

## ORIGINAL ARTICLE

## EFFECTIVENESS OF KINESIO TAPING WITH OROMOTOR EXERCISES IN IMPROVING DROOLING AMONG CHILDREN WITH CEREBRAL PALSY

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## ABSTRACT

**Objective:** To determine the effectiveness of kinesio taping (KT) with oromotor exercises (OME) in improving drooling in children with cerebral palsy. **Material and Methods:** A randomized control trial (RCT) was conducted at National Institute of Rehabilitation Medicine (NIRM). Forty eight CP children, age ranged 4-8 years, having good head control and fair comprehension for verbal commands with drooling severity  $\geq 3$  rated on Thomas Stonells drooling scale were included in the study. The n=48 CP children were equally divided into two groups. Group A (n=24) participants were given an hour time which included taping of orbicularis oris muscle followed by oral motor exercises. Group B (n=24) participants were given the same treatment except there was only application of Kinesio taping of orbicularis oris muscle without oral motor exercises. The participants were assessed 5 times; at week 0 (Baseline) and then during intervention at week 4, week 8, week 12 and finally at week 16 after completion of intervention. Data was collected through Thomas Stonells drooling scale and drooling impact scale. Data was analyzed by using SPSS version 21. For presentation of categorical and demographic variables, mean and standard deviation were used. RM-ANOVA was used to analyze changes within the groups and independent samples t-test was used for differences between the groups. **Results:** The mean age in group A is  $3.93 \pm 1.7$  years and the mean age in group B is  $3.66 \pm 1.26$  years. The result showed significant improvement within both groups ( $p \leq 0.05$ ). Between groups comparison revealed more significant decrease in drooling severity and its impact in group A (KT+OME) as compared to group B (KT) at  $p \leq 0.05$ . In case drooling frequency no significant difference was observed. **Conclusion:** The results of the study indicated that kinesio tapping along with oro-motor exercises were more effective management option for drooling severity and impact on CP children life.

**Keywords:** Cerebral palsy, drooling, kinesio taping, oro-motor exercises, Thomas Stonells drooling scale, drooling impact scale.

## INTRODUCTION

Cerebral Palsy (CP) is a developmental disorder of brain that leads to movement and posture dysfunction. It may affect oral motor skills resulting in speech delay, drooling and troubles with sucking, gulping and biting<sup>1,2</sup>. The sustaining issues of oral motor dysfunction leads to feeding difficulties that results in growth and development retardation<sup>3</sup> while drooling prompts physical issues and affects social improvement<sup>4</sup>. CP is a common disorder throughout the world which accounts for 1.5 to 4 kids for each 10000 living labors. This adds up to around 5000-10000 children born with CP annually in United States. Consistently around 1500 babies are diagnosed to have this disorder every year. The overall prevalence of significant chronic drooling in childhood is put up to 0.6%. The commonest population group with severe and persisting difficulty is children with quadriplegic CP where the prevalence rate is as high as 30%-53%<sup>5</sup>. Symptoms of CP include feeding difficulties, communication difficulties, drooling, spasticity, bowel and bladder dysfunction, constipation and contractures. The overall picture of CP shows disturbances in growth, sensation, communication,

gait and cognition, all contribute to physical and mental dysfunction<sup>6</sup>. As a result of neurodevelopmental delay primary functions such as swallowing, intraoral tongue suction and lip closure are disturbed. 10 to 37% of CP children are estimated to be affected by drooling<sup>7</sup>. CP children do not have neuromuscular control that's why it's not possible for them to manage the posterior drooling of saliva in which the tongue spills back the saliva. This causes children with cerebral palsy having problems with breathing, aspiration into trachea and coughing that all can sometimes leads to recurrent pneumonia<sup>8</sup>.

