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Effectiveness of Oromotor Therapy Through Parent Mediated Intervention for Drooling in Children with Spastic Cerebral Palsy

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Abstract:

➢ ***Background***

Drooling occurs in nearly half of the population of individuals with cerebral palsy, with spastic cerebral palsy being the most prevalent type. This study aims at administration of oromotor therapy as a parent mediated intervention and in obtaining a quantified data of the measure of improvement among the children with spastic cerebral palsy.

➢ ***Method***

A quasi-experimental study was conducted with parents, of children with spastic cerebral palsy that have drooling, as participants. Children with spastic cerebral palsy aged 5 to 15 years were screened using Modified Ashworth Scale (MAS), Gross Motor Function Classification Scale (GMFCS), drooling severity and frequency scale (DSFS). Oromotor Therapy (OMT) was administered to 20 children with spastic cerebral palsy via a parent mediated intervention, following which drooling was evaluated using the Drooling Impact Scale. Over the course of 10 weeks, a single group received OMT, with a frequency of three sessions per week, each session lasting thirty minutes.

➢ ***Result***

From the statistical analysis, it is shown that there is a significant difference in the pre-test and post-test scores, and drooling significantly decreased which suggest the effectiveness of oromotor therapy through parent mediated intervention for drooling in children with spastic cerebral palsy.

➢ ***Conclusion***

The result of the study concludes that there is a reduction in drooling through the administration of parent mediated intervention among the children with spastic cerebral palsy.

Keywords: *Spastic Cerebral Palsy, Oromotor Therapy, Parent Mediated Intervention.*

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I. INTRODUCTION

➢ *Cerebral Palsy*

Cerebral palsy (CP) is a group of neurological disorders that affect movement, muscle tone, and motor skills. It is brought on by damage to the developing brain or aberrant brain development, which frequently happens prior to, during, or soon after birth (1). Movement and posture abnormalities are characteristic feature of cerebral palsy and can be linked to other conditions like epilepsy, learning disorders, intellectual disabilities, and vision or hearing impairments.

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CP is brought on by numerous traumas like trauma, infection; oxygen deprivation during pregnancy, labor, or the immediate postpartum period is linked to the causes of cerebral palsy. Although it is a permanent disability, people can enhance their functioning and quality of life with the right care and early intervention (2).

➢ *Drooling in Spastic Cerebral Palsy and its Impact:*

Drooling (also known as driveling, ptyalism, sialorrhea, or slobbering) refers to the flow of saliva outside the mouth unintentionally, defined as "saliva beyond the margin of the lip" (3). A dysfunction of the salivary gland can also cause drooling (4).

A neuromuscular control system for swallowing that is out of balance and poor tongue control causes drooling linked with spastic cerebral palsy. It can be a complex problem that includes head posture and control issues in addition to a lack of intraoral feeling. Because it emphasizes the proper posture for kids to promote their oral sensorimotor processes and head control, both of which are crucial components of drooling (5).

Drooling may continue in children with neurodevelopmental difficulties because of swallowing disorders of the oral and/or oral-pharyngeal phase. The Gross Motor Function Classification Scale (GMFCS) stage indicates a substantial association between the degree of gross motor function and oral motor severity, and the incidence of drooling in cerebral palsy varies from 22 to 85.7%, with a higher frequency in spastic quadriplegia (6). Even though drooling rarely persists in a developmentally typical child, it is deemed abnormal, after the age of four (7). 44% is the prevalence rate of drooling in persons with cerebral palsy (11).

Serious clinical, functional, and socio-emotional issues include aspiration, asphyxia, feeding issues, skin tears; rejection, stigmatization, and isolation are brought on by drooling. It also interferes with education and leads to increased dependency, affecting overall quality of life (11, 10). Drooling can lead to functional difficulties in chewing and speech interference (9).

➢ *Oromotor Therapy:*

Oro-motor therapy (OMT) is a conventional swallowing rehabilitation treatment that works well for enhancing drool control, oral motor promotion, and safe and efficient swallowing. It seeks to enhance high-level oral movement control, oral sensory adaption, oral structural movement coordination, and posture control. Additionally, it works well for psychological aspects including stress relief and enhancing the bond between parents and kids. Children with Down syndrome, intellectual disabilities, and cerebral palsy can all benefit from oral motor therapy as a means of managing their drooling (10). Studies have shown that incorporating OMT into the intervention protocols for children with CP can lead to significant improvements in oral motor functions, reduction of drooling and enhancing the overall quality of life (11,12).

