by the same group discovered that children with CP had impaired trunk control, which varies depending on topography and the severity of the motor impairment (Ilharreborde et al., 2020).

A research recently called Segmental assessment of trunk control (SATCo) featured the Sitting Assessment of Children with Neuromotor Disability, the Trunk Control Measurement Scale, the Trunk Impairment Scale, and the Segmental Assessment of Trunk Control (Marsico et al., 2017). The Sitting Assessment of Children with Neuromotor Disability, Trunk Control Measurement Scale, and Trunk Impairment Scale are all tests based on functional sitting skills. The SATCo exam is different from the others in that it is biomechanics test rather than a functional test (Blazer et al., 2018). The SATCo's mission is to discover the unique trunk postural control systems that support a person's effective sitting capacity (Marsico et al., 2017).

A segmental technique is used to assess the static, active, and reactive balance at distinct trunk levels. Static, active, and reactive balance are needed to varied degrees depending on the motor function and environment (Malone et al., 2016). By examining each aspect of postural balance independently, the tester may examine the segmental level of each of the aforementioned parts of postural control. In clinical practice, this allows the therapist to construct a more concentrated therapeutic goal (Curtis et al., 2015).

Children with neurological disorders typically have poor postural control, which may affect trunk stability, mobility, and upper-limb selectivity (Marisco et al., 2021). In clinical practice, many strategies are employed to treat these issues, such as balance training during physical therapy or hippotherapy (Marisco et al., 2017). Valid, accurate, and responsive outcome measures are necessary to evaluate trunk control in order to assess the effectiveness of such interventions. A recent analysis looked at the psychometric aspects of sitting balance assessments for children with cerebral palsy (CP) (Balzer et al., 2018). Among the seven outcome assessments employed (TCMS) were the Pediatric Reach Test, Level of Sitting Scale, Sitting Assessment for Children with Neuromotor Dysfunction, Segmental Assessment of Trunk Control, Seated Postural Control Measurement, Trunk Impairment Scale, and Trunk Control Measurement Scale (Marisco et al., 2021).

When testing trunk ability while sitting, the TCMS gives an objective result metric (Ko et al., 2018). The TCMS includes both static and dynamic sitting balancing, with the latter divided into selective movement control and dynamic reaching. In children with spastic CP, ages 2 to 15, this diagnostic approach offers a good degree of relative reliability (Heyrman et al., 2018).

To evaluate whether reported changes are 'real' or not, absolute measurement errors must be determined. While the absolute measurement error of the total score was investigated in the same study (the smallest discernible difference [SDD] was 4.66 points for interrater reliability and 5.47 points for interrater reliability), no comparable data for the TCMS sub scores is available; additionally, these findings were limited to children with spastic CP and were discovered in a small cohort of children (n=26) (Saether et al., 2013). Because impaired trunk control can be seen in younger children and those with other neurological diagnoses (e.g., dyskinetic or ataxic CP and other neuromotor disorders, such as acquired brain injuries, myelomeningocele, or different syndromes), it's important to see if these findings apply to a larger group of people (Ko et al., 2013).

Apart from the TCMS's dependability, there was a need to discover how much trunk control a child needs to be self-sufficient in movement and self-care in everyday life, since the child's independence is important to both the child and the family (Levitt et al., 2018). The discriminative validity of the TCMS and its sub scores was assessed by comparing them to the Functional Independence Measure for Children (WeeFIM) mobility and self-care categories (Park et al., 2013). Children were recruited from both inpatient and outpatient settings at the University Children's Hospital Zurich's Rehabilitation Centre for Children and Adolescents in Affoltern am Albis and the Foundation Regional Group Zurich's Children Therapy Centres. (1) neurological condition such as CP (GMFCS level I–IV); (2) acquired brain damage; (3) spinal cord injury; and (4) age 5 to 19 years were the inclusion criteria. The students needed to be able to understand and follow basic instructions. Exclusion considerations included surgery or botulinum toxin injections within the preceding three months, as well as discomfort or medical limits on weight bearing (Adar et al., 2017). Parents and teenagers aged 15 and up completed an informed permission form. This study was conducted with the help of children under the age of 15. The ethics committee of the Canton of Zurich authorized the research, which followed the Declaration of Helsinki and good clinical practice guidelines. The objective was to collect data on at least 50 youngsters. The COSMIN group considers a sample size of more than 50 to be adequate (Marisco et al., 2017).

The Berg balance scale (BBS) and the paediatric balance scale (PBS) are both effective measures for assessing balance. However, there have been few reports of BBS and PBS scores in teenage cerebral palsy (Jantakat et al., 2015). The study's goals were to look into functional balance capacities in adolescents with cerebral palsy as measured by the BBS and PBS, compare total PBS and BBS scores across Gross Motor Function Classification System-Expanded and Revised (GMFCS-E&R) levels, and compare static balance PBS and BBS scores within each GMFCS-E&R level (Niiler et al., 2020). Fifty-eight school-aged adolescents with cerebral palsy between the ages of 12 and 18 were recruited, with GMFCS-E&R levels ranging from I to IV. The Kruskal–Wallis test was used to compare the median PBS and BBS scores across the various GMFCS-E&R levels (Calacci et al., 2016).

The differences in static balance scores between the PBS and the BBS within the same GMFCS-E&R levels were investigated using Wilcoxon signed-rank tests. The BBS and PBS scores differed amongst the four GMFCS-E&R levels, according to the findings. Only individuals with cerebral palsy and level III GMFCS-E&R had a significant difference between their BBS and PBS scores (Erden et al., 2021). In adolescents with cerebral palsy, the BBS and PBS are valid and trustworthy methods for clinical assessment and discriminating between degrees of functional balance (Hurria et al., 2014).

Cerebral palsy (CP) is a term used to describe a set of neurological illnesses that impact the development of mobility and posture and restrict activities (Addison et al., 2018). Due to the reduced functional movements of CP patients, their motor development is not age-appropriate when compared to typically-developing people (Kerr et al., 2017). Several studies have shown that throughout puberty or early adulthood, adolescents with CP have a reduction in gross motor performance (Groh et al., 2019). As a result, starting at the age of 14, teenagers with CP need additional help from carers (Travis et al., 2017).

Hanna (2019) performed a 5-year longitudinal cohort research in which 657 children with CP aged 16 months to 21 years had their gross motor abilities assessed up to ten times. They discovered a loss in motor function in patients with GMFCS levels III, IV, and V, with the biggest declines in those with GMFCS level IV. The average GMFM-66 score decreases of 4.7–7.8 points were enough to cause clinically significant alterations in the execution of various critical gross motor activities. Gross motor competence is clearly linked to functional balance (Gan et al., 2018); Poor postural control during everyday tasks reduces functional mobility, particularly in individuals with moderate to severe CP. Level III GMFCS-E&R children spent more time practicing sit-to-stand motions than those with GMFCS levels I and II, according to Kumban and colleagues (2013). (Kumban et al., 2013). To compensate for weak functional balance, slow motions were adopted. Furthermore, among people with poor Berg balance scale (BBS) scores, the mechanical efficiency of functional activity is much lower and closely connected with balance (Lebowitz et al., 2018).

Pavao and colleagues advocated for postural control testing during functional activities in children with cerebral palsy to assist them discover how to balance in their everyday lives (Pavao et al., 2013). The BBS and the paediatric balance scale (PBS) are two functional balance tests that have been suggested as suitable testing for this group of people (Pavao et al., 2013). During functional motions, the BBS analyzes both static and dynamic balance. BBS scores for children with CP have only been recorded in a few studies (Aisen et al., 2011). PBS is a modified version of BBS designed for use by young children. According to recent research, the PBS can distinguish between functional balance variations in children aged 4 to 10 years with GMFCS levels of I to III (Deshpande et al., 2016).

The BBS and PBS have both been found to be reliable tests that correspond with the execution of functional tasks such as everyday activities (Chen et al., 2018). Both tests have been evaluated for reliability and validity in children under the age of 15 (Yi et al., 2017), and recent research looked at the use of the PBS in CP patients with GMFCS levels of I–V who were 0–18 years old (Pavao et al., 2019).

However, there is minimal information available on the BBS and PBS's capabilities for teenagers with moderate to severe CP between the ages of 15 and 18 who are experiencing function and balance decreases. We predicted in this research that the PBS static balancing tasks would be simpler for these participants than the BBS ones. As a result, the PBS is regarded to be a useful functional balancing test for adolescents with CP, particularly those who have moderate to severe disability. In this research, both the BBS and PBS were assessed in CP adolescents with GMFCS levels ranging from I to IV, with PBS being examined within each GMFCS-E&R level. We were also interested in the BBS and PBS reliabilities in teenagers with CP (Jantakat et al., 2015). Cerebral palsy (CP) is a term used to describe a set of neurological illnesses that impact the development of mobility and posture and restrict activities (Saether et al., 2019). Due to the reduced functional movements of CP patients, their motor development is not age-appropriate when compared to typically-developing people (Kerr et al., 2017). Several studies have shown that throughout puberty or early adulthood, adolescents with CP have a reduction in gross motor performance (Bar-Haim et al., 2018). As a result, starting at the age of 14, teenagers with CP need additional help from carers (Rosenbaum et al., 2016).

Cerebral palsy (CP), the most common neuromuscular disorder in children, causes physical and sometimes intellectual difficulties (Karaby et al., 2016). Despite advancements in diagnosis and treatment, the frequency of CP has grown in line with the higher survival rates of preterm infants (Niebaum et al., 2018). Regardless of the prevalence of CP, the treatment objectives remain the same. Children with diplegic CP may lack trunk control due to stiffness and weakness in their trunk muscles (Pavo et al., 2017). A balanced sitting posture is encouraged by the coordinated activation of the trunk's extensors and flexors. Some children with CP may need to rely on their parents for everyday duties, depending on their neurological status (O'Shea et al., 2020).

Treatment for children with CP is to help them do everyday tasks as independently as possible, reduce their dependency on family members, and enhance their quality of life. As a consequence, maintaining a healthy sitting posture is essential since it helps the upper extremities to appropriately perform everyday tasks (Karabay et al., 2019).

CHAPTER-III	METHODOLOGY

3.1 Study Design

This study was conducted using Snapshot/ Cross Sectional design under a quantitative study method. Survey methodology was chosen to meet the study aim as an effective way to collect data.

3.2 Study Site

The study was conducted in pediatric unit of Center for the Rehabilitation of the Paralyzed (CRP). It is a tertiary level of rehabilitation centre. It is a non-government organization working for the development of health care delivery system of Bangladesh through providing Physiotherapy, Occupational therapy, Speech and Language therapy services in indoor and outdoor programs. Pediatric unit provides service for child with different types of disability.