There are different treatment strategies being used for the management of drooling i.e. surgical, pharmacological, therapeutic exercises for orofacial muscles and intra oral devices. These treatment options for the management of drooling include improving tone of orofacial muscles to develop voluntary control of muscles and increasing sensory awareness. Techniques for orofacial facilitation include manipulation, vibration and brushing<sup>9</sup>.

In the past few years use of Kinesio tape in the treatment of neurological problems has become more wide spread. In children the neurological problems for which the Kinesio



tape is being used includes dysarthria including difficulty in closing mouth with increased drooling, TMJ hypermobility and articulation problems<sup>10</sup>. Kase'et al<sup>11</sup> described various benefits of Kinesio taping that depends on the amount of stretch applied during the application of Kinesio tape. It helps moving exudates towards the lymph duct for removal of edema, 2) alignment of facial tissues, 3) assistance in limitation of motion and providing sensory stimulation, 4) through skin providing a positional stimulus, 5) lifting tissues and fascia over the area of inflammation and pain creating more space. Wearing time of 1 application of Kinesio tape is usually longer than 3 to 4 days. It is composed of 100% cotton that's allows it to quickly dry and evaporation so that without reapplying it can be worn in pool and shower<sup>11</sup>.

On the other hand oral motor exercises include brushing of tongue, upper and lower gums, hard palate and inside of cheeks including vibration of chin and neck<sup>12</sup>. Oral motor therapy includes physiotherapist, speech therapist and patient's family and will definitely have a beneficial effect in oral motor functions in CP child<sup>13</sup>. Different intraoral appliances including sensory-motor activator and regulators are also now being used for the management of drooling and have been found beneficial in controlling the problem<sup>14</sup>.

As there are limited well designed clinical trials on the effectiveness of kinesio taping and its comparison with oral motor exercises for the management of drooling in CP children so this study was conducted to determine this fact.

## MATERIAL & METHODS

A randomized clinical trial was conducted to make comparison in terms of drooling severity in patients presenting with cerebral palsy by using kinesiotaping with and without oromotor exercises. Total 48 CP children were recruited for this study. Males and females, having age ranged between 4-8 years and drooling rate of  $\geq 3$  rated on Thomas Stonells drooling scale were included in the study. Only those CP patients were included who had good understanding of verbal commands and had good head control. The children who were undergoing any other treatment strategy for drooling like medications, recent surgery, history of intra salivary gland injections, uncontrolled seizures, uncorrected or corrected cleft palate or cleft lip and open wounds around lips or on face were excluded from the study.

The participants were divided into two homogeneous groups. Group A experimental group(n=24) participants were given an hour time which included taping of orbicularis oris muscle followed by oral motor exercises.

Oral motor exercises included brushing on tongue, upper and lower gums, inner cheeks and vibration on chin and neck for about 20 minutes. These sessions were given for 2 days per week and for total of 16 weeks. For the rest of the days of the weeks the parents were guided to follow the same taping procedure and oral motor exercises at home. Group B (n=24) participants were given the same treatment except there was only application of Kinesio taping of orbicularis oris muscle without oral motor exercises. The participants were assessed 5 times; at week 0 (Baseline) and then during intervention at week 4, week 8, week 12 and finally at week 16 after completion of intervention. The study was conducted at National institute of Rehabilitation Medicine (NIRM), Islamabad.

Before collection of data permission was obtained by the institutional review board as well as written consent was taken from the parents after explanation of the study purpose and ensuring confidentiality for inclusion of their children in clinical trial. Non-probability convenience sampling was used to select the participants for the study. Drooling severity scale (DS), drooling frequency (DF) scale and drooling impact (DI) scale was used for follow up assessments.

Technique for taping was, 2 inches cut tape according to the size of orbicularis oris muscle. Length was cut to fit the tape around the fully opened mouth. The tape was attached at the centre of mouth above the upper lip with paper-off (10%) pull or tension. Tape was not on the lips, just outside the lips and tape ended on the corners of the lips. The second piece of tape was laid on the centre of the lower lip. Tape surrounded the mouth following orbicularis oris muscle. The ends of the tape overlapped each other slightly. Taping was applied for a single stretch of 3 to 4 hours per day for 16 weeks.

