



EFFECT OF DIAPHRAGMATIC STRETCHING ON DIAPHRAGMATIC EXCURSION AND CHEST EXPANSION AMONG ASYMPTOMATIC YOUNG ADULTS - EXPERIMENTAL STUDY

Physiotherapy

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ABSTRACT

Diaphragm is the main muscle of respiration and according to the recent study done on the diaphragm it is proved that the age group of 19- 28 years has better diaphragmatic activity as compared to older individual. Hence, there is a technique called as Diaphragmatic Stretching Technique, by using it we can further enhance the diaphragmatic activity. Therefore, this study was to find out the Effect of Diaphragmatic Stretching on Diaphragmatic Excursion and Chest Expansion Among Asymptomatic Young Adults. Study conducted in Nashik District of asymptomatic young individuals with 82 sampling. Subjects received Diaphragmatic Stretching for 5 times per week for 2 weeks for 5 – 7 mins. The diaphragmatic excursion and chest expansion was the outcome measures. There was statistical significant improvement in both the outcome measures and study concluded that, the diaphragmatic stretching effectively improves the diaphragmatic excursion and chest expansion.

KEYWORDS

Diaphragmatic Excursion, Diaphragmatic Stretching, Chest Expansion.

INTRODUCTION:

The diaphragm is the primary inspiratory pump muscle of breathing¹ as, During inhalation, the diaphragm contracts and moves in the inferior direction and when the diaphragm relaxes (moves in the superior direction), air is exhaled by elastic recoil process of the lung and the tissues lining the thoracic cavity. Diaphragm has two types of fibres. The type of diaphragmatic fibres, that is 50 % of the fibres in the diaphragm which is formed by the fast twitch fibres is responsible for the diaphragmatic strength and diaphragmatic activity⁴ The age group of 19- 28 years has better diaphragmatic activity as compared to older individual and the age group 28 to 80 years has pulmonary function and aerobic capacity each decline by 40%⁵. Pulmonary function begins to decline at approximately from age 28 years⁵. As the diaphragm is the main muscle, it is further related to many measures like Diaphragmatic Excursion, Chest Expansion, etc. As the Diaphragmatic Excursion is basically ability of diaphragm to expand hence, if the diaphragm movement /mobility decreases due to any circumstances then it is further decreasing the Diaphragmatic Excursion.

To prevent the disorders of the diaphragm or the weakening of the diaphragm some preventive measures are necessary to be taken. There are many ways from which we can conserve the activity of diaphragm such as rib stretching⁹, then stretching of intercostal muscles specifically, followed by the chest PNF, diaphragmatic stretching technique and the manual diaphragmatic technique¹⁰. Many researches done in the case of diaphragm, but most of the study included the subjects with chronic obstructive pulmonary disorder^{8,9,11}, with asthma or cerebral palsy and many more, but until now not many researchers have been done in case of healthy adults.

Hence, with the help of Diaphragmatic Stretching Technique we can further enhance the diaphragmatic activity. Diaphragmatic Stretching Technique is a simple and convenient method as compare to the other studies. Hence aim of this study was to find out the effect of Diaphragmatic Stretching on Diaphragmatic Excursion and Chest Expansion among asymptomatic young adults. Objectives of the study were,

1. To find out the effect of Diaphragmatic Stretching Technique on Diaphragmatic Excursion.
2. To find out the effect of Diaphragmatic Stretching Technique on Chest Expansion.

Research Design & Methodology:

This was experimental study conducted in Medical Colleges and Allied Institutes in Nashik and done on 82 asymptomatic healthy young individuals age group of 19 to 28 years. The convenient sampling method

was used. 100 individuals were screened and 82 young individuals were selected according to inclusion and exclusion criteria.

The individuals both male and female who willing to participate were included in the study while individuals with history of neck trauma, rib fracture, herniated disk or lumbar protrusion, back surgery, respiratory or neurological condition which directly affects the respiration were excluded from the study. Study was approved by Institutional Ethical Committee and duration was 6 months.

Diaphragmatic excursion and Chest Expansion were outcome measures and taken on pre-treatment, one week after treatment and at end of two weeks. Individual received Diaphragmatic Stretching for 5 – 7 mins for 5 times per week for 2 weeks.

Diaphragmatic stretching were given to individual in following way,

- Subject was asked to sit in erect position.
- Therapist was in standing position behind the subject
- Then therapist was pass her hand around the thoracic cage of the patient, by introducing the figures in the coastal margin.
- Subject was then asked to round or slightly flex the trunk in terms to relax the rectus abdominis to initiate a good stretch.
- Firstly, the patient is asked to inhale deeply, then he is instructed to inhale and exhale partially deep.
- As the patient exhales, the therapist eases their hands caudally grasping the lower ribs at the coastal margins of the lung.
- Hence, firm but gentle traction was maintained until patient inhales.