Oromotor therapy includes activities that involve sensory stimulation to or actions of the lips, jaw, tongue, soft palate, larynx, and respiratory muscles which are intended to influence the physiologic underpinnings of the oropharyngeal mechanism and thus improve its functions. OMTs may include Active muscle exercise, Passive exercise, and Sensory stimulation (13).

Oromotor Therapy (OMT) is incorporated into occupational therapy plans when working with kids who have difficulties in swallowing, eating and drooling. Active exercises, Passive exercises, and Sensory applications are the three main OMT categories that are frequently employed in clinical practice (14).

- Active exercises are activities that require a person to put forth physical effort in order to activate their muscles. Active range of motion, stretching, and strength training are just a few examples. These activities increase muscle fiber size, which recruits more motor units and aids in the development of strength, endurance, and power. Activities such the "touch nose" and "touch chin" exercises; "tongue extension" activity, "lip stretching" activity, "card pull" activity, and "spoon holding" activities are among them (13).
- Passive exercises do not require active muscular contraction and can be carried out with help, such as from a therapist, to move joints and muscles through their full range of motion. It includes a number of methods, including passive range-of-motion activities, tapping, vibration, stimulation, stroking, and massage. These exercises require little involvement from the patient receiving therapy because the physician or care-giver assists or performs the movements themselves. These therapies aim to maintain or improve joint flexibility, stimulate the senses, and encourage circulation. According to theories, some of the methods used during passive activities are able to normalize feeding pattern and reduce drooling which is achieved by reducing abnormal oral reflexes, normalization of muscle tone, or desensitization of oral region (13).
- Sensory applications include applying heat, cold, electrical stimulation, high frequency vibration, or other substances to muscle tissues. Certain stimuli, such as cold, can be used to initiate the swallowing reflex and enhance sensory awareness. Others, including electrical stimulation, are used to improve the swallowing muscles. A key part of clinical decision making is selecting an appropriate intervention based on the three fundamental principles of evidence-based practice: the child's and family's choices, the clinician's experience, and an assessment of the most recent available data (13).

➢ *Parent Mediated Intervention*

Interventions where parents actively participate are known as parent-mediated interventions (PMI), and they are typically technique-focused. The child gains indirect benefits as the parents receive education regarding the child's condition. These PMI can be primary, in which the parent provides the intervention primarily or secondary, in which the parents collaborate with a qualified therapist(15).

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According to Conrad et al., parent-mediated interventions are therapeutic approaches in which medical professionals provide coaching and education to empower parents to support their child's development by acquiring the skills, information, and techniques they need to enhance outcomes for both the parent and the child. In order to provide these interventions, medical professionals or organizations instruct and mentor parents on how to improve the development of their disabled child by putting interventions into practice in the home. Parent-mediated therapies can be provided directly through in-person consultations with medical professionals, via telehealth, internet forums, or both. A variety of children and families with different contexts can benefit from parent-mediated therapies.

II. AIM AND OBJECTIVES

➢ *Aim of the Study:*

To find the Effectiveness of Oromotor therapy as Parent mediated intervention in reducing drooling among children with spastic cerebral palsy.

➢ *Objectives of the Study:*

- To assess Drooling using the Drooling Impact Scale.
- To provide a session of parental training program.
- To provide parent mediated intervention of Oromotor Therapy for 30 sessions.
- To reassess the Drooling using the Drooling Impact Scale.
- Compare the pre & post-test value scores of Drooling Impact Scale.
- To determine the Effectiveness of Oromotor therapy as a parent mediated intervention for drooling.

➢ *Hypothesis*

➢ *Null Hypothesis:*

There is no significant reduction in drooling through administration of Oromotor therapy as a Parent mediated intervention for drooling.

➢ *Alternative Hypothesis:*

There is significant reduction in drooling through administration of Oromotor therapy as a Parent mediated intervention for drooling.

III. NEED OF THE STUDY

Children with cerebral palsy often struggle with drooling, which can lead to both skin and psychological disorders. Oromotor therapy is the most effective treatment for sialorrhea, followed by various non-invasive therapies (16).Because child will require significant, sustained encouragement and support to achieve any level of success, family members and carers must also "buy in" to oral-motor programs (17).

