Feeding and Swallowing Disorders in the Paediatric Population. The Speech and Language Pathologist's Perspective

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Abstract

The development of feeding and swallowing skills is a complex process, which begins during the prenatal period and continues until early childhood. Feeding and swallowing disorders (dysphagia) may occur in the paediatric population, affecting the oral phase, the triggering of the swallowing reflex, the pharyngeal phase and the oesophageal phase of swallowing. Paediatric dysphagia may present with various symptoms relevant to the phases of swallowing, and it is associated with several conditions, including medical, nutritional, psychosocial disturbances and impaired feeding skills. Speech and language pathologists (SLPs) play a key role in the assessment and management of paediatric dysphagia. The fact that paediatric dysphagia is multifactorial, makes the contribution of a multidisciplinary team to the assessment and management of feeding and swallowing dysfunction imperative. A comprehensive assessment of the paediatric population with dysphagia includes clinical and instrumental evaluation, while paediatric dysphagia management involves a range of strategies, which have been developed to ensure the efficiency and safety of feeding and swallowing process and improve children's quality of life (QoL).

Key words: *Paediatric dysphagia; assessment; management; speech and language pathologist*

INTRODUCTION

It is estimated that around 20-45% of infants and young children exhibit some form of feeding and swallowing difficulty [1-3] , demonstrating various complications, such as slow weight gain, disrupted nutrition and acute choking. Severe complications relevant to feeding and swallowing disorders may lead to aspiration-based infections of the nasal sinuses, middle ears and lungs, which may threaten children's life [4-7]. On the strength of medical and technological development, neonatal and infant mortality has significantly decreased leading to a rise in the number of children with feeding and swallowing disorders, and proper care focuses not only on survival but also on quality of life (QoL) improvement. For this reason, the range and complexity of feeding and swallowing disorders challenges healthcare, educational and rehabilitation systems [8]. The complete understanding of both normal and impaired feeding and swallowing process is integral for speech and language

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pathologists (SLPs) to carry out a comprehensive feeding and swallowing assessment and to make optimal management decisions for every child, dealing with medical, nutritional, psychosocial issues and feeding dysfunction. Although SLPs play a central role in the assessment and management of dysphagia, children and their parents/ caregivers are better served by a multidisciplinary team [9].

The primary objective of the current review is to summarize most recent evidence-based data related to paediatric feeding and swallowing disorders. The secondary aim is to bring up to date the paediatric specialists about different topics related to paediatric dysphagia, to familiarize them with signs of dysphagia and inform them under what circumstances they should refer these children to an SLP. Awareness of all topics related to paediatric dysphagia is crucial for SLPs and paediatric specialists to conduct appropriate evaluations and therapeutic procedures for every child.

THE PROCESS OF NORMAL SWALLOWING

Swallowing is a multidimensional complex procedure, which requires intact innervation of the muscles related to swallowing, structural integrity of the musculoskeletal systems of the head, neck, thorax and abdomen, adequate airway protection and intact gastrointestinal system. The process of swallowing involves four phases, including the (i) oral phase, (ii) triggering of the swallowing reflex, (iii) pharyngeal phase and (iv) oesophageal phase [10].

Several studies describe the physiology of normal eating and swallowing procedure, suggesting that this process involves volitional and reflexive activities [10, 11]. The oral phase of swallowing combines the oral preparation of the food/ fluid bolus (oral preparatory phase) and the oral propulsion of the food/ fluid bolus (oral propulsive phase). In neonates and young infants, the oral phase is reflexive and involuntary. However, later in infancy, the oral phase comes under voluntary control with nasal breathing and an open airway, allowing children to handle various food textures. The triggering of the swallowing reflex is a basic reflex, which provides safe and efficient swallowing, preventing aspiration and retention of food in the pharyngeal stage. The swallow reflex is an involuntary activity, even if it can be controlled voluntarily. The pharyngeal phase of swallowing begins with the initiation of the pharyngeal swallow response as the food/ fluid bolus passes through the pharynx and is under reflexive neurological control. The oesophageal phase of swallowing begins with the opening of the upper oesophageal sphincter (UES) and ends as the food/ fluid bolus passes through the lower oesophageal sphincter into the stomach and constitutes an involuntary activity. Table 1 demonstrates the typical swallow sequence of children during the oral, pharyngeal and oesophageal phases [10].