3.3 Study population

A population refers to the entire group of people who meet the criteria set by the researcher. The populations of this study were the cerebral palsy children who were admitted at pediatric unit in CRP.

3.4 Sample size

Sample is a group of subjects are selected from population, who are used in a piece of research (Hicks, 2009). A sample is a smaller group taken from the population. Sometimes the sample size may be big and sometimes it may be small, depending on the population and the characteristics of the study. When the sample frame is finite, The equation of finite population correction in case of cross-sectional study is:

$$n = \frac{z^2pq}{d^2}$$

$$= \frac{(1.96)^2 \, x \, 0.034 \, x \, 0.795}{(0.05)^2}$$

$$= \frac{3.8416 \, x \, 0.034 \, x \, 0.795}{0.0025}$$

= 41.54

Here, Z (confidence interval) = 1.96

P (prevalence) =3.4% (Khandakar et al., 2019)

And, q= (1-p)

= (1-0.205)

= 0.795

The actual sample size was, n= 41.54

Researcher has taken 55 participants as sample. Due to time limitation the researcher has chosen 55 participants to conduct this study; within the short time it could not be possible to conduct the study with a large number sample.

3.5 Sampling Technique

Findings the appropriate number and type of people taking part in the study is called "sampling" (Hicks, 2009). The study was conducted by using the hospital based random sampling methods due to the time limitation and as it was the one of the easiest, cheapest and quicker method of sample selection. The researcher used this procedure, because, getting of those samples whose criteria were concerned with the study purpose.

3.6 Inclusion criteria

- Children were examined by qualified paediatric physical therapist to find out whether, they met inclusion criteria for the study:
- Age range: Children of 1 to 14 years of age,
- Afflicted with any types of cerebral palsy,
- GMFCS levels I, II and III,
- Children able to understand the test instructions,
- Both sex (Panibatla et al., 2017).

3.7 Exclusion Criteria

- Age range less than 1 or more than 14 years.
- Has not Willingness of the patient.
- If GMFCS levels are IV and V.
- If not afflicted with cerebral palsy.
- Afflicted children who had undergone spinal surgeries.
- History of injury to spine and pelvis.
- On medication like anti-epileptic and anti-spastic drugs.
- Progressive neurological disorder.

- Genetic or metabolic disorder.

3.8 Data Processing

3.8.1 Data Collection Tools

- Record or Data collection form
- Informed Consent
- Self developed questionnaire
- Papers, pen, and pencil etc.

3.8.2 Data Collection Procedure

At the very beginning researcher clarified that, the participant has the right to refuse to answer of any question during completing questionnaire. They can withdraw from the study at any time. Researcher also clarify to all participants about the aim of the study. Participants were ensured that any personal information would not be published anywhere. Researcher took permission from each volunteer participant by using a written consent form. After getting consent from the participants, standard questionnaire was used to identify the complain and collect demographic information. Questions were asked according to the Bangla format. For conducting the interview, the researcher conducted a face-to-face interview and asked questions. Physical environment was considered strictly. Stimuli that can distract interviewee were removed to ensure adequate attention of interview. Interviewee was asked questions alone as much as possible with consent as sometimes close relatives can guide answer for them. The researcher built a rapport and clarified questions during the interview. Face to face interviews are the most effective way to get full cooperation of the participant in a survey. Face to face interviews are also effective to describe characteristics of a population. Face to face interviews was used to find specific data which describes the population descriptively during discussion. According to the participants' understanding level, sometimes the questions were described in the native language so that the patients can understand the questions perfectly and answer accurately. All the data were collected by the researcher own to avoid the errors.

3.9 Data Analysis

Descriptive statistics were used to analyze data. Descriptive statistics refers methods of describing a set of results in terms of their most interesting characteristics (Hicks, 2009). Data were analyzed with the software named Statistical Package for the Social Science (SPSS) version 22.0. The variables were labeled in a list and the researcher established a computer-based data definition record file that consist of a list of variables in order. The researcher put the name of the variables in the variable view of SPSS and defined the types, values, decimal, label alignment and measurement level of data. The next step was cleaning new data files to check the inputted data set to ensure that all data has been accurately transcribed from the questionnaire sheet to the SPSS data view. Then the raw data were ready for analysis in SPSS. Data were collected on frequency and contingency tables. Measurements of central tendency were carried out using the mean plus standard deviation (SD) for variables. For the study of the association of numeric variables chi squared test, Spearman Correlation test were used. Data were analyzed by descriptive statistics and calculated as percentages and presented by using table, bar graph, pie charts etc. Microsoft office Excel 2021 was used to decorating the bar graph and pie charts. The results of this study were consisted of quantitative data. By this study a lot of information was collected.

Chi-square test:

A chi-squared test, also written as $\chi 2$ test, is any statistical hypothesis test where the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. The chi-squared test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories.

Assumptions of the Chi-square:

The data in the cells should be frequencies, or counts of cases rather than percentages or some other transformation of the data.

The levels (or categories) of the variables are mutually exclusive. That is, a particular subject fits into one and only one level of each of the variables.

Each subject may contribute data to one and only one cell in the $\chi 2$. If, for example, the same subjects are tested over time such that the comparisons are of the same subjects at Time 1, Time 2, Time 3, etc., then $\chi 2$ may not be used.

The study groups must be independent. This means that a different test must be used if the two groups are related. For example, a different test must be used if the researcher's data consists of paired samples, such as in studies in which a parent is paired with his or her child.

There are 2 variables, and both are measured as categories, usually at the nominal level. However, data may be ordinal data. Interval or ratio data that have been collapsed into ordinal categories may also be used. While Chi-square has no rule about limiting the number of cells (by limiting the number of categories for each variable), a very large number of cells (over 20) can make it difficult to meet assumption #6 below, and to interpret the meaning of the results.

The value of the cell expecteds should be 5 or more in at least 80% of the cells, and no cell should have an expected of less than one. This assumption is most likely to be met if the sample size equals at least the number of cells multiplied by 5. Essentially, this assumption specifies the number of cases (sample size) needed to use the $\chi 2$ for any number of cells in that $\chi 2$. This requirement will be fully explained in the example of the calculation of the statistic in the case study example.

Calculating Chi-square

The formula for calculating a Chi-Square is:

$$\sum x_{i-j}^2 = \frac{(O-E)^2}{E}$$

Where,

O = Observed (the actual count of cases in each cell of the table)

E = Expected value

$\chi 2$ = The cell Chi-square value

$\sum \chi 2$ = Formula instruction to sum all the cell Chi-square values

$x2$ i$-j$ = i–j is the correct notation to represent all the cells, from the first cell (i) to the last cell (j); in this case Cell (i) through Cell (j).

The first step in calculating a $\chi 2$ is to calculate the sum of each row, and the sum of each column. These sums are called the "marginals" and there are row marginal values and column marginal values.

Spearman`s Correlation test:

The correlation **r** measures the strength of the linear relationship between two quantitative variables.

$$r = \frac{1}{n-1}\sum\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$$

- r is always a number between -1 and 1.
- r> 0 indicates a positive association.
- r<0 indicates a negative association.
- Values of r near O indicate a very weak linear relationship.
- The strength of the linear relationship increases as r moves away from 0 toward-1 or 1.
- The extreme values r = 1 and 1 occur only in the case of a perfect liner relationship.

Absolute Value of r (Strength of Relationship)

r<0.3 (None or very weak)

0.3<0.5 (Weak)

0.5<r<0.7 (Moderate)

r>0.7 (Strong)

3.10 Ethical Consideration

The researcher maintained some ethical considerations: Researcher has followed the Bangladesh Medical Research Council (BMRC) guideline & WHO research guideline. A research proposal was submitted to the physiotherapy department of BHPI for approval and the proposal was approved by the faculty members and gave permission initially from the supervisor of the research project and from the course coordinator before conducting the study. The proposal of the dissertation including methodology was presented to the Institutional Review Board (IRB) of Bangladesh Health Professions Institute (BHPI) for oral presentation defense was done infront of the IRB. Then the necessary information was approved by Institutional Review Board and was permitted to do this research. After getting the permission of doing this study from the academic institute the researcher had been started to do it. The researcher had been taken permission for data collection from the Paediatric dept. CRP, Savar. The participants would be informed before to invite participation in the study. A written consent form used to take the permission of each participant for the study. The researcher ensured that all participants were informed about their rights and reserves and about the aim and objectives of the study. Researcher also ensured that the organization (CRP) was not hampered by the study. All kinds of confidentiality highly maintained. The researcher ensured not to leak out any type of confidentialities. The researcher was eligible to do the study after knowing the academic and clinical rules of doing the study about what should be done and what should not. All rights of the participants were reserved and researcher was accountable to the participant to answer any type of study related question.

CHAPTER-IV	RESULTS

4.1 Socio-demographic information

4.1.1 Age of the participants

Among 55 participants, 87% (n=48) were between 1-5 years age range, 12.7% (n=07) were 6-10 years range, 0% (n=0) were 11-14 years range. The mean age is 1.13. The standard deviation is 0.336. (Table no 1)

Table no 1: Age of the participants

Age	Frequency	Percentage	(SD)	Mean
1-5 years	48	87.3%	0.336	1.13
6-10 years	07	12.7%		
11-14 years	00	0.0%		

4.1.2 Types of Cerebral Palsy of the participants

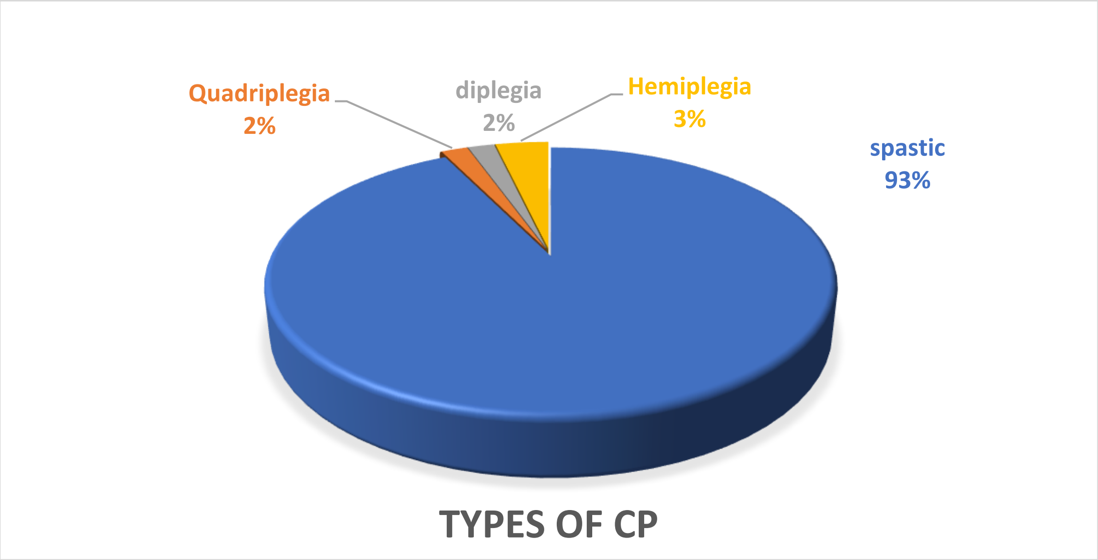


Figure 1: Types of Cerebral Palsy of the participants

Among 55 participants, 92.7% (n=51) were Spastic type of Cerebral Palsy, 1.8% (n=01) were Quadriplegia, 1.8% (n=01) were Diplegia, 3.6% (n=02) were Hemiplegia. (Figure 1)