This study will increase the amount of information in the literature that occupational therapist and other professionals can use to plan services and it educates the parents about rehabilitative services and challenges as well as the sources that are available. The study adds corroboration to the existing evidence-based approaches about parent mediated intervention. Additionally, prior research has demonstrated that parental involvement enhances the parents' quality of life, reduces their stress levels, and is said to intensify therapy (18). Therefore, the purpose of this research is to quantify the measure of improvement obtained via a parent mediated intervention.

Long-term symptom reduction, better prognoses for a variety of behavioural and brain functions, and improved parent-child dyadic social communication are all outcomes associated with parent-mediated interventions (19).

IV. REVIEW OF LITERATURE

Eshani Mallick et al., (2017) conducted a study on "Effect of Oral Sensorimotor Stimulation on Drooling and its Relationship with Feeding Behavior in Children with Spastic Cerebral Palsy". The two outcome measures used to assess feeding behavior and drooling are the Drooling Impact Scale and the Behavioral Pediatrics Feeding Assessment Scale, respectively. The study's findings show that oral sensory-motor stimulation, when integrated with conventional occupational therapy, improves feeding behavior and decreases drooling in children with spastic cerebral palsy more than conventional occupational therapy separately. Also, it has been demonstrated that among children with spastic cerebral palsy, drooling has a positive effect on feeding behavior (20)**.**

Ashwini Malokar et al., (2023) conducted a study on "To Study the Effectiveness of Roods Approach Versus Oromotor Stimulation Exercise on Drooling Cerebral Palsy Children - A Randomized Control Trial"**.** Oro-motor exercises were found to be a more effective management strategy for CP children's drooling frequency and effect on their lives than Rood's approach (21).

Nimmy, S. Priya, Evin C. Evans et al., (2024) did a study on "Oromotor rehabilitation on drooling and feeding activities in children with cerebral palsy: A case study". This case report intends to explain the difficulties that children with cerebral palsy encounter in oromotor functional activity. The results of the study shows a clinical improvement in the drooling impact and feeding activities (22).

Julia Cullenward et al., 2024, conducted a study on "Characteristics of effective parent mediated interventions for parents of children with neurodevelopmental in rural areas: a systematic review protocol". This review covers both primary and supplementary interventions, as well as the phases of the implementation process. This systematic review concludes listing the components of a successful parent-mediated intervention for parents of children with neurodevelopmental problems who live in the countryside(19).

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V. METHODOLOGY

- Research Design: Quasi experimental study design (Single group pre-test and post-test study).
- SAMPLING: Convenience sampling was used for this study.
- Sample Size: (n) = 20
- Duration of Study: 30 minutes per session, 3 times a week for a period of 10 weeks.
- Place of Study: College Of Occupational Therapy, Department of Therapeutics; Cross-Disability Early Intervention Center (CDEIC) and The Special School at the National Institute for Empowerment of Persons with Multiple Disabilities (NIEPMD), Chennai.
- Dependent Variable: Drooling.
- Independent Variable: Oromotor therapy.

➢ *Selection Criteria:*

- *Inclusion Criteria:*

✓ Children of the age group of 5 to 15 years, who have spastic cerebral palsy.
✓ Gross Motor Functional Classification System: Grade I to Grade IV
✓ Children who are cooperative enough to the parents.
✓ Both genders.
✓ Children who are able to comprehend simple instructions.
✓ Parents who are able to read and understand simple written instructions and communicate effectively in either English or Tamil.

- *Exclusion Criteria:*

✓ Child that has undergone medical interventions for drooling in last 3 months (23).
✓ Presence of co-morbid conditions like cleft lip and cleft palate, micrognathia.

➢ *Tools Used*

- Drooling Impact Scale (DIS):

The DIS consists of 10 items, each rated on a 10-point scale (1 to 10) with higher scores indicating a greater impact. The tool helps assess the impact of drooling on a child's quality of life and the parents/caregiver. Total scores of the questionnaire can range from 10 to 100, with 10 indicating no drooling or effect on quality of life and 100 indicating constant, severe drooling with significant effect on patient and caregiver quality of life (24).