Additionally to the complexity of the swallowing process, children's feeding and swallowing skills are affected by maturational changes. The pharyngeal swallow becomes obvious between 10- and 11-weeks' gestation and sucking between 18- and 24-weeks' gestation. However, it is evident that sucking and swallow-

Table 1. *Typical swallow sequence of children during the swallowing phases.*

Phases of Swallowing	Typical swallow sequence
Oral phase	• Preparing the bolus for swallow • Chewing (if necessary) • Transferring the bolus from the oral cavity into the pharynx
Pharyngeal phase	• Velopharyngeal closure occurs to close off the nasopharynx • Posterior movement of the base of tongue • Pharyngeal closure through contraction of the superior, middle, and inferior pharyngeal constrictors • Adduction of the vocal folds with brief cessation of respiration • Hyolaryngeal excursion and closure of the larynx through epiglottic tilt • Opening of the upper oesophageal sphincter through relaxation of the cricopharyngeus muscle and biomechanical forces contributed through hyolaryngeal excursion
Oesophageal phase	• Peristaltic action of the oesophagus • Moving the bolus into the stomach.

ing coordination matures between 33- and 36-weeks' gestation [12]. The neurologically intact full-term infant is born with a number of oropharyngeal reflexes, which support the feeding and swallowing procedure. These include the rooting reflex, the gag reflex, the phasic bite, the transverse tongue reflex, the tongue protrusion, suckling and swallow reflex [13]. At the age of 4-6 months, infants come to a period of transitional feeding until approximately 3 years of age. During this period, neurodevelopmental processes and anatomical and structural changes lead to the inhibition of basic feeding reflexes and support the development of more refined oral sensorimotor and swallowing skills. This progress in feeding and swallowing procedure enables the ingestion of various complex food and fluid textures, from various feeding utensils, and continues until approximately 3 years of age [14]. In a neurologically intact infant with a normal airway, cough may be an indicator of aspiration. While cough can be elicited at birth, it is a reflex that develops over time, providing airway protection [15].

PAEDIATRIC FEEDING AND SWALLOWING DISORDERS

The term dysphagia is defined as a feeding and swallowing disorder, which includes dysfunction of the motor or sensory aspects of swallowing [16], and originates from impairment in the mouth (including mandible, lips, teeth, tongue, cheeks, hard and soft palates), the pharynx, the larynx, and the upper oesophagus [12]. Paediatric dysphagia may include impairment to the cranial nerves: trigeminal (V), facial (VII), glossopharyngeal (IX), vagus (X), accessory (XI), and hypoglossal (XII) [17]. Functionally, paediatric dysphagia may include difficulties with sucking, drinking, chewing, swallowing, eating, progressing from breast or bottle to pureed or solid foods, control of saliva, ingesting medication, airway protection, while children may demonstrate gagging, choking, or vomiting incidents with the introduction of pureed or solid foods [18]. Dysphagia is a symptom [19] that involves the oral, pharyngeal or oesophageal phase of swallowing and can negatively impact health and quality of life (QoL) [20]. Paediatric dysphagia may have subsequent effects on everyday activity and participation [21].

For some children, the presence of a dysphagic symptom may signal the occurrence of a disease [22]. Children with dysphagia can present with various feeding and swallowing disorders affecting any or all of the swallowing phases. The most common paediatric dysphagia symptoms relevant to the oral phase are absent oral reflexes or primitive/neurological oral reflexes, inadequate lip closure, weak or uncoordinated suck, immature or disordered biting and/or chewing, poor bolus propulsion and poor bolus containment, impaired clearance of the bolus from the mouth following the swallow, oral sensorimotor impairments [1, 10, 23, 24]. The triggering of the swallow reflex may be affected when an infant or a child demonstrates absent swallow reflex, delayed triggering of the swallow and suck/swallow/breath incoordination [10]. Dysphagic symptoms related to the pharyngeal phase include delayed pharyngeal swallow response/ initiation, laryngeal penetration, oropharyngeal aspiration and silent aspiration, choking, pharyngeal residue, nasopharyngeal reflux [1, 10, 23]. Symptoms of dysphagia related to the oesophageal phase are residue above the upper oesophageal sphincter and residue or pooling in the oesophagus because of motility problems or gastroesophageal reflux [1].

