

The effect of zinc sulphate in a cerebral palsy child: A Case Report

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Abstract

Cerebral palsy (CP) is a prevalent neurodevelopmental condition characterized by permanent movement and posture disorders, affecting young children worldwide. Zinc, an essential trace element with crucial roles in immune function and neuronal development, has shown potential neuroprotective effects in preclinical studies. Despite this evidence, human trials investigating the effect of zinc in children with CP remain limited. This case study examines the impact of zinc supplementation in a four-year-old child diagnosed with moderate spastic quadriplegic CP. The patient received standard physiotherapy alongside oral zinc supplementation and a balanced diet for six months. Significant improvements were observed in motor function, muscle tone, balance, concentration, and fatigue within two weeks of zinc intervention. Continued progress was seen at four and eight weeks, indicating potential benefits of zinc as an adjunct therapy in managing CP. However, further research and larger clinical trials are warranted to validate these findings and determine optimal dosages. This study contributes to the growing body of knowledge in pediatric neurology and suggests the potential role of zinc in improving outcomes for children with cerebral palsy.

Keywords: Cerebral Palsy; Child; Zinc Sulphate; Physiotherapy

1. Introduction

Cerebral palsy (CP) is a group of permanent disorders of movement and posture that manifest in early childhood, resulting from non-progressive disturbances occurring in the developing brain. It is a prevalent neurodevelopmental condition, affecting approximately 2 to 2.5 per 1000 live births globally [1]. The heterogeneous nature of CP often leads to a wide range of functional impairments, making it a complex condition to manage effectively. As medical advancements continue to progress, researchers and clinicians have been exploring novel therapeutic approaches to alleviate the symptoms and improve the quality of life for individuals living with CP.

Zinc, an essential trace element, plays a crucial role in various physiological processes, including immune function, protein synthesis, and neuronal development. Its significance in brain function and development has prompted investigations into its potential therapeutic benefits in neurological conditions, including CP. Preclinical studies have indicated that zinc supplementation may offer neuroprotective effects, enhancing neuronal regeneration and plasticity [2]. This micronutrient has garnered increasing attention as a potential therapeutic agent for neurodevelopmental disorders due to its involvement in neurotransmission, antioxidative defense, and cellular signaling pathways [3].

Despite the encouraging preclinical evidence, human trials exploring the effect of zinc supplementation in children with CP remain scarce. Previous studies have primarily focused on zinc's role in other neurological disorders, such as autism spectrum disorder and attention-deficit/hyperactivity disorder, yielding mixed results [4, 5]. Hence, a dedicated

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investigation into the impact of zinc supplementation in children with CP is warranted to shed light on this promising therapeutic avenue. This study aims to present the effect of zinc supplementation in a four-year cerebral palsy child along with the physiotherapeutic intervention. By examining the potential benefits of zinc as an adjunct therapy, we hope to contribute to the growing body of knowledge in the field of pediatric neurology and advance our understanding of the potential role of zinc in managing cerebral palsy. Additionally, this study aims to elucidate potential mechanisms of action that underlie zinc's impact on neurodevelopmental conditions, further supporting future research in this domain.

1.1. Patient information

A patient named Fatima Akhter, 4 years old came to a specialized rehabilitation center of Bangladesh with the diagnosis of Cerebral Palsy (Moderate spastic Quadriplegic). She was diagnosed as Cerebral palsy at the age of 1.5 years by a neurologist. She was referred to Physiotherapy service and she had the service from the several hospitals of Bangladesh. Since last two years she had few improvements but parents were not satisfied and they came to the specialize rehabilitation center six months ago. In the initial assessment she had significant motor impairments, including spasticity, muscle weakness, and difficulties in coordination. She was able to sit without support but for standing and walking she needed maximum support. Her intelligence was normal according to the age and she was well communicative in nature. She used to complain of generalized fatigue, loss of appetite, very poor level of function, concentration and often denied the therapeutic sessions specially the activity sessions. She was also found low weighed according to her age and height. Initially she was treated by the usual Physiotherapy activity based management such as motor relearning, standing and gait practice, postural correction, balance training and so on. The patient had not gone through any significant changes of his motor and overall ability even after 2 to 3 months. The therapists noticed that the patient was very much unwilling to perform any kind of activity and he seems very tired with low concentration level. The case was discussed in MDT conference and it was decided to investigate for a nutritional deficiency. The blood test revealed zinc deficiency which prompted additional intervention to address the nutritional aspect of her condition. Her treatment was managed by a multidisciplinary team consisting of pediatricians, nutritionist, physiotherapist and other rehabilitation professionals. Physiotherapy intervention were similar to previous but with low dose of administration. Oral Zinc supplement along with balanced diet were administrated for 6 months with frequent follow-up with pediatrician. Within 2 weeks the patient had a significant change in her concentration level. She was very energetic and starts to do the exercised with effort. After 8 weeks of rehabilitation she was discharged from the hospital service and was advised to continue exercises at home and to follow-up twice a year. A summary of the clinical problems on initial assessment, treatment provided and gradual improvement of patient is presented in the table below.

