

## Original Research



# A Mini Review on Cerebral Palsy and Its Implications in Dentistry

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## Abstract

The most common motor disability that is caused due to a progressive brain injury or lesion in childhood is known as Cerebral Palsy (CP). It is primarily an infirmity of posture and muscular tone that occurs as a result of an injury to the developing brain like hypoxia which is non progressive in nature. The history of CP dates back to 1843 where Sir William John Little was credited with its first description. He also coined the term 'cerebral palsy' in 1889. Census from around the world in population-based studies reports that overall birth prevalence of CP is approximately two per 1,000 live births. CP results in impaired motor function thereby affecting the overall oral health. Hence, awareness regarding the care and treatment of these patients amongst dentists is imperative. This review aims at studying the various aspects of CP as well as highlighting the role of the dentist in the treatment of the patients suffering from this condition. It also provides information regarding the implications of CP on dental health.

## Keywords

Cerebral Palsy; Dental; Nervous System Conditions; Oral Health

## Introduction

Cerebral Palsy (CP) is a common chronic motor disorder with associated cognitive, communicative, and seizure disorders [1,2]. But due to the elaborate and ongoing research, it is now a term used to describe a group of disorders comprising of distribution, motor and functional level. This might occur in the antenatal, perinatal or early postnatal period. Many deficits such as mental retardation, speech and language and oromotor problems invariably affect the CP population [3]. Some of the motor disorders associated with CP are disturbances in coordination, cognition, communication, and seizure disorders [3]. This creates a significant morbidity rate that can further affect the wellbeing of these compromised children and impact their quality of life negatively [3]. The incidence of developing dental disorders in these children are high. Mental retardation, motor weaknesses makes the CP population dependant on caretakers for maintaining the oral hygiene [4,5].

Due to further development of the neuro physiological system and adaptations there might be changes in the muscle structure, composition, its function and coordination and activity [3]. The most exhausting factor of CP is the loss of muscle tone and causes spasticity [3,6]. This disorder is commonly diagnosed at birth [6]. A thorough evaluation of neurodevelopmental assessment of the child with CP should be done so that comprehensive early intervention program can be planned and executed [7].

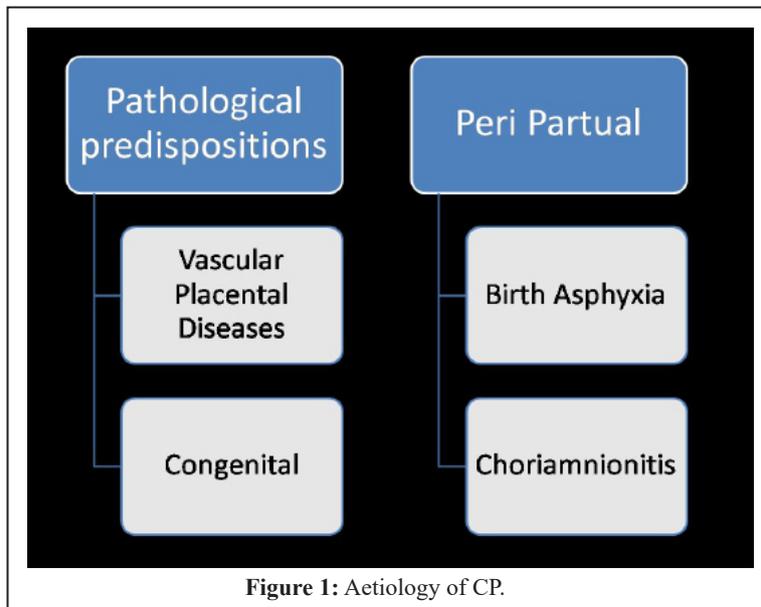
## Common Risk Factors of CP

The common risk factors for CP include placenta-mediated pregnancy complications [8], congenital malformations [9], multiple gestations [10], perinatal strokes [11,12], preterm and after preterm deliveries. These factors are very common and the need for reduction of such risk factors can help prevent CP (Figure 1). The reduction and prevention of CP can be divided in to Preterm, during Preterm and after Preterm Delivery.