4.1.3 GMFCS level of the participants:

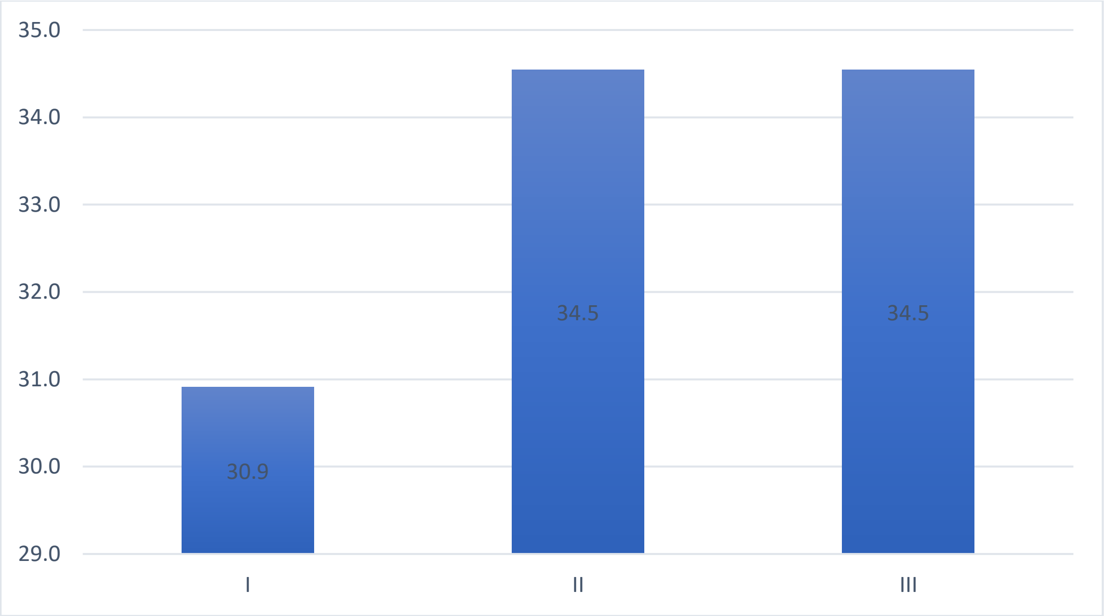


Figure 2: GMFCS of the participants

Among 55 participants, 30.9% (n=17) were GMFCS type-I, 34.5% (n=19) were GMFCS type-II, 34.5% (n=19) were GMFCS type-III. (Figure 2)

4.1.4 Address of the Participants

In this table we will know about the Addresses of the participants. Among 55 patients 1.8% (n=1) came from Ashulia, 1.8% (n=1) came from Bagherhat, 3.6% (n=2) came from Barishal, 1.8% (n=1) came from Bogura, 3.6% (n=2) came from Comilla, 3.6% (n=2) came from Dhaka, 1.8% (n=1) came from Gaibandha, 14.5% (n=8) came from Gazipur, 1.8% (n=1) came from Gopalganj, 1.8% (n=1) came from Hemayetpur, 3.6% (n=2) came from Jamalpur, 5.5% (n=3) came from Khulna, 1.8% (n=1) came from Kustia, 5.5% (n=3) came from Manikganj, 3.6% (n=2) came from Mymensingh, 5.5% (n=3) came from Narayanganj, 1.8% (n=1) came from Nator, 5.5% (n=3) came from Norshingdi, 1.8% (n=1) came from Nougaon, 1.8% (n=1) came from Rajshahi, 1.8% (n=1) came from Rangpur, 14.5% (n=8) came from Savar, 1.8% (n=1) came from Shatkhira, 3.6% (n=2) came from Tangail, 1.8% (n=1) came from Uttara, 1.8% (n=1) came from Zhalkathi and 1.8% (n=1) came from Zhinaidah. (Table no 2)

Table no 2: Address of the participants

Address	Number (n)	Parcent (%)
Ashulia	1	1.8
Bagherhat	1	1.8
Barishal	2	3.6
Bogura	1	1.8
Comilla	2	3.6
Dhaka	2	3.6
Gaibandha	1	1.8
Gazipur	8	14.5
Gopalganj	1	1.8
Hemayetpur	1	1.8
Jamalpur	2	3.6
Khulna	3	5.5
Kustia	1	1.8
Manikganj	3	5.5
Mymensingh	2	3.6
Narayanganj	3	5.5
Nator	1	1.8
Norshingdi	3	5.5
Nougaon	1	1.8
Rajshahi	1	1.8
Rangpur	1	1.8
Savar	8	14.5
Shatkhira	1	1.8
Tangail	2	3.6
Uttara	1	1.8
Zhalkathi	1	1.8
Zhinaidah	1	1.8
Total	55	100

4.2 Association between Age and GMFCS of the participants

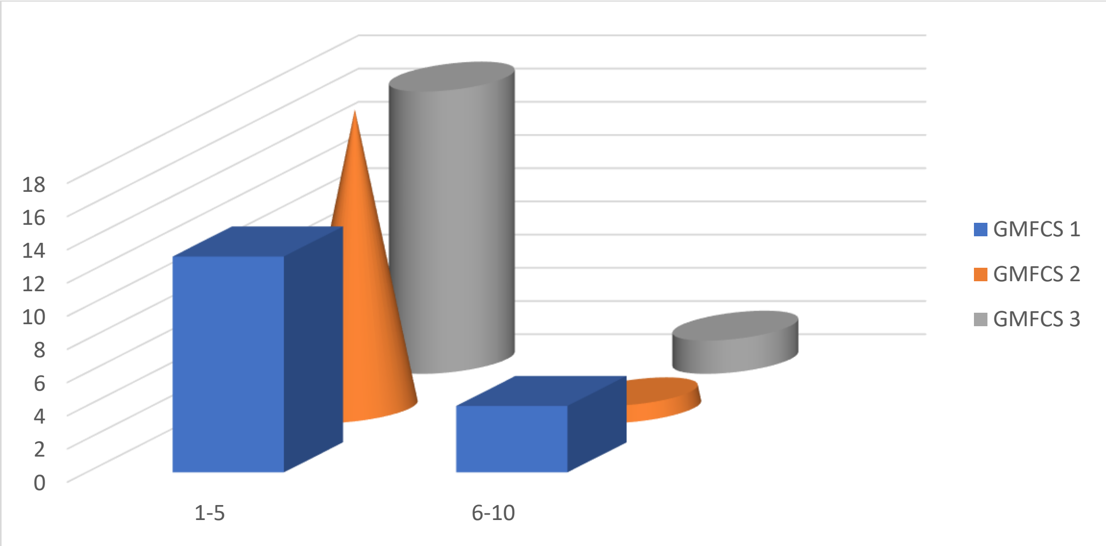


Figure 3: Association between Age and GMFCS of the participants

Among 55 participants, for age range of 1-5, (n=13) were GMFCS type-I, (n=18) were GMFCS type-II, (n=17) were GMFCS type-III. For age range of 6-10, (n=4) were GMFCS type-I, (n=1) were GMFCS type-II, (n=2) were GMFCS type-III. This observed Chi-square value was 2.822 and P-Value was 0.244. So, there was no association between age and GMFCS of the participants. (Figure 3)

4.3 Association between Gender and GMFCS of the participants

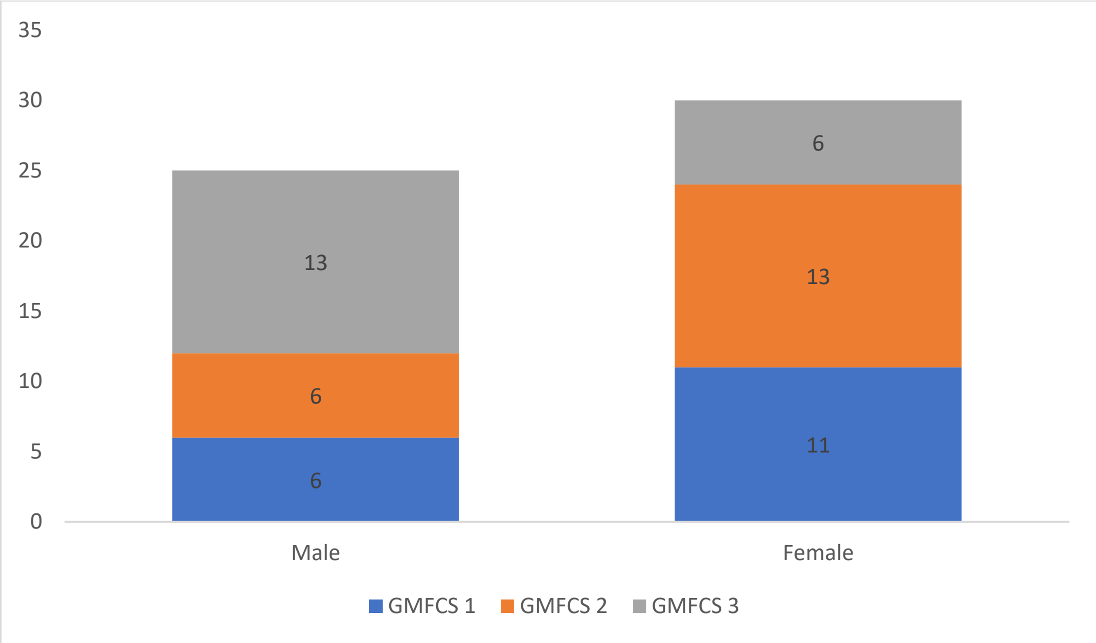


Figure 4: Association between Gender and GMFCS of the participants

Among 55 participants, for male children, (n=6) were GMFCS type-I, (n=6) were GMFCS type-II, (n=13) were GMFCS type-III. For female children, (n=11) were GMFCS type-I, (n=13) were GMFCS type-II, (n=6) were GMFCS type-III. This observed Chi-square value was 6.225 and P-Value was 0.044. So, there was association between Gender and GMFCS of the participants. (Figure 4)