- Modified Ashworth Scale (MAS)
- Gross Motor Function Classification System (GMFCS)
- Drooling Severity and Frequency Scale (DSFS)

VI. INTERVENTION PROTOCOL

The modified treatment protocol consists of 10 activities to provide sensory as well as motor stimulation to face, tongue and gums. Treatment duration was given for 30 minutes, 3 sessions per week for 10 weeks (20).

Each of the activities is classified into 3 categories:

- Active movements: blowing out candles, blowing a whistle, blowing thermocol balls with a straw, lateral tongue movement, chewing.
- Sensory stimulation: massage, brushing.
- Passive movement: Tapping, pressing, stroking.

➢ *Positioning While Providing Intervention:*

Oromotor therapy was given to the single group in seated position on a special seating device, corner seat or any rigid chair that has a 90-degree backrest and an armrest. Trunk in upright position, shoulders and arms rested on arm rests or lap boards and hips, knees, ankles at 90 degree were maintained (25).

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Table 1: Intervention Protocol

SI.NO	TREATMENT PROTOCOL	APPLICATION TECHNIQUE	FREQUENCY
1.	Tapping	Slow rhythmic tapping of both sides of cheek outside of upper and lower gums over the lower lip.	10 repetitions 5 times
2.	Pressure	Rhythmic downward pressure with finger in middle of the tongue. Firm rhythmic pressure through the lower jaw (chin). Firm pressure over the lower lip.	5 times
3.	Stroking	Deep and firm pressure using downward bilateral strokes on cheeks towards lips. Downward stroke with fingers on child's throat.	5 times
4.	Candle blowing	Blowing candle kept at distance where the child could blow at least once. If able to blow all 10 times, then 1 cm distance was increased.	10 times
5.	Whistling	Hold the stem of the whistle in the mouth and blows air until the sound is made.	5 times
6.	Blowing	Blowing thermocol balls through straw Hold the straw in the mouth. Patient blows air through the straw at the balls for 3 seconds and then repeated.	10 times
7.	Tongue lateralization	Tongue lateralization by use of jam placed on four corners of the lips alternatively: left and right corner and middle of upper and lower lips so that the tongue had to remove the stimulus from outside the oral cavity.	5 times
8.	Brushing	Brush downward over the outer surface of teeth/ gums. The brush can also be dipped in cold water for temperature input.	5 times
9.	Vigor of chewing by biscuits	Small pieces of biscuits will be placed on the molars to the right or left alternatively and then the child will be encouraged to chew the biscuit piece	5 times
10.	Pressure on the biting surface of teeth	Moderate to firm pressure input downward through the biting surfaces of the lower teeth/ gums and upward through the biting surfaces of the upper teeth or gums.	6 to 10 seconds

(20)**,** (26)

VII. PROCEDURE

Parents of children with spastic cerebral palsy of the age group 5- 15 were selected based on the selection criteria. A convenience sampling was used for the study. The study was conducted in College of Occupational Therapy, Department of Therapeutics; Cross-Disability Early Intervention Center (CDEIC) and the Special School at the National Institute for Empowerment of Persons with Multiple Disabilities (NIEPMD), Chennai. The parents of the children were explained about the purpose of the study. Then the written consent was obtained from the parents of the children prior to the study. It was assured to them that all the information would be kept confidential. Assessment of Cerebral Palsy children with spasticity was done by using Modified Ashworth Scale (MAS), Gross motor function classification system (GMFCS), Drooling Frequency and Severity Scale (DSFS) as a screening measure. In the Twenty children with spastic cerebral palsy who fulfilled the inclusion criteria, drooling was assessed using the Drooling Impact Scale (DIS). Parental training was provided in group for one session during which the parents were trained about the protocol through explanation and demonstration; and were given an instruction manual (developed based on the modified protocol) in either English or Tamil according to their preference. Also initially, the parents were asked to provide intervention under the supervision of the therapist to enable them to provide feedback to the parents. The participants were given 30 sessions of Oromotor Therapy by the parents, each session was for 30 minutes for a period of 10 weeks. A Parental Self-report Log was used to monitor the number of sessions. Then using the Drooling Impact Scale reassessment for drooling was done for all twenty participants. The collected data was analyzed and estimated using Wilcoxon Signed Rank Test. The results were obtained.

