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EFFECT OF KINESIOLOGY TAPING ON DIAPHRAGM IN ASYMPTOMATIC YOUNG MALE SMOKERS

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ABSTRACT

Kinesiology taping improves muscle function due to cutaneous stimulation of the sensorimotor and proprioceptive systems. The main aim of the study was to study the effect of kinesiology taping on diaphragm in asymptomatic young male smokers. 24 asymptomatic young male smokers were selected randomly into two groups. Group A was the control group and Group B received kinesiology taping on diaphragm. The outcome measures used were maximum inspiratory pressure (PI_{max}) and range of diaphragmatic excursion. The subjects were assessed prior to intervention on first day and then on seventh day post intervention. The results show that the study carried out using these interventions is not significant statistically, largely due to a small sample size. But, clinically, these interventions have shown positive prognostic results. Thus, we can conclude that kinesiology taping on diaphragm has clinically positive prognostic effects on diaphragm muscle performance.

KEYWORDS: Kinesiology Taping, Diaphragm, Asymptomatic Young Male Smokers.

INTRODUCTION

Smoking tobacco in the form of bidi or cigar or cigarette is a very common practice.[1] It leads to various disorders of the cardiovascular and the pulmonary system like chronic obstructive pulmonary disease and Buerger's disease.[2]

WHO has estimated that tobacco use (smoking and smokeless) is currently responsible for the death of about six million people across the world each year.[3] The prevalence of smoking in Mexico was 16.5%, Philiphines was 18.4% and Egypt was 19.7%.[4] According to the Global Adult Tobacco Survey (GATS) India, there are 24.3% of male smokers which includes 10.3% of cigarette smokers, 16.0% of bidi smokers and 1.9% smoked tobacco in some other form.[1] 14% of smokers were females.[5] The average age of initiation of tobacco use was 17.8%.[1] Smoking in adults mainly affects the cilia, thus retaining mucus trapped in the air passages of the human respiratory tract. Cigarette smoke causes oxidative stress and sarcomeric injury to the diaphragm which activates the proteolytic machinery causing contractile protein wasting, and a loss of force production of diaphragm, thus reducing its activation.[6,7]

There are many physiotherapy interventions used to improve diaphragm excursion like exercise therapy, taping and biofeedback.[8] Kinesiology taping (KT) is a newer technique which helps to improve muscle function due to cutaneous stimulation of the sensorimotor and proprioceptive systems. It is developed by Dr. Kenzo Kase in 1993. The application of the tape results in therapeutic effects improving muscle facilitation. Taping from insertion of the muscle to its origin inhibits muscle function, whereas taping from muscle origin to insertion facilitates the muscle function.[9]

There is very limited evidence on the fact to associate improvement in muscle strength of the diaphragm and range of diaphragmatic excursion by kinesiology taping on diaphragm in young adult asymptomatic tobacco smokers. Presently, there are physical therapy interventions used for enhancing the recruitment of the diaphragm in an efficient manner to reduce the work of breathing in smokers by reducing the activation of accessory muscles of respiration and improving the facilitation of the diaphragm. This is a sincere effort to study the effect of kinesiology taping on diaphragm in asymptomatic young male smokers in an Indian population. The main objective of the study was to study the effect of kinesiology taping on diaphragm in asymptomatic young male smokers.

MATERIALS AND METHODOLGY

An ethical committee approval was taken prior to the study from Dr. D.Y. Patil College of Physiotherapy, Pune. Inclusion criteria for the study were males, 20 to 30 years of age, and smokers with a history of smoking since 5 years. The subjects excluded from the study were subjects with respiratory diseases, cardiovascular diseases like unstable angina and skin