Data was analyzed by using SPSS version 21. For presentation of categorical and demographic variables, mean and standard deviation were used. RM-ANOVA was used to analyze changes within the groups and independent samples t-test was used for differences between the groups.

## RESULTS

The results of the statistical analysis, carried on the data set, are mentioned here. The factors which are considered during the analysis are Age, Gender, Type of CP, Gross Motor Function Classification System and drooling impact scale.

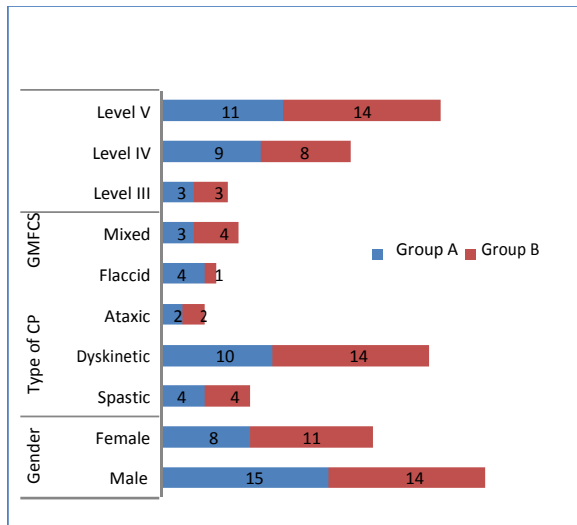


Figure 1: demographic characteristics

The mean age in group A is 3.93±1.7 and the mean age in group B is 3.66±1.26. The detail distribution of demographic characteristics in both groups is shown in figure 1.

The results of study showed significant overall decrease in symptoms of drooling in group A (KT+OME) as well as in group B (KT) with in group changes in term of severity, frequency and impact of drooling ( $p < 0.05$ ) (table 1). But between groups comparison group A (KT+OME) showed more early improvement in the drooling severity (KT+OME mean difference = 1.52 > KT mean difference = 0.04) and its impact on child's life than group B (KT). But between group changes of drooling frequency was not significant (Tables 2,3,4).

Table 1: Within The Group Comparison of Drooling severity & Drooling Frequency DS & DF (Group A&B)

Sessions	KT+OME		KT		
	Mean±SD	p-value	Mean±SD	p-value	
Drooling Severity Scale	Before intervention	4.00±.60	0.00 <sup>a</sup>	3.52±.58	0.00 <sup>a</sup>
	After 1 <sup>st</sup> month	3.56±.58	0.01 <sup>b</sup>	3.08±.70	0.30 <sup>b</sup>
	After 2 <sup>nd</sup> month	3.13±.69	0.02 <sup>c</sup>	2.84±.74	1.00 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.78±.59	0.05 <sup>d</sup>	2.80±1.29	0.88 <sup>d</sup>
	After 4 <sup>th</sup> month	2.47±.66	0.00 <sup>e</sup>	2.48±1.04	0.00 <sup>e</sup>
Drooling Frequency Scale	Before intervention	3.86±.45	0.00 <sup>a</sup>	3.88±.43	0.05 <sup>a</sup>
	After 1 <sup>st</sup> month	3.39±.49	0.01 <sup>b</sup>	3.60±.50	0.02 <sup>b</sup>
	After 2 <sup>nd</sup> month	2.95±.56	0.02 <sup>c</sup>	3.28±.54	0.05 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.60±.58	0.05 <sup>d</sup>	3.00±.40	0.01 <sup>d</sup>
	After 4 <sup>th</sup> month	2.30 ±.70	0.00 <sup>e</sup>	2.64±.56	0.00 <sup>e</sup>