VIII. RESULT

Age distribution of the participants chosen for the study ranges from 5 to 15 with a mean value of age 10 and there was an equal gender distribution among the 20 participants, 10 females and 10 males constituting 50% and 50% respectively.

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Table 2: Wilcoxon Signed Rank Test was Performed to Compare the Pre and Post-Test Scoring Regarding DIS (Components) at 5% Level of Significance was Observed

DIS Components		Mean	N	Std. Deviation	Z – Value (P - Value)
DIS 1	Pre	7.65	20	1.694	-4.006 (0.001)*
	Post	5.95	20	1.638	
DIS 2	Pre	8.05	20	1.905	-3.572 (0.001)*
	Post	6.60	20	1.789	
DIS 3	Pre	5.45	20	1.669	-3.345 (0.001)*
	Post	4.20	20	1.542	
DIS 4	Pre	5.30	20	1.949	-2.070 (0.038)*
	Post	4.95	20	1.638	
DIS 5	Pre	4.55	20	1.791	-2.598 (0.009)*
	Post	4.00	20	1.806	
DIS 6	Pre	7.60	20	1.984	-3.903 (0.001)*
	Post	6.00	20	1.919	
DIS 7	Pre	5.95	20	1.905	-2.111 (0.035)*
	Post	5.60	20	1.759	
DIS 8	Pre	6.55	20	1.791	-3.920 (0.001)*
	Post	5.00	20	1.717	
DIS 9	Pre	6.75	20	1.888	-3.542 (0.001)*
	Post	5.75	20	2.023	
DIS 10	Pre	6.90	20	1.586	3.314 (0.001)*
	Post	5.80	20	2.093	

* Indicates Statistically Significance

Table 2: The above table shows that there is significant difference between the pre and post-test scoring regarding Drooling Impact Scale (DIS) in each component while providing the Oromotor therapy as parent mediated intervention to reduce drooling in children with spastic cerebral palsy.

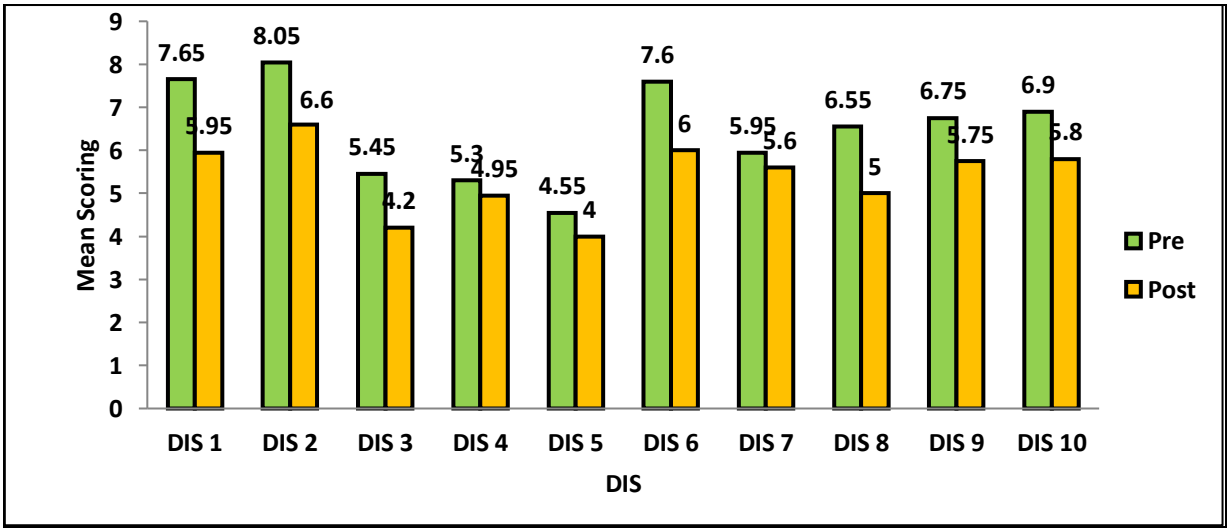

Fig – 1: The above picture depicts the graphical representation of pre-test and post-test scores between the individual items of the drooling Impact Scale (DIS) while providing the oromotor therapy as parent mediated intervention in the reduction of drooling.

