American Journal of Sciences and Engineering Research

E-ISSN -2348 – 703X, Volume 6, Issue 1, 2023

Efficacy of Sensory Approach for the Management of Pediatric Dysphagia (1- 3 Years of Age)

Sabeen Iqbal Rajput[1], Tasneem Ali[2], Fatima Yousuf[3], Rabbiah Binte Sohail[4]

[1,] *BS-SLT, Speech Language Therapist, Ziauddin College of Speech Language and Hearing Sciences, Ziauddin University, Karachi, Pakistan.*
[2,] *MS-SLP, Speech Language Pathologist, Via Services, Santa Clara, CA.*
[3,] *BS-SLT, Speech Language Therapist, Ziauddin College of Speech Language and Hearing Sciences, Ziauddin University, Karachi, Pakistan.*
[4,] *BS-SLT, Speech Language Therapist, Ziauddin College of Speech Language and Hearing Sciences, Ziauddin University, Karachi, Pakistan.*

ABSTRACT:

Objectives: *The purpose of this paper is to review the recent literature about the sensory approaches, which do not involve the use battery-operated tools for the treatment of dysphagia, in the pediatric population. The paper will shed light on the reasons of prompt intervention needed for this age group of children. The paper will attempt to distinguish between the motor and sensory systems involved in the process of swallowing and how these systems are affected due to certain disorders. Finally, this paper will provide insight on the efficacy of sensory (stimulation) approach in minimizing the feeding/swallowing difficulties in the pediatric population.*

Method*: A review of the recent literature from 2000-2021 was studied about the sensory stimulation approaches of treatment for dysphagia in pediatric population for children (1-3 years of age). Key sources of literature search included the Sci-hub, PubMed, HINARI (Health Inter Network Access to Research Initiative) and Google Scholar data bases.*

Conclusion: *There is a dire need to conduct high quality research studies for oropharyngeal dysphagia in pediatric population in Pakistan. The investigative studies must include different disorders and larger sample size for making strong recommendations relating to the sensory approaches for dysphagia management in children aged 1-3 years.*

Key words: sensory stimulation, oropharyngeal dysarthria, oral tactile stimulation

I. INTRODUCTION

Dysphagia refers to difficulty /discomfort with feeding or swallowing. It is not characterized as a disorder itself, but it is a symptom which may be found with different disorders and diseases. It is difficulty in placing, receiving, maintaining, and transferring food and liquids from mouth to the esophagus and the stomach (Sheppard et al. 2014).

The act of deglutition can be divided into phases: (1) the oral phase which involves suckling or mastication, and the movement of the bolus towards the pharynx (2) initiation of the swallowing reflex; (3) In pharyngeal phase the bolus moves through the pharynx and (4) esophageal phase in which the bolus moves through the esophagus to the stomach (Dodrill et al. 2015). Any difficulty or impairment in one of these phases will result in a feeding/swallowing concern.

Feeding skills are developed in a sequential pattern like the chronological pattern. The simple oral motor patterns appear first and gradually as the individual grows more complex oral motor patterns are achieved. If the child is fixed in a particular set of patterns and not able to advance further a feeding problem is warranted. (Kerwin et al. 2003).

Feeding/swallowing difficulties in children are detrimental because they have significant effects on the nutritional aspect which in turn is related to their cognitive growth and development. (Dodrill et al. 2015). Feeding difficulties in children can have a greater impact on the nutritional intake. This reduced nutritional intake is mostly associated with the cognitive and behavioral concerns. Feeding issues impacts a child's social, emotional, and cultural development (Schuberth et al.2010).

Normal feeding and swallowing are a sequential process from oral gross motor skills to more fine motor skills, in young infants all the 4 phases of swallowing are reflexive and involuntary but as they grow up the oral phase comes under the voluntary control (Dodrill et al. 2014)

The Suckle reflex comes in first and is mastered till the age of 4 months of age (Kerwin et al. 2005) and then the child progresses to more complex movements such as: sucking, munching, and chewing (Bosma et al. 1986) the skills continue to develop until child reaches the rotary chewing which is the most complex movement for feeding/swallowing (Newton et al. 1991).