## Gross Motor Function Classification System Expanded and Revised

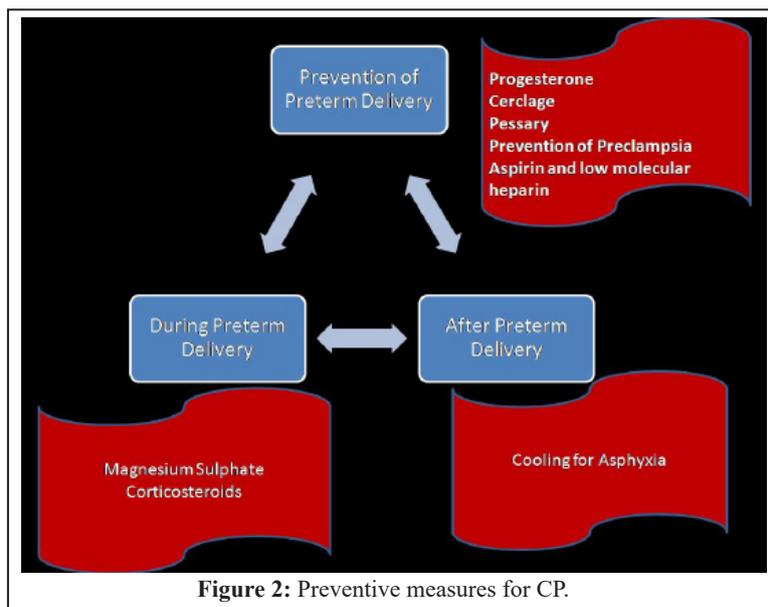
The gross motor function of children and young people with CP can be categorised into five different levels using a tool called the Gross Motor Function Classification System Expanded and Revised (GMFCS - E&R) [15].

LEVEL I - Walks without Limitations



The drugs used for Preterm delivery that help in preventing CP are progesterone, Cerclage, Pessary, Prevention of Preeclampsia, Aspirin and low molecular heparin. During acute situation Magnesium Sulphate and corticosteroids are used [13,14]. And post exposure prevention is by cooling for Asphyxia and lowering Neural Inflammation (Figure 2).

- LEVEL II - Walks with Limitations
- LEVEL III - Walks Using a Hand-Held Mobility Device
- LEVEL IV - Self-Mobility with Limitations; May Use Powered Mobility
- LEVEL V - Transported in a Manual Wheelchair



GMFCS focuses on the scale of movement be it of any type including walking, sitting or even use of mobility devices like wheelchair. It provides the clinicians with the child's motor capabilities and its maximum function. It also gives the family an idea about the child's mobility capacity [15].

## Diagnosis

The early signs involved in the diagnosis of CP are demonstrated in the figure 3. Moreover, it can also be diagnosed by ultrasound, whether it is hypoechoic and hyperechoic, by physical examination, pathological and neurological findings [16]. Metabolic and genetic studies should not be routinely obtained in the evaluation of the child with CP but neuroimaging is recommended with MRI preferred to CT [17,18].

in a higher number of clusters than in children with typical development in terms of total number of synergies deployed during walking, synergies, and indicating significantly greater stride-to-stride variability. This analysis expands its clinical utility and may provide a method to tailor rehabilitation strategies which can in turn help the CP child to use its motor capacity to its maximum function.

## Socioeconomic Status and CP

The socio economic status can be related with CP. The role of individual-level and area-level determinants in CP phenotypes is debated but the socio-economic differences in maternal and child health are well recognized [24]. Gradients were reported in literature with differences in maternal and perinatal factors,