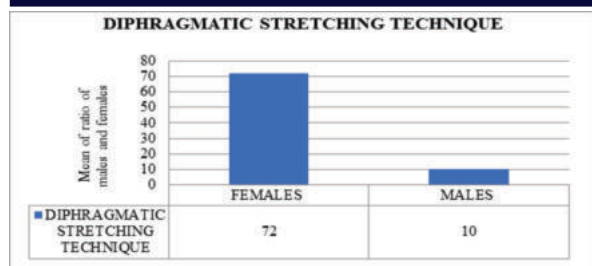
RESULT:

A total of 100 subjects were screened. On the basis of the inclusion and exclusion criteria 82 subjects were selected. This was an experimental study hence all the subjects were given diaphragmatic stretching technique for 2 weeks. Data was collected from all the subjects. Data were not passed normality test hence, Anova non parametric test Kruskal Wallis test.

There was no statistical significant difference between baseline characteristics. Out of 82 subjects, 10 subjects were males and 72 were females. All the subjects were given the protocol for equal time. (Table and Graph No 1)

Table No. 1 Ratio of Male & Female

DIPHRAGMATIC STRETCHING TECHNIQUE	
FEMALES	72
MALES	10



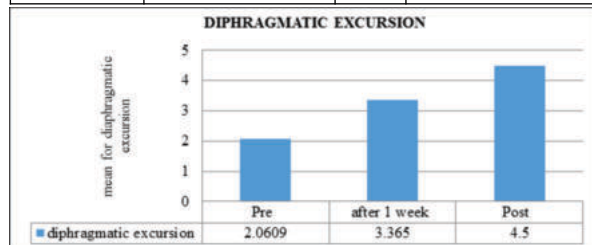
Graph No. 1 Ratio of Male & Female

Diaphragmatic Excursion:

For the Kruskal Wallis Test, the mean of pre-treatment was 2.0609, after 1 week was 3.365 and post treatment was 4.5 while the standard deviation was 0.7260, 0.7780 and 0.7577 respectively. The p-value for the Kruskal Wallis Test was 0.0001 i.e., extremely statistically significant. (Table and Graph No 2)

Table No. 2 Descriptive Statistic for Diaphragmatic Excursion

Group	Number of Patients	Mean	Standard Deviation
Pre	82	2.0609	0.7260
After 1 week	82	3.365	0.7780
Post	82	4.5	0.7577



Graph No. 2 Descriptive Statistic for Diaphragmatic Excursion

Chest Expansion:

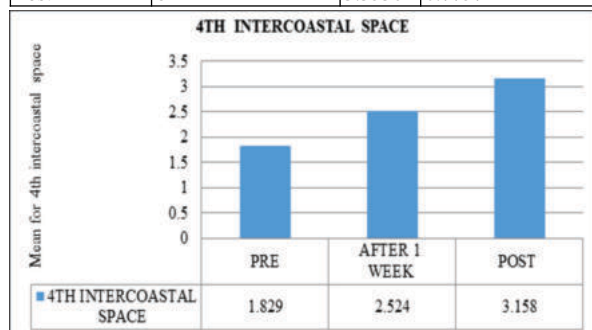
For the Kruskal Wallis Test,

4th Intercoastal Space - The mean of pre-treatment was 1.829, after 1 week was 2.524 and post treatment was 3.158 and the standard deviation was 0.6993, 0.5927 and 0.5322 respectively. The p value for the Kruskal Wallis Test was < 0.0001 i.e., extremely statistically significant (Table and Graph No. 3).

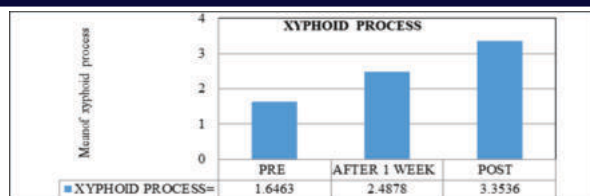
Xyphoid Process - The mean of pre-treatment was 1.646, after 1 week was 2.4878 and post treatment was 3.3536 and the standard deviation was 0.5746, 0.7411 and 0.7757 respectively. The p value for the Kruskal Wallis Test was < 0.0001 i.e., extremely significant (Table No 3 and Graph No 4).