<sup>a</sup> before intervention vs. after 1st month, <sup>b</sup> 1st vs. after 2nd month, <sup>c</sup> 2nd vs. after 3rd month, <sup>d</sup> 3rd vs. after 4th month and <sup>e</sup> before intervention vs. after 4th months

Table 2: Between the Group Comparison of DS & DF (Group A&B)

Sessions	KT+OME	KT	p-value	
	Mean±SD	Mean±SD		
Drooling Severity Scale	Before intervention	4.00±.60	3.52±.58	0.00 <sup>a</sup>
	After 1 <sup>st</sup> month	3.56±.58	3.08±.70	0.01 <sup>b</sup>
	After 2 <sup>nd</sup> month	3.13±.69	2.84±.74	0.17 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.78±.59	2.80±1.29	0.95 <sup>d</sup>
	After 4 <sup>th</sup> month	2.47±.66	2.48±1.04	0.99 <sup>e</sup>
Drooling Frequency Scale	Before intervention	3.86±.45	3.88±.43	0.93 <sup>a</sup>
	After 1 <sup>st</sup> month	3.39±.49	3.60±.50	0.15 <sup>b</sup>
	After 2 <sup>nd</sup> month	2.95±.56	3.28±.54	0.04 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.60±.58	3.00±.40	0.00 <sup>d</sup>
	After 4 <sup>th</sup> month	2.30±.70	2.64±.56	0.07 <sup>e</sup>

<sup>a</sup> before intervention vs. after 1<sup>st</sup> month, <sup>b</sup> 1st vs. after 2<sup>nd</sup> month, <sup>c</sup> 2nd vs. after 3<sup>rd</sup> month, <sup>d</sup> 3<sup>rd</sup> vs. after 4<sup>th</sup> month and <sup>e</sup> before intervention vs. after 4<sup>th</sup> months

Table 3: Within The Group Comparison of Drooling Impact Scale DIS (Group A&amp;B)

