Chapter 3
Feeding and Swallowing Issues in Children With Neuro-Developmental Disorders

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ABSTRACT
The chapter highlights the feeding and swallowing issues seen in children with neuro-developmental disorders, types, and extent of the problem across different disorders; its relation with the neuro-development of the child; effect on the quality of life of the parents/caregivers along with the child, specifically in the Indian context. It also focuses on the importance of assessment, team approach, and review of available tests for the assessment of feeding and swallowing problems in these children. The chapter is also going to give a few insights into the challenges faced by speech-language pathologists during the assessment of the feeding and swallowing issues in these children in the Indian scenario. The chapter will also include a section on applications of ICF model to feeding and swallowing issues in children with neurodevelopmental disorders.

INTRODUCTION
The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association, 2013) describes Neuro-developmental disorders (NDDs) as a group of conditions, which have their onset in the developmental period. The diversity and extent of developmental deficits vary from very specific limitations of learning or control of executive functions to global impairments of social skills or intelligence, which can affect speech, language, and cognitive abilities. The conditions such as Intellectual Disability, Autism Spectrum Disorders, Cerebral Palsy, Attention-Deficit/ Hyperactivity Disorders and Global developmental delay are a few of the common NDDs.

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It is well known that in these developmental disorders, the deficits can be seen in either one or multiple domains such as cognition, motor, speech, and language, or social skills. However, very little is known about the commonly associated feeding and swallowing issues in these children with NDD, which occurs due to various underlying deficits. The objective of the present chapter is to provide an overview of the feeding and swallowing issues reported in children with cerebral palsy, intellectual disability, and autism spectrum disorders. Further, the chapter includes a review of the available assessment tests or tools for feeding and swallowing and the need for developing feeding/swallowing assessment scales based on International Classification of Functioning, Disability, and Health (ICF; WHO, 2001). The chapter also includes a brief note on the importance of early intervention of feeding and swallowing issues in children with NDD, highlighting the role of speech-language pathologists (SLPs), with a few future directions.

INTRODUCTION TO FEEDING AND SWALLOWING

Feeding, in general, is a basic skill which exists from the beginning of infancy. It provides nutrition for normal growth and development; satisfies hunger and maintains the homeostasis, gives opportunities for sensory and motor stimulation, and oro-motor skill development, etc., thus serving to fulfill the biological functions of the body. Feeding also has a deep impact on the psychological aspect of a developing child. The behaviors of both parent/caregiver and child during feeding contribute significantly to the overall success of the feeding interaction as well as feeding performance, which in turn strengthen the mother-child bonding. Mealtimes with the family as well as outside the family play an important role in the social life of the child (Morris & Klein, 1987; Kummer, 2008).

The development of feeding in infancy depends on the maturation of gut, lungs and neural system. The functional and anatomic development of gut includes improvement in esophageal and intestinal motility, the functioning of the lower esophageal sphincter (LES), the process of ejection of stomach contents and development of the absorptive surface area of the gut. The respiration becomes more efficient by 32 to 34 weeks of gestation and continues to develop until two years of age. Our central nervous system matures in a peripheral to central sequence and our brainstem begins to mature by the second trimester. The brainstem controls our vital functions such as heart rate, blood pressure, digestion and sleep; and cerebral cortex regulates our functional life such as voluntary actions, thought process, memory etc. During early infancy, brainstem plays a major role in controlling all our life-sustaining reflexes (including breathing, sucking etc.) (Kliegman & Stanton, 2011; Kenner & McGrath, 2010; Gardner & Merenstein, 2002; Stiles & Jernigan, 2010).

Physiologically, the stages of feeding are divided into four main components: (a) oral phase (inclusive of oral preparatory and oral transport); (b) triggering of the swallow reflex; (c) pharyngeal phase, and; (d) esophageal phase. The process of feeding includes the placement of food in the mouth, the manipulation of food in the oral cavity prior to the initiation of the swallow, including mastication (oral preparatory phase), and the oral transport stage of the swallow when the bolus is propelled backwards by the tongue. When the food substance reaches the anterior faucial arch at the rear of the mouth, the pharyngeal swallow reflex is triggered. Following this, the pharyngeal phase occurs in which the base of the tongue and the pharyngeal wall move toward each another to create the pressure that is needed to project the bolus into the pharynx. The pharynx contracts and squeezes the bolus down. The pharyngeal phase is complete when the cricopharyngeal sphincter opens and the food or liquid moves into the esophagus. The esophageal phase follows, when the muscles of the esophagus move the bolus in peristaltic or
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