diseases or infections. An informed consent was taken from the subjects. A randomized controlled trial was done. 24 asymptomatic young male smokers were selected randomly into two groups. The study took place at Dr. D.Y. Patil Medical Hospital, Pune between August, 2015 to February, 2016. The outcome measures used were maximum inspiratory pressure (PI_{max}) in mm Hg and range of diaphragmatic excursion in cms.[10,11] The treatment duration was for 7 days consecutively. The subjects were randomly allocated into two groups using chit method. Group A was the control group which received no interventions and Group B was the experimental group which received kinesiology taping on diaphragm. Twenty four samples were selected which met the eligibility criteria and an informed consent was taken from them. The subjects were assessed and pre – intervention outcome measures like PI_{max} and range of diaphragmatic excursion were taken. Subjects were then assessed for inspiratory muscle strength by measuring the PI_{max} by using a negative pressure gauge manometer. For measuring PI_{max} each subject was seated and was asked to wear a nose clip. The subject held the negative pressure gauge manometer in his hand and pressed the mouthpiece tightly against his lips during the pressure measurement to prevent perioral leak. Maximum inspiratory pressure was measured near residual volume (RV) after a maximum expiration. The pressure measured was maintained for at least one second. The same process was repeated two more times until two satisfactorily measurements were recorded; the higher value was used in subsequent calculations. A pictorial representation of assessment of PI_{max} is shown in Image 1. Diaphragmatic movement was then assessed by measuring the range of diaphragmatic excursion. The percussion of the diaphragm began superiorly and extend inferiorly to identify the level during normal quiet (tidal volume) breathing. The position of the diaphragm was noted. The subject was then asked to 'inhale fully' and then 'Hold it' and then again begin percussing inferiorly, to determine the new level of the diaphragm during forced maximal inspiration. The new level was noted and the subject was asked to 'breathe normally'. Image 2 gives a pictorial representation of assessment of range of diaphragmatic excursion. Group A which was the control group received no intervention and was re-assessed 7 days later. The Group B which was the experimental group received kinesiology taping on the diaphragm for 7 days. One 'I' strip was applied on the origin of the diaphragm with the middle part of the diaphragm on the xiphoid process, as shown in Image 3. A second 'I' tape was applied on the corresponding level on the posterior surface of the back, as shown in Image 4. This is the facilitatory technique for muscle recruitment with Kinesiology taping.[12] The subjects were again reassessed after 7 days. However, there were no drop-outs. Data collection was done and statistical tests were carried out.

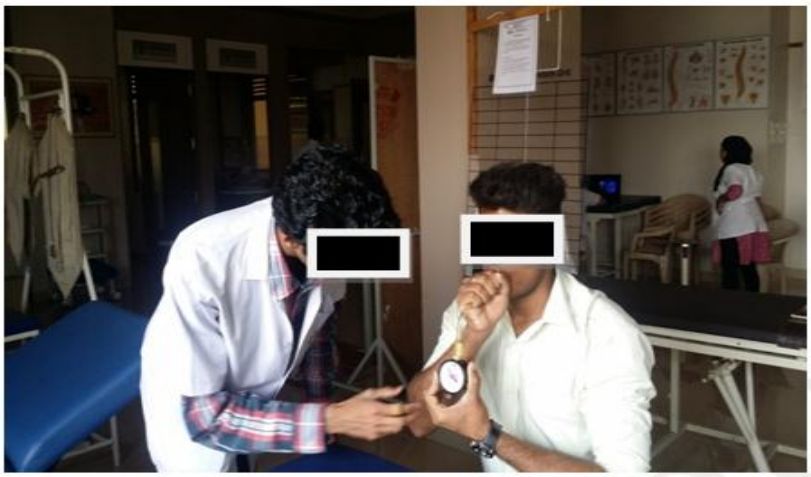


Image. 1. Shows the subjects being assessed for respiratory muscle strength by using Maximal Inspiratory Pressure (PI_{max}).

Image. 2. Shows subjects being assessed for range of diaphragmatic excursion.

Image. 3. Shows subject with kinesiology taping on diaphragm on the abdomen aspect.