		KT+OME		KT	
		M±SD	p-value	M±SD	p-value
How frequently did your child dribble?	Before intervention	8.65±.77	0.00 <sup>d</sup>	8.48±.96	0.08 <sup>d</sup>
	After 1 <sup>st</sup> month	6.91±1.4	0.03 <sup>b</sup>	7.80±1.60	0.01 <sup>b</sup>
	After 2 <sup>nd</sup> month	6.08±1.72	0.01 <sup>c</sup>	7.08±1.63	0.06 <sup>c</sup>
	After 3 <sup>rd</sup> month	5.39±2.03	0.02 <sup>d</sup>	6.12±2.04	0.05 <sup>d</sup>
	After 4 <sup>th</sup> month	4.65±2.38	0.00 <sup>e</sup>	5.56±2.27	0.00 <sup>e</sup>
How severe was the drooling?	Before intervention	6.60±.72	0.00 <sup>d</sup>	6.56±.71	0.00 <sup>d</sup>
	After 1 <sup>st</sup> month	4.91±1.41	0.04 <sup>b</sup>	5.16±1.40	0.04 <sup>b</sup>
	After 2 <sup>nd</sup> month	4.13±1.65	0.05 <sup>c</sup>	4.44±1.60	1.00 <sup>c</sup>
	After 3 <sup>rd</sup> month	3.34±1.11	0.02 <sup>d</sup>	4.44±1.44	0.56 <sup>d</sup>
	After 4 <sup>th</sup> month	2.69±1.06	0.00 <sup>e</sup>	4.04±1.85	0.00 <sup>e</sup>
How many times a day did you have to change bibs or clothing due to drooling	Before intervention	5.34±1.40	0.09 <sup>d</sup>	5.12±1.45	0.13 <sup>d</sup>
	After 1 <sup>st</sup> month	4.47±.79	0.01 <sup>b</sup>	4.36±.90	0.00 <sup>b</sup>
	After 2 <sup>nd</sup> month	4.08±.66	0.10 <sup>c</sup>	3.92±.64	1.00 <sup>c</sup>
	After 3 <sup>rd</sup> month	3.43±.84	1.00 <sup>d</sup>	3.92±1.15	0.01 <sup>d</sup>
	After 4 <sup>th</sup> month	3.47±.73	0.00 <sup>e</sup>	3.36 ±1.38	0.00 <sup>e</sup>
How offensive was the smell of the saliva on your child	Before intervention	3.86±.45	0.00 <sup>d</sup>	3.68±0.69	0.00 <sup>d</sup>
	After 1 <sup>st</sup> month	3.39±.49	0.01 <sup>b</sup>	3.20±0.57	0.04 <sup>b</sup>
	After 2 <sup>nd</sup> month	2.95±0.56	0.02 <sup>c</sup>	2.84±0.55	0.01 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.60 ±.58	0.05 <sup>d</sup>	2.48± 0.58	0.05 <sup>d</sup>
	After 4 <sup>th</sup> month	2.30±.70	0.00 <sup>e</sup>	2.20± 0.70	0.00 <sup>e</sup>
How much skin irritation has your child had due to drooling	Before intervention	3.95±.36	0.01 <sup>d</sup>	3.68±.69	0.00 <sup>d</sup>
	After 1 <sup>st</sup> month	3.56±.58	0.09 <sup>b</sup>	3.20 ±.57	0.04 <sup>b</sup>
	After 2 <sup>nd</sup> month	3.17±.49	0.01 <sup>c</sup>	2.84±.55	0.01 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.65±.64	0.55 <sup>d</sup>	2.48±.58	0.05 <sup>d</sup>
	After 4 <sup>th</sup> month	2.39±.72	0.00 <sup>e</sup>	2.20±.70	0.00 <sup>e</sup>
