Online ISSN: 2581-3935
Print ISSN: 2589-7837

International Journal of Medical Science and Diagnosis Research (IJMSDR)

Available Online at www.ijmsdr.com

Volume 2, Issue 5; September-October: 2018; Page No. 44-48

A comparative study of Diaphragmatic Breathing and Resistive Inspiratory Muscle Training on Dyspnea during Pregnancy: A Pilot study

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ABSTRACT:

Dyspnea is an awareness of breathlessness that correlates with the respiratory drive in a person. Since there is an increased respiratory drive in pregnancy, it causes a perception of dyspnea. It is one of the commonest problem in pregnancy and has been noted in an approximately 60-70% of women.

Objective: This study was done to compare the effect of Inspiratory Muscle Training and Diaphragmatic Breathing Exercises on dyspnea during pregnancy.

Method: This was a pilot study on a sample size of 12 pregnant women, who were randomly divided into two groups. One group received Inspiratory Muscle Training (IMT) and another received Diaphragmatic Breathing Exercise (DBE). The outcome measure was dyspnea, which was analysed at baseline and after the intervention of 4 weeks.

Result: Inspiratory muscle training was found to be beneficial to decrease dyspnea grade during pregnancy.

Conclusion: The present study suggested that the performance of IMT in pregnancy during third trimester helps to reduce dyspnea.

Keywords: Pregnancy, Inspiratory Muscle Training, Diaphragmatic Breathing Exercise, Dyspnea.

Introduction:

Pregnancy is a physiological phenomenon wherein a women experiences physical and psychological changes that are typical of this time period.[1,2] Studies have shown that the alterations in the functional, physiological, biomechanical, biochemical and psychological factors affects the respiratory system, which may lead to the disruption of breathing pattern.[3] Dyspnea is one of the main problem amongst pregnant women. Dyspnea has been reported in approximately 60-70% of healthy pregnant women.[4] It was initially attributed to an increased mechanical load by chest wall distortion from the gravid uterus. But, dyspnea typically begins before any upward displacement of the diaphragm, that suggests that factors other than mechanical encumbrance may be involved.[5] Passmore and Durnin, in their study demonstrated the effects of increasing body weight on energy expenditure during level walking at different speeds.[6] 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.[7]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.[8] F. Lotters, B Van Tolet.al. in 2002, in their study "Effects of controlled inspiratory muscle training in patients with COPD", and had concluded that Inspiratory Muscle Training alone significantly improves muscle strength and endurance, sensation of

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dyspnea in patients with COPD. [9] This study was intended to see the effect of IMT on dyspnea during pregnancy.

Materials and Methods:

This was a prospective experimental study conducted at SGT Hospital, Gurgaon. This study was done on 12 women during third trimester of pregnancy with age group of 20-30 years in primigravida and having dyspnea that affects their daily living. The females with the history of cardiovascular diseases, patients with thyroid problems and history of any psychological disease like anxiety or depression were excluded from the study. Participants were explained about the aim and procedure of the study and informed consent was taken. Dyspnea was measured by Modified Borg Scale.

Protocol:

The participants (n=12) were randomly allocated in 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 lasted 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 sessions. 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 were 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:

Variables	**IMT Group Mean ± SD**	**DBE Group Mean ± SD**	***p* value**
Age	24.91 ± 2.8	25.32 ± 2.9	0.9^{NS}
BMI	22.96 ± 5.34	21.74 ± 5.29	0.2^{NS}
MBS	5.7 ± 1.44	5.2 ± 1.32	0.9^{NS}

NS: Non significant

Dyspnea: At baseline, both the groups were having high grade of dyspnea. The mean of Modified Borg Scale was found to be significantly decreased after the intervention in the IMT group when compared to DBE as shown in table 2. Between the group, it was found to be statistically significant (p=0.001). Use of IMT during third trimester of pregnancy showed a significantly lower score of Modified Borg Scale compared at rest after the intervention.

Table 2: Changes in Dyspnea Grade (Modified Borg Scale 0-10) during the study:

Variables	DBE Group Frequency (%)	IMT Group Frequency (%)	χ^2	*p*
Modified Borg Scale Pre (0-10)				
3	1(0.12%)	0(0%)	1.886	0.39^{NS}
4	1(0.12%)	3(0.36%)		
5	3(0.36%)	0(0%)		
6	1(0.12%)	2(0.24%)		
7	0(0%)	1(0.12%)		
Modified Borg Scale Post (0-10)				
0	0(0%)	0(0%)	2.393	0.001**
1	0(0%)	2(0.24%)		
2	2(0.24%)	1(0.12%)		
3	3(0.36%)	3(0.36%)		
4	1(0.12%)	0(0%)		

NS: **Non Significant**
****: Highly Significant**

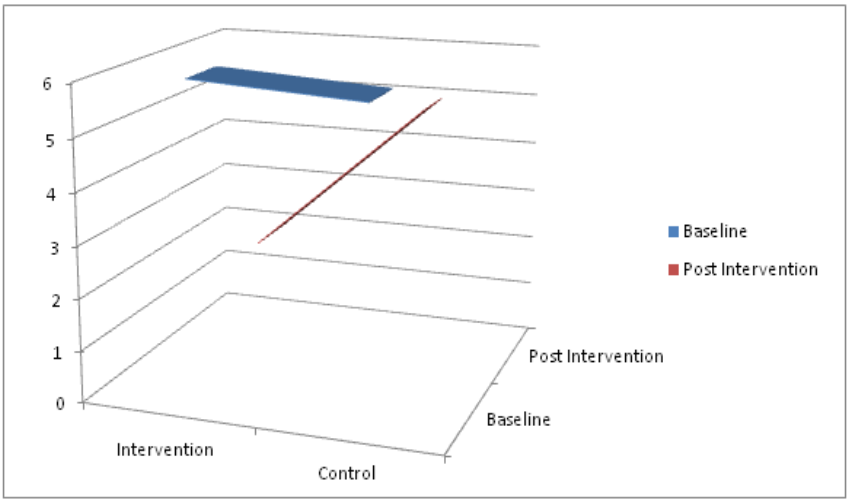

Figure 1.1: shows the changes in Dyspnea (MBS) at baseline and after intervention between both the groups.

Discussion:

The physiological changes during normal pregnancy affecting respiratory system shows increased respiration thereby causing dyspnea.[10] Milne et.al, reported the onset of dypnea, as early as, in the first gestation trimester,[11]which suggests that mechanical and biochemical changes contribute to dyspnea during pregnancy.[12-13] However, many authors believed dyspnea to be caused by the discrepancy between the feedback from receptors and feed-forward message to ventilator muscle.[14] Garcia-Rio et al. in his study showed that a normal pregnant women with dyspnea inspite of having a similar oxygen consumption, lung volume distribution and respiratory muscle strength to those with normal breathing, had a higher respiratory drive when responding to hypoxia and CO_2.[15] A study published in 2018 by Amola M et.al. discussed that there being decrease in the level of ERV causes changes in the airway and the respiratory drive, which may lead to breathlessness during pregnancy but in their study they did not comment about the effect of IMT training on Dyspnea.[16] Many scientists believed that the excessive ventilation response to PaO2 and/or PaCO2 is related to the physiologic dyspnea in pregnancy.[17] IMT strengthens the muscles of respiration and hence makes it easier for patients to breathe, increasing the ventilator workload. This study shows a statistical improvement in the dyspnea score in the IMT group post intervention as compared with the DBE group. This study is the first time intervention for declaring a positive effect of Inspiratory muscle training on Dyspnea 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 smaller 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 grade of dyspnea (MBS).

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