CONDITIONS ASSOCIATED WITH PAEDIATRIC FEEDING AND SWALLOWING DISORDERS

It is increasingly recognised that feeding and swallowing disorders in the paediatric population are multifactorial. The domains that underlie paediatric feeding and swallowing disorders are medical, nutritional, feeding skills, and psychosocial [25].

The most common medical issues that a child with feeding and swallowing disorders may deal with are gastroesophageal reflux, neurological and cardiopulmonary conditions [24, 18, 25, 26], craniofacial anomalies [18, 24, 26], renal disease [24, 26], food allergies/ intolerance [18, 24], neurodevelopmental disorders (Autism Spectrum Disorders) [25], genetic, oncologic and metabolic causes [26]. Table 2 depicts common medical diagnoses associated with paediatric feeding and swallowing disorders [5, 27, 28].

Children with feeding and swallowing disorders may consume a limited quality, quantity, and/or variety of foods. As a result, they may deal with nutritional issues which include malnutrition, overnutrition, micronutrient deficiency or toxicity, and dehydration [25].

Feeding skill factors include impairment in oral sensory functioning, oral motor functioning, pharyngeal sensation functioning and pharyngeal motor functioning [25]. Disorders in gross-motor development, such as reduced postural stability or head control, and sensory processing issues, such as regulation disorders, sensory discrimination, and sensory-based motor delays are factors that lead to feeding and swallowing disorders

Table 2. *Common medical conditions associated with Paediatric Feeding and Swallowing Disorders.*

Neurological/ Neurodevelopmental	Prematurity, Cerebral Palsy, Perinatal Asphyxia, Acquired Brain Injury, Traumatic Brain Injury, Hypoxic Brain Injury, Cranial Nerve Injury, Myopathy, Congenital Myopathy, Myasthenia Gravis, Myotonic Dystrophy, Muscular Dystrophy, Seizures/ Seizure Disorders, Laryngeal Paralysis, Vocal Cord Paralysis, Autism Spectrum Disorder (ASD)
Structural	Cleft Lip/Palate, Craniofacial Anomalies, Macroglossia, Laryngomalacia, Laryngotracheal Cleft, Laryngeal Stenosis/ Cleft, Oesophageal Atresia, Tracheomalacia, Tracheosophageal Fistula, Iatrogenic (Tracheostomy)
Cardiopulmonary	Aspiration Lung Disease, Bronchopulmonary Dysplasia, Congenital Heart Disease, Respiratory Syncytial Virus
Gastrointestinal	Food Allergy/ Intolerance, Gastroesophageal Reflux Disease, Necrotizing Enterocolitis, Oesophageal Dysmotility
Genetic	Down Syndrome, Pierre-Robin Sequence, Prader-Willi, CHARGE Syndrome, Treacher-Collins Syndrome, Cornelia de Lange Syndrome

in the paediatric population [18].

Children with oral sensory functioning issues may demonstrate hyposensitivity, as they do not feel the food in their mouth and as a result they illustrate limited bolus formation, loss of food from the mouth, and gagging or refusal of liquids and food textures that provide inadequate sensory input [25]. Children with hypersensitivity may demonstrate gagging with specific food type/ texture/ size/ flavour/ temperature/ viscosity/ appearance [29, 30], excessive chewing, and limited variety of intake [25]. Sensory regulation problems can cause feeding and swallowing difficulties, such as food refusal and self-limited diets [31]. Children with oral motor functioning issues may reveal inefficient intake, messy eating, restricted control of liquids and food, slow or ineffective bolus formation and propulsion, gagging during bolus formation, and post swallowing residues [32].