How frequently did your child's mouth need wiping	Before intervention	8.65±.77	0.00 <sup>d</sup>	8.48±.96	0.08 <sup>d</sup>
	After 1 <sup>st</sup> month	6.91±1.41	0.03 <sup>b</sup>	7.80±1.60	0.01 <sup>b</sup>
	After 2 <sup>nd</sup> month	6.08±1.72	0.01 <sup>c</sup>	7.08±1.63	0.06 <sup>c</sup>
	After 3 <sup>rd</sup> month	5.39±2.03	0.02 <sup>d</sup>	6.12±2.04	0.05 <sup>d</sup>
	After 4 <sup>th</sup> month	4.65±2.38	0.00 <sup>e</sup>	5.56±2.27	0.00 <sup>e</sup>
How embarrassed did your child seem to be about his/her dribbling?	Before intervention	4.00±.60	0.00 <sup>d</sup>	4.44±.82	0.00 <sup>d</sup>
	After 1 <sup>st</sup> month	3.56±.58	0.01 <sup>b</sup>	4.04±.73	0.02 <sup>b</sup>
	After 2 <sup>nd</sup> month	3.13±.69	0.02 <sup>c</sup>	3.72±.84	0.04 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.78±.59	0.05 <sup>d</sup>	3.24±.72	0.05 <sup>d</sup>
	After 4 <sup>th</sup> month	2.47±.66	0.00 <sup>e</sup>	2.96±.88	0.00 <sup>e</sup>
How much do you have to wipe or clean saliva from household items	Before intervention	3.86±.54	0.04 <sup>d</sup>	4.44±.82	0.00 <sup>d</sup>
	After 1 <sup>st</sup> month	3.47±.51	0.17 <sup>b</sup>	4.04±.73	0.02 <sup>b</sup>
	After 2 <sup>nd</sup> month	3.13±.69	0.01 <sup>c</sup>	3.72±.84	0.04 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.73±.54	0.10 <sup>d</sup>	3.24±.72	0.02 <sup>d</sup>
	After 4 <sup>th</sup> month	2.47±.66	0.00 <sup>e</sup>	2.92±.90	0.00 <sup>e</sup>
To what extent did your child's drooling affect his or her life	Before intervention	4.08±.59	0.00 <sup>d</sup>	4.44±.82	0.00 <sup>d</sup>
	After 1 <sup>st</sup> month	3.60±.58	0.01 <sup>b</sup>	4.04±.73	0.02 <sup>b</sup>
	After 2 <sup>nd</sup> month	3.17±.65	0.01 <sup>c</sup>	3.72±.84	0.04 <sup>c</sup>
	After 3 <sup>rd</sup> month	2.78±.59	0.05 <sup>d</sup>	3.24±.72	0.05 <sup>d</sup>
	After 4 <sup>th</sup> month	2.47±.66	0.00 <sup>e</sup>	2.96±.88	0.00 <sup>e</sup>
To what extent did your child's dribbling affect you and your family's life	Before intervention	4.34±.88	0.00 <sup>d</sup>	4.48±.96	0.00 <sup>d</sup>
	After 1 <sup>st</sup> month	3.78±.85	0.00 <sup>b</sup>	4.04±.97	0.00 <sup>b</sup>
	After 2 <sup>nd</sup> month	3.30±.87	0.05 <sup>c</sup>	3.48±.77	0.00 <sup>c</sup>
	After 3 <sup>rd</sup> month	3.00±.79	0.02 <sup>d</sup>	3.08±.70	0.11 <sup>d</sup>
	After 4 <sup>th</sup> month	2.65±.93	0.00 <sup>e</sup>	2.84±.74	0.00 <sup>e</sup>

