

EFFECTS OF ABDOMINAL MUSCLE EXERCISES ON PEAK EXPIRATORY FLOW RATE IN COLLEGE GOING OBESE FEMALES

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Aim: To find the effectiveness of abdominal muscle exercises on peak expiratory flow rate (PEFR) in college going obese females.

Material and Methods:A total of 20 college going obese females were selected based on inclusion and exclusion criteria who did not receive any sort of exercise and went about their daily routines as usual. Abdominal exercise protocol will include crunches,hiprolls,double knee to chest movement,planks,flutter kicks .PEFR was measured using Peak flow meter.The maximum of the 3 similar trials were taken, and the mean of these trials were calculated, which gave us the final pre PEFR reading of each participant. After recording the pre peak expiratory flow rate all participant were given exercises for a period of 3 months, 4 days a week, 3 sets of each exercise with 10 repetitions per set which gives us post PEFR reading .

Result:Statistical Analysis was done using paired group ‘t’ test to compare pre and post peak expiratory flow rate, which is statically significant with ($p < 0.05$).The pre intervention peak expiratory flow rate values were (226.50 ± 40.04), whereas post intervention the value was (292 ± 38.61).

Conclusion:When the effectiveness of Abdominal exercise on PEFR was checked using Peak Flow Meter, after 3 months of training, they showed significant improvement in PEFR reading.It shows that the Abdominal exercises are significantly effective in increasing respiratory muscle strength.

Keywords:Abdominal muscle exercise, Peak expiratory flow rate, obese females.

INTRODUCTION

Obesity is defined as a condition with excessive fat accumulation in the body to the extent that the health and wellbeing are adversely affected. Obesity results from a complex interaction of genetic, behavioral and environmental factors causing imbalance in energy production and expenditure. It is a major risk factor resulting in respiratory conditions. This may result in obesity related morbidities such as cardiovascular, endocrinal and rheumatologic disorders, sleep related disorders etc. ^[1]

Obesity has a negative impact on health often resulting in reduced respiratory functions and reduced strength of abdominal muscles. ^[2] It is therefore important to strengthen abdominal muscles so that they can improve respiratory muscle strength and enhancing their function.

Obesity decreases the lung and chest wall compliance owing to the increase in the weight of the chest wall and the higher position of diaphragm in the thoracic cavity thereby affecting PEFR, which subsequently leads to the increase in work of breathing. In addition, the central pattern of deposition of fat on the chest wall may impede the chest expansion and excursion of the rib cage, through a direct loading effect or by altering the intercostal muscle function ^[3]

Obesity thus has a clear potential to have a direct effect on respiratory wellbeing by increasing oxygen consumption and carbon dioxide production, while at the same time it stiffens the respiratory system and increases the mechanical work needed for breathing. Obesity thus has direct effect on respiratory wellbeing as well as general health and body functions ^[4]

PEFR (Peak Expiratory Flow Rate) gives idea about the strength of expiratory muscles, since forceful expiration is required for the above. Abdominal muscle exercises improve the strength of abdominal muscles which assists in the act of forced expiration ^[5] PEFR is the most commonly used method to monitor lung function. It is the Maximal expiratory flow rate achieved with a maximally forced effort from a position of maximal inspiration and is expressed in lit /min. It is measured with a instrument known as Peak flow meter.

Obesity is measured with several methods, like BMI (basal metabolic index), skin thicknesses fold and also with waist /hip ratio (waist : hip ratio or waist circumference alone).

The purpose of this study was to find the effectiveness of abdominal muscle exercises on peak expiratory flow rate in college going obese females.

MATERIAL AND METHODS

Place of study : Ujjain Institute of Paramedical Science and College of physiotherapy, Ujjain.

Study duration : 3 months.

Study type : experimental.

Sample size : 20

Type of sampling : convenient sampling

Sample population : college going obese females of age 18-25 years

Inclusion criteria :

- College going obese girls between the age of 18 to 25 years.
- Waist hip ratio of more than 0.85.
- Abdominal muscle strength of grade3
- Low physical activity.
- Subject participation willingly.

Exclusion criteria :

- Disorder of spine.
- Low back pain
- Cardio respiratory disease.
- Gynecological disorders.
- Recent surgeries.
- Individual undergoing any exercise program like gym and yoga.

Material used: consent form, peak expiratory flow meter, pen, paper, height chart, inch tape, calculator , yoga mat.

Procedure:

This Study consisted of 20 overweight and obese college going young females aged 18 to 25 years and those not under any physical training program for the last three months. All the procedure were explained to the participants. Prior to starting the study a written consent was taken from all the participants.

1. Inch tape method – to measure Waist hip ratio -It is the ratio of the circumference of waist to that of hips. This is calculated as waist circumference divided by hip circumference (W/H). Waist and hip circumference were measured in centimeters. Waist circumference: The subjects stood upright and relaxed. A horizontal measurement was taken at 1 inch above the umbilicus. Hip circumference: under similar conditions, the hip circumferences of the subjects were measured around the largest area of the subject's hip and buttocks. Waist hip ratio was measured by measuring the circumference of waist and measuring the circumference of hip by inch tape, and ratio was calculated. The participants were classified as obese on the basis of waist hip ratio of more than 0.85.