4.4 Correlation TEST Between TCMS and PBS

Among 55 participants, there is strong correlation between TCMS and PBS. For TCMS, Spearman's rho (r) of PBS is .754. For PBS, Spearman's rho of TCMS is .754 and for both significance value is 0.004. We know correlation is significant at the 0.01 level, when r>0.7, it proves that correlation is strong. So, there is strong association between TCMS and PBS. For this, we can say there is strong relation between trunk control and balance. (Table no 4)

Table no 3: Spearman`s Correlation TEST Between TCMS and PBS

			TCMS	**PBS**
Spearman's rho	TCMS	Correlation Coefficient	1	.754**
	PBS	Correlation Coefficient	.754**	1

**. Correlation is significant at the 0.01 level.

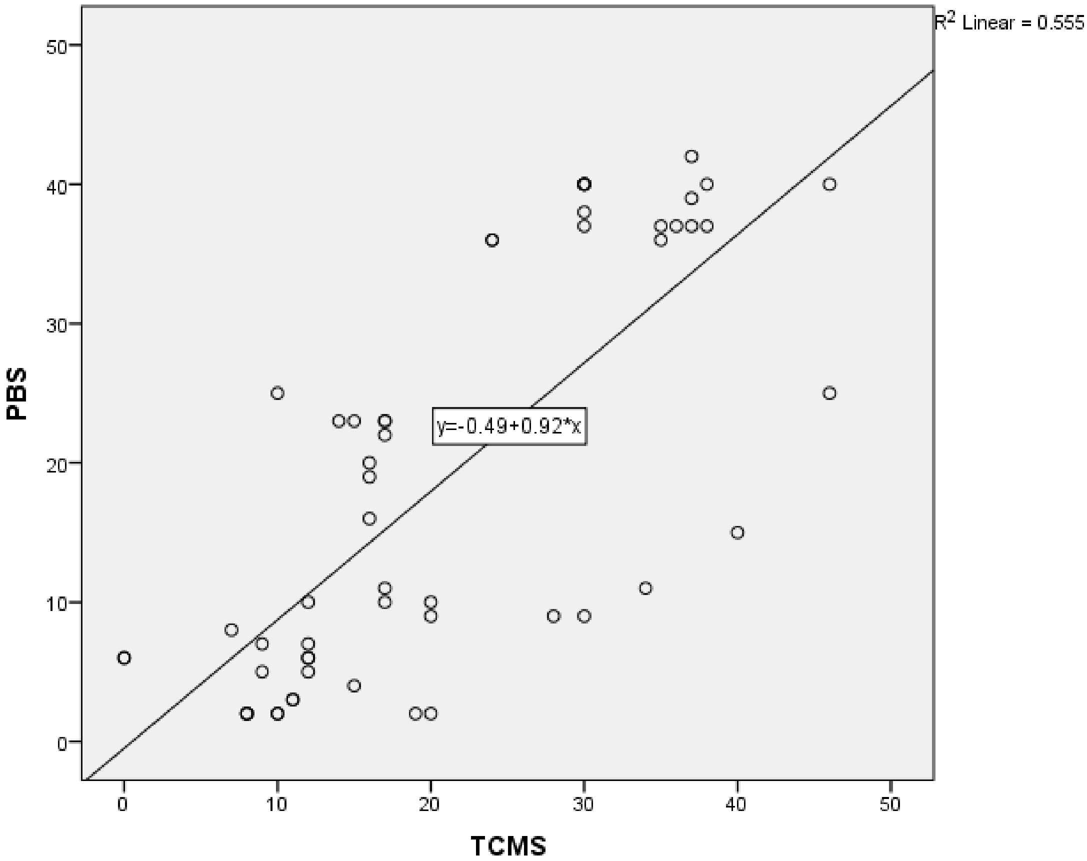


Figure 5: Correlation Between TCMS and PBS (Graph)

CHAPTER-V	DISCUSSION

There is a widespread agreement that, cases should be included in monitoring programs as an extra cohort to those who have acquired CP in the prenatal or perinatal period. This is particularly important given the identification of several common risk factors, such as heart abnormalities. There is no standardization in place for the inclusion criteria regarding the time of neonatal brain damage. Some people have picked 27 or 28 days, the end of the newborn phase (also known as the post neonatal period), as the minimum age; nevertheless, the majority of monitoring programs do not define a minimum age. A recognized event with brain damaging potential in an infant or child that was previously well is the key determining factor in whether or not CP should be considered to be post neonatally acquired. This means that while an infection diagnosed in an unwell infant may be assumed to be related to the uterine environment and classified as pre/perinatal, a previously well infant with a cerebral infection or head injury should be classified as having post neonatally acquired CP. Between the ages of 2 and 8 years old is the cutoff point for those who can be diagnosed with post neonatal acquired brain damage as a criteria. It is not clear whether this range reflects the ages at which surveillance programs finalize their data, their understanding of when the developing brain is considered matured, or regional definitions of brain injury relating to service access. It is possible that all three of these factors are at play. (Smithers-Sheedy et al., 2014).

Among the 55 participants, 87 percent (n = 48) fell into the age range of 1-5 years, 12.7 percent (n = 07) were in the age range of 6-10 years, and 0 percent (n = 0) were in the age range of 11-14 years. The average age is 1.13 years old. 0.336 is the value of the standard deviation.

Spastic cerebral palsy is by far the most prevalent kind of cerebral palsy, accounting for between 70 and 80 percent of all cases. When it comes to determining which kind of spastic cerebral palsy is the most frequent, the standards of diagnosis in industrialized nations and those in poor countries are not identical. It has been found that the prevalence of quadriplegic cerebral palsy in nations with little resources is much greater than in countries with modern healthcare systems. The greater survival of very preterm newborns is thought to be the cause of this drop in the quadriplegic kind of cerebral palsy in industrialized nations. The spastic form of the illness was shown to be the most common, although it was equally distributed across spastic diplegic and spastic quadriplegic kinds. This was another finding that was similar to what was found in the research. Marriage within the same family and a lack of access to prenatal care were two of the most significant community-related risk factors found. Because of the complex and intimate nature of the family structure in this region of the globe, consanguinity is a very frequent social norm. In European nations, its connection to CP has been brought up, despite the fact that it is not entirely obvious. CP has been shown to have a statistically significant connection with low birth weight in a number of investigations conducted in the West. This is mostly due to the availability of sophisticated obstetric care, which has resulted in an increase in the survival rate of preterm babies and kids born with a low birth weight. This, in turn, has led to an increase in the likelihood that these newborns may have CP. (Bangash et al., 2014).

92.7 percent of the subjects had the spastic form of cerebral palsy (n = 51), 1.8 percent had quadriplegia (n = 01), 1.8 percent had diplegia (n = 01), and 3.6 percent had hemiplegia (n = 02).

To determine whether they were eligible for the trial, children were assessed by a licensed pediatric physical therapist. Spastic cerebral palsy sufferers between the ages of one and fourteen, afflicted with GMFS levels one through three who can understand the test instructions, sit without trunk and feet support for at least 30 minutes, and stand without upper extremity support for four seconds are eligible for this study. Affected children who had undergone spinal surgeries, botulinum toxin prescribed in the last six months, intrathecal baclofen pump implantation, history of spinal and pelvic injury, on medication like anti-epileptic and anti-spastic drugs, a progressive neurological disorder, genetic or metabolic disorder, and severe concurrent illness or disease not typically associated with CP were excluded from the research (Panibatla et al., 2017).

30.9 percent of the participants (n = 17) had GMFCS type-I, 34.5 percent of the participants (n = 19) had GMFCS type-II, and 34.5 percent of the participants (n = 19) had GMFCS type-III.

Children who were female and had cerebral palsy were less likely to get rehabilitation treatments than children who were male and had the condition. In the United States of America, researchers discovered that young girls with cerebral palsy had a likelihood that was four times higher than that of young boys to need rehabilitation services. On the other hand, Sinha and Sharma found that there is no correlation between sexual activity and the use of rehabilitation services by children who were diagnosed with CP in India. In low- and middle-income countries, women who have impairments carry a double burden, both because of their gender responsibilities and their disability. When it comes to gaining access to chances like rehabilitation, a disabled woman has a larger obstacle to overcome because of her disability. According to McConachie et al. (2011), having a male kid may encourage parents to seek out rehabilitation treatments, especially in remote communities. It's possible that this has something to do with the idea that men ought to be able to provide for their families as they are older. Lalmonirhat (numbering 42), Mymynsingh (numbering 44), Gaibandha (numbering 55), Bogura (numbering 109), kishoreganj (numbering 99), Brahmanbaria (numbering 39), and Pabna (numbering 2464) are represented among the participants of the study (Imam et al., 2021).

Among 55 patients 1.8 percent (n=1) came from Ashulia, 1.8 percent (n=1) came from Bagherhat, 3.6 percent (n=2) came from Barishal, 1.8 percent (n=1) came from Bogura, 3.6 percent (n=2) came from Comilla, 3.6 percent (n=2) came from Dhaka, 1.8 percent (n=1) came from Gaibandha, 14.5 percent (n=8) came from Gazipur, 1.8 percent (n=1) came from Gopalganj, 1.8 percent (n=1) came from Hemayetpur, 3.6 percent (n=2) came from Jamalpur, 5.5 percent (n=3) came from Khulna, 1.8 percentage points (n=1) came from Kustia, 5.5 percentage points (n=3) came from Manikganj, 3.6 percentage points (n=2) came from Mymensingh, 5.5 percentage points (n=3) came from Narayanganj, 1.8 percentage points (n=1) came from Nator, 5.5 percentage points (n=3) came from Norshingdi, 1.8 percentage points (n=1) came from Nougaon, 1.8 percentage points (n=1) came from the city of Rajshahi, 1.8 percentage points (n=1) came from the city of Rangpur, 14.5 percentage points (n=8) came from the city of Savar, 1.8 percentage points (n=1) came from the city of Shatkhira, 3.6 percentage points (n=2) came from the city of Tangail, 1.8 percentage points (n=1) came from the city of Uttara, 1.8 percent points (n=1) of the population came from the Zhalkathi, while 1.8 percent points (n=1) of the population came from the Zhinaidah.

