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Short Communication

Evaluation of the synergistic effect of physiotherapy and preventive dental treatment on drooling in children with special healthcare needs

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ABSTRACT

Drooling is the involuntary, passive spillage of saliva due to inability to handle oral secretions, normally occurring in infants and young children. It is considered abnormal to have problems with saliva control beyond the age of 4 years. Physiotherapy treatment including oral motor stimulation has been regularly used to decrease drooling but its effect along with dental treatment is unknown. Therefore, the study was conducted with the combined effect of physiotherapy and dental treatment on drooling in children with developmental disorders. A study with pre-post intervention experimental design was conducted to study the combined effect of physiotherapy and dental treatment. Ten children with developmental disorders in the age group of 4-12 years with a complaint of drooling were recruited from the pediatric out-patients department and child developmental centre of a tertiary care hospital and a special school in Belagavi, India. Pre interventions outcomes for drooling severity through 5-minute drooling quotient scale, impact of drooling through drooling impact scale and oral hygiene status through OHIS index were noted. Children were subjected to dental intervention consisting of oral prophylaxis and fluoride application followed by physiotherapy intervention consisting of oral motor stimulation thrice a week for 4 weeks. Data was analyzed using descriptive analysis. The results indicated a significant improvement in drooling with a mean difference of 11.20±4.87 and p=0.001 on the drooling impact scale and mean difference of 23.66±6.07 and p=0.001 on the 5-minute drooling scale. It also indicated a significant improvement in plaque scores with the mean difference of 0.25±0.16 and p=0.001 ($p<0.05$). This study showed that combination of physiotherapy and dental treatment is useful for the treatment of drooling in children with developmental disorders and shown that interdisciplinary approach is more effective in management of these children.

Keywords: Children, Dental treatment, Developmental disorders, Drooling, Physiotherapy treatment

INTRODUCTION

Drooling or sialorrhea is the involuntary, passive spillage of saliva from the mouth due to inability to handle oral secretions, normally occurring in infants and young children.[1,2]As neurological control of the tongue and bulbar musculature develops, salivary "continence" normally occurs by the 15-18 months, though a high number of typically developing children will continue to drool until the age of 3 years. The ability to control saliva

develops alongside normal feeding and oral-motor control. It is considered abnormal to have problems with saliva control (sialorrhea) beyond the age of 4 years.[3]

The unconscious swallowing of saliva is a complex process and requires the coordination of over 25 pairs of bulbar muscles.[3] Drooling is a multifaceted dysfunction, with lack of external somatic and intraoral sensation being involved as well as the impaired motor coordination in or around the mouth.

The most frequent causes in the drooling of saliva in neuro-disability include difficulties in oral motor function when swallowing, sensory disturbances around the mouth leading to impaired swallowing of saliva and lack of correlation between the sense of spilling of saliva and swallowing process, inflammation or infections of the oral cavity or the dental problems causing hypersalivation.[3,4]

Overall prevalence of significant chronic drooling in childhood is put at up to 0.6% and is more common children with developmental/neurological co-morbidities.[2,3] Commonest populations with severe and persisting difficulty is children with quadriplegic cerebral palsy where prevalence rate is as high as 30-53%.[2] Sullivan et al estimated 28% of children with neurological impairment to suffer from continuous drooling.[5]

Consequences of drooling include irritated facial skin, unpleasant odour, increased oral and perioral infections, hygiene problems, dehydration, negative comments from other children, social embarrassment.[1,2] It also necessitates frequent clothing change, can cause damage to books, electronic equipment, and other educational materials.[2] Importantly, social-emotional effects can be debilitating and may include reduced self-esteem and quality of social interactions, and potential peer rejection resulting in reduced participation in home, school and community life.[4] Children who drool have increased difficulty forming a bolus, reduced lip closure, slightly less intraoral suction, and more oral residue after the swallow.[2]

Management of drooling involves a multidisciplinary approach. Some procedures such as behavior modification, oral motor therapy, speech therapy, drug therapy, orofacial regulation therapy, treatment of malocclusion and gingivitis have been suggested to treat drooling.[1] Physiotherapy treatment consisting of Oral Motor interventions involve innerving sensory nerves for exact working of the mouth contents and respiratory muscles which are meant to effect the physiological support of the oral-pharyngeal process and thus improving its functions.[4] Dental treatment includes oral health hygiene, brushing techniques, dental prophylaxis and intraoral devices. Maintenance of good oral health is very important to avoid exacerbation of sialorrhoea as well as therefore routine dental appointments are important.[3]

