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Pilot Study

A comparative study of Effectiveness between Diaphragmatic Breathing and Resistive Inspiratory Muscle Training on Pulmonary Functions (ERV) during Pregnancy

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Abstract
Background: *Changes in Expiratory Reserve Volume (ERV), demonstrating alteration in Pulmonary Functions during third trimester in pregnancy. At present, there is no study demonstrating the comparative effect of Inspiratory muscle training with Deep Breathing Exercises on ERV during pregnancy.*
Objective: *This study was done to compare the effect of Inspiratory Muscle Training and Diaphragmatic Breathing Exercises on Pulmonary Functions (ERV) during pregnancy.*
Design: *Pilot Study*
Setting: *This study was conducted at SGT Hospital, Gurugram.*
Method: *This was a pilot study done a sample size of 12 pregnant women, who were randomly divided between two groups. One group received IMT and another received DBE. The outcome measure was ERV which was analysed at baseline and after the intervention of 4 weeks.*
Result: *There was a significant increase in ERV in Inspiratory Muscle Training as compared to DBE group during pregnancy.*
Conclusion: *The present result suggested that the performance of IMT in pregnancy during third trimester helps to improve Pulmonary functions (ERV).*

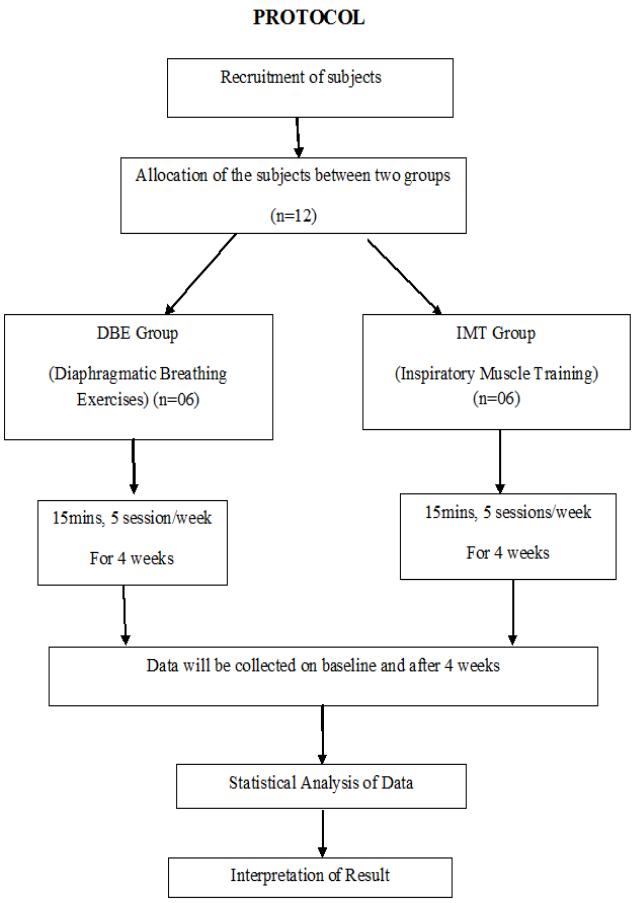
Introduction

Pregnancy is a physiological phenomenon wherein a women experiences physical and psychological changes that are typical of this time period. Maternal pulmonary functions during pregnancy changes because of multiple reasons like enlarged uterus, increased blood volume and progesterone.[1,2] Breathing is clinical presentation of the functional, physiological, biomechanical, biochemical and psychological factors that affects the respiratory system. Studies have shown that the disturbances caused by the disruption of breathing pattern might have a role in part of the problems in pregnancy.[3] Decrease in downward movement of the diaphragm, decreases the resting lung volumes causing the negative pressure to become less negative.[4] Studies have shown that pulmonary function in pregnancy is affected by changes of the airway, respiratory drive and thoracic cage.[5,6] Progressive decrease in expiratory reserve volume from 1300ml to 100ml and Residual volume 1500ml to 1200ml,[7]

reduces functional residual capacity by 17-21%. Tidal volume increases by 30-50%, due to progesterone stimulus and is main cause of increased minute ventilation by 40%.[8] Diaphragmatic breathing, or deep breathing, has many benefits in pregnancy. Thus, the knowledge about the use of diaphragm muscle, to its fullest potential, can prove to be the most significant change that a pregnant woman can have to encourage her own health, and the health of her unborn child.[9,10] Inspiratory muscle training defined as a course of therapy consisting of series of breathing exercises that aim to strengthen the muscles of respiration and hence will make it easier for patients to breathe.[11] Tiago Vasconcelos, Andreia Hall, et. al, in 2016, in their study " Influence of IMT on lung function in female basketball players- a randomised controlled trial", concluded that a 4-week IMT protocol leads to a positive evaluation of basketball player's pulmonary function.[12]This study was the first time intervention, which was done to add a new protocol for the pregnancy rehabilitation to improve ERV.