Table – 3: Wilcoxon Signed Rank Test was Performed to Compare the Pre and Post-Test Scoring Regarding DIS (Total) at 5% Level of Significance was Observed

DIS		Mean	N	Std. Deviation	Z – Value (P - Value)
Total	Pre	64.75	20	16.248	-3.922 (0.001)*
	Post	53.50	20	16.237	

* Indicates Statistically Significance

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Table – 3: The above table shows the comparison between pre-test and post-test total mean scores, it is observed that there is a significant difference between the DIS total scores while providing the Oromotor therapy as parent mediated intervention in the reduction of drooling.

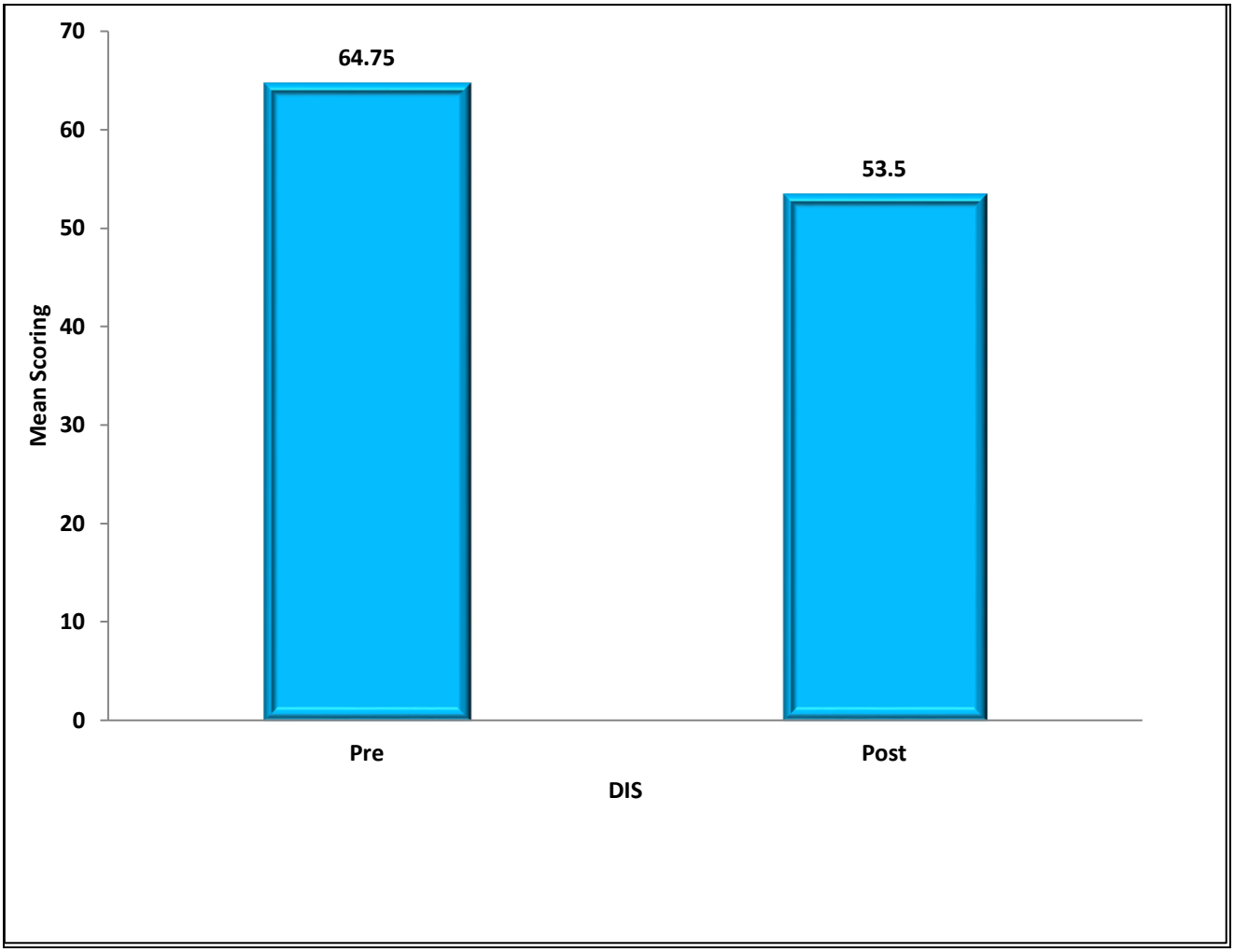

Fig – 2: The Above Picture is a Graphical Representation of the Pre-Test and Post-Test Total Scores Using the Drooling Impact Scale.