Goday et al. cite the complications which are related to impairment in pharyngeal sensation and motor functioning [25]. Impairment in pharyngeal sensation functioning includes poor awareness of bolus location, delayed pharyngeal swallow response, nasopharyngeal reflux, post-swallow residue, laryngeal penetration and oropharyngeal aspiration. Impairment in pharyngeal motor functioning inhibits pharyngeal movements, as reduction in the strength and coordination of pharyngeal constrictors, velar and laryngeal elevation, and vocal fold closure may be noticed. When a child's feeding skills are not safe, age appropriate and efficient, feeding and swallowing disorder is hard to avoid.

Psychosocial factors in the child and/or caregiver can contribute to feeding and swallowing disorder [33], given that feeding occurs in the context of the caregiver-child dyad. Psychosocial factors are characterized as developmental factors, mental and behavioral health problems, social factors, or environmental factors [34, 35]. Paediatric feeding and swallowing disorders may become obvious with various behaviors. These behaviors include child's learned aversions to food, disruptive behavior, food overselectivity, failure to advance to age-appropriate diet despite adequate skills, grazing, child's and/or caregiver's stress or inappropriate caregiver's strategies to improve child's nutritional status [34].

THE ROLE OF THE SLP AND THE MULTIDISCIPLINARY TEAM IN PAEDIATRIC FEEDING AND SWALLOWING DISORDERS

Given that paediatric feeding and swallowing disorders occur in conjunction with multiple factors, a multidisciplinary approach is critical for the evaluation and appropriate treatment of these difficulties [26, 27]. Depending on the age and severity of feeding and swallowing disorders, children may receive intervention in various settings [36]. A multidisciplinary team consists of SLPs, occupational therapists (OT), physiotherapists (PT), nurses, dieticians, physicians, paediatricians, gastroenterologists and radiologists when radiological studies are necessary [28, 37]. Definitely, all professionals are not necessary for all children, as they may have different issues, which change over time [1]. SLPs are recognised by the American Speech-Language-Hearing Association (ASHA) as the primary experts involved, and they are responsible for the evaluation and management of dysphagia [23]. Specifically, the professional roles and responsibilities of SLPs involve the conduction of

a comprehensive assessment, including clinical and instrumental evaluations, the participation in decision-making regarding the appropriateness of instrumental evaluation procedures and follow-up, the diagnosing of feeding and swallowing disorders and the recognition of behavioural feeding problems, the education of parents/ caregivers to prevent complications related to feeding and swallowing disorders and the collaboration with other professionals, family members, caregivers in order to facilitate the treatment plan.

FEEDING AND SWALLOWING EVALUATION PROCESS

Commonly, physicians refer children to an SLP as seemingly deal with behavioural issues. A child may reveal refusal to eat, a limited diet based upon texture, taste and visual appearance, or difficult transition from breast or bottle to pureed or solid foods, accompanied by gagging, choking, or vomiting incidents with the introduction of food [18]. An in-depth SLP evaluation may reveal that all these difficulties are related with medical and developmental issues. Consequently, behavioural issues may develop secondary to feeding and swallowing difficulties in the oral phase.

Clinical Assessment Based on the World Health Organisation Concepts

According to the ASHA, the assessment of feeding and swallowing disorders should follow the International Classification of Functioning, Disability and Health (ICF) framework [38]. The World Health Organization's ICF, provides a standard language for international and multidisciplinary use, and incorporates (i) body function and structures, (ii) activities and participation, (iii) environmental factors and (iv) personal factors [39]. Studies provide a description of the different components of the ICF in relation to feeding and swallowing disorders [1, 40]. Specifically, the body functions components involve the swallowing procedure including specific movements (i.e. sucking, biting, chewing). The body structures components relate to the neurological system and the structures needed to carry out the physical act of the feeding procedure (i.e. teeth, tongue, jaw, larynx). Impairment of body function and structures, is relevant to deficits, including motor and sensory skills, neuromuscular and orthopaedic conditions or respiratory status. Activities involve the child's activity restrictions during mealtime, including self-feeding skills or adaptive equipment needs. Participation is linked to the social and physical mealtime settings where the child participates, including home and school. Environmental factors include facilitators or barriers, such as the availability of appropriate food texture or the support of family members. Personal factors include demographic characteristics (i.e. age, race), personality traits and preferences. For a comprehensive and in-depth assessment, information related to ICF components is necessary, while participation is the primary consideration in a feeding and swallowing assessment [1].