Materials and Methods

This was a prospective experimental pilot study conducted at SGT Hospital, Gurgaon. This study includes 12 pregnant women during third trimester of age group between 20-30 years with primigravida. Exclusion criteria includes the females with the history of cardiovascular diseases, history of respiratory conditions that affect pulmonary functions like asthma, patients with thyroid problems and history of any psychological disease like anxiety or depression. Participants were explained about the aim and procedure of the study and were given informed consent before inclusion. Pulmonary functions (ERV) were measured by Spirometer. The participants (n=12) were randomly allocated between the two groups i.e. IMT (inspiratory muscle training group and DBE group (Deep breathing exercises). IMT group (n=06) received supervised Inspiratory muscle training for 15 minutes, 5 days per week for 4 weeks. Each session lasting for 2 minutes and comprising of 7 sessions in it with the help of an Inspiratory training threshold device followed by 1 min of rest in-between the session. Throughout the training session, subjects were allowed to choose their breathing pattern. Subjects in Diaphragmatic Breathing group (n=06) performed diaphragmatic breathing exercise for 15 minutes, 5 days for 4 weeks. Each intervention involved a 15 minute resting breathing session and a 15 minute diaphragmatic session consequently. During diaphragmatic breathing, they will be instructed to inhale as deeply as they could while their abdomen expanded with 5 seconds hold, and exhale as slowly as they could while their abdomen contracted.



Result

12 patients were analyzed at baseline and after the intervention of four weeks. There was no significant difference between the groups at baseline as shown in table 1.

Table 1: Baseline characteristics of the participants

Descriptive Statistics

Variables	N	Mean	Std. Deviation (SD)	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
Age	12	25.25	2.598	22	30	23.00	25.00	27.75
Weight	12	69.67	9.168	56	88	65.50	68.00	69.75
Height	12	165.67	3.916	162	176	163.00	165.00	167.75
BMI	12	25.558	3.6493	20.9	33.1	23.125	25.250	26.425

In the DBE group, the mean change in the ERV increased from 0.52-0.62, and it was not found to be significantly different as shown in Table 2. In the IMT group, the ERV increased from 0.51 to 0.69, which was found to be significantly different (p=0.003).

Table 2: Changes in ERV at baseline and after the intervention in the DBE group

Variables	Pre Intervention Mean±SD	Post Intervention Mean±SD	*p*
ERV	0.52±0.43	0.62±0.62	0.21

Table 3: Changes in ERV at baseline and after the intervention in the IMT group

Variables	Pre Intervention Mean±SD	Post Intervention Mean±SD	*p*
ERV	0.51±0.43	0.69±0.62	0.003**

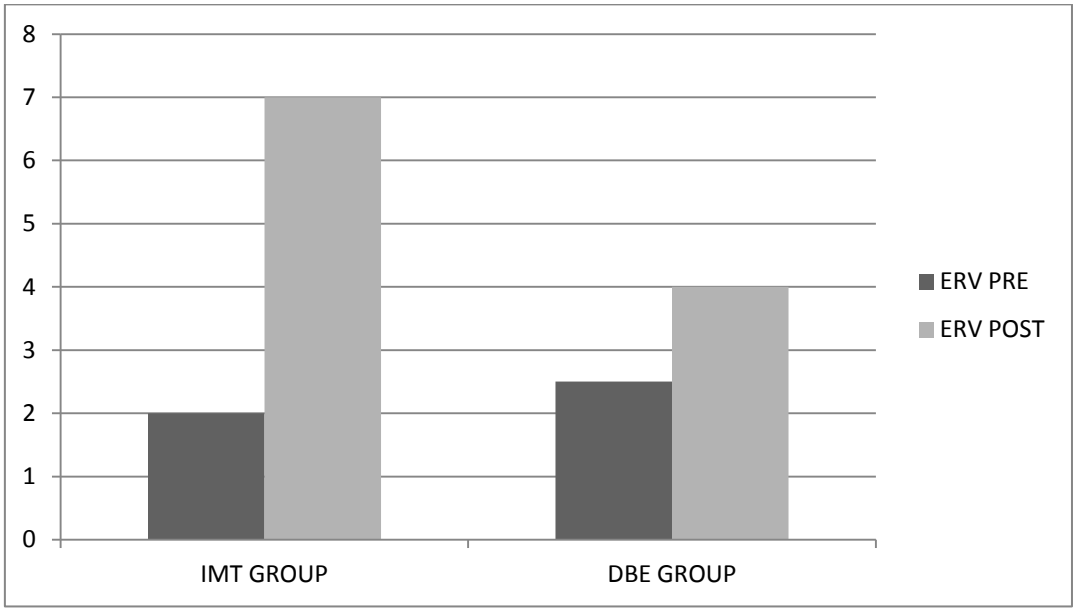


Figure 1.1 Shows the changes in ERV at baseline and after intervention between both the groups

Discussion

Many investigators have studied pulmonary function tests during normal pregnancy, most of them found a significant decrease in pulmonary function test parameters during all pregnancy trimesters.[13-15] Others showed that the PFTs parameters are normal in the first trimester but there was significant decrease in them in the second and third trimesters, or in the third trimester only.[16] This study showed significant improvement in lung function parameters (ERV) in third trimesters. This study is the first time intervention for declaring a positive effect of Inspiratory muscle training in pregnancy during

third trimester. Our results are encouraging to use IMT as a part of rehabilitation protocol during this phase of pregnancy. Although it was a pilot study with small sample size therefore, there is a need for further future studies with the larger sample size. Future studies can explore and compare the effect of IMT between the trimesters and different intensities of IMT during this phase.

Conclusion

The present study shows that there was a significant increase in Inspiratory Muscle Training group in pregnancy during third trimester. The result suggested that the performance of IMT in pregnancy during third trimester helps to improve pulmonary functions (ERV).

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