

Effect of Diaphragmatic Breathing Exercise verses Guided Imagery on Anxiety and Stress in Third Trimester of Pregnancy: A Randomized Trial

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Abstract: ***Introduction:** Parenthood has an impact on stress, anxiety, and mood during pregnancy and the postpartum period. Mood swings are common in the first and third trimesters, mood swings are more common due to hormonal changes. Pregnant women's stress levels rise in the third trimester. Stress should be handled to reduce potential dangers. This study is an attempt to compare the effectiveness of Guided imagery and diaphragmatic breathing exercises on anxiety and stress in the third trimester of pregnancy. **Methods:** This was a prospective randomized controlled trial. The study was designed to compare the effects of diaphragmatic breathing exercise with guided imagery on anxiety and stress in the third trimester of pregnancy. A total of 50 pregnant females were recruited (25 in each group). The outcome measures used were blood pressure, heart rate, respiratory rate, the Beck inventory anxiety scale, and perceived stress score scale. **Results:** The control and intervention groups were comparable at baseline. Significant differences were observed between the 2 groups. Results indicated that both the diaphragmatic breathing exercise and guided imagery applied by pregnant women for five weeks; it had positive effects on physiological parameters such as blood pressure, heart rate, and respiratory rate with their levels being significantly reduced. **Conclusion:** There is significant difference between the diaphragmatic breathing exercise group and the guided imagery group in effective management of anxiety and stress in the third trimester of pregnancy.*

Keywords: Stress, anxiety, third trimester, diaphragmatic breathing exercise, guided imagery

1. Introduction

Pregnancy and the transition to parenthood involve major physiological and psychological phenomena that affect various organs and body systems of pregnant women.

^[1]Psychological components mainly include anxiety, stress, and mood. Mood changes increase during the first and third trimesters; this is due to various hormonal changes. In addition, during the third trimester, the cortisol levels increase, which in turn causes stress and anxiety. ^[2] Stress and anxiety have been associated with pregnancy complications such as preterm birth, low birth weight, preeclampsia, and cardiovascular diseases. ^[3] According to studies, the prevalence of anxiety disorders during pregnancy in developed and developing countries is 10% and 25%, respectively. In India, the prevalence of perceived stress among pregnant women is reported to be 33 % (2019). ^[4]The above percentage depends on the gestational age, as the incidence reported in the third trimester of pregnancy is 14% worldwide (2014). ^[5]Previous studies have reported that approximately 50% of pregnant women experience prenatal anxiety in their third trimester (2002). ^[6]

In the third trimester phase, there is a surge in the stressful experiences of pregnant women. This could be predominantly due to negative thought processes, fear of losing a child, emotional experience etc. For this reason, pregnancy is a time of increased vulnerability for the onset or relapse of a mental disorder. ^[7] Hence, stress management plays a vital role during the third trimester.

Stress should be handled to reduce any potential risk from stressful conditions. ^[8] There are various documented studies done on methods to decrease anxiety and stress associated with pregnancy like: Diaphragmatic breathing exercise, relaxation therapy, guided imagery, cognitive behavioral therapy, attention training technique, mindfulness. Among them, diaphragmatic breathing exercises and guided imagery are integral part.

Studies have shown the effectiveness of diaphragmatic breathing exercise in both anxiety and stress reduction in pregnant women. It was found to be an effective non-pharmacological intervention for enhancing sleep and emotions, as well as lowering anxiety, sadness, and stress. ^[9]

In addition, guided imagery represents a basic principle of psychophysiology in which every thought has a physiological response