Screening Questions for Primary Care Physicians

SLPs are the most suitable professionals who can carry out an effective feeding and swallowing assessment. However, because of the fact that physicians are often the first professionals who meet children and their family, they should be able to elicit information regarding child's feeding and swallowing skills from parents/ caregivers, so as to refer them to an SLP, if indicated. Arvedson et al, proposes a list of questions which physicians may find helpful to determine if a child faces feeding and swallowing difficulties [1]:

- "How long does it take to feed the child?"
- "Is the child totally dependent on others for feeding? Does the child do some assisted feeding or some independent feeding?"
- "Does the child refuse food?"
- "Are mealtimes stressful?"
- "Has the child slowed or stopped gaining weight in the previous 2-3 months?"
- "Are there any signs of respiratory distress?"
- "Does the child vomit regularly? When? Under what circumstances does the vomiting occur? Can parents estimate the volume per event?"
- "Does the child get irritable or become lethargic during mealtimes?"

There are two methods for diagnosing paediatric dysphagia: The clinical feeding and swallowing evaluation and the instrumental evaluation of swallowing. It is essential for children to have a clinical feeding and swallowing evaluation prior to the instrumental evaluation of swallowing to enable diagnostic planning and priorities of the procedure.

Clinical Feeding and Swallowing Evaluation

The clinical feeding and swallowing evaluation includes a review of child's medical status, gross, fine and oral-motor development, sensory processing and nutritional status [8]. According to Arvedson et al, the clinical feeding and swallowing evaluation includes

history taking, pre-feeding evaluation, oral structure and function assessment and examination of cranial nerves function [1], as is described below:

Review of family, medical, development and feeding history, obtained from medical charts, clinicians and teachers, parents/ caregivers. The history should provide information on feeding environment, parent/ caregiver-child interaction and parental worries [1, 4, 41, 42].

The pre-feeding evaluation includes observation of saliva control, general posture, positioning and movement patterns, respiratory patterns, the child's response to stimulation (tactile, visual, auditory, olfactory), the level of responsiveness and mental state, the level of interaction and communication, self-regulation and self-calming [1, 43].

The oral structure and function assessment are carried out, evaluating structure, symmetry, tone and movement of the facial features including the jaw, lips, cheeks, tongue, hard and soft palate and uvula.

Feeding and swallowing evaluation includes the examination of cranial nerves function by evaluating oral reflexes, laryngeal function and movement during feeding related tasks [1].

A complete assessment process should include evaluation of feeding readiness, breast and bottle feeding (where age appropriate), drinking from various utensils, spoon feeding and eating solids. Initial interventions (trialing various food and fluid textures, taste, temperature) may be trialled to assess their effects, providing essential information on treatment planning [1].

The high incidence of children with feeding and swallowing disorders because of various reasons, results in a great need of validated non-instrumental swallowing and feeding assessment in paediatric population. The Schedule for Oral-Motor Assessment (SOMA) [44-46] and the Dysphagia Disorder Survey (DDS) [47] are two of the more commonly used standardized clinical measures of oral motor and feeding assessment for identification of feeding and swallowing disorders in paediatric populations [47, 48].

Instrumental Evaluation of Swallowing

Instrumental evaluation of swallowing is conducted to understand the nature and pathophysiology of the swallowing dysfunction and to obtain the information needed to develop the most appropriate treatment plan.

The two most used instrumental evaluations of swallowing for the paediatric population are the Videofluoroscopic Swallowing Study (VFSS) and the Flexible Endoscopic Evaluation of Swallowing (FEES). The decision regarding which instrumental evaluation of swallowing is necessary depends on the functional and anatomical process to be evaluated [49].