Feeding and swallowing is conceptualized as a chore which requires 25-32 skills-based steps and not a simple 2 step process that involves sitting and eating food. (Kerwin 2005)

Children who have developmental delays are often seen to have more feeding and swallowing difficulties as compared to the ones who are typically developing (Keen et al. 2008). The causes of dysphagia in children are different from that of the adult population (Newman LA et al. 2001). Often the children who have cerebral palsy, acquired traumatic brain injuries and other neuromuscular, craniofacial malformation and gastrointestinal diseases are observed to have oropharyngeal dysphagia (AL Nassar et al. 2011).

Before moving to the treatment, it is always essential to look at the underlying factors which may be sensory, motor or both. (McAllister et al.2018). Typical assessment for swallowing and feeding skills include: a detailed medical and developmental history, examination of the anatomy and physiology of structures important for swallowing, identifying the level and effectiveness of development for these skills and the behaviors associated with these tasks. In some cases, a modified barium swallow study may be warranted (Arvedson et al. 2002). VFSS and FEES exam can be complimentary, and both provide accurate diagnosis of dysphagia in pediatric population when applied and interpreted by experienced clinicians. (Dodrill et al. 2015).

The sensory aspect involved in swallowing is a complex system. The child receives the information from receptors for touch, pressure and taste and this changes from moment to moment during activities that involve swallowing and thus guides the coordination of structures and systems (Arvedson et al. 2002)

Cohesive sensory information from different receptors (contact receptors, distance receptors, proprioceptors, and organ systems) is important for building up motor planning skills that incorporate both motor control and motor learning (Roley et al. 2001)

The sensory approach is more of a direct management technique that targets physiological impairments which enhances neuromuscular control and strength (Logemann et al. 2000).

The stimulation for oral and perioral muscles were focused for attaining total oral feeding, sensory motor approaches may improve feeding skills (Arvedson et al. 2010). The stimulation programs consisted of stroking or application of light pressure to lips, cheeks, tongue, and oral structures (McFarland et al. 2012).

The sequential-oral-sensory (SOS) approach to feeding is a multifaceted approach which assesses and provides treatment for the children who struggle to eat. SOS approach looks at the child as a whole and employ a holistic approach to feeding difficulties. SOS approach is a play-based approach in which the child is given different textures to practice with.

Systematic desensitization is the treatment method which is used in SOS. The therapist uses social role modeling and play with food to help child visually explore and then move up to manipulating, smelling,

touching, tasting, and finally eating the food (Toomey et al. 2011). The SOS approach for feeding is widely used currently by occupational therapist and speech therapist for feeding selectivity and refusal, (Boyd et al. 2007).

Three comprehensive research studies were conducted for investigating the impact of SOS feeding approach on the feeding and swallowing issues. In 2006 a study was conducted by Creech with the age range of 17 months to 31 months. The mealtime was videotaped while using SOS feeding approach and it was noted that there is a significant improvement and increase in positive mealtime (i.e., reduction of sensory responses like gag, vomiting and hand retraction on different texture after 10 weeks of intervention (Creech et al.2006).

Another study was conducted in 2007 on 37 children, aged 18 months to 61 months, the intervention was given for 12 weeks once a week for an hour. The results showed improved feeding skills and decreased oral hypersensitivity, with 7 children fully transitioned from gastrostomy tubes to age-appropriate diet. (Boyd et al.2007).