<sup>a</sup> before intervention vs. after 1<sup>st</sup> month, <sup>b</sup> 1<sup>st</sup> vs. after 2<sup>nd</sup> month, <sup>c</sup> 2<sup>nd</sup> vs. after 3<sup>rd</sup> month, <sup>d</sup> 3<sup>rd</sup> vs. after 4<sup>th</sup> month and <sup>e</sup> before intervention vs. after 4<sup>th</sup> months

Table 4: Between the Group Comparison of DIS (Group A&amp;B)

		KT+OME	KT	p-value
		Mean±SD	Mean±SD	
How frequently did your child dribble?	Before intervention	8.65±.77	8.48±.96	0.49
	After 1 <sup>st</sup> month	6.91±1.4	7.80±1.60	0.04
	After 2 <sup>nd</sup> month	6.08±1.72	7.08±1.63	0.04
	After 3 <sup>rd</sup> month	5.39±2.03	6.12±2.04	0.22
	After 4 <sup>th</sup> month	4.65±2.38	5.56±2.27	0.18
How severe was the drooling?	Before intervention	6.60±.72	6.56±.71	0.81
	After 1 <sup>st</sup> month	4.91±1.41	5.16±1.40	0.54
	After 2 <sup>nd</sup> month	4.13±1.65	4.44±1.60	0.51
	After 3 <sup>rd</sup> month	3.34±1.11	4.44±1.44	0.00
	After 4 <sup>th</sup> month	2.69±1.06	4.04±1.85	0.00
How many times a day did you have to change bibs or clothing due to drooling	Before intervention	5.34±1.40	5.12±1.45	0.58
	After 1 <sup>st</sup> month	4.47±.79	4.36±.90	0.63
	After 2 <sup>nd</sup> month	4.08±.66	3.92±.64	0.38
	After 3 <sup>rd</sup> month	3.43±.84	3.92±1.15	0.10
	After 4 <sup>th</sup> month	3.47±.73	3.36±1.38	0.71
How offensive was the smell of the saliva on your child	Before intervention	3.86±.45	3.68±0.69	0.27
	After 1 <sup>st</sup> month	3.39±.49	3.20±0.57	0.22
	After 2 <sup>nd</sup> month	2.95±0.56	2.84±0.55	0.47
	After 3 <sup>rd</sup> month	2.60±.58	2.48±.58	0.45
	After 4 <sup>th</sup> month	2.30±.70	2.20±.70	0.61
How much skin irritation has your child had due to drooling	Before intervention	3.95±.36	3.68±.69	0.08
	After 1 <sup>st</sup> month	3.56±.58	3.20±.57	0.03
	After 2 <sup>nd</sup> month	3.17±.49	2.84±.55	0.03
	After 3 <sup>rd</sup> month	2.65±.64	2.48±.58	0.33
	After 4 <sup>th</sup> month	2.39±.72	2.20±.70	0.35
How frequently did your child's mouth need wiping	Before intervention	8.65±.77	8.48±.96	0.49
	After 1 <sup>st</sup> month	6.91±1.41	7.80±1.60	0.04
	After 2 <sup>nd</sup> month	6.08±1.72	7.08±1.63	0.04
	After 3 <sup>rd</sup> month	5.39±2.03	6.12±2.04	0.22
	After 4 <sup>th</sup> month	4.65±2.38	5.56±2.27	0.18
How embarrassed did your child seem to be about his/her dribbling?	Before intervention	4.00±.60	4.44±.82	0.03
	After 1 <sup>st</sup> month	3.56±.58	4.04±.73	0.01
	After 2 <sup>nd</sup> month	3.13±.69	3.72±.84	0.01
	After 3 <sup>rd</sup> month	2.78±.59	3.24±.72	0.02
	After 4 <sup>th</sup> month	2.47±.66	2.96±.88	0.06
How much do you have to wipe or clean saliva from household items	Before intervention	3.86±.54	4.44±.82	0.00
	After 1 <sup>st</sup> month	3.47±.51	4.04±.73	0.00
	After 2 <sup>nd</sup> month	3.13±.69	3.72±.84	0.01
	After 3 <sup>rd</sup> month	2.73±.54	3.24±.72	0.00
	After 4 <sup>th</sup> month	2.47±.66	2.92±.90	0.06
To what extent did your child's drooling affect his or her life	Before intervention	4.08±.59	4.44±.82	0.09
	After 1 <sup>st</sup> month	3.60±.58	4.04±.73	0.03
	After 2 <sup>nd</sup> month	3.17±.65	3.72±.84	0.01
	After 3 <sup>rd</sup> month	2.78±.59	3.24±.72	0.02
	After 4 <sup>th</sup> month	2.47±.66	2.96±.88	0.04
To what extent did your child's dribbling affect you and your family's life	Before intervention	4.34±.88	4.48±.96	0.09
	After 1 <sup>st</sup> month	3.78±.85	4.04±.97	0.03
	After 2 <sup>nd</sup> month	3.30±.87	3.48±.77	0.01
	After 3 <sup>rd</sup> month	3.00±.79	3.08±.70	0.00
	After 4 <sup>th</sup> month	2.65±.93	2.84±.74	0.00

## DISCUSSION

The objective of the study was to determine the effects of kinesi taping in improving symptoms of drooling cerebral palsy children. It was hypothesized that kinesi taping along with oromotor exercise was effective management for drooling in CP children; on the basis of results  $H_0$  was rejected.

Kinesio Tapping is assumed to have beneficial therapeutic effects in aligning the tissues and fascia in its desired position, it lifts the skin above the areas of pain & inflammation and increases the stimulation of skin mechanoreceptors to stimulate movement or limit movement, thus providing a positional stimulus to skin, and decreases pressure above the lymphatic channels which will provide a path for the removal of exudates.