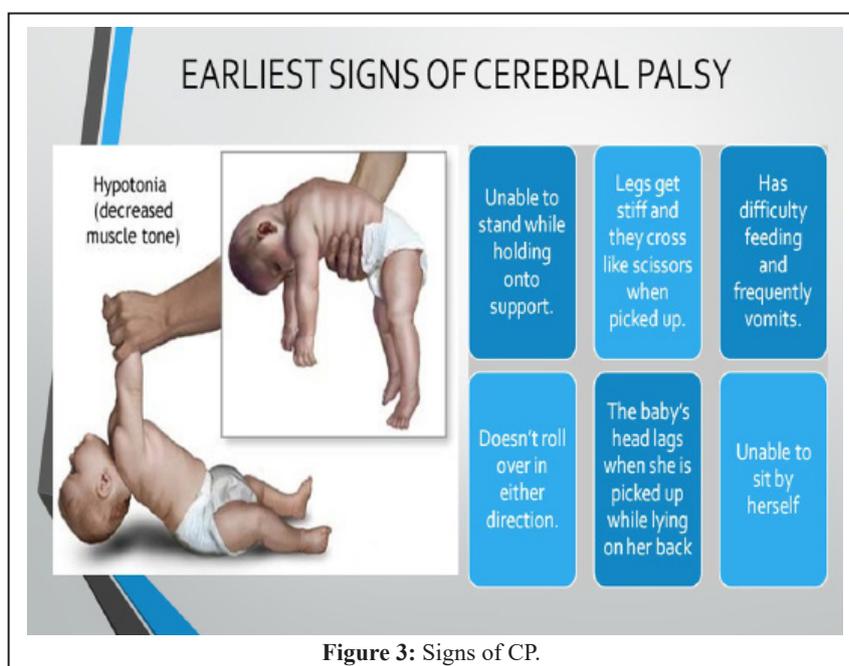


Figure 3: Signs of CP.

## Muscle and CP

The severity and symptoms of the disease may vary in different patients according to the cause of the disease [19]. Spastic CP was associated with any increase in sarcomere length and fascicle diameter, collagen content, and a reduction in the number of satellite cells within the spastic CP muscle [20,21]. Changes in fascicle lengths and fibre diameters were seen with the muscle fibres [22]. The muscular coordination is very important in performing the day to day activities like taking care of the oral hygiene [23]. Moreover, the interaction or cooperation of two or more muscles are known to produce a combined effect greater than the sum of their separate effects. This property known as a synergy is routinely used to find out variation in the pathological gait patterns. Children with CP are present

especially since highly educated mothers were less deprived than less educated mothers [25-28]. The severity of CP impacts the contextual socio-economic factors. A group of multidisciplinary professionals including a dentist offers an efficient approach to treat the CP child. This team should consist of the dentist, physical therapist, and a speech therapist to provide for a better quality of life for the patient and consequently improves the oral as well as general hygiene. The oral manifestations like drooling of saliva, open bite, periodontal diseases and considering the special health care needs in these patients so as to provide comprehensive dental care. The oral health quality of life in Children with CP is a concern for parents and clinicians and a lot of factors contribute to it. The oral health-related quality of life in children with CP is significantly lower when compared with normally developing children but the oral health status

of children with CP is not significantly different from that of normally developing children [29]. Physical barriers can further be increased by other factors like visual impairment, drugs seizures, physical impairment and hearing impairment and contribute to the diseased oral health. Due to the impaired motor function and irregular diet habits, there are various dental problems that are commonly seen in CP children. As the diet is very important for the oral hygiene, CP children were found to consume the packaged juices, in between meals like biscuits chocolates and potato chips at a higher percentage [30,31]. This emphasised the need for education of the importance of diet for proper oral hygiene in CP children and the lack of it among parents/guardians [32-34].