2. Manual muscle testing for abdominal muscle -Abdominal muscle strength was assessed using manual muscle test of abdominal muscle ^[6] (particularly Transverse Abdominis, and Rectus Abdominis). The manual muscle testing is a system that grades muscle strength on a scale of 0 to 5 based on how well muscles are able to resist gravity or manual pressure exerted by an examiner. Graded abdominal muscle exercises include;

Starting position-The subjects were instructed to lie in supine with the hips at 45 degree and knees at 90 degree and hand at sides. In all these activities subjects were instructed to keep the low back flat. Grade 0- No palpable or observable muscle contraction

Grade 1-subjects were asked to perform the curl ups by contracting abdominal muscles and then lifting the head off table with flexed knees.

Grade 2-the progression was made by lifting the shoulders until the top of scapulae lift from table, keeping the arms extended towards knees.

Grade 3- The next progression was done by lifting the shoulders until the scapulae clear table, keeping the arms horizontal.

Grade 4- The subjects were asked to progress further by keeping the arms crossed over chest, until scapulae clear table.

Grade 5- The subjects were asked to progress the difficulty of the curl ups by having the subject change the arm position from horizontal and then to behind the neck, until scapulae clear table.

Participants having Grade 2 of abdominal muscle strength were included in the study .

3 .Peak Expiratory Flow Rate Measurement- To find out PEFR, method to use the peak expiratory flow meter (Figure 1) was explained to the subjects.The mouthpiece was attached to the side marked in the arrows then side the indicator to the bottom of numbered scale,standing up straight subject was asked to take a deep breath, completely filling the lungs then place the mouthpiece and blow out as hard and fast as possible in a single blow, the final position was the indicator of peak flow. The maximum of the 3 similar trials were taken, and the mean of this trials were calculated, which gave us the final pre PEFR reading of each participant. After recording the pre peak expiratory flow rate all subjects were given exercises for a period of 3 months, 4 days a week, 3 sets of each exercise with 10 repetitions per set which gives us post PEFR reading.(Figure 2)

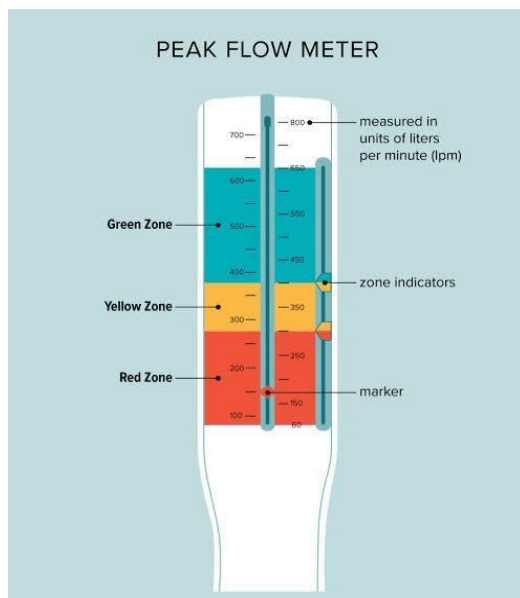


Figure1- Peak flow meter



Figure 2-Participant measuring PEFR Using Peak Flow Meter

Exercise protocol are as follows :-

1. Warm up : A warm up period of 5 min before the start of exercise session was given to each participant ,which included general body stretching, deep breathing exercises and active range of motion exercise for upper and lower extremities.
2. Abdominal exercise protocol will include crunches,hiprolls,double knee to chest movement,planks,flutter kicks having 3 sets of 10 reptitions each (Figure 1-6).
3. Cool down : A cool down period of 5 min was given to each individual, post exercise that included general body relaxation and deep breathing exercise.

Outcome Measure:Peak Expiratory Flow Rate for respiratory muscles



Figure 2-Crunches



Figure 3-Hiprolls



Figure 4-double knee to chest movement



Figure 5-Leg lowering movement



Figure 5-Planks



Figure 6-Flutter Kicks

Statistical Analysis

The data was analyzed using SPSS Software 21.0 version. To compare the pre test and post test mean values in group, paired ‘t’ test was used.

RESULTS

Table 1: Comparison of Mean PEFR Pre and Post Intervention

It was found that Mean PEFR (292.00 ± 38.61) score were significantly higher Post intervention as compared to pre intervention (226.50 ± 40.04). ($P < 0.05$)

	N	MeanPEFR L/min	SD	t	P Value
Pre Intervention	20	226.50	40.04	12.122	0.000
Post Intervention	20	292.00	38.61		

DISCUSSION

It was found that Mean PEFR significantly increased post intervention after following abdominal muscle exercise protocol for three months. The results showed increase in peak expiratory flow rate post intervention (Table 1) is most likely due to abdominal muscle strengthening exercises and the facilitator function of abdominal muscles, which improves the diaphragm's ability to create pressure during respiration. The diaphragm merely relaxes during expiration, and the elastic recoil of the lung, chest wall, and abdominal tissues compresses the lungs and expels the air. However, during heavy breathing, the elastic forces are insufficient to induce the required quick expiration, therefore extra effort is provided mostly by abdominal

muscle contractions, which push the abdominal contents upward against the bottom of the diaphragm, compressing the lungs.

These results are in accordance with the study done by Dr. Shradha Sawant Deshpande et al who found that abdominal muscle exercise improves forced expiratory flow rate in healthy people.^[7] These findings were also in accordance with the study done by Sudhan SG et al who discovered that abdominal strengthening exercises improve cardiovascular responses and abdominal strength, confirm this result.^[8]

CONCLUSION

1. When the effectiveness of Abdominal exercise on PEFR was checked using Peak Flow Meter, after 3 months of training, they showed significant improvement in PEFR reading.
2. It was concluded from the ongoing study that graded Abdominal exercises are significantly effective in increasing respiratory muscle strength in college going obese females.

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