Chapter 5
Augmentative and Alternative Communication Systems for Children With Cerebral Palsy

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ABSTRACT

Cerebral palsy (CP) is a congenital neurological disorder of movement, muscle tone, or posture. Children with CP may also have associated sensory and motor disorders such as visual impairment, hearing loss, intellectual disability, speech-language and communication disorders, as well as swallowing-related problems. They often require long-term treatment and rehabilitation from various disciplines such as speech-language therapy, augmentative and alternative communication (AAC) therapy, physiotherapy, occupational therapy, along with medical/surgical line of treatment. Augmentative and alternative communication (AAC) therapy approaches focus on providing the individual with communication methods using residual functional abilities. This chapter aims at briefing the reader on the principles, methods, and key features of AAC communication systems such as switches, pointing devices, visual displays, virtual and modified keyboards, AAC devices with digitized speech output, AAC apps and software, eye gaze systems, etc.

INTRODUCTION

Cerebral Palsy (CP) is a non-progressive, neurodevelopmental disorder that affects muscle tone, movement, motor co-ordination and body posture secondary to lesions or anomalies of the brain acquired during the pre-natal, peri-natal or post-natal period (Mutch, Leyland, & McGee, 1993). There is no one known cause for CP. However, few conditions have been identified as significant risk factors. These includes

low birth weight (Reddihough, 2011), birth complications such as asphyxia (Krigger, 2006), lesions or mal-development of brain structures (Krägeloh-Mann & Cans, 2009), and many genetic causes (Badawi et al., 1998). The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour, by epilepsy, and by secondary musculoskeletal problems (Rosenbaum et al., 2007). It is a life-long condition resulting in motoric impairment and it is reported to be the most common cause of physical disability in childhood (Krageloh-Mann & Cans, 2009).

In nearly 50% of the population with CP, professionals fail to identify one exact cause. However, they are in consensus that the most common cause of cerebral palsy is deviated brain development in embryological stages or an acquired brain lesion during or after birth. Table 1 summarizes the causes for such brain damage that potentially could result in CP.

Table 1. Common causes of Cerebral Palsy

Prenatal causes	
Cerebral Haemorrhage	It is a bleeding in a specific area of brain that is commonly seen in premature children causing CP
Infections	Intrauterine infections, high fever, UTI may be passed from mother to child in the womb. E.g. Cytomegalo-virus (CMV), measles, rubella etc
Environmental factors	Maternal exposure to toxic substance (methyl mercury, exposure to drugs, radiations, smoking, alcohol consumption by mothers, and other environmental factors) (Kondo, 2000).
Genetic/Hereditary factors	A small number of cases may be due to genetic factors (Schaefer, 2008)
Nutrition	Iron deficiency, iodine deficiency in expecting mothers.
Maternal diseases	Diabetes, hypertension, hyperthyroidism etc during pregnancy
Fertility problems	Advanced age at conception, history of infertility, recurrent fetal wastage
Other possible factors	Poor antenatal care Poor socioeconomic status
Perinatal causes	
Birth asphyxia	Lack of oxygen circulation to fetal brain induced with placental failure, drug, breech delivery, forceps delivery and maternal anoxia or maternal hypotension.
Prematurity	Child born before 38 weeks of gestation.
Abruptio placentae	Premature separation of placenta from the foetus.
Postnatal causes	
Head injuries	Fall, accidents or similar head trauma sustained during the first five years of life.
Infections	Brain infections such as Encephalitis, Meningitis in early life.
Lack of oxygen	Accidents or chocking that deprive oxygen to brain
Low birth weight	Child born with < 2.5Kg weight at birth.
APGAR score	A low health score soon after birth due to variations in activity, pulse, respiration and other health factors.

Based on the number and distribution of limb weakness, CP is topographically classified as monoplegia, diplegia, hemiplegia, paraplegia, triplegia, quadriplegia. As a disorder of muscle tone and activity, CP is also classified as spastic, flaccid, ataxic, athetoid, and mixed type. Odding, Roebroeck and Stam (2006) reported that up to 80% of those with CP have dysarthria (disorder of movement), and they are classified as non-verbal (Ratcliff & Little, 1996; Hustad, Gorton, & Lee, 2010). Children with CP ex-

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