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The Immediate Effect Of Diaphragmatic Myofasical release On Peak Expiratory Flow Rate In Obese Individual - An Experimental Study

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INTRODUCTION

Obesity is the abnormal or excess accumulation of fat resulting from an imbalance between energy intake and energy expenditure [(1)]. According to WHO classification of obesity, based on the BMI (Body Mass Index), individuals with BMI>30 Kg/m2 are categorized as obese [(1)]

Obesity adversely affects the chest wall mechanics and decreases the total respiratory compliance due to increased deposition of fat in subcutaneous adipose tissue, the fat deposition between the muscles and the ribs, leading to increase in the metabolic demands and work load of breathing [(1)]. Obesity causes mechanical compression of the diaphragm, lungs, and chest cavity, which can lead to restrictive pulmonary damage. [(11)] The diaphragm tissue of obese showed a distorted submicroscopic architecture, with compact mitochondria and increased collagen myofibrils, disarrangement of sarcomere alignment, and thickened Z-lines with loss of muscle myofibril orientation. [(11)] Obesity generates a mechanical overload, which alters breathing pattern and diaphragm morphology, mainly increasing the work of breathing, respiratory drive, and diaphragm thickness and excursion. [(11)]

structural changes in the thoracoabdominal area, restricted diaphragmatic mobility and rib movements, promote changes in dynamics of the respiratory system and decreased respiratory compliance, leading to mechanical impairment of the respiratory muscles and decreased peak expiratory flow rate (PEFR)[(2)]

lower PEFR in obese young individuals with overweight and obesity, habituated to sedentary life style, are at greater risk for respiratory problems and prone to developing chronic obstructive pulmonary diseases at the later stage. [1]

Lower PEFR in obese young individuals with overweight and obesity, habituated to sedentary life style, are at greater risk for respiratory problems exertional dyspnea, sleep apnea syndrome and more prone to develop chronic obstructive pulmonary disease (COPD), asthma, pulmonary embolism, and aspiration pneumonia. [1]

Diaphragmatic MFR is an intervention intended to directly stretch the diaphragmatic muscle fibers thereby increasing chest wall mobility, improve diaphragmatic mobility, improve, PEFR exercise capacity and inspiratory capacity immediately after intervention. [6]

There has been previous article that study the immediate effect of diaphragmatic myofasical release (MFR) in COPD patient

There are limited evidences available onthe effect of diaphragmatic myofascial release (MFR) on peak expiratory flow rate (PEFR) in obese individual. Thus present study aims is to find out immediate effect of diaphragmatic myofascial release (MFR) on peak expiratory flow rate (PEFR) in obese individual.

NEED OF STUDY

The diaphragm tissue of obese showed a distorted submicroscopic architecture, with compact mitochondria and increased collagen myofibrils, disarrangement of sarcomere alignment, and thickened Z-lines with loss of muscle myofibril orientation. [12], mainly increasing the work of breathing, respiratory drive, and diaphragm thickness and excursion. [11]. Structural changes in diaphragm and decreased respiratory compliance, leading to mechanical impairment of the respiratory muscles, and decreased peak expiratory flow rate (PEFR) [2].

Lower PEFR in obese young individuals with overweight and obesity, are at greater risk for respiratory problems exertional dyspnea, sleep apnea syndrome and more prone to develop chronic obstructive pulmonary disease (COPD), asthma, pulmonary embolism, and aspiration pneumonia. [1]

Diaphragmatic MFR is an intervention intended to directly stretch the diaphragmatic muscle fibers thereby increasing chest wall mobility and improve PEFR, improve diaphragmatic mobility, exercise capacity and inspiratory capacity immediately after intervention. [6]

There are limited evidences available onthe effect of diaphragmatic myofascial release (MFR) on peak expiratory flow rate (PEFR) in obese individual. Thus, present study aims is to find out immediate effect of diaphragmatic myofascial release (MFR) on peak expiratory flow rate (PEFR) in obese individual.