In terms of the occurrence of different forms of CP, there was not found to be a statistically significant difference between males and females. In regard to the GMFCS categorization, there were no differences discovered in age ranges. CP Classification and Motor Performance According to the GMFCS, no statistically significant correlation was discovered between the kind of cerebral palsy and age range when utilizing the GMFCS to make the diagnosis (Perenc et al., 2015).

In the study that I conducted, among 55 participants, for age range of 1-5, (n=13) were GMFCS type-I, (n=18) were GMFCS type-II, (n=17) were GMFCS type-III. For age range of 6-10, (n=4) were GMFCS type-I, (n=1) were GMFCS type-II, (n=2) were GMFCS type-III. This Chi-square value that was measured was 2.822, and its corresponding P-Value was 0.244. Therefore, there was no correlation found between the individual's ages and their GMFCS.

According to the findings of Alriksson-Schmidt et al. (2016), In terms of the occurrence of different forms of CP, there was not found to be a statistically significant difference between males and females. In regard to the GMFCS categorization, there were no differences discovered between the sexes. There was a statistically significant correlation discovered between the gender of the participants and the degree of motor function development as measured by the GMFCS.

In my experiment, among 55 participants, for male children, (n=6) were GMFCS type-I, (n=6) were GMFCS type-II, (n=13) were GMFCS type-III. For female children, (n=11) were GMFCS type-I, (n=13) were GMFCS type-II, (n=6) were GMFCS type-III. The Chi-square value that was measured was 6.225, and the P-Value was 0.044. Therefore, there was a relation between the GMFCS of the individuals and their gender.

Panibatla, Kumar, Narayan, (2017) estimate that, females had a higher overall TCMS median score (92.2%) and performed better in the dynamic component (90.7%) than boys (TCMS total 88.7% and TCMS dynamic 86.8%). However, there were no significant differences in the median PBS total scores for both girls and boys. There was a substantial association between TCMS and PBS, however the correlation was found to be better in girls than in boys. Spastic diplegics' median total TCMS and PBS scores were lower than spastic hemiplegics' total scores.

Children with spastic diplegia had trouble executing lateral trunk displacements, which would have resulted in poor scores.

There is a significant association between TCMS and PBS among the group of 55 individuals. The value of Spearman's rho (r) for PBS is.754 for TCMS. For PBS, the value of Spearman's rho for TCMS is.754, and the significance value for both is 0.004. When r is more than 0.7, which indicates that correlation is high, we know that the correlation is significant at the 0.01 level. Therefore, there is a close connection between the TCMS and the PBS. Because of this, we are able to state that trunk control and balance have a significant relation to one another.

Both TCMS and PBS correlations were higher for GMFCS levels I, II, and III. This means that a lack of trunk control in both static and dynamic aspects will affect a child's ability to function. These findings suggest that trunk control and balance are essential elements of the functional abilities of children with CP. All of the PBS items were strongly linked to all of the TCMS parts. To be able to do functional activities, the upper and lower extremities need to be able to move freely, which depends on how stable the trunk is. So, it is thought that interventions that focus on the trunk to improve TCMS scores, improve gross motor function and PBS performance.

LIMITATION OF THE STUDY:

The current study had some potential limitations. The main limitation of this study was its short duration. The study was conducted with 55 Cerebral Palsy children which was a very small number of samples.

This study only conducted in Pediatric Unit of CRP, Saver, that is not cover the full area of Bangladesh.

The data collection was challenging in hospital site.

There was no available research done in this area in Bangladesh. So, relevant information about relation between trunk control and balance for Bangladesh was very limited in this study.

CHAPTER-VI CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The purpose of this study was to investigate the correlation between TCMS (trunk control) and PBS (functional balance) in order to better understand the relationship between the two. The TCMS and the PBS showed a significant connection. All of the PBS items were strongly linked to all of the TCMS parts. At the conclusion of the study, it was discovered that there was a significant positive link between TCMS and PBS in children who were diagnosed with cerebral palsy. We are able to state that the ability to control one's trunk and one's balance have a strong relation to one another. Therefore, my study indicates, there is a strong relation between Trunk Control and Balance.

6.2 Recommendations

The aim of this study was to find out the Relation between trunk control and balance of children with cerebral palsy attended at CRP and the result which found from the study has fulfilled the aim of this research project. The following recommendations are-
Should take more samples for generating the result and make more valid and reliable.
Should take more time in conducting this type of study. Sample should collect from different hospital, clinic, institute and organization of Bangladesh to generalize the result.
This is an undergraduate study and doing the same study at graduate level will give more precise output. There were some limitations of this study mentioned at the relevant section; it is recommended to overcome those limitations during further study. So, for further study it is strongly recommended to increase sample size with adequate time to generalize the result in all of the children with cerebral palsy for better results and perspectives.

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APPENDIX

Permission letter

Date: April 25, 2022

To

Head of the Physiotherapy Department

Center for the Rehabilitation of the paralysed (CRP)

Savar, Dhaka-1343.

Subject: Application for permission to collect data to conduct a research study.

Dear Sir,

I respectfully state that I am Md. Moshiwor Rahman, student of 4th year B.Sc. in Physiotherapy of Bangladesh Health Professions Institute (BHPI). In 4th year course curriculum, I have to do research project. My research title is **'Relation between trunk control and balance of children with cerebral palsy attended at Centre for the Rehabilitation of the Paralysed'**. For this reason, I need to collect data from the department of paediatric unit at CRP. I need your kind permission for collecting data from paediatric unit at CRP, Savar.

Therefore, I pray and hope that you would be kind enough to grant my application and give me the permission for collect data.

Yours faithfully,

Md. Moshiwor Rahman
Moshiwor
4th year, B.Sc. in physiotherapy

Class roll: 26

Session: 2016-2017

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CRP, Savar, Dhaka-1343

He will collect data from paediatric Dept. please help him. Thanks
25-4-22
Hosneara Perveen
Head of Department
Department of Paediatric
CRP, Savar, Dhaka

বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: CRP/BHPI/IRB/04/2022/595

Date: 23/04/2022

Md. Moshiwor Rahman
4th Year B.Sc. in Physiotherapy
Session: 2016 – 2017
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of the research project proposal **"Relation between trunk control and balance of children with cerebral palsy attended at Centre for the Rehabilitation of the Paralysed"** by ethics committee.

Dear Moshiwor Rahman,
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator and Prof. Md. Obaidul Haque as thesis supervisor. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation Proposal
2	Questionnaire (English and Bengali version)
3	Information sheet & consent form.

The purpose of the study is to find out the relation between trunk control and balance of children with cerebral palsy attended at Centre for the Rehabilitation of the Paralysed. Should there any interpretation, types, spelling and grammatical mistakes in the title, it is the responsibilities of the investigator. Since the study involves questionnaire that takes maximum 10-15 minutes and have no likelihood of any harm to the participants, the members of the Ethics Committee approved the study to be conducted in the presented form at the meeting held at 09:00 AM on October 12, 2021, at BHPI (30th IRB Meeting).

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd, www.crp-bangladesh.org

সম্মতিপত্র

আস-সালামু আলাইকুম,

আমি মোঃ মশিউর রহমান, ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধিভুক্ত বাংলাদেশ হেলথ প্রফেশনস্ ইন্সটিটিউট এর বি.এস.সি ইন ফিজিওথেরাপি কোর্সের চূড়ান্ত বর্ষের একজন শিক্ষার্থী। অধ্যয়নের অংশ হিসেবে আমাকে একটি গবেষণা সম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের একটা অংশ। নিম্নোক্ত তথ্যাদি পাঠ করার পর অংশগ্রহণকারীদের গবেষণায় অংশগ্রহণের জন্য অনুরোধ করা হল। আমার গবেষণার বিষয় হল **"সেন্টার ফর দ্যা রিহ্যাবিলিটেশন অব দ্যা প্যারালাইজড এ ভর্তি হওয়া সেরিব্রাল পালসি শিশুদের মধ্য শরীর নিয়ন্ত্রণের সাথে শরীরের ভারসাম্যের সম্পর্ক"**। এই পরীক্ষামূলক গবেষণার মাধ্যমে আমি মধ্য শরীর নিয়ন্ত্রণের সাথে শরীরের ভারসাম্যের সম্পর্ক বের করব সেরিব্রাল পালসি শিশুদের। আমি যদি গবেষণাটা সার্থক ভাবে সম্পূর্ণ করতে পারি তবে যে সব বাচ্চারা সেরিব্রাল পালসিতে ভুগছেন, তারা উপকৃত হবেন। গবেষণার ক্ষেত্র বিবেচনা করে আপনার বাচ্চার মাঝে আমার গবেষণায় অংশগ্রহণ করার জন্য প্রয়োজনীয় বৈশিষ্ট্য লক্ষ্য করা গেছে। এজন্য, আপনি আমার গবেষণার একজন সম্মানিত অংশগ্রহণকারী হতে পারেন এবং আমি আপনাকে আমার গবেষণায় অংশগ্রহণ করতে অনুরোধ জানাচ্ছি। তথ্য সংগ্রহ করার সময়, আপনার সন্তানকে কিছু কার্যকলাপ দেওয়া হবে তবে সেগুলো আপনার সন্তানের জন্য বিপদজনক নয়। আপনাকে বলে রাখি, এটা পুরোপুরি প্রতিষ্ঠানিক অধ্যয়ন এবং তথ্য কখনো অন্য কোন কাজে ব্যবহার করা হবে না। আপনাকে আশ্বস্ত করছি, সকল তথ্য গোপন রাখা হবে। আমি প্রতিজ্ঞা করছি যে, এই গবেষণা আপনার জন্য ঝুঁকিপূর্ণ হবে না অথবা আপনার কোন ক্ষতি করবে না। গবেষণা চলাকালীন সময়ে কোন রকম দ্বিধা কিংবা ঝুঁকি ছাড়াই যে কোন সময়ে আপনি এটাকে বাদ দিতে পারবেন। এরপরেও ভবিষ্যতে যদি আপনার কোন প্রশ্ন থাকে, আমাকে মোঃ মশিউর রহমান, ফোন নম্বরঃ ০১৭১৫৪৭৭১৬৮ কিংবা আমার অধীক্ষক অধ্যাপক মোঃ ওবায়দুল হক, ফোন নম্বরঃ ০১৭৩০০৫৯৬৪০ এর সাথে যোগাযোগ করতে পারবেন।

শুরু করার আগে আপনার কী কোন প্রশ্ন আছে?

আমি কি শুরু করতে পারি?

হ্যা/না

বাচ্চার অভিভাবকের স্বাক্ষর ও তারিখ............................

তথ্য সংগ্রহকারীর স্বাক্ষর ও তারিখ..................................

সাক্ষীর স্বাক্ষর ও তারিখ...