However, no studies have evaluated the effect of physiotherapy combined with dental treatment to decrease drooling in children with developmental disorders. Therefore, the aim of this study was to determine the combined effect of physiotherapy and dental treatment on drooling in children with developmental disorders

METHOD

The present study is an in vivo study which was conducted among ten children who reported to the outdoor patient department of Pediatric physiotherapy ward at the child development centre at KAHER's KLE Physiotherapy ward and one special child school in Belagavi, India. Children with the developmental disorders and aged between 4-12 years with chief complaint of drooling as stated by parents were included in the study. Children who were on medications for controlling drooling, those who have undergone surgeries for drooling or around the oral cavity or have undergone any trauma to oral cavity or face within the past 3 months were excluded from the study.

Sample size was calculated using the standard sample size formula based on the previous study keeping the confidence level at 85% and the probability of 0.05. A total of ten participants were included. The study was conducted between October 2020 to April 2021. Ethical clearance has been obtained from the institutional review board. After obtaining a written informed consent from the parents and verbal/written informed assent from the child, baseline assessment for drooling was done using drooling impact scale, 5-minute drooling quotient and oral hygiene index scale (OHIS).

The treatment consisted of two phases of dental treatment and twelve sessions of physiotherapy including oral motor stimulation thrice a week for four weeks. Dental treatment was comprised of preventive treatment procedures including oral prophylaxis followed by fluoride application (Figure 1). Furthermore, children and their parents were also taught regarding proper brushing technique for the maintenance of hygiene as well. The assessment of plaque and calculus score was done using Oral hygiene Index scale at baseline and post operatively after 4 weeks after preventive treatment on recall visit.

For physiotherapy treatment, oral motor stimulation with the help of NUK brush was given (Figure 2). It consisted of stimulation of the subject's hard palate vertically (10 times) and horizontally (10 times), stimulation of inside and outside of upper and lower gums (5 times each), massaging the center and both sides of the tongue (5 times each) and stimulation of inside of each cheek (5 times on either side). The assessment was carried out at the baseline and at the end of 4 weeks post therapy.

Figure 1: The preventive dental treatment.

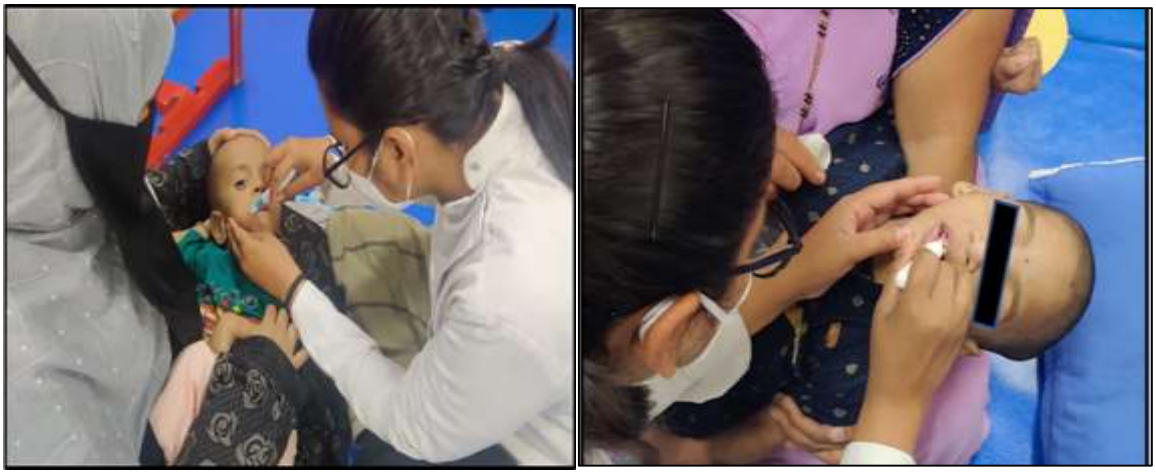

Figure 2: Oro motor stimulation.