REVIEW OF LITERATURE

1. Dr. Shanmugapriya Chinnaiyan, Dr.Vinodha Ramayyan in year 2015 conducted study on "**COMPARISON OF PEAK EXPIRATORY FLOW RATES (PEFR) BETWEEN OBESE AND NON-OBESE INDIVIDUAL**". In India, obesity is rapidly escalating in all age groups. Obesity has significant effects on respiratory function and reduces lung volume. Peak Expiratory Flow Rate (PEFR) demonstrates the caliber of the airways and is accepted worldwide as the objective indicator of ventilatory capacity, and is useful for the diagnosis and management of respiratory illness. 'Study concluded that significant reduction in PEFR in obese as compared to non-obese. This study highlights the need for aggressive reduction of weight in obese in order to increase respiratory efficiency

2. Sharon M. Fruh, PhD, RN, FNP-BC (Professor) in year 2017 conducted study on "**OBESITY: RISK FACTORS, COMPLICATIONS, AND STRATEGIES FOR SUSTAINABLE LONG-TERM WEIGHT MANAGEMENT***".* Obesity is associated with a range of comorbidities, including diabetes, cardiovascular disease, obstructive sleep apnea, and cancer; however, modest weight loss in the 5%-10% range, and above, can significantly improve health-related outcomes. Many individuals struggle to maintain weight loss, although strategies such as realistic goal-setting and increased consultation frequency can greatly improve the success of weight-management programs., 'Study concluded that Obesity is associated with a range of comorbidities, including diabetes, cardiovascular disease, obstructive sleep apnea, and cancer.'

3. Dr. Gauri subhash asawadekar, Dr. aashirwad Mahajan (Assistant professor, Dr. A.P.J. Abdul Kalam College of Physiotherapy, PIMS (DU), Ahmednagar, Loni) in year 2019 conducted study on **"IMMEDIATE EFFECT OF DIAPHRAGMATIC MYOFASICAL RELEASE IN COPD PATIENT"**, ' Diaphragmatic myofascial release techniques are manipulative treatments that attempts to release tension in the fascia in which pressure is applied to muscle and fascia. Though these techniques

are widely used in clinical practice that Diaphragmatic release may cause activation of parasympathetic system which regulates relaxation, thus, reducing dyspnea. Also, respiratory muscle length and thoracic cage flexibility increases, reducing the work of breathing,' Study concluded that diaphragmatic myofascial release significantly improves peak expiratory flow rate (PEFR) ($p<0.001$) and reduces dyspnea in COPD patients.

4. Gisele C. Rodrigues,1 Nazareth N. Rocha,1,5 Ligia de A. Maia,1 Isabella Melo,1 Ana Carolina Simo˜es,1Mariana A. Antunes,1 Flavia F. Bloise,2 Juliana Woyames,3 conducted study on **"IMPACT OF EXPERIMENTAL OBESITY ON DIAPHRAGM STRUCTURE, FUNCTION, AND BIOENERGETICS",** study conclude that Obesity generates a mechanical overload, which alters breathing pattern and diaphragm morphology, mainly increasing the work of breathing, respiratory drive, and diaphragm thickness and excursion. To meet this higher demand, the muscle fiber type may switch from glycolic toward an oxidative-capacity phenotype

AIM

To find the immediate effect of diaphragmatic myofascial release (MFR) on peak expiratory flow rate (PEFR) in obese individual

OBJECTIVES

To find the immediate effect of diaphragmatic MFR on peak expiratory flow rate (PEFR) in obese individual using peak flow meter

HYPOTHESIS

Null hypothesis (H_0):

There will be no immediate effect of diaphragmatic MFR on peak expiratory flow rate in obese individual.

Alternative hypothesis:

There will be immediate effect of diaphragmatic MFR on peak expiratory flow rate (PEFR) in obese individual.

MATERIALS

- Pen
- Paper
- Couch
- Stop watch
- Peak flow meter
- Measuring tape
- Weighing machine

METHODOLOGY

- Study design: Pre -post Experimental study
- Sampling method: convenient sampling
- Sample size: 60
- Study population: obese individual
- Study setting: In and around city
- Study duration: 6 months'

INCLUSION CRITERIA

- Age 35-55 years [(1)]
- Both male and female [(1)]
- Waist-to-hip ratio :0.90 (male);0.85 (female)[(10)]
- BMI: ≥ 30 [(1)] grade I
- PEFR value: (320± 28.06/min) for female [(1)]

  (457 ± 63.92/min) for male [(9)]