Videofluoroscopic Swallowing Study (VFSS)

The VFSS constitutes an instrumental evaluation which is performed by an SLP and a radiologist [50] and provides dynamic imaging of the phases of swallowing: the oral phase, the pharyngeal phase and the upper oesophageal phase of swallowing. Depending on which structures is essential to be evaluated, the VFSS can be carried out in the anterior-posterior or lateral view (more common) [1]. During the VFSS, the position of the child is similar to their usual feeding position (upright in a suitable paediatric chair, semi-reclined in an infant seat, or side-lying for some infants) [50]. The SLP is responsible for the preparation and presentation of various amounts and consistencies of barium sulfate, with or without food [51]. Food and fluids may be given to the children in various textures (such as purees, lumpy, mashed (semisolid) textures, chewable solid, thickened fluids (mild, moderate, thick) and thin fluid [23, 50] and are given with their regular utensils (bottles, teats, cups, spoons, etc) [50]. During this radiographic examination, variations, such as postural variations, altering head and neck position, changing food/ fluid bolus size and/ or texture, effect of additional dry swallows, food/ fluid bolus placement in the mouth, changing utensils and therapeutic manoeuvres, may be assessed to determine their effect [23] and also to facilitate the treatment plan. The VFSS can identify delays in the pharyngeal transit time, dysfunction in the velopharyngeal closure and laryngeal penetration and aspiration, before or during the swallow [41].

Flexible Endoscopic Examination of Swallowing (FEES/ FEES-ST)

The FEES is an instrumental evaluation which is completed by an SLP and a paediatric Otolaryngologist (ENT) [1, 52] and provides visualisation of events, which occur before and after the pharyngeal swallow [1]. A flexible endoscope is inserted through the child's nose, which allows for the visualisation of nasal, pharyngeal, and laryngeal structures. FEES is possible to be performed at the bedside and the child should swallow a bolus of food and/ or fluid that includes an amount of methylene blue. Food and fluids can be given to the children in various textures and with multiple utensils, and compensatory and therapeutic swallowing tech-

niques can be implemented [53]. During this examination, the examiner(s) may wish to perform a sensory test (FEESST), which uses air pressure to evaluate laryngeal reflexes [1]. The swallowing function parameters which are assessed during FEES/ FEESST involve pharyngeal pooling of secretions, premature spillage into pharynx, laryngeal penetration, aspiration, vocal fold paresis, gag reflex and laryngeal adductor reflex (LAR) [49].

Other Diagnostic Evaluations

While VFSS and FEES exams are the most commonly instrumental feeding and swallowing assessments in paediatric practice, other methods have received attention for their diagnostic usefulness in paediatric populations. Ultrasonography (US) is carried out in order to visualize temporal relationships between movement patterns during the oral and pharyngeal phase in infants and young children [1]. Specialized diagnostic evaluations may be essential for children who deal with respiratory issues. These evaluations may include chest radiographs, pulmonary function tests, high-resolution CT, and bronchoscopy. Endoscopy may be crucial for children who deal with gastrointestinal issues [27].

MANAGEMENT OF PAEDIATRIC FEEDING AND SWALLOWING DISORDERS

The multidisciplinary approach plays a leading role in the diagnosis and management of dysphagia in the paediatric population [27]. In order the most appropriate dysphagia intervention to be achieved, SLPs should focus on improved individual functioning across all ICF components.

Common feeding and swallowing treatment strategies that address the pathophysiology of swallowing dysfunction in infants and children include medical or surgical intervention, Oral-Motor Exercises (OME), adapted feeding equipment, diet modifications, compensatory strategies, Neuromuscular Electrical Stimulation (NMES), supplemental feeding, behaviourally based intervention, environmental changes, and also oral hygiene.

For children with physical or anatomic issues (laryngeal cleft or tracheoesophageal fistula), inflammatory issues (eg, esophagitis), gastroesophageal reflux disease (GERD) [27] and congenital abnormalities preventing optimal swallow function (stricture, severe reflux, cleft palate, etc), medical or surgical interventions can be used to treat dysphagia [43]. In very severe cases of chronic aspiration, laryngotracheal separation may be considered by the medical team [54]. For children with tracheotomies, a cap or a speaking valve can be used to increase pressure, aiding in the development and function of a more normal oropharynx [43].

