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# **Research Article**

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# Correlation between motor impairment and participation in children with cerebral palsy

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#### **ABSTRACT**

**Background:** Children with chronic functional limitations have considerably more difficulties in the social and behavioral aspects of their lives than typical children. In CP, dysfunction of muscle control prevails, which can lead to spasticity or shifting muscle tone, to associated pathological postures, and to decreased range of joint motions. Activity limitations refer to difficulties in executing tasks or actions which focused on limitations in mobility, addressing walking, lifting and arm/hand use, and in self-care activities. Few studies are available which measure the participation and impairments. But there is also need to evaluate participation in relation to impairments. So, the purpose of the current study is to find out the co- relation between motor impairment and participation in children with cerebral palsy.

**Methods:** Convenient sample of 20 children with CP were selected according to selection criteria i.e. diagnosed case of CP with age 5 years or more and children with conditions like autism spectrum disorder, attention deficit hyperactive disorder, Down's syndrome, spina bifida, metabolic disorders, and traumatic brain injuries were excluded. GMFCS and PEDI were taken in each of them. Statistical analysis was done.

**Results:** The result showed negative correlation between GMFCS level and different domains of PEDI: self-care, mobility and social function using spearman's correlation with r: -0.77, -0.82, -0.78.

**Conclusion:** Children with lower level of GMFCS had higher participation while those with higher level of GMFCS had lower participation. So, participation is depends up on motor impairments.

Keywords: Cerebral palsy, Motor impairment, Participation, GMFCS level, PEDI

# INTRODUCTION

Cerebral palsy (CP) is described as a group of permanent disorders of the development of movement and posture, causing activity limitations, which are attributed to nonprogressive disturbances that occurred in the developing fetal or infant brain.

The motor disorder of CP is often accompanied by disturbances of sensation, perception, cognition, communication and behavior, by epilepsy, and by

musculoskeletal problems. <sup>1,2</sup> CP is clinically classified as spastic, athetoid, ataxic, and hypotonic; the most prevalent form is spastic CP, <sup>3</sup> which affects motor and postural development and which causes sensory disorders and learning disabilities. <sup>4</sup> There are an estimated over 25 lakh children and people in India with CP. The incidence of CP is up to 3 cases per 1000 live births. <sup>5</sup>

CP is in many ways the prototype for developmental disabilities. By definition the problems stem from one of many impairments of the developing central nervous

system.<sup>6</sup> CP affects gross motor function to a varying extent. A child's resulting overall development, specifically in mobility and other aspects of development and learning. Delayed or aberrant motor function affects the development of a child's capacity to explore actively and to learn about space, effort, independence, and the social consequences of moving, touching, and getting into mischief.

Children with CP are considerably more likely to have functional difficulties unrelated to movement but related to their central nervous system including sensory, epileptic, learning, behavioral, and related developmental impairments. These impairments may begin early in life as difficulties in feeding, irritability, and disordered sleep patterns. These problems, when present, affect day to day life and can cause considerable distress to children, parents and caregivers.

Children with chronic functional limitations have considerably more difficulties in the social and behavioral aspects of their lives than typical children.<sup>8</sup>

According to the World Health Organization's (WHO) International Classification of Functioning, Disability and Health (ICF), impairments are described as significant deviations or loss of body function or body structure.

The classification defines "participation" as involvement in life situations; it is understood to be a consequence of a dynamic interaction between a person and environmental factors rather than a direct consequence of illness. Disabled children experience difficulty in participating across a wide range of domains. <sup>9,10</sup> Which include non-discretionary aspects of participation that are essential to daily life, such as eating, sleeping, and toileting.

In CP, dysfunction of muscle control prevails, which can lead to spasticity or shifting muscle tone, to associated pathological postures, and to decreased range of joint motions. Activity limitations refer to difficulties in executing tasks or actions which focused on limitations in mobility, addressing walking, lifting and arm/hand use, and in self-care activities.<sup>11</sup>

The most commonly described impairments in CP include the following:

Muscle tone, muscle weakness, loss of selective movements, co-contraction of agonist antagonist muscle pairs, postural control, musculoskeletal problems, sensory impairments, cognitive and perceptual impairments etc. 12

Recently there has been growing interest to measure participation and activity limitations for children with developmental disabilities, and new classification systems - such as the Gross Motor Function Classification System (GMFCS) - have been integrated into clinical practice. The GMFCS, for instance,

measures a child's motor abilities and groups them into different level. 13

The Pediatric Evaluation of Disability Inventory (PEDI) is developed in accordance with WHO's International Classification of Impairments, Disabilities and Handicaps (ICIDH) (WHO, 1980).<sup>14</sup> it is a wide-range clinical evaluation measure developed by Haley et al. In order to determine functional skill and performance of children aged between 6 months and 7 years. A child's daily activities are evaluated with respect to both skill and performance. It is a known fact that self-care skills, motor functions, and communication and social cognition of these children obviously vary depending on age, environmental factors and the sociocultural status. 15 Using PEDI together with GMFCS makes it easier to understand functional limitation. Ostensjø et al. 16 evaluated 95 children with CP using PEDI and GMFCS. They showed that a child's GMFCS level may strongly predict the success rate of the activities in self-care, and social function domains in the functional skill scale. Ostensjø et al. also found that limitation in achievement of activities and need for assistance increased progressively with GMFCS level. 16

Few studies are available which measure the participation and impairments. But there is also need to evaluate participation in relation to impairments. So, the purpose of current study is to find out the co-relation between motor impairment and participation in children with cerebral palsy.