Toomey in 2002 studied 46 children by SOS feeding therapy for 12 weeks, these children were struggling to gain weight because of poor feeding skills. After 12 weeks of intervention, the increase in the weight was evident (Toomey et al. 2002)

The use of tapping (tactile stimulation) provided in combination with pressure and speed of input was studied in 2000. The results showed that this approach does change the tone of the muscles. Frist the perioral musculatures are targeted and then transitioned is to intraoral musculatures (Morris et al.2000). The combination of fast tapping and light pressure applied with fast pace the oral motoric system and can increase the tone of the muscles, whereas slow tapping with deep pressure applied tend to decrease the rigidity or decrease the tone of oral musculature (Morris et al. 2000).

A series of intervention studies have been conducted for children who refuse to eat food. The sample size was limited to 119 children and age bracket for the study was from 4 months to 15 years of age. The impact of oral tactile stimulation was studied in children who were present with dysphagia from a neurogenic cause. The positive results were seen when the oral tactile stimulation was combined with other interventions, such as swallowing therapy, and behavior modification (Gibbson et al. 2007, Elliot et al. 2006, Lamm NC et al. 2005)

Diet modification enhances the sensory awareness in the child's mouth. If the child is having difficulty in feeding and swallowing, one option is diet modification. Changing bolus size, flavor, and texture according to the child's need is done. Opting for a large bolus size is used to increase the sensory awareness within the oral cavity and it also reduces the pharyngeal transit time, whereas small bolus size is recommended (Hollin et al. 2011).

Texture and flavor of the bolus is also used for increasing sensory awareness and reduce the risk of aspiration, as it is advised to use thickened liquids for the reduction of aspiration risks in children (Hollin et al. 2011), Although it requires further investigation and evidence investigation (Coleman et al. 2011).

A systematic literature review was conducted in 2014 which concluded that there are number of different approaches and strategies which can be utilized by the professionals to provide intervention for the children facing feeding and swallowing difficulties. These may include behavioral strategies, environmental modification, oral-motor exercises, and sensory approaches. The children may benefit the most with the combination of these mentioned approaches and may increase food intake and meal participation (Cerase et al. 2014).

A recent study was conducted with the focus sample population of 45 children with severe dysphagia and the treatment given to them was intra oral tactile stimulation .and the results suggested that most of the children were able to eat after 2 years of therapy (Lamm NC et al. 2005). Significant impact of oral tactile stimulation intervention was seen when combined with other therapy approaches (Lindh et al.2018).

A systematic review was done in 2021 which included 7 investigative studies on oral motor, oral sensory and oral sensorimotor interventions for children diagnosed with feeding and swallowing difficulties. These studies served as evidence for the effectiveness of oral motor and oral sensory facilitation approaches.

The children benefited from these approaches and further improvement were seen along with the Innsbruck Sensorimotor Activator and Regulator (ISMAR), Sequential Oral Sensory (SOS) and postural control for the participants with neurodevelopmental diagnosis (Voniati L et al. 2021).

II. DISCUSSION

The sensory system is of critical importance in the development and progression of feeding and swallowing skills in children, especially when the children are aged 1 to 3 years. At this age the transition from liquid to solid food consistency is achieved and different food consistencies are being explored by the child. In neonates, the oral phase of swallowing is reflexive, whereas when they grow up it goes under the voluntary control and require highly coordinated and efficient sensory motor skills to full fill the nutritional requirements of body

As we know through the literature that this age is one of the most crucial periods of development as the child is growing (physically and cognitively) at a certainly fast and rapid rate, so the nutritional requirements are to be met and if there is difficulty at any phase of feeding or swallowing then the growth and development of the child is compromised.

The sensory and motor systems have strong and infused relation with each other and cannot be separated from one another. If the oral sensation, awareness, and stimulation is provided intervention it will influence the oral motor skills and hence the swallowing mechanism.

The child might be struggling with feeding and swallowing skills because either of the two underlying factors: concerns in oral motor system and/or the oral sensory system. The most common symptoms may be observed as the child might pocket the food , refuse to eat , gag ,vomit or spit out the food just because s/he might not have efficient oral-motor skills to manipulate the bolus which requires tongue lateralization, rhythmic chew, jaw stability, grading, tongue elevation and coordination or s/he might be having some impairment in sensory system presenting symptoms such as food aversions, refusal, spitting out food, gaging and vomiting because the child may be hypersensitive (i.e. the sensory awareness of bolus is high) or hyposensitive (i.e. lack of sensation, awareness) to food.