SLPs working with children who deal with feeding and swallowing disorders frequently incorporate OME into their treatment plan. OME constitute (i) active exercises, (ii) passive exercises, and (iii) sensory applications [55]. Active exercises include active range of motion, stretching, and strength training and are used to increase strength, endurance, and power of the face, tongue, lips, and palate muscles [56]. Passive exercises include massage, tapping, stimulation, stroking, vibration, and passive range of motion exercises, provided by the SLP with little action from the child [36]. Passive exercises aim to provide sensory input, improve circulation, enhance joint flexibility, reduce abnormal oral reflexes, facilitate normal muscle tone, and desensitize the oral cavity [57]. Sensory applications constitute the use of heat, cold, electrical stimulation, high-frequency vibration, or other agents to muscle tissues. Sensory applications may be applied to enhance sensory awareness to initiate a swallow response or to strengthen the swallowing musculature [36]. Although OME are widely applied by SLPs, the use of them outside of a functional setting remains controversial. Both Beckman et al, and Rosenfeld-Johnson et al, support that the application of OME outside of a functional setting can improve the swallowing process [58, 59] . However, other authors support that there is insufficient evidence to determine the effects of OME on paediatric populations with feeding and swallowing disorders without the use of functional therapy tasks that directly impact on eating and drinking skills and/or safety [36, 60, 61].

When the child has improved sensory regulation and their oral-motor skills, a therapeutic feeding program can be designed, including adaptive utensils, various bottles, nipples, cups, spoons and therapeutic straws [62]. The adapted feeding equipment is used to control liquid flow and bolus size and shape. Diet modifications can improve the timing, coordination and sensory input of food and liquid. The modification of food and liquids is achieved by modifying viscosity, texture, temperature or taste [63]. Compensatory swallowing manoeuvers can lead to improved oropharyngeal musculature, airway protection and safe transition of food/ liquid bolus, by adjusting the child's position during the feeding process [63]. These manoeuvers may be appropriate for older children with signs of aspiration, depending on the pathophysiology and the ability of children to follow

directions [27]. Treatment recommendations, relevant to the most appropriate compensatory swallowing manoeuver, are made based on instrumental examination findings. NMES is usually used as a swallowing therapy in case of pharyngeal dysphagia. However, there are studies which support that the impact of NMES on dysphagia management is controversial. According to a study, the use of NMES of anterior neck muscles in a heterogeneous group of children with swallowing dysfunction did not impact on swallow function compared with the control group, which received only OME and diet modifications [64]. On the other hand, NMES constitutes an effective intervention for different paediatric caseloads with pharyngeal phase dysfunction as it is evidenced by a case series design [65].

In case of severe dysphagia, recommendation of alternative avenues of nutrition and hydration (including nasogastric tube or gastrostomy) may be made, so that safe swallowing and adequate nutrition/ hydration to be ensured [43]. Despite the feeding tube placement, SLPs and caregivers should make efforts to offer tastes to children for swallowing practice [27].

For children with behavioral feeding issues, behavioural approaches focus on parent/ caregiver education, behavioral modifications and the presentation of shaping, prompting, modelling, stimulus fading and antecedent manipulation [63]. Behaviourally based interventions may have beneficial impact on feeding behaviour [66]. Environmental changes, such as alteration of the temperature, light and noise in the child's feeding environment, may relax infants and young children [67], demonstrating improved feeding skills. Oral hygiene is an intimate component of all treatment techniques because poor oral hygiene is a risk factor for lung infections.

Overall, the specific treatment strategies, used by SLPs in collaboration with the multidisciplinary team, are individualized and depend on the nature of the feeding and swallowing disorder, as well as the child's response to treatment interventions.

CONCLUSION

The development of feeding and swallowing skills begins in the fetal period and continues until early childhood. Feeding and swallowing dysfunction in the paediatric population may be attributed to various aetiologies and may be manifested with different signs and symptoms. The primary expert for the evaluation and management of paediatric dysphagia is the SLP. However, the collaboration between SLPs and multidisciplinary team plays a critical role in decision making, as dysphagia is multifactorial. Feeding and swallowing evaluation in the paediatric population involves clinical and instrumental swallowing evaluation and provides vital information to diagnosis and treatment planning. The primary goal of all therapeutic approaches is the safeguarding of adequate nutrition, hydration, and airway protection.

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