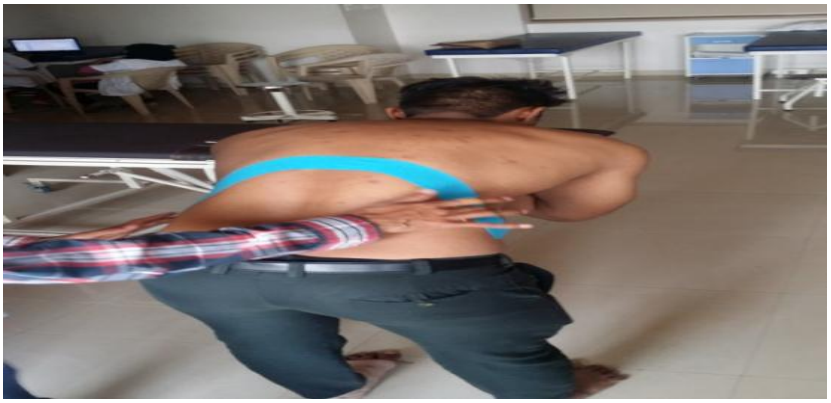
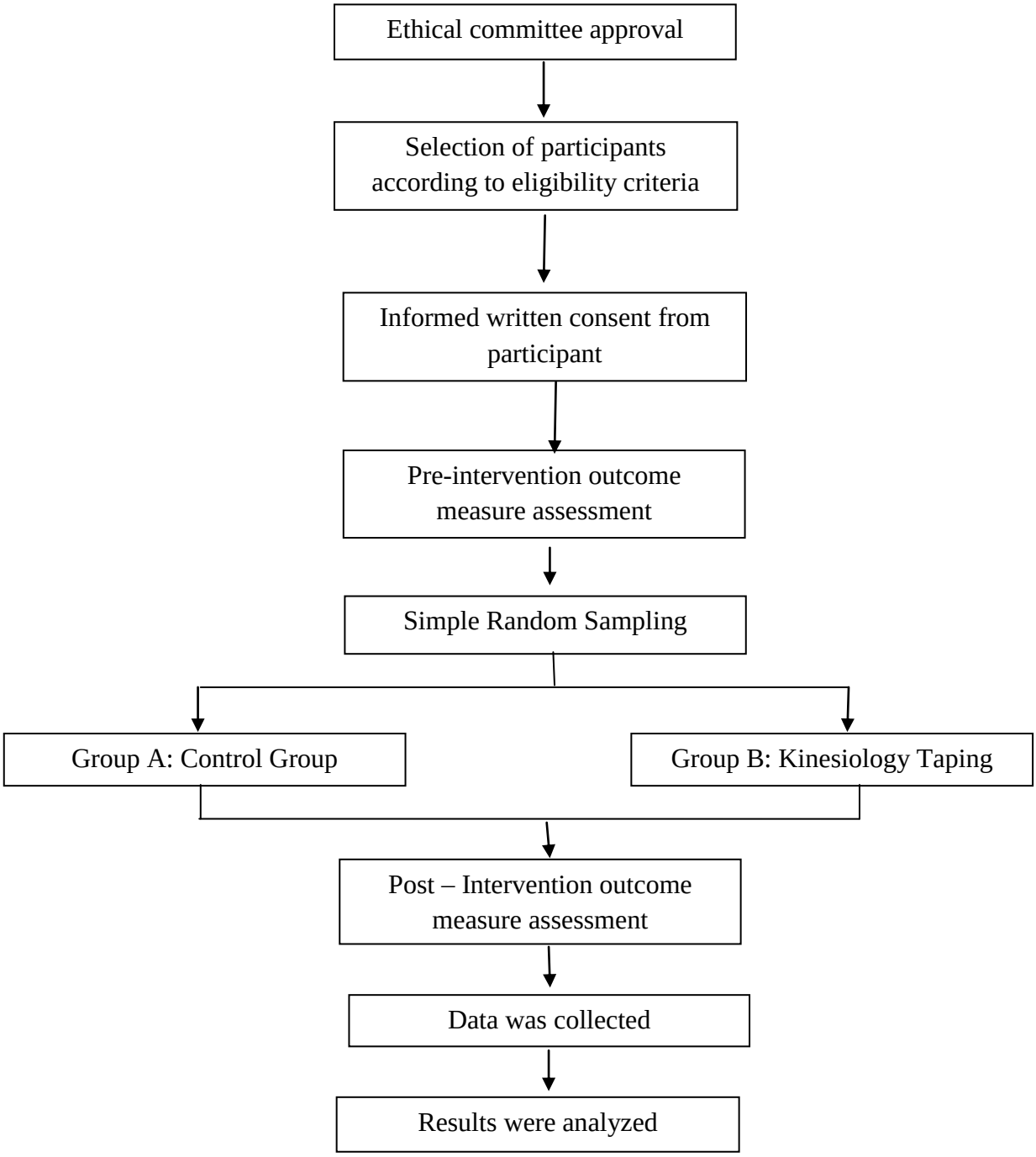