## Oral Diseases and CP

Periodontal Diseases occur due to poor oral hygiene and medications which may cause hyperplasia. Medications like phenytoin taken for seizures are known to cause gingival hyperplasia [35]. Inability and inefficient cleaning of teeth and the gums possess a risk towards the development of periodontal disease [36]. Dental Caries is the most common type of oral disease and the involved aetiology is often multifactorial but primarily inadequate oral hygiene [23,37,38]. Since poor motor control predisposes towards poor oral hygiene, dental caries is frequently noted in children with CP. Malocclusion in people with CP is a musculoskeletal problem which usually involves more than just misaligned teeth [39,40]. Tongue thrusting and mouth breathing often create an open bite with protruding anterior teeth and is commonly associated with CP [23]. The inability to close the lips because of an open bite also contributes to excessive drooling. This affects daily oral care as well as social interaction. Furthermore, CP also results in a hyperactive bite and gag, hence an early morning appointment should be scheduled for the patient on a light or an empty stomach without eating or drinking anything [23]. The gag reflex can also be reduced by using mouth props or making the patient sit upright. Dysphagia, difficulty with swallowing, also possesses a problem in people with CP [41,42]. Pouching of food in the mouth longer than usual, increasing the risk for caries. Since abuse is reported more frequently in people with developmental disabilities than in the general population, bruxism is more common in people with CP, especially those with severe forms of the disorder owing to anxiety [43-47]. Bruxism can be intense and persistent and cause the teeth to wear prematurely [35,48].

## Discussion

### General considerations during dental appointments

There are various ways in which the clinician can handle the CP patient. Since, uncontrolled movements are common in

people with CP, this proves to be a major drawback for their treatment on the dental chair. When the patients move their limbs, the uncontrolled movements increase. Hence, it is important to make the child calm and familiar to the clinic. Making the treatment environment calm and supportive helps the patient relax. Relaxation will not stop uncontrolled body movements, but it may reduce their frequency or intensity. The clinician should accustom the patient to the treatment as well as gently cradle the patient's head during the treatment. Appointments should be kept short and people with CP may need sedation, General Anaesthesia (GA), or hospitalization if extensive dental treatment is required [49-51]. Also, many kids are associated with visual impairment. Therefore, there should be Braille signs in the clinic. Using the other senses to sensitize the patient towards the treatment is also imperative. Furthermore, seizures occur very commonly and hence a physician's consent should be taken prior to conducting any treatment, since trauma to the tooth, cheek bite might occur during it. The airway should also be managed in case of any emergency. The first visit should be focused on building trust and confidence. The CP child needs to be made familiar and cooperative. Radiographic examinations are done with help of auxiliaries and immobilisation. A 16-inch floss is tied to the film while taking a radiograph in order to prevent the child from choking. The chair should also be adjusted according to the comfort of the child.

### General anaesthesia

According to severity, if the child is uncooperative, the dental treatment is performed under GA [52,53]. These procedures are offered to a broad cross-section of patients and may be indicated for improvement in mobilization or ease of care, in keeping with the broad goals of managing children with CP. The consent of the parents/ guardians must be obtained for GA and sedation. Nasal masks to sedate with the nitrous oxide and oxygen are used for conscious sedation. Jensen et al., [54] found a significant reduction in the movements when the patient was given nitrous oxide (70% nitrous oxide, 30% pure oxygen). Due to the newer drugs the recovery after sedation is much easier than before. But when it comes to patients with special health care needs, the recovery might be a little difficult as obeying or following the instructions is difficult by the patient. So it is better to use immobilising equipments like Velcro straps and papoose boards. Most of the major postoperative complications like nausea and vomiting can be avoided in GA with sevoflurane and propofol was concluded by Loyola-Rodriguez et al., [55]. The paper reported that conscious sedation is an excellent tool to provide dental treatment in CP patients.

### Conclusion

Oral Health care for the CP patients is as important as the

general health care [37]. The awareness about the oral health amongst the parents of these children and the dentists treating them has increased [37,38]. Early diagnosis of the disease is necessary and early treatment of the children is beneficial [56]. Essential equipments to handle these children in a dental clinic, like GA, velcro straps and skills of a specially trained dentist are requisites of the treatment. GA is used only after looking into other medical conditions and only after obtaining the required physician's consent. Early preventive interventions and treatment will in turn reduce the severity of the oral diseases which are common to them. This helps to prevent further complications of the same [57]. The multidisciplinary approach for welfare of CP children covers and integrates the various aspects of health of these children like lack of motor skills [57], speech, increased oral diseases and other medical problems. Hence the oral diseases and other medical issues can be reduced to large extent and are in control through regular monitoring and check-ups.

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