EXCLUSION CRITERIA

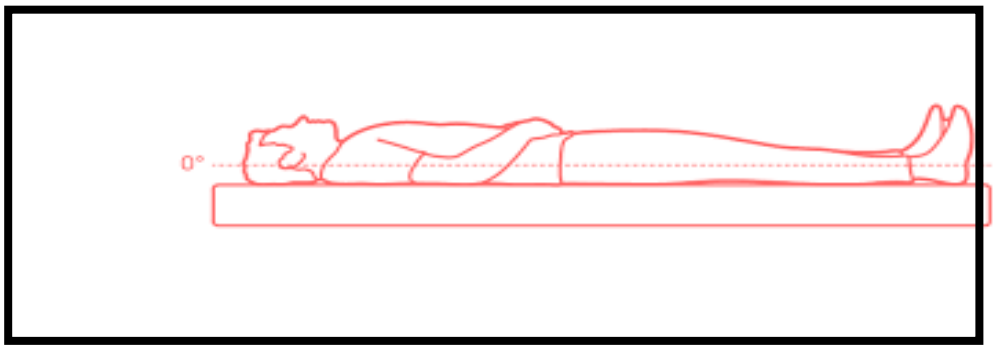
- (BMI < 30) [1]
- Addiction (alcohol, cigarette smoking, cigar smoking, tobacco) [2,13,14]
- Diagnosed Obstructive disorder (COPD, chronic bronchitis, asthma,) [2]
- Diagnosed Restrictive disorder (pleural, alveolar, interstitial, neuromuscular, and thoracic cage abnormalities). [2,15]
- Participant doing regular exercises and on gym training or other fitness training [3]

PROCEDURE

- Study began with the presentation of synopsis and ethical clearance to the ethical committee in PES Modern College of Physiotherapy.
- Participants were selected based on inclusion and exclusion criteria.
- Participants was explained about the study and written consent was taken from the participant
- Pre intervention peak expiratory flow rate was measured
- Diaphragmatic MFR was given
- Peak expiratory flow rate (PEFR) measurement was taken immediately post intervention and the post peak expiratory flow rate (PEFR) value was compared with pre intervention value.

DIAPHRAGMATIC MFR [6]

- Patient position: supine lying



- Therapist position: by the head end of the patient

- The therapist made manual contact with the hypothenar region and last three fingers bilaterally to the underside of the seventh to tenth rib costal cartilages

- While inspiration the therapist was gently pulling the points of contact with both hands in the direction of the head and slightly laterally, accompanied the elevation of the ribs

- While patient expire therapist deepens the contact towards the inner coastal margin

- Rep :2 sets of 10 reps given with 1 min rest in between (inhale of 5 sec and exhale of 5 sec)
- Then patient is asked to be in sitting position and PEFR measured

OUTCOME MEASURE

Peak flow meter (INDIAN PREDICTED VALUES PREDICTED PEFR VALUES FOR MALE AND FEMALE)

Peak Expiratory Flow Rate
Normal Values

Men

Height	1.6m - 5'3"	1.67m - 5'6"	1.75m - 5'9"	1.83m - 6'	1.90m - 6'3"
Age-Years	PEF L/min BJ Scale	PEF L/min BJ Scale	PEF L/min BJ Scale	PEF L/min BJ Scale	PEF L/min BJ Scale
15	485	498	511	524	535
20	540	555	571	586	598
25	575	591	608	624	637
30	594	611	628	645	659
35	601	618	636	653	666
40	599	615	633	650	664
45	590	606	623	640	653
50	575	591	608	624	637
55	557	572	588	603	616
60	536	550	566	581	593
65	513	527	542	556	567
70	490	503	517	530	541
75	466	478	491	503	514
80	442	453	465	477	487
85	418	429	440	451	460

In men, readings up to 100 L/min lower than predicted are within normal limits. For women, the equivalent figure is 85 L/min. Values are derived from Caucasian populations.

Women

Height	1.52m - 5'	1.60m - 5'3"	1.67m - 5'6"	1.75m - 5'9"	1.83m - 6'
Age-Years	PEF L/min BJ Scale	PEF L/min BJ Scale	PEF L/min BJ Scale	PEF L/min BJ Scale	PEF L/min BJ Scale
15	385	394	402	411	418
20	409	419	428	437	445
25	422	433	441	451	459
30	427	437	446	456	465
35	425	436	445	454	463
40	420	431	439	449	457
45	412	422	431	440	448
50	401	411	419	428	436
55	389	399	407	415	423
60	376	385	393	401	408
65	362	371	378	386	393
70	348	356	363	371	378
75	334	342	348	355	362
80	320	327	334	340	346
85	306	313	319	325	331