In recent years the attention has shifted from geriatric population to pediatric population for investigating the sensory aspect of dysphagia, as there is a dire need of understanding and evidence-based approaches for this population. Some research studies have suggested that oral tactile stimulation, tapping perioral and oral, changing of texture, flavor and bolus size plays an important role in minimizing the symptoms of oropharyngeal dysphagia when used with behavioral management techniques for feeding

As the symptoms of motor and sensory issues may overlap with each other and cannot be separated, the clinicians should opt for a comprehensive feeding and swallowing assessment to carefully understand the underlying factor.

Interventions such as Sequential Oral Sensory (SOS) approach for feeding is a holistic approach where different aspects are worked upon to achieve better feeding and swallowing skills. This approach still needs more evidence and studies, to pin down the hierarchy of sensory activities to be used with different disorders.

Limited investigation is present in literature to analyze the outcomes of sensory approaches without the use of battery-operated tools on the oropharyngeal dysphagia for the pediatric population especially from 1 year till 3-year aged children. Most of the studies have analyzed the effects of strategies with a combination approach without distinction between battery operated tools and non- battery operated tools.

The sample sizes in the literature documented is limited and homogenous. The studies have most often investigated a particular disorder (neurogenic). There is a limited number of research present on this topic.

These studies which have been reflected upon for this review article gives an insight that there is a need for deep and enhanced understanding on the sensory approaches to be used as intervention for dysphagia in pediatric population.

III. CONCLUSION

Feeding and swallowing is a complex and integrated task requiring efficient oral motor and sensory systems and if there is any deficit or impairment in these systems it might have grave impact on the physical growth and the cognitive development of children

Current evidence from literature has shown that sensory stimulation, awareness, and diet modification approaches have significant impact on minimizing difficulty with feeding and swallowing when used with other swallowing and behavior modification techniques for neurogenic disorders. To start with sensory stimulation and oral tactile stimulation, the child must have medical stability (i.e., Vitals are in the normal limits) and postural alignment (body's alignment to allow the child to sit)

Strong evidence-based data is warranted for the sensory approaches used in pediatric population, not the holistic viewpoint but specifically pertaining to the sensory awareness, oral tactile stimulation and diet modification, proper hierarchical sensory activities should be made and tested with different disorders and larger sample size

Most studies conducted in past highlight that the right combination of different approaches can work, but the evidence relies mostly on studies done with small sample sizes. Due to this reason, there is need to assess and validate multiple different types of interventions and this responsibility needs to be with speech language therapists. The therapists further need to ensure that the approaches proposed remain cost effective for patients. Use of battery-operated tools and other devises makes the treatment more expensive for patient, without full evidence of their effectiveness. It would be important for the therapists to develop an intervention plan which is adapted to the affordability levels, socio-economic awareness, and medical requirement of the cases. These assessments can be done more scientifically in developed markets (where data can be leveraged), and will require strong judgement from therapist in developing markets (relying more on experience and interviews with parents).

A heterogeneous a sample size investigative studies both quantitative and qualitative are warranted in the domain of sensory strategies without the use of battery-operated devices for the pediatric population in this region of the world.