Table No. 3 Descriptive Statistic for Chest Expansion

Group	Number of Patients	Mean	Standard Deviation
4th Intercoastal Space			
Pre	82	1.829	0.6993
After 1 week	82	2.524	0.5927
Post	82	3.158	0.5322
Xyphoid Process			
Pre	82	1.6463	0.5746
After 1 week	82	2.4878	0.7411
Post	82	3.3536	0.7757



Graph No. 3 Descriptive Statistic for Chest Expansion



Graph No. 4 Descriptive Statistic for Chest Expansion

DISCUSSION:

The lung matures at the age of 25 to 29 yrs. and starts ageing at the age of 35, prevalence of the respiratory diseases occurring in the adults after 35 yrs. are high. The respiratory system undergoes various anatomical, physiological and immunological changes with age. The structural changes include chest wall and thoracic spine deformities which impairs the total respiratory system compliance leading to increase work of breathing.³

Hence a study needed to be done on to strengthen and to increase the contractility of the diaphragm, which would be helpful directly or indirectly to the older patients. So, the study was conducted on the diaphragmatic stretching technique and we have found that there were positive effects of Diaphragmatic Stretching Technique on the diaphragmatic excursion and chest expansion in young healthy adults. Chest wall expansion determines lung volume and functional capacity. Factors determining chest wall expansion include respiratory muscle strength. Accordingly, there may be association among respiratory muscle strength and chest wall expansion.⁷ The degree of chest expansion intercostals muscle expanding the transverse dimensions, but it is also associated with contraction of the diaphragm amid expanding the vertical diameter of the thoracic cavity.⁷

Diaphragmatic Excursion stretch also renders a mechano-receptor stimulation leading to activation of sympathetic chain ganglia and related structures. These stimulations may contribute to improved sympathetic tone in the lung, increased tension in the muscle, finally Improving the viscoelastic properties of the muscle.⁸

Author Aishwarya Nair¹ Gopala Krishna Alaparthi et.al. have also studied the effect of diaphragmatic stretching technique on chest expansion, have done study on the COPD patients and have found positive results on the chest expansion. Then Author G Swathi et. al. have also studied about diaphragmatic stretching technique along with other technique like rib stretching in normal adults and have found out increased chest expansion after the technique is applied.

CONCLUSION:

The study concluded that Diaphragmatic Stretching having significant improvement in Diaphragmatic Excursion and Chest Expansion Among Asymptomatic Young Adults.

REFERENCES:

- Lewis, P., & O'Halloran, K. D. (2016). Diaphragm muscle adaptation to sustained hypoxia: lessons from animal models with relevance to high altitude and chronic respiratory diseases. *Frontiers in Physiology*, 7, 623.
- Aliverti, A. (2016). The respiratory muscles during exercise. *Breathe*, 12(2), 165-168.
- Sharma, G., & Goodwin, J. (2006). Effect of aging on respiratory system physiology and immunology. *Clinical interventions in aging*, 1(3), 253-260.
- Michael a. Roman, harry b. Rossiter and richard casaburi and the title of the study is "exercise, ageing and the lung" and the journal name - journal of european respiratory society, year 2016, volume no- 48, page no. - 1471-1486
- The title of the study is diaphragmatic excursion from wikipedia, year 2020.
- Padkao, T., Boonla, O., Padkao, T., & Boonla, O. (2020). Relationships between respiratory muscle strength, chest wall expansion, and functional capacity in healthy nonsmokers. *Journal of exercise rehabilitation*, 16(2), 189-196.
- Aishwarya nair, krishnaprasad k m*, gopala krishna alaparthi, shyam krishnan3, santhosh rai and the title of the study is "the effect of diaphragmatic stretch technique on diaphragmatic excursion in chronic obstructive pulmonary disease", journal name - international journal of research in pharmaceutical sciences, year 2020, volume no. - 11, issue no-3, page no.- 4518-4523.
- Jevtic-Somlai, C. (2019). *Woodwind Breathing Techniques: An Annotated Bibliography*. Arizona State University.
- G swathi, s suneel, ch ashok chakravarthi, the title of the study is "effectiveness of diaphragmatic stretching versus rib stretching on improving pulmonary function and thoracic excursion in subjects with copd", journal name -international journal of innovative science and research technology, year -october 2021, volume -6, issue no-10, page no.359-367.
- Helmy, M. A., Milad, L. M., Osman, S. H., Ali, M. A., & Hasanin, A. (2021). Diaphragmatic excursion: A possible key player for predicting successful weaning in patients with severe COVID-19. *Anaesthesia, Critical Care & Pain Medicine*, 40(3), 100875.
- George r. Harrison and the title of this study is "the anatomy and physiology of the diaphragm", book name - upper gastrointestinal surgery, and the page no -45 to 58
- The author's name is rosalind e.] Vlcandless and the title of the study is "the role of the thoracic diaphragm", journal name - the australian journal of physiotherapy, year 1975, volume no. - xxi, issue no. - 3, page no - 104 - 108.