প্রশ্নপত্র (বাংলা)

১ম পার্ট: ব্যক্তিগত তথ্যাবলী

এই প্রশ্নপত্রটি গড়ে তোলা হয়েছে সেন্টার ফর দ্যা রিহ্যাবিলিটেশন অব দ্যা প্যারালাইজড এ ভর্তি হওয়া সেরিব্রাল পালসি শিশুর মধ্য শরীর নিয়ন্ত্রণের সাথে শরীরের ভারসাম্যের সম্পর্ক বিবেচনা করতে। ব্যক্তিগত তথ্যাবলী অংশটি রুগী কিন্তু বিশেষ বিবেচনায় ফিজিওথেরাপিস্ট কালো কিংবা নীল কলমের দ্বারা পূরণ করবেন। সঠিক জবাবটি বাম পার্শে টিক (√) চিহ্ন দিন।

তারিখঃ	
রোগীর নামঃ	
1. বয়সঃ	
2. লিঙ্গঃ	1. ছেলে, 2. মেয়ে
3. সেরিব্রাল পালসির ধরনঃ	মস্তিষ্কে আঘাত অনুযায়ীঃ 1. স্পাস্টিক, 2. এটাক্সিক, 3. মিক্সড, 4. ডিস্কাইনিটিক
	শরীরের অংশ অনুযায়ীঃ 5. কোয়াড্রিপ্লেজিয়া 6. ট্রাইপ্লেজিয়া 7. ডাইপ্লেজিয়া 8. হেমিপ্লেজিয়া 9. মোনোপ্লেজিয়া
4. GMFCS Level:	
5. ঠিকানাঃ	
ফোন নংঃ	

২য় পার্ট

মধ্য শরীর নিয়ন্ত্রণ পরিমাপের স্কেল

স্থির ভাবে বসে ভারসাম্য রাখাঃ

		দ্বিপার্শ্বিক/ডান	বাম
2.1. রোগীকে সোজা হয়ে ১০ সেকেন্ড বসে থাকতে বলা।	0- রোগী পড়ে যাবে কিংবা বসাতে গেলে রোগীর দুই বাহু ধরে রাখতে হবে। 1- ১০ সেকেন্ডের জন্য রোগীর এক বাহুতে ধরে বসাতে হবে। 2- রোগী ১০ সেকেন্ড সোজা হয়ে বসে থাকতে পারবে কোন সহায়তা ছাড়াই।	0 1 2	
2.2. রোগী দুই হাত চোখ বরাবর ১ সেকেন্ডে তুলে আবার আগের জায়গাতে নেবে।	0- রোগী পড়ে যাবে কিংবা হাত তুলতে পারবে না। 1- রোগী না পড়েই হাত তুলতে পারবে তবে সাথে গচ্চা থাকবে। সম্ভাবনাময় গচ্চা সমূহঃ (১) পেছনে হেলে যাওয়া, (২) মধ্য শরীর ভাঁজ হওয়া, (৩) পাশে ভাঁজ হওয়া, (৪) অন্যান্য। 2- গচ্চা ছাড়াই হাত তুলতে পারবে।	0 1 2	
2.3. থেরাপিস্ট এক পা ক্রস করে অপর পায়ের উপর রাখবে।	0- রোগী পড়ে যাবে, পা ক্রস করতে পারবে না কিংবা তার দুই বাহুতে ধরে বসিয়ে রাখতে হবে । 1- ১০ সেকেন্ডের জন্য রোগীর এক বাহুতে ধরে বসাতে হবে । 2- রোগী ১০ সেকেন্ড সোজা হয়ে বসে থাকতে পারবে কোন সহায়তা ছাড়াই।	0 1 2	0 1 2
2.4. রোগী এক পা ক্রস করে অপর পায়ের উপর রাখবে। (এক হাত ব্যবহার করতে পারবে)	0- রোগী পড়ে যাবে, পা ক্রস করতে পারবে না কিংবা তার দুই বাহুতে ধরে বসিয়ে রাখতে হবে । 1- রোগী পা ক্রস করে রাখতে পারবে শুধু এক হাতের সাপোর্ট নিয়ে। 2- রোগী কোন হাতের সাপোর্ট না নিয়ে পা ক্রস করবে তবে মধ্য শরীর সরে যাবে। 3- মধ্য শরীর খুব কম সরবে।	0 1 2 3	0 1 2 3

2.5. রোগী ১০ সেঃমিঃ ওপরে পা তুলবে এবং পা আগের জায়গায় রাখবে। (১০ সেঃমিঃ = হাঁটু সমান উচ্চতা)	0- রোগী পড়ে যাবে, পা তুলতে পারবে না কিংবা তার দুই বাহুতে ধরে সাপোর্ট দিতে হবে। 1- রোগী পা তুলতে পারবে শুধু এক হাতের সাপোর্ট নিয়ে। 2- রোগী কোন হাতের সাপোর্ট না নিয়ে পা তুলবে তবে মধ্য শরীর সরে যাবে। 3- মধ্য শরীর খুব কম সরবে।	0 1 2 3	0 1 2 3

স্থির ভাবে না বসে ভারসাম্য রাখাঃ

		দ্বিপার্শ্বিক/ডান	বাম
2.6.a রোগীকে বলতে হবে সামনে ঝুঁকে (প্রায় ৪৫°) আবার পূর্বের অবস্থায় ফিরে যেতে।	0- রোগী পড়ে যাবে কিংবা পারবে না। 1- রোগী পারবে।	0 1	
2.6.b.	0- গচ্চা লাগবে যেমনঃ (১) মাথা বেশি ঝুঁকে যাবে, (২) মধ্য শরীর বেশি ভাঁজ হবে, (৩) কোমর পেছনে বাঁকাবে, (৪) হাঁটু বেশি ভাঁজ হবে, (৫) অন্যান্য। 1- গচ্চা ছাড়াই পারবে।	0 1	
2.7.a. রোগীকে বলতে হবে পেছনে ঝুঁকে (প্রায় ৪৫°) আবার পূর্বের অবস্থায় ফিরে যেতে।	0- রোগী পড়ে যাবে কিংবা পারবে না। 1- রোগী পারবে।	0 1	
2.7.b.	0- গচ্চা লাগবে যেমনঃ (১) মাথা বেশি ঝুঁকে যাবে, (২) মধ্য শরীর বেশি ভাঁজ হবে, (৩) হাঁটু বেশি ভাঁজ হবে, (৪) অন্যান্য। 1- গচ্চা ছাড়াই পারবে।	0 1	
2.8.a. রোগীকে বলা হবে তার কনুই বরাবর টেবিলকে ছুঁতে (ব্যবহৃত পাশটা সংকুচিত এবং	0- রোগী পড়ে যাবে কিংবা পারবে না। 1- রোগী পারবে।	0 1	0 1

অব্যবহৃত পাশ প্রসারিত হবে) এবং ফিরে আসবে।			
2.8.b.	0- (১) ব্যবহৃত পাশ সংকুচিত/দীর্ঘায়িত হবে না কিংবা (২) বিপরীত হবে। 1- ব্যবহৃত পাশ সংকুচিত/দীর্ঘায়িত হবে।	0 1	0 1
2.8.c.	0- গচ্চা লাগবেঃ (১) মধ্য শরীর ভাঁজ হবে, (২) সামনে/পেছনে ঝুঁকবে, (৩) কোমর ভাঁজ হবে, (৪) অন্যান্য। 1- গচ্চা ছাড়াই পারবে।	0 1	0 1
2.9.a. রোগীকে বলা হবে একপাশের কোমর তুলতে এবং আগের অবস্থানে ফিরতে।	0- রোগী পড়ে যাবে কিংবা পারবে না। 1- পারবে।	0 1	0 1
2.9.b.	0- (১) ব্যবহৃত পাশ সংকুচিত/দীর্ঘায়িত হবে না কিংবা (২) বিপরীত হবে। 1- ব্যবহৃত পাশ সংকুচিত/দীর্ঘায়িত হবে।	0 1	0 1
2.9.c.	0- গচ্চা লাগবেঃ (১) মাথা ঝুঁকবে, (২) কোমর সরে যাবে, (৩) অন্যান্য। 1- গচ্চা ছাড়াই পারবে।	0 1	0 1
2.10.a. রোগীকে বলা হবে মাথা সোজা রেখে শরীরের উপরের অংশ ৩ বার ঘোরাতে।	0- (১) রোগী পড়ে যাবে, (২) ঘোরাতে পারবে না, (৩) উল্টা-পাল্টা ঘোরাবে। 1- সামান্য পরিমানে ঘোরাতে পারবে। 2- রোগী ঘোরাতে পারবে।	0 1 2	

2.10.b.	0- রোগী মাথাসহ ঘোরাবে। 1- মাথা ছাড়া ঘোরাবে।	0 1	
2.11.a. রোগীকে বলা হবে মাথা সোজা রেখে শরীরের নিচের অংশ ৩ বার ঘোরাতে।.	0- (১) রোগী পড়ে যাবে, (২) ঘোরাতে পারবে না, (৩) উল্টা-পাল্টা ঘোরাবে। 1- সামান্য পরিমানে ঘোরাতে পারবে। 2- রোগী ঘোরাতে পারবে।	0 1 2	
2.11.b.	0- কোমর বাঁকা করে ঘোরাবে। 1- বাঁকা না করে ঘোরাবে।	0 1	
2.12.a. রোগীকে বলা হবে ৩ বার কোমর সামনে এবং পেছনের দিকে নিতে।	0- রোগী পড়ে যাবে কিংবা পারবে না। 1- সামান্য পরিমানে পারবে। 2- রোগী পারবে সাথে কোমর ভাঁজ করে।	0 1 2 3	
2.12.b.	0- রোগী পারবে তবে কোমর সরে যাবে। 1- ভালোভাবেই পারবে।	0 1	

প্রগতিশীল পৌঁছানোঃ

		দ্বিপার্শ্বিক/ডান	বাম
2.13. চোখের সামনে ১ হাত দূরত্বে কোন জিনিস রেখে রোগীর দুই হাত সামনের দিকে সোজা রেখে রোগীকে এগোতে বলা এবং আগের যায়গায় ফিরতে বলা।	0- রোগী পড়ে যাবে কিংবা পৌঁছাতে পারবে না। 1- পৌঁছাতে পারবে তবে তার জন্য কষ্টকর হবে। 2- কোন সমস্যা ছাড়াই রোগী পারবে।	0 1 2	
2.14. ১ হাত দূরত্বে	0- রোগী পড়ে যাবে কিংবা পৌঁছাতে	0	