RESULTS

Present study comprised 10 children with developmental disorders between the age group of four to twelve years. It included 70% male and females 30%. Equitable distribution of all participants seen according to age owing to mean value of 7.02±which shows lesser selection bias and more standardization.

In our study we have recorded the amount of drooling in the children with the developmental disorders with the help of drooling impact scale and 5 minutes drooling quotient. The values are recorded at baseline and post physiotherapy. The mean drooling value pre-treatment was 39.30±11.33. Post therapy mean value was 28.10±8.35. On assessing the difference in the amount of drooling in the child pre and post therapy using 't' test, the mean difference of 11.20±4.87 was obtained owing to a t=7.270. The results were found statistically significant owing to a p=0.001 (p<0.05) (Table 1).

Similarly, the mean drooling value while assessing through 5 minutes drooling quotient pre-treatment was 44.95±8.23. Post therapy mean value was found to be 21.30±7.47. On assessing the difference in the amount of drooling in the child pre and post therapy using 't' test, the mean difference of 23.66±6.07was obtained owing to a t=12.328. The results were found statistically significant owing to a p=0.001 (p<0.05) (Table 2).

Moreover, oral hygiene status was evaluated using oral hygiene index scale. Recorded mean plaque and calculus value pre-treatment was 0.63±0.29. Post therapy mean value was found to be 0.37±0.26. On assessing difference in plaque scores in child pre and post preventive procedure using t test, mean difference of 0.25±0.16 obtained owing to t=4.941. Results found statistically significant owing to p=0.001 (p<0.05) (Table 3).

Thus, a significant change in the levels of drooling and oral hygiene was found when the physiotherapy was combined with the preventive oral treatment.

Table 1: Pre and post operative values of drooling impact scale using 't' test.

Pre	Post	Diff	Effect size	T value	P value
Mean±SD	**Mean±SD**	**Mean±SD**			
39.30±11.33	28.10±8.35	11.20±4.87	2.30	7.270	0.001

Table 2: Pre and post operative values of 5 minutes drooling quotient using 't' test.

Pre	Post	Diff	Effect size	T value	P value
Mean±SD	**Mean±SD**	**Mean±SD**			
44.95±8.23	21.30±7.47	23.66±6.07	3.90	12.328	0.001

Table 3: Pre and post operative values of oral hygiene index scale using 't' test.

Pre	Post	Diff	Effect size	T value	P value
Mean±SD	**Mean±SD**	**Mean±SD**			
0.63± 0.29	0.37± 0.26	0.25±0.16	1.56	4.941	0.001

DISCUSSION

Drooling is defined as an uncontrolled and continuous discharge of saliva from the mouth in children or adults, occurring due to wide range of causes. It is considered to be normal in small children during the eruption of teeth and until 18-24 months of age, but is regarded abnormal if it persists beyond 4 years of age.[6] It is most commonly seen in the children with motor dysfunction and markedly in children with cerebral palsy.

Cerebral palsy has been referred as one of the non-progressive disorders of posture and movement caused due to injury of brain. American academy for cerebral palsy and developmental medicine describes it as a group of disorders of the development of posture and movement, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The keynote elements which describe the condition are the disorganized motor functions, prenatal etiology along with static causative lesions.[7]

In these children oro-facial dysfunction is seen as a severe health problem which is usually not readily accepted by the peers and society. Most common manifestations are drooling, eating, drinking and speech disorders. In regards to the literature available till date, ninety percent of children with cerebral palsy have oro motor dysfunction.[7] However, the treatment rate pertaining to the dysfunction has been extremely low. It in turn affects the quality of life of these children.

Oro motor dysfunction can be treated cumulatively using an oral motor therapy which contains array of procedures that aims to enhance oral function via eliminating the deleterious oral habits. It also attempts to rejuvenate the altered neuromuscular functions initiating from an early age in order to achieve adequate mouth and lip seal, provide nasal breathing and adequate neuromuscular coordination. It thus aids in maintaining the oral health quality of life in children.[6]

Conversely, clinical management of drooling should not only be restricted to the implementation of therapeutic strategies designed to potentiate or enhance the patient neuromuscular imbalances and reducing the salivary flow rate. The problem is complex, due to high intervening factors and thus, a multidisciplinary approach is required, with the likely intervention of pediatric dentist, pediatricians, neurologists, physiotherapists, surgeons and speech therapists.