IV. REFRENCES

1. Sheppard, J. J. (2008). Using motor learning approaches for treating swallowing and feeding disorders: A review. *Language, speech, and hearing services in schools*
2. Dodrill, P., &Gosa, M. M. (2015). Pediatric dysphagia: physiology, assessment, and management. *Annals of Nutrition and Metabolism*, *66*(Suppl. 5), 24-31.
3. Manno, C. J., Fox, C., Eicher, P. S., &Kerwin, M. E. (2005). Early oral-motor interventions for pediatric feeding problems: What, when and how. *Journal of early and intensive behavior intervention*, *2*(3), 145.
4. Sjögreen, L., Gonzalez Lindh, M., Brodén, M., Krüssenberg, C., Ristic, I., Rubensson, A., & McAllister, A. (2018). Oral Sensory-Motor Intervention for Children and Adolescents (3-18 Years) With Dysphagia or Impaired Saliva Control Secondary to Congenital or Early Acquired Disabilities: A Review of the Literature, 2000 to
5. Toomey, K. A., & Ross, E. S. (2011). SOS approach to feeding. *Perspectives on Swallowing and Swallowing Disorders (Dysphagia)*, *20*(3), 82-87.
6. Benson, J. D., Parke, C. S., Gannon, C., & Muñoz, D. (2013). A retrospective analysis of the sequential oral sensory feeding approach in children with feeding difficulties. *Journal of Occupational Therapy, Schools, & Early Intervention*, *6*(4), 289-300.
7. Overland, L. (2011). A sensory-motor approach to feeding. *Perspectives on Swallowing and Swallowing Disorders (Dysphagia)*, *20*(3), 60-64.
8. Creech, E. (2006). Behavioral changes across ten weeks of SOS Approach to Feeding therapy. *Unpublished manuscript*.
9. Malandraki, G. A., Roth, M., & Sheppard, J. J. (2014). Telepractice for pediatric dysphagia: A case study.

International journal of telerehabilitation, *6*(1),

10. Gibbons BG, Williams KE, Riegel KE. Reducing tube feeds and tongue thrust: combining an oral-motor and behavioral approach to feeding. Am J OccupTher. 2007;61(4):384-391.
11. Korbmacher H, Limbrock HJ, Kahl-Nieke B. Orofacial development in children with Down's syndrome 12 years after early intervention with a stimulating plate. J OrofacOrthop. 2004;65(1):60-73.
12. Eckman N, Williams KE, Riegel K, Paul C. Teaching chewing: a structured approach. Am J OccupTher. 2008;62(5):514-521.
13. Sjögreen L, Tulinius M, Kiliaridis S, Lohmander A. The effect of lip strengthening exercises in children and adolescents with myotonic dystrophy type 1. Int J PediatrOtorhinolaryngol. 2010;74(10):1126-1134.
14. Theodoros, D. (2012). A new era in speech-language pathology practice: Innovation and diversification. *International Journal of Speech-Language Pathology*, *14*(3), 189-199.
15. Arvedson, J. C. (2008). Assessment of pediatric dysphagia and feeding disorders: clinical and instrumental approaches. *Developmental disabilities research reviews*, *14*(2), 118- 127.
16. Miller, C. K., &Willging, J. P. (2003). Advances in the evaluation and management of pediatric dysphagia. *Current opinion in otolaryngology & head and neck surgery*, *11*(6), 442-446.
17. Cerase, B. S., OTS, M., Faigle, B. S., OTS, A., Hunsinger, B. A., OTS, E., ... & OTS, E. (2014). Food for Thought: Effectiveness of Occupational Therapy Interventions to Improve Feeding and Eating in Children.
18. Voniati, L., Papaleontiou, A., Georgiou, R. *et al.* The Effectiveness of Oral Sensorimotor Intervention in Children with Feeding Disorders. *Curr Dev Disord Rep* **8**, 201–211 (2021).
19. Kerzner, B., Milano, K., MacLean, W. C., Berall, G., Stuart, S., &Chatoor, I. (2015). A practical approach to classifying and managing feeding difficulties. *Pediatrics*, *135*(2), 344-353.
20. Miller, C. K., Burklow, K. A., Santoro, K., Kirby, E., Mason, D., & Rudolph, C. D. (2001). An interdisciplinary team approach to the management of pediatric feeding and swallowing disorders. *Children's Health Care*, *30*(3), 201-218.