কোন জিনিস রেখে রোগীর দুই হাত সামনের দিকে সোজা রেখে রোগীকে তার পাশ বরাবর যেতে বলা এবং আগের যায়গায় ফিরতে বলা।	পারবে না। 1- পৌঁছাতে পারবে তবে তার জন্য কষ্টকর হবে। 2- কোন সমস্যা ছাড়াই রোগী পারবে।	 1 2	
2.15. রোগীকে ১ হাত দূরতে পেছাতে বলা এবং পূর্বের অবস্থানে ফিরে আসতে বলা।	0- রোগী পড়ে যাবে কিংবা পৌঁছাতে পারবে না। 1- পৌঁছাতে পারবে তবে তার জন্য কষ্টকর হবে। 2- কোন সমস্যা ছাড়াই রোগী পারবে।	0 1 2	

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পেডিয়াট্রিক ভারসাম্য স্কেল

পদের বর্ণনা	**সংখ্যার বর্ণনা**	**মার্ক**
3.1. বসা থেকে দাঁড়ানো	4.স্বাধীনভাবে হাত ব্যবহার না করেই দাঁড়াতে এবং টিকে থাকতে পারে। 3. স্বাধীনভাবে হাত ব্যবহার করেই দাঁড়াতে পারে। 2. কয়েকবার চেষ্টার পর দাঁড়াতে পারে। 1. সামান্য সাহায্যের দরকার হয়। 0. মাঝারি থেকে সর্বোচ্চ সাহায্যের দরকার হয়।	
3.2. দাঁড়ানো থেকে বসা	4. নিরাপদে বসতে পারে হাতের কম ব্যবহার করে। 3. হাত ব্যবহার করে বসে। 2. বসার সময় পায়ের পেছন দিক চেয়ারের সাথে লাগিয়ে দেয়। 1. স্বাধীনভাবে বসে, তবে বসাটা তার নিয়ন্ত্রণে নেই। 0. বসতে সহায়তায় দরকার।	
3.3. স্থানান্তর	4. হাতের কম ব্যবহার করে নিরাপদে স্থানান্তর হতে পারে। 3. হাতের বেশি ব্যবহার করে নিরাপদে স্থানান্তর হতে পারে। 2. মুখ দিয়ে বলে তদারকি করতে হয়। 1. একজন লোকের সাহায্য লাগে। 0. দুইজন লোকের সাহায্য লাগে।	
3.4. বিনা সহায়তায় দাঁড়ানো	4. নিরাপদে ৩০ সেকেন্ড দাঁড়াতে পারে। 3. মুখ দিয়ে বলার পর ৩০ সেকেন্ড দাঁড়াতে পারে। 2. সাহায্য ছাড়াই ১৫ সেকেন্ড দাঁড়াতে পারে। 1. সাহায্য ছাড়াই কয়েকবার চেষ্টার পর ১০ সেকেন্ড দাঁড়াতে পারে। 0. সাহায্য ছাড়া ১০ সেকেন্ড দাঁড়াতে পারে না।	
3.5. বিনা সহায়তায় বসা	4. নিরাপদে ৩০ সেকেন্ড বসে থাকতে পারে। 3. মুখ দিয়ে বলার পর ৩০ সেকেন্ড বসে থাকতে পারে। 2. সাহায্য ছাড়াই ১৫ সেকেন্ড বসে থাকতে পারে। 1. সাহায্য ছাড়াই কয়েকবার চেষ্টার পর ১০ সেকেন্ড বসে থাকতে পারে। 0. সাহায্য ছাড়া ১০ সেকেন্ড বস থাকতে পারে না।	

3.6. চোখ বন্ধ করে দাঁড়ানো	4. নিরাপদে ১০ সেকেন্ড দাঁড়াতে পারে। 3. মুখ দিয়ে বলার পর ১০ সেকেন্ড দাঁড়াতে পারে। 2. ৩ সেকেন্ড দাঁড়াতে পারে। 1. ৩ সেকেন্ড দাঁড়িয়ে থাকতে পারে তবে চোখ বন্ধ রাখতে পারে না। 0. সাহায্য না করলে পড়ে যায়।	
3.7. দুই পা একসাথে রেখে দাঁড়ানো	4. স্বাধীনভাবে একসাথে দুই পা রেখে ৩০ সেকেন্ড দাঁড়াতে পারে। 3. মুখ দিয়ে বলার পর স্বাধীনভাবে একসাথে দুই পা রেখে ৩০ সেকেন্ড দাঁড়াতে পারে। 2. দুই পা রেখে ৩০ সেকেন্ডের কম সময় দাঁড়াতে পারে। 1. দাঁড়াতে সাহায্য করতে হয়, তবে ৩০ সেকেন্ড থাকতে পারে। 0. সম্পূর্ণ সাহায্যের দরকার হয়।	
3.8. একপায়ের সামনে অপর পা রেখে দাঁড়ানো	4. স্বাধীনভাবে এক পায়ের সামনে অপর পা রেখে ৩০ সেকেন্ড দাঁড়াতে পারে। 3. দুই পা একসাথে রেখে ৩০ সেকেন্ড দাঁড়াতে পারে। 2. ছোট ছোট পদক্ষেপ ফেলে ৩০ সেকেন্ড দাঁড়াতে পারে। 1. সাহায্যের দরকার হয়, ১৫ সেকেন্ড দাঁড়াতে পারে। 0. ভারসাম্য হারিয়ে ফেলে।	
3.9. এক পায়ে দাঁড়ানো	4. স্বাধীনভাবে এক পা তুলে ১০ সেকেন্ড রাখতে পারে। 3. স্বাধীনভাবে এক পা তুলে ৩-৯ সেকেন্ড রাখতে পারে। 2. স্বাধীনভাবে এক পা তুলে ৩-৪ সেকেন্ড রাখতে পারে। 1. ৩ সেকেন্ড রাখতে পারে না, তবে দাঁড়িয়ে থাকে। 0. চেষ্টাই করে না	
3.10. ৩৬০° ঘুরতে পারা	4. ৪ সেকেন্ডে নিরাপদে ৩৬০° ঘুরতে পারে। 3. শুধুমাত্র নির্দিষ্ট একদিকে ৪ সেকেন্ডে নিরাপদে ৩৬০° ঘুরতে পারে। 2. নিরাপদে ৩৬০° ঘুরতে পারে তবে ধীরে। 1. মুখ দিয়ে বলে কাজটা করাতে হয়। 0. সাহায্যের দরকার হয়।	

3.11. পেছনের দিকে তাকানোর উদ্দেশ্যে ঘোরা	4. পেছনে তাকাতে পারে/ দুই বাহুর উপর দিয়ে; মধ্য শরীর ঘুরবে। 3. পেছনে তাকাতে পারে/ দুই বাহুর উপর দিয়ে; মধ্য শরীর ঘুরবে না। 2. বাহুর উপর দিয়ে তাকানোর চেষ্টায় মাথা ঘোরায়। 1. মুখ দিয়ে বলে কাজটা করাতে হয়। 0. মাটিতে পড়া থামাতে সাহায্যের দরকার হয়।	
3.12. মেঝে থেকে কোন জিনিস তোলা	4. নিরাপদে এবং সহজে মেঝে থেকে রবার তুলতে পারে। 3. মেঝে থেকে তুলতে পারে তবে বলে দিতে হয়। 2. রবার তুলতে পারে না, তবে নিয়ন্ত্রণ না হারিয়ে ১-২ ইঞ্চি এগোতে পারে। 1. রবার তুলতে পারে না, তবে মুখে বলে দিলে চেষ্টা করে। 0. চেষ্টাই করে না/ পড়ে যায়।	
3.13. অপর পা ফেলার চেষ্টা	4. স্বাধীনভাবে দাঁড়ায় এবং ২০ সেকেন্ডে ৮টি ধাপ ফেলে। 3. স্বাধীনভাবে দাঁড়ায় এবং ২০ সেকেন্ডের বেশি সময়ে ৮টি ধাপ ফেলে। 2. সাহায্য ছাড়াই ৪টি ধাপ ফেলে তবে বলে দিতে হয়। 1. ২টি ধাপ ফেলে, সামান্য সহায়তায়। 0. সহায়তা না করলে পড়ে যায়।	
3.14. বাহু প্রসারিত করে সামনে এগিয়ে যাওয়া	4. অসংশয়ে ১০ ইঞ্চির বেশি এগোয়। 3. নিরাপদে ৫ ইঞ্চির বেশি এগোয়। 2. নিরাপদে ২ ইঞ্চির বেশি এগোয়। 1. সামনে এগোয় তবে বলে দিতে হয়। 0. চেষ্টা করতে গিয়ে নিয়ন্ত্রণ হারায়।	

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Consent Form

Assalamualaikum

I am Md. Moshiwor Rahman, Final Year B.Sc. in Physiotherapy student of Bangladesh Health Professions Institute (BHPI) under the Faculty of Medicine, University of Dhaka. To obtain my Bachelor degree, I have to conduct a research project and it is a part of my study. The participants are requested to participate in the study after a brief of the following. My research title is "**Relation between trunk control and balance of children with cerebral palsy attended at Centre for the Rehabilitation of the Paralysed**." Through this study I will find the relation between trunk control and balance of Cerebral Palsy children. If I can complete this study successfully, patients may get benefits who are suffering from Cerebral Palsy. To fulfil my research project, I need to collect data. So, you can be a respected participant of this research. During data collection, your children will be provided some activity but they are not harmful for your child. I would like to inform you that this is a purely academic study and will not be used for any other purposes. I assure that all data will be kept confidential. Your participation will be voluntary. You may have the rights to withdraw consent and discontinue participation at any time of the experiment. You also have the rights to answer a particular question that you don't like. If you have any question further, you can contact me, Md. Moshiwor Rahman, phone no: 01715477168 or my supervisor Professor Md. Obaidul Haque, phone no: 01730059640.

Do you have any questions before I start?
So, may I have your consent to proceed with the interview?
Yes / No

Signature of parents and date …………………………………
Signature of data collector and Date..
Signature of the witness and Date………………………………

Questioner (English)
Part: I
Subjective Information

This questionnaire is developed to Relation between trunk control and balance of children with cerebral palsy attended at Centre for the Rehabilitation of the Paralysed and this section will be filled by tick (√) mark in the left of point by patients but in special consideration physiotherapist using a black or blue pen.