On the contrary, the treatment of oro-facial dysfunction is that part of physiotherapy which has often been neglected or missed completely in the process of rehabilitation. Some areas of body such as face, tongue, palate and throat can be effectively treated in the children with cerebral palsy. A sound knowledge regarding the muscles in these areas, along with the physiotherapist's ability to re-train function and patience pertaining to both therapist and patient can help in achieving the results and in overall improvement in Oro motor functions.[8]

Nonetheless, oral health-related quality of life (OHRQoL) in children can be defined as a multidimensional construct which includes the subjective evaluation of the child's oral health, overall functional and emotional well-being, expectations and satisfaction with care along with a sense of self.[9] Thus, the ideal case scenario of effectively managing the child with Oro motor dysfunction can be achieved by combing the two approaches that are Physiotherapy along with the preventive dental treatment. This will enhance the overall well-being to the child.

To the best of our knowledge, the current study is a first attempt to combine physiotherapy with dental treatment to treat drooling in children with developmental disorders. Previous research has proved that Oral health-related quality of life (OHRQoL) in children as a multi-dimensional construct which includes the subjective evaluation of the child's oral health, overall functional and emotional well-being, expectations and satisfaction with care along with a sense of self.[7] Thus, the ideal case

scenario of effectively managing the child with oro-motor dysfunction can be achieved by combing the two approaches that are physiotherapy along with the preventive dental treatment. Hence, this study incorporated both aspects for the treatment of drooling. In our study the appointments for both the treatments (physiotherapy and dental) was scheduled and provided during the morning hours meeting to the need and more cooperative behavior of the children with developmental disorders. However, amendments were done on request of the parents pertaining to a definitive reason.

With this aim in mind, an attempt has been made to carry out this multi centric research and approach. In our study we have assessed and evaluated the oral hygiene status in children with cerebral palsy preoperatively and post operatively using oral hygiene index scale (OHIS). This was followed by a preventive treatment comprising of oral prophylaxis and fluoride application. Simultaneously, for recording severity the drooling in these patients, 5 minutes drooling quotient and Drooling impact scale has been taken to record the findings pre and post operatively. It was followed by oro-motor stimulation using the NUK brush. This in turn facilitated the proper coordination of muscles and their organization leading to decrease in drooling.

In study conducted by Sığan et al on 81 children with cerebral palsy, they reported that oral motor training had significant effect on feeding problems on children. Likewise, study also showed significant improvement on drooling in children with developmental disorders.[8]

Contrary to the results of this study, Domaracki and Sisson researched the effect of oral motor stimulation on drooling, which affects social life and health in children. Two patients received oral motor training for an hour on school days, but there was no reduction seen in drooling. This further shows that dental treatment must have added to the effect of physiotherapy in the treatment of drooling.[9]

To our exclamation a highly significant results were obtained in our study with a $p=0.001$ ($p<0.0010$), when the Oro-motor physiotherapy has been given to these children, a high rate to reduction in drooling was observed due to enhancement of muscular harmony and function. Furthermore, the addition of preventive dental treatment had led to marked improvement in the oral hygiene of these children.

Oral health is gradually recognized as a key foundation for general health and wellness and a key indicator for the success of dental treatment.[10] The combined efforts of physiotherapy and preventive dental care in the direction to initiate and rehabilitate the Oro-motor dysfunction in the children with developmental disorders, can serve as a stepping stone towards the enrichment of these children.

Stating from the definition of pediatric dentistry which involves imparting of oral health care to the children with special health care needs, it is of prime importance as a Pediatric dentist to visualize the clinical condition from the multi faceted view. The knowledge of multi specialty approach along with the basic preventive and therapeutic care can lead a pediatric dentist make difference in the quality of life of especially able children of our society. It also facilitates team work among health professionals for quality health services for children with special needs in terms of oral health

CONCLUSION

Combination of physiotherapy and dental treatment is effective for the treatment of drooling in children with developmental disorders. An interdisciplinary approach should be used for the treatment of drooling in these children.

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