Kinesio taping is effective in hypo tonic or over stretched orbicularis oris muscles, which is the cause of poor mouth closure. Hence in the present study kinesio taping technique was incorporated and the effect seen by the tape application may be due to the delay in the fatigue level of the orbicularis oris muscle which is over stretched due to poor mouth closure or can be contributed to the mechanoreceptors of skin which facilitates the muscle and provides accurate information about the joint position and movement.<sup>15</sup>

There are three fundamental classes for oral motor exercises that are utilized as a part of clinical practice: active exercises, passive exercises and sensory applications<sup>16</sup>. Active exercises incorporate, however are not restricted to, dynamic movements, stretching and strengthening activities. These activities are utilized to build muscle strength, power and endurance through the recruitment of extra motor units as muscle fibers are amplified<sup>17</sup>. Passive exercises may incorporate rubbing, stroking, tapping, vibration and passive activities, which are performed with the help of or completely by external force. These methods are perceived to give tactile information, enhance circulation and upgrade muscle flexibility. These strategies normalize feeding patterns by decreasing anomalous oral reflexes, encouraging normal muscle tone and desensitizing the oral area. Sensory or tactile applications comprise the use of warmth, ice electrical stimulation, high frequency vibration or different agents to muscle tissue. Some (e.g. cold) applications may be utilized to increase tactile awareness to start swallowing response while others (e.g. electrical stimulation) are utilized to reinforce the swallowing musculature.<sup>18</sup>

An experimental study was conducted by Shukra Abhyaraj M to evaluate the effectiveness and benefits of Kinesio taping in CP children for drooling management. He took a sample of 40 children and compared Kinesio taping with oral motor exercises. His results indicated that Kinesio taping is effective and safe method<sup>19</sup> which supports the current study results that combination therapy of Kinesio taping and oral motor exercises proved to be more effective than Kinesio taping alone.

Sajjan Kumar additionally conducted a similar study and the outcomes demonstrated significant improvement in drooling frequency, severity score, jaw control and lip control scores after oral motor stimulation treatment in diminishment of drooling. MOT et al. led an investigation on 25 spastic CP children and concentrated on utilization of tapping, firm pressure, tongue stretching and mobility and their joined impact in decreasing drooling through jaw and lip control. He likewise utilized exercises to strengthen oral musculature which resulted in significant

improvement in oral motor skills. The similar results were obtained in the current study where the children were treated with Kinesio taping treatment around the orbicularis oris muscle for eight weeks. The significant results showed in both studies<sup>20</sup>.

Trish Martin described the taping technique for orbicularis oris muscle. In this technique orbicularis oris muscle which is debilitated due to poor mouth closure and poor positioning of head and neck is tapped. The present method of Kinesio tape application was comparable to Trish Martin study where similar method was utilized along with oral motor exercises and reported to be beneficial in lessening of drooling which demonstrated statistically significant improvement. The conceivable reason behind that was, kinesio tape gives cutaneous input and stimulates the muscle henceforth in this way enhancing mouth closure and reduction in drooling<sup>8</sup>.

Romana et.al was also conducted a study at Armed Forces Institute of Rehabilitation Medicine (AFIRM) Rawalpindi, Pakistan n=30 CP children with age between 2-6 years with moderate to severe drooling were included in the study. Kinesio tape was applied on each child for 45 minutes per session, 5 days per week for two months continuously. Data was collected through Thomas-Stonell and Greenberg drooling scale to measure frequency and severity of drooling and drooling impact scale on 1st day and finally on 8th week within the same group. The results of the study indicated, that the kinesio taping has an important role for reducing drooling in cerebral palsy children and proved one of the safest treatment option for management of drooling in cerebral palsy children.<sup>21</sup>

It is also important to mention here that the kinesio tape is not widely available in Pakistan. It is very expensive and affordability of kinesio tape is the issue.

## CONCLUSION

The results of the study indicated that the kinesio taping along with oro-motor exercises and kinesio tapping alone significantly improve drooling severity, frequency its impact on CP children. The combination of kinesio taping and oro-motor exercises were more effective for drooling severity and its impact than kinesio tapping alone. It is suggested that a future study should be conducted with oro-motor exercises group alone, so effects of oro-motor exercises can be compare. As the affordability in Pakistan is the issue, incorporation of oro-motor exercises may be effective for the management of drooling in CP.

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