Date:	
Patient's name:	
1. Age:	
2. Gender:	i. Boy ii. Girl
3. Type of Cerebral Palsy:	By brain injury location: i. Spastic, ii. Ataxic, iii. Dyskinetic, iv. Mixed.
	By body part: i. Quadriplegia ii. Triplegia iii. Diplegia iv. Hemiplegia v. Monoplegia (Bangash et al., 2014).
4. GMFCS	
5. Address:	
Mobile number:	

Part II
Trunk Control Measurement Scale

Static Sitting Balance:

		Bilat/Left	Right
2.1. Patient is instructed to sit upright and hold this position for 10 seconds.	0 - Patient falls or can only maintain upright sitting with double arm support 1 - Patient can only maintain upright sitting with single arm support for 10 sec 2 - Patient can maintain upright sitting without arm support for 10 sec	0 1 2	
2.2. Patient lifts both arms at eye height in one second and returns to starting position.	0 - Patient falls or cannot lift arms 1 - Patient can lift arms without falling but with compensations. Possible compensations are: (1) backward lean, (2) increase of trunk flexion, (3) lateral flexion, (4) other 2 - Patient lifts arms without compensations	0 1 2	
2.3. Therapist crosses one leg over the other leg.	0 - Patient falls, cannot cross legs or can only maintain sitting with double arm support 1 - Patient can maintain sitting with single arm support for 10 sec 2 - Patient can maintain sitting without arm support for 10 sec	0 1 2	0 1 2
2.4. Patient crosses one leg over the other leg (assistance with one hand is allowed)	0 - Patient falls, cannot cross legs or can only cross legs with double arm support 1 - Patient can only cross legs with single arm support 2 - Patient crosses legs without arm support but with clear trunk displacement 3 - Patient crosses legs with minimal trunk displacement	0 1 2 3	0 1 2 3
2.5. Patient abducts one leg over 10 cm and returns to starting position (10 cm width = width of the knee).	0 - Patient falls, cannot abduct leg or can only abduct leg with double arm support 1 - Patient can only abduct leg with single arm support 2 - Patient abducts leg without arm support but with clear trunk displacement 3 - Patient abducts leg with minimal trunk displacement	0 1 2 3	0 1 2 3

Dynamic Sitting Balance:

		Bilat/Left	Right
2.6.a. Patient is instructed to lean forward with a fixed trunk for approximately 45° and return to starting position.	0 - Patient falls or cannot reach target position 1 - Patient can lean forward	0 1	
2.6.b.	0 - Patient compensates (1) increased head extension, (2) increased trunk flexion, (3) increased lumbar lordosis, (4) increased knee flexion, (5) other 1 - Patient leans forward without compensations	0 1	
2.7.a. Patient is instructed to lean backward with a fixed trunk for approximately 45° and return to starting position.	0 - Patient falls or cannot reach target position 1 - Patient can lean forward	0 1	
2.7.b.	0 - Patient compensates (1) increased head flexion, (2) increased trunk flexion, (3) increased knee extension, (4) other 1 - Patient leans backward without compensations	0 1	
2.8.a. Patient is instructed to touch the table with the elbow at level of the femoral head (by shortening the ipsilateral side and lengthening the contralateral side) and return.	0 - Patient falls or does not touch the table with the elbow 1 - Patient can touch the table with the elbow	0 1	0 1
2.8.b.	0 - Patient demonstrates (1) no shortening/lengthening or (2) opposite shortening/lengthening 1 - Patient demonstrates expected shortening/lengthening	0 1	0 1

2.8.c.	0 - Patient compensates: (1) increased trunk flexion, (2) forward or backward lean, (3) pelvic lift, (4) other 1 - Patient touches the table without compensations	0 1	0 1
2.9.a. Patient is instructed to lift the pelvis at one side and return to starting position.	0 - Patient falls or cannot lift the pelvis 1 - Patient can lift the pelvis	0 1	0 1
2.9.b.	0 - Patient demonstrates no shortening/lengthening Patient demonstrates partially expected shortening/lengthening (partial = short and/or small ROM) 1 - Patient demonstrates expected shortening/lengthening	0 1	0 1
2.9.c.	0 - Patient compensates: (1) contralateral head flexion, (2) marked lateral trunk displacement, (3) other 1 - Patient lifts the pelvis without compensations	0 1	0 1
2.10.a. Patient is instructed to rotate the upper trunk three times with head fixated in starting position.	0 - Patient (1) falls, (2) cannot rotate the upper trunk i.e., patient cannot perform the rotation movement, even not with the entire trunk, or (3) demonstrates no selective rotation of the upper trunk 1 - Patient demonstrates partial selective rotation of the upper trunk (partial = asymmetrical, small ROM, more shoulders than trunk) 2 - Patient demonstrates expected selective rotation of the upper trunk	0 1 2	
2.10.b.	0 - Patient rotates the upper trunk with head rotation 1 - Patient rotates the upper trunk without head rotation	0 1	

2.11.a. Patient is instructed to rotate the lower trunk three times with head fixated in starting position.	0 - Patient (1) falls, (2) cannot rotate the lower trunk i.e., patient cannot perform the rotation movement, even not with the entire trunk, or (3) demonstrates no selective rotation of the lower trunk 1 - Patient demonstrates partial selective rotation of the lower trunk (partial = asymmetrical, small ROM, additional movement of upper trunk) 2 - Patient demonstrates expected selective rotation of the lower trunk	0 1 2	
2.11.b.	0 - Patient compensates with pelvic tilt 1 - Patient rotates the lower trunk without compensations	0 1	
2.12.a. Patient is instructed to shuffle the pelvis three times in a forward direction and return backwards in three times to the starting position.	0 - Patient falls or cannot shuffle the pelvis in forward and backward direction 1 - Patient can partially shuffle the pelvis 2 - Patient can shuffle the pelvis by use of both lateral flexion and rotation in one direction and partially in the other direction 3 - Patient can shuffle the pelvis by use of both lateral flexion and rotation in both directions	0 1 2 3	
2.12.b.	0 - Patient compensates with excessive trunk displacement 1 - Patient shuffles pelvis without compensations	0 1	

Dynamic Reaching:

		Bilat/Left	Right
2.13. Patient is instructed to reach forward with both arms straight to target at eye level positioned at a distance, corresponding with	0 - Patient falls or cannot reach target 1 - Patient reaches target, but has difficulties in performance 2 - Patient reaches target and returns to starting position without difficulties	0 1 2	

the forearm length and return to starting position.			
2.14. Patient is instructed to reach sideward with one arm straight to target at eye level positioned at a distance, corresponding with the forearm length and return to starting position.	0 - Patient falls or cannot reach target 1 - Patient reaches target, but has difficulties in performance 2 - Patient reaches target and returns to starting position without difficulties	0 1 2	
2.15. Patient is instructed to reach across the midline with one arm (reach to the opposite side) and return to starting position.	0 - Patient falls or cannot reach target 1 - Patient reaches target, but has difficulties in performance 2 - Patient reaches target and returns to starting position without difficulties	0 1 2	

Total Score: ……. / 58

Pediatric Balance Scale

Item Description	Number Description	Marks
3.1. Sitting to standing	4. able to stand without using hands and stabilize independently 3. able to stand independently using hands 2. able to stand using hands after several tries 1. needs minimal assist to stand or to stabilize 0. needs moderate or maximal assist to stand	
3.2. Standing to sitting	4. sits safely with minimal use of hands 3. controls descent by using hands 2. uses back of legs against chair to control descent 1. sits independently, but has uncontrolled descent 0. needs assistance to sit	
3.3. Transfers	4. able to transfer safely with minor use of hands 3. able to transfer safely; definite need of hands 2. able to transfer with verbal cueing and/or supervision 1. needs one person to assist 0. needs two people to assist or supervise to be safe	
3.4. Standing unsupported	4. able to stand safely 30 SECONDS 3. able to stand 30 SECONDS with supervision (spotting) 2. able to stand 15 SECONDS unsupported 1. needs several tries to stand 10 SECONDS unsupported 0. unable to stand 10 SECONDS unassisted	
3.5. Sitting unsupported	4. able to sit safely and securely 30 SECONDS 3. able to sit 30 SECONDS under supervision 2. able to sit 15 SECONDS 1. able to sit 10 SECONDS 0. unable to sit 10 SECONDS without support	
3.6. Standing with eye close	4. able to stand 10 seconds safely 3. able to stand 10 seconds with supervision (spotting) 2. able to stand 3 seconds 1. unable to keep eyes closed 3 seconds but stays steady 0. needs help to keep from falling	
3.7. Standing with feet together	4. able to place feet together independently and stand 30 seconds safely 3. able to place feet together independently and stand for 30 seconds with supervision	

	2. able to place feet together independently but unable to hold for 30 seconds 1. needs help to attain position but able to stand 30 seconds with feet together 0. needs help to attain position and/or unable to hold for 30 seconds	
3.8. Standing with one foot in front	4. able to place feet tandem independently and hold 30 seconds 3. able to place foot ahead of other independently and hold 30 seconds 2. able to take small step independently and hold 30 seconds 1. needs help to step, but can hold 15 seconds 0. loses balance while stepping or standing	
3.9. Standing on one foot	4. able to lift leg independently and hold 10 seconds 3. able to lift leg independently and hold 5 to 9 seconds 2. able to lift leg independently and hold 3 to 4 seconds 1. tries to lift leg; unable to hold 3 seconds but remains standing 0. unable to try or needs assist to prevent fall	
3.10. Turning 360 degrees	4. able to turn 360 degrees safely in 4 seconds 3. able to turn 360 degrees safely in one direction only in 4 seconds or less 2. able to turn 360 degrees safely but slowly 1. needs close supervision (spotting) or constant verbal cueing 0. needs assistance while turning	
3.11. Turning to look behind	4. looks behind/over each shoulder; weight shifts include trunk rotation 3. looks behind/over one shoulder with or no trunk rotation 2. turns head to look to level of shoulder; no trunk rotation 1. needs supervision when turning o. needs assist to keep from losing balance or falling	
3.12. Retrieving object from floor	4. able to pick up an eraser safely and easily 3. able to pick up eraser but needs supervision 2. unable to pick up eraser but reaches 1 to 2 inches from eraser and keeps balance independently 1. unable to pick up eraser; needs supervision while attempting 0. unable to try, needs assist to keep from losing balance or falling	

3.13. Placing alternate foot on stool	4. stands independently and safely and completes 8 steps in 20 seconds 3. able to stand independently and complete 8 steps >20 seconds 2. able to complete 4 steps without assistance, but requires close supervision 1. able to complete 2 steps; needs minimal assistance 0. needs assistance to maintain balance or keep from falling, unable to try	
3.14. Reaching forward with outstretched arm	4. can reach forward confidently >10 inches 3. can reach forward >5 inches, safely 2. can reach forward >2 inches, safely 1. reaches forward but needs supervision 0. loses balance while trying, requires external support	

Total Score: ……. / 56