Adapted by Clement Clarke for use with peak flow meters from Nunn & Gregg
BR Med J 1989;289; 1068-70

Procedure:

- Slide the marker down as far as it will go. This sets the meter at zero
- patient position Standing or sitting
- Breathe out fully
- Take a deep breath in and open the mouth
- Place the meter in their mouth with their lips forming a tight seal around the mouthpiece
- Keep their fingers away from the markings
- Blow out once as hard and fast as they can

- Repeat two more times (resetting the marker to zero each time)
- Their peak flow is the highest of these 3 readings

DATA ANALYSIS

- Total 60 participant of both gender male and female of grade I obesity of age group 35-55 were recruited for this study according to inclusion and exclusion criteria and data analysis was done

RESULT

Graph 1: Pre and post PEFR score difference

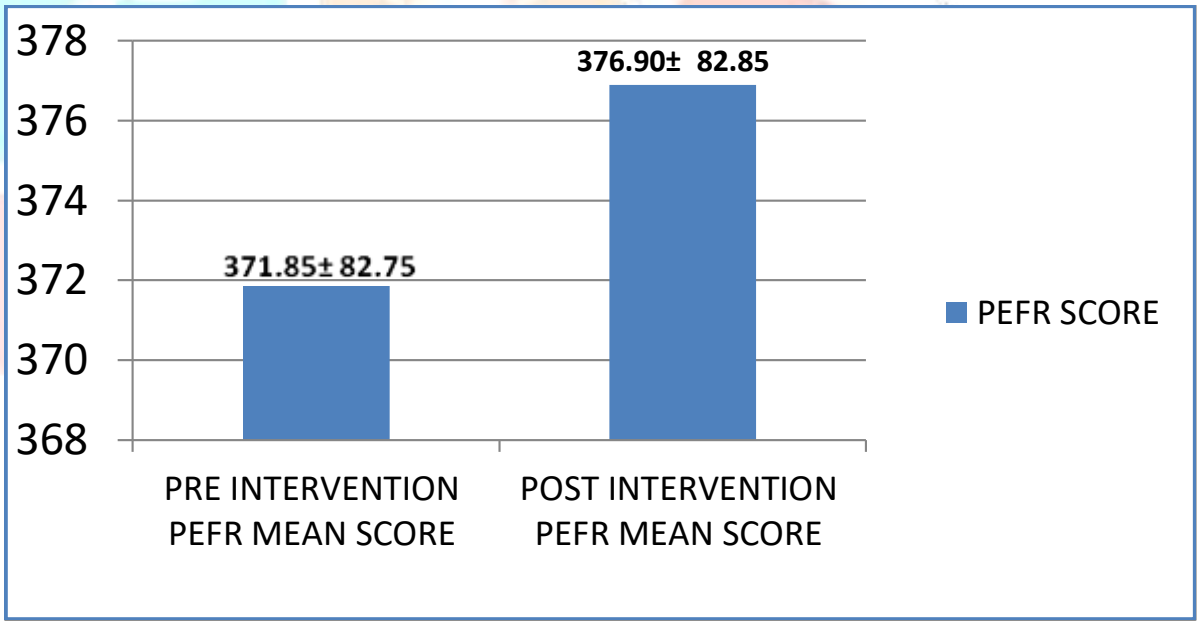


Table no.1: Difference of pre and post PEFR

PEFR SCORE	PRE-INTERVENTION PEFR SCORE MEAN + SD	POST INTERVENTION PEFR SCORE MEAN + SD	t value	p value	Results
	371.85± 82.75	376.90± 82.85	6.8959	less than 0.0001	Extremely statistically significant.