Image. 4. Shows kinesiology tape being applied on diaphragm on the back aspect.

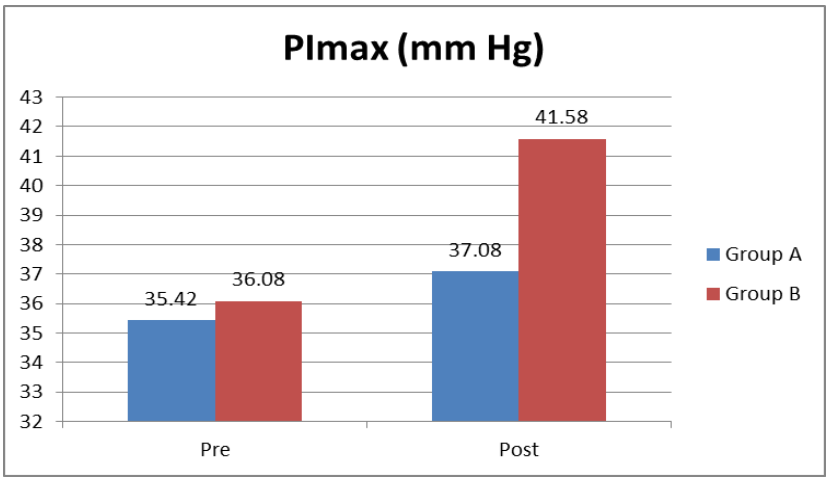


RESULTS

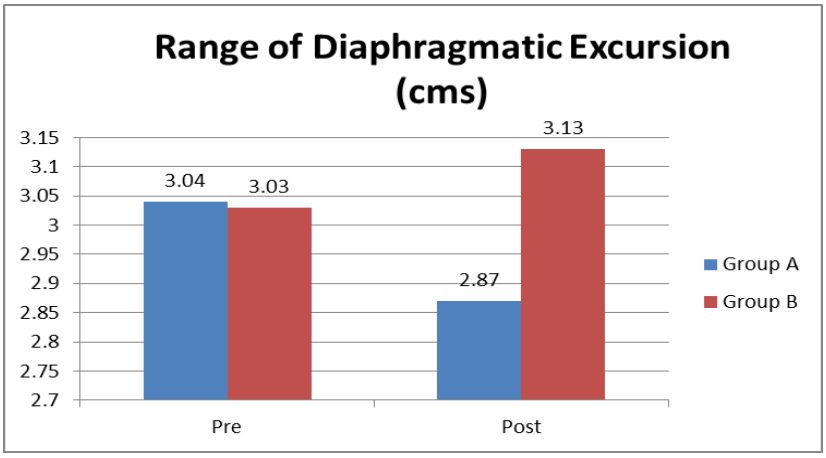
The data collected was analyzed using the unpaired t test for both groups using PI_{max} (Pre) and PI_{max} (Post) and the range of diaphragmatic excursions pre and post values. These values were used to find the P value for these parameters. The p value calculated was found to be insignificant largely due to a small sample size.