# **METHODS**

# **Participants**

Twenty children with CP were selected from pediatric rehabilitation OPD, SBB College of physiotherapy, VS general hospital, Ahmedabad, Gujarat. The inclusion criteria for the study were a diagnosis of CP with age five years or more and child who excluded with other conditions like autism spectrum disorder, attention deficit hyperactive disorder, Down's syndrome, spina bifida, metabolic disorders, and traumatic brain injuries. According to inclusion and exclusion criteria children were evaluated and selected for the study. Parents were explained about the purpose of the study, a written informed consent was obtained from them.

- Study design: cross sectional study
- Outcome measure: PEDI and GMFCS

PEDI [measures participation] with reliability is  $0.90 - 0.99^{17}$  and GMFCS [measures motor impairment] with inter rater reliability = 0.93, test retest reliability = 0.79. Positive predictive value = 0.74, negative predictive value = 0.90. <sup>18,19</sup>

#### **RESULTS**

The different value of GMFCS and PEDI's sub score that is self-care, mobility and social function of 20 children with CP were self-care mean (39.27  $\pm$  21.56), mobility (25.27  $\pm$  21.21), social function (37  $\pm$  22.02). Correlation coefficient between GMFCS & PEDI by Spearman's test with self-care domain r=-0.77, mobility domain r=0.82 with social function domain r=-0.78. The Spearman's test shows negative correlation between GMFCS and PEDI different domains.

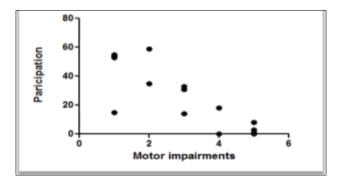


Figure 1: Correlation between motor impairment and participation.

#### **DISCUSSION**

According to the present study co-relation is present between motor impairments and different domains of participation. With all domains of PEDI, negative and strong co-relation is present. But among all domains of the PEDI stronger co-relation is found with mobility.

Several studies have explored the relationship between the GMFM and the PEDI in order to identify whether improvement in gross motor function is actually related with improvement in daily functional skills.

Smits et al. reported that the GMFM-66 explained 90% of variables in the mobility domain of the PEDI in 116 children with CP aged between 4 years and 8 months and 7 years and 7 months.<sup>20</sup>

Holsbeeke et al. reported that the correlations between motor capacity, motor capability, and motor performance were high, between 0.84 and 0.92, and significant (P <0.001) in children with CP aged 30 months on average. However, when comparing children with the same level of motor capacity or capability, large ranges at the level of motor performance were found.<sup>21</sup>

Tieman et al. also reported statistically significant difference in performance across multiple settings for children with CP in all capability groups. As gross motor function (capacity) and functional skill (capability or performance) do not always correlate with each other, examination of a child's capability and performance in the

settings that are important to the child's daily life, such as home, school and outdoors, needs to be considered.  $^{22}$ 

In recent years, the probability of long-term survival has increased even among children with a severe level of disability (Hutton et al. 1994, Blair et al. 2001) that means that appropriate services will need to be provided for children with CP through adolescence and into adulthood.<sup>23,24</sup>

Standardized functional assessments like the GMFCS, along with evidence of additional impairments, have been shown to be very important (Lenski et al. 2001).<sup>25</sup>

Children with CP have reduced levels of participation in a number of areas of life including education, social life and recreation (Margalit 1981, Beckung & Hagberg 2002, Schenker et al. 2005, Stevenson et al. 2006, Michelsen et al. 2009). Furthermore, when children with CP do participate they are more likely to be engaged in passive activities being predominantly home-based and limited in variety (Majnemer et al. 2008). <sup>28</sup>

In different studies of participation in children with CP, there is consensus that the severity of motor impairment is a key predictor of participation restriction (Beckung & Hagberg 2002, Kerr et al. 2006, <sup>33</sup> Morris et al. 2006, Maheret al. 2007, <sup>34</sup> Majnemer et al. 2008, Fauconnier et al. 2009, Michelsen et al. 2009). <sup>30</sup> It is easy to understand that with increasing severity in impairment there will be total body involvement which leads to limitations in participation.

# Clinical implication

With knowledge of impairment and participation the need of the child can be understood and goals for therapy can be set up for the child and family.

# Limitation

Study was done with small sample size and co-relation of motor impairments and participation was not determined in relation to type and characteristics of cerebral palsy.

# Future recommendation

Impairments and participation can be assessed according to the type and characteristics of the cerebral palsy with large sample size and blinding will advisable to rule out experimenters' bias and random error.

# **CONCLUSION**

Children with lower level of GMFCS had higher participation while those with higher level of GMFCS had lower participation. So, participation is depends up on motor impairments.

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