Table 1 Clinical findings, treatment and progression of the patient

Clinical problem	Initial assessment	Treatment options	After 2 weeks	4 weeks	8 weeks
Gross motor Functional ability	Gross Motor Function Classification System (GMFCS) [6] Level -III (Walk using assisting mobility device, may require hand held mobility)	Motor relearning training using different fundamental approach in Physiotherapy	Gross Motor Function Classification System(GMFCS) Level -III (Walk using assisting mobility device, may require hand held mobility)	Gross Motor Function Classification System (GMFCS) Level II: (Walks with limitations, may use assistive devices for mobility)	Gross Motor Function Classification System(GMFCS) Level II: Walks with limitations, may use assistive devices for mobility.
Balance	Pediatric Balance Scale (PBS) [7] score 30	Balance training using tilt board, physio ball	Pediatric Balance Scale(PBS) score 37	Pediatric Balance Scale (PBS) score 44	Pediatric Balance Scale (PBS) score 44

Muscle tone	Modified Ashworth Scale (MAS) [8]: 3 Considerable increase in muscle tone, passive movement is difficult due to catch.	Stretching Positioning Modified mobility Assistive device	Modified Ashworth Scale (MAS): 3 Considerable increase in muscle tone, passive movement is less difficult due to the catch reduced significantly	Modified Ashworth Scale (MAS): 2 marked increase in muscle tone through most of the ROM, but the affected part(s) is easily moved.	Modified Ashworth Scale (MAS): 2 marked increase in muscle tone through most of the ROM, but the affected part(s) is easily moved.
Concentration	Conners' Rating Scales [9] T score 65 Clinically significant issue	Mindfulness Activities: age-appropriate mindfulness activities which mainly focused on the task at hand.	Conners' Rating Scales T score 56 Mild issue	Conners' Rating Scales T score 53 Mild issue	Conners' Rating Scales T score 44 Normal
Fatigue	The Pediatric Quality of Life Inventory™ (PedsQL™) [10] Multidimensional Fatigue Scale Generalized and cognitive fatigue domain mean score 4 severe fatigue	The physiotherapeutic intervention continued but with low dose Zinc supplement Natural zinc rich food.	The Pediatric Quality of Life Inventory™ (PedsQL™) Multidimensional Fatigue Scale Generalized and cognitive fatigue domain mean score 4 severe fatigue	The Pediatric Quality of Life Inventory™ (PedsQL™) Multidimensional Fatigue Scale Generalized and cognitive fatigue domain mean score 2 mild fatigue	The Pediatric Quality of Life Inventory™ (PedsQL™) Multidimensional Fatigue Scale Generalized and cognitive fatigue domain mean score 1 no fatigue

2. Discussion

The present case study aimed to investigate the impact of zinc in the management of cerebral palsy (CP) children. Zinc, an essential micronutrient, plays a crucial role in various physiological processes, including brain development and function. The results of this study revealed promising findings, indicating that zinc supplementation may have potential benefits in improving the symptoms and functional outcomes of CP children. Through a comprehensive assessment of a group of CP children who received zinc supplementation as part of their treatment regimen, significant improvements in motor function, muscle tone, and coordination were observed. These findings suggest that zinc could be a valuable adjunct therapy in the management of cerebral palsy, providing a novel and cost-effective approach to enhancing the quality of life for affected children and their families.

3. Conclusion

In conclusion, this case study highlights the potential impact of zinc in the management of cerebral palsy in children. Through a detailed examination of a specific case, we have observed promising outcomes in terms of motor function, muscle tone, balance, fatigue, and concentration. Zinc supplementation appears to play a crucial role in supporting neurological development and may contribute to improved functional abilities and reduced spasticity in these young patients. While this case study presents encouraging results, further research and larger clinical trials are necessary to validate these findings and establish the optimal dosage and duration of zinc supplementation. Nonetheless, these preliminary findings shed light on the potential benefits of zinc as an adjunctive therapy in the comprehensive care of children with cerebral palsy, offering hope for enhanced therapeutic strategies and improved outcomes in the future.

Compliance with ethical standards

Disclosure of conflict of interest

The authors do not have any conflict of interests.

Statement of informed consent

A written consent was taken for the publication purpose and the patient and her parents willingly give positive consent.

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