There is significant difference (P<0.0001; t=12.8959) between mean difference of pre intervention PEFR (371.85± 82.75) and post intervention PEFR (376.90± 82.85) on PEFR score

DISCUSSION

- The aim of study was to find the immediate effect of diaphragmatic myofascial release (MFR) on peak expiratory flow rate (PEFR) in obese individual
- Total 60 participant of both gender male and female of grade I obesity of age group 35 -55 were recruited for this study.
- According to WHO classification of obesity, based on the BMI (Body Mass Index), individuals with BMI>30 Kg/m2 were categorized. (1)
- Diaphragmatic MFR is an intervention intended to directly stretch the diaphragmatic muscle fibers thereby increasing chest wall mobility, improve diaphragmatic mobility, improve, PEFR exercise capacity and inspiratory capacity immediately after intervention. (6)
- There has been previous article that study "the immediate effect of diaphragmatic myofasical release (MFR) in COPD patient." diaphragmatic MFR is an intervention intended to directly stretch the diaphragmatic muscle fibers thereby increasing chest wall mobility, improve diaphragmatic mobility, improve, PEFR exercise capacity and inspiratory capacity immediately after intervention. Study concluded that the diaphragmatic MFR significantly improves PEFR in COPD patient
- Diaphragmatic MFR manual action on underside of last four costal cartilage allowed the traction of the lower rib cage in cranial direction and that the manual compression of the tissue in the area of insertion of the anterior costal diaphragm fibers lengthened the diaphragm in its insertional zone and improved diaphragmatic mobility. (6)
- Obesity causes mechanical compression of the diaphragm. The diaphragm tissue of obese showed a distorted submicroscopic architecture, with compact mitochondria and increased collagen myofibrils, disarrangement of sarcomere alignment, and thickened Z-lines with loss of muscle myofibril orientation. (11)

- Results in altered respiratory biomechanics and length tension relationship of the diaphragm as diaphragmatic myofascial release helps to improve length-tension relationship and diaphragmatic mobility these changes might allow the diaphragm to work efficiently and increase the patient's ability to exhale and thus improves Peak expiratory flow rate of the patient.

- The result of this study indicates that diaphragmatic myofascial release is useful in increasing peak expiratory flow rate in obese grade I individual Helps to improve length-tension relationship and diaphragmatic mobility, allow the diaphragm to work efficiently and increase the patient's ability to exhale and thus improves Peak expiratory flow rate of the patient.

CONCLUSION

- The study concluded that there is significant effect of diaphragmatic MFR in increase peak expiratory flow rate in obese grade I individual.

LIMITATION

- Grade II and III of obesity not included in study

FUTURE SCOPE

- Grade II and III of obesity can be included in study.
- Comparative study can be done on the immediate effect of diaphragmatic MFR on peak expiratory flow rate in obese individual of grade I, II,III
- Long term effect of diaphragmatic MFR on peak expiratory flow rate in obese individual can be seen.

CLINICAL IMPLICATION

- Obese young individuals with overweight and obesity, are at greater risk for respiratory problems exertional dyspnea, sleep apnea syndrome and more prone to develop chronic obstructive pulmonary disease (COPD), asthma, pulmonary embolism, and aspiration pneumonia.

- Diaphragmatic MFR is an intervention increasing chest wall mobility and improve PEFR, improve diaphragmatic mobility, exercise capacity.

- Diaphragmatic MFR helps to improve PEFR thus the clinical implication of diaphragmatic MFR help to reduce development of comorbidities in obese individual.

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ANNEXURE I

Evaluation form

- Name: _____
- Age :_____
- Gender: _____
- Height :_____(m) ; Weight : _____(kg)
- BMI : _____(Kg/m^2)
- Waist circumference : _____ ; Hip circumference : _____
- Waist hip ratio : _____
- Addiction :_____ (since :_____)
- Any Diagnosed respiratory condition : _____ (since : _____)
- Doing regular exercises : yes / no ; Type:_____
- On any gym training : yes / no (Duration :_____) (Type : _____)

ANNEXURE II

Consent form

I Mr./Mrs. _____ am giving my consent for participating in the study of "THE IMMEDIATE EFFECT OF DIAPHRAGMATIC MYOFASCIAL RELEASE (MFR) ON PEAK EXPIRATORY FLOW RATE (PEFR) IN OBESE INDIVIDUAL – (AN EXPERIMENTAL STUDY)"

Conduct by Vaishnavi M. Bhaturkar as (physiotherapy UG student) as a part of her curriculum under the guidance of Dr. Sonal S. Patole.

I have informed that no part of my information shall be revealed anywhere else except for the study and adequate secrecy will be maintained throughout

I am aware that i may choose to quit being a part of study at any time without having to give any reason for doing so.

I agree to cooperate fully and have no objection in participating and hereby give the consent for doing so.

Name of participant: _____

Contact number: _____

Address: _____

Name of the institution: _____

Signature: _____ date: _____