Table. 1. Shows, the Pre and Post values of PI_{max} and Range of Diaphragmatic Excursion.

	Group A	Group B	p value
PI_{max}(Pre)	35.42±10.84	37.08±5.20	0.51
PI_{max}(Post)	36.08±11.16	41.58±6.07	0.40
Range of Diaphragmatic Excursion (Pre)	3.04±0.27	2.87±0.38	0.09
Range of Diaphragmatic Excursion (Post)	3.03±0.27	3.13±0.40	0.69



Graph. 1. Shows average maximum inspiratory pressure pre and post treatment in each group.



Graph. 2. Shows range of diaphragmatic excursion (cms) pre and post treatment in each group.

24 subjects were randomly allocated into 2 groups. Each group had 12 subjects each. The statistical analysis was carried for both groups. The data collected was analyzed using the unpaired t test for both groups using PI_{max} (Pre) and PI_{max} (Post) and the range of diaphragmatic excursions pre and post values. The Pre PI_{max} score for Group A was 35.42 and the post PI_{max} score was 37.08, for Group B the pre PI_{max} score was 36.08 while and the post PI_{max} score was 41.58 as shown in Graph 1. The pre score of range of diaphragmatic excursion for the Group A was 3.04 and for Group B was 3.03 and the post score for range of diaphragmatic excursion for Group A was 2.87 and the post score was 3.13. The p value was found to be not less than 0.05. The results show that the study carried out using these interventions is not significant statistically, largely due to a small sample size. But, clinically, these interventions have shown positive prognostic results.

DISCUSSION

In our study, twenty four asymptomatic young male smokers were assessed for inspiratory muscle strength by using PI_{max} in mm Hg and range of diaphragmatic excursion in cms. None of the subjects who were assessed complained of any peripheral muscle weakness. The control group received no interventions. It was seen that the subjects who underwent no interventions for diaphragm muscle weakness had no improvement or slight change in diaphragm muscle performance.

The experimental group received kinesiology taping on diaphragm in a muscle facilitation approach. This resulted in better activation of the diaphragm due to cutaneous sensorimotor stimulation of the diaphragm, as kinesiology taping improved the muscle activation. Zubeyir S. et al stated that Kinesiology Taping on the diaphragm can help in re-educating the diaphragm for working efficiently as a chief inspiratory muscle.[12] Also, Huang C. et al in a study in 2011 on kinesiology taping on medial gastrocnemius found a significant increase on muscle activity on EMG. This was mainly due to better proprioceptive stimulation and recruitment of the muscles due to kinesiology taping.[12,13] Also, Kalantari K. et al in a study on kinesiology taping on the extensor aspect of the forearm found a significant increase in grip strength. This improvement was found mainly due to better recruitment of the muscle fibres.[14]

Clinically, kinesiology taping on the diaphragm has positive prognostic effects for diaphragm weakness. It showed improvement in PI_{max} and range of diaphragmatic excursion. Although, the results have showed to be clinically significant, it is found not to be statistically

significant largely due to a small sample size. The p value was found to be not less than 0.05. Thus, it cannot be generalised that kinesiology taping on diaphragm will improve the muscle performance in asymptomatic young male smokers.

The limitations of the study were a small sample size, due to which the results could not be generalised. Another limitation was the application of kinesiology taping on diaphragm was only for seven days. It should have been applied for a longer duration to achieve improvements in muscle strength. It is suggested that, future researches can be carried out by increasing the sample size in order to get a statistically significant result. Also, the time duration for application of kinesiology taping can be increased too to achieve gains in muscle strength of diaphragm. No adverse events during the course of the treatment session were noted.

CONCLUSION

Thus, we can conclude that kinesiology taping on diaphragm has clinically positive prognostic effects on diaphragm muscle performance. However, further research is required, in order to generalise on the efficacy of kinesiology taping on diaphragm in asymptomatic young male smokers.

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