IX. DISCUSSION

- *Table 2 & 3: Comparison of Mean Scores (Pre-Test vs. Post-Test)*

The Wilcoxon Signed Rank Test confirmed that each individual items of the DIS showed significant improvement post-intervention. The mean scores for all DIS items decreased significantly, with values ranging from 0.001 to 0.038, indicating that Oromotor therapy was effective in reducing drooling. Additionally, the overall total score for drooling impact showed a significant decrease from a pre-intervention mean of 64.75 to a post-intervention mean of 53.50 ($p = 0.001$), further substantiating the effectiveness of the intervention. These results echo findings from prior studies, such as Mallick et al. (2017) and Bavikatte et al. (2016), which highlight the efficacy of Oromotor therapy in reducing drooling severity and improving caregiving dynamics (20,23).

Starting with DIS 1 (Frequency of Drooling), Pre-test mean score was 7.65, which reduced to 5.95 in the post-test, showing a significant improvement of 1.70 reflecting a reduction in drooling frequency. Similarly, in the DIS 2 (Severity of Drooling), the Pre-test mean score was 8.05, which reduced to 6.60 in the post-test, showing an improvement of 1.45. In terms of the DIS 3 (Frequency of Clothing Changes), mean score improved from 5.45 to 4.20, showing an improvement of 1.25. DIS 4 (Saliva Odor), showing a relatively smaller improvement compared to other items, still showed an improvement of 0.35. For DIS 5 (Skin Irritation), the Pre-test mean score was 4.55, which reduced to 4.00 in the post-test, showing an improvement of 0.55. Notably in the DIS 6 (Mouth Wiping Frequency), Pre-test mean score was 7.60, which reduced to 6.00 in the post-test, showing an improvement of 1.60. The DIS 7 (Child's Embarrassment) showed an improvement of 0.35 where the mean score was 5.95 in the pre-test, which reduced to 5.60 in the post-test. In item DIS 8 (Cleaning Saliva from Household Items), the Pre-test mean score was 6.55, which reduced to 5.00 in the post-test, showing an improvement of 1.55. The item which showed the most improvement, measures the need to clean saliva from household items indicating a substantial

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reduction in the need for cleanup, thereby reducing the burden on caregivers. In terms of DIS 9 (Impact on Child's Life), the Pre-test mean score was 6.75, which reduced to 5.75 in the post-test, showing an improvement of 1.00. For DIS 10 (Impact on Family's Life), the Pre-test mean score was 6.90, which reduced to 5.80 in the post-test, showing an improvement of 1.10. Improvements across all items further substantiate the findings of Iram et al. (2014) and Min et al. (2022), which demonstrated Oromotor therapy's impact on physical, social, and emotional aspects of drooling management (10,16).

In summary, the results of this study demonstrated a statistically significant reduction in drooling as assessed through the Drooling Impact Scale (DIS) after the administration of Oromotor therapy as a parent-mediated intervention. The Oromotor therapy intervention significantly reduced the impact of drooling across all components of the Drooling Impact Scale (DIS), with notable improvements in reducing practical caregiving tasks and drooling frequency. Age-wise, there were no major differences in therapy effectiveness, although older children had higher pre-test scores in specific components like saliva odor. Similarly, the intervention was equally effective across both genders, with no significant discrepancies in outcomes. The results highlight the broad applicability and effectiveness of parent-mediated Oromotor therapy in managing drooling.

X. CONCLUSION

The findings of this study demonstrate that parent-mediated Oromotor therapy is an effective intervention for reducing the impact of drooling in children. The therapy showed significant improvements in various physical, social, and emotional aspects of drooling, as measured by the Drooling Impact Scale. The intervention was equally effective across different age groups and genders, indicating its broad applicability. By addressing the items of the Drooling Impact Scale, the therapy enhanced the quality of life for both children and their families.

LIMITATION

- Stratified sampling technique could have been used for the study.

RECOMMENDATIONS

- All or other types of cerebral palsy can be included.
- Furthermore, large-scale comparative studies about different Oromotor treatment modalities can be conducted.

- Declaration by Authors

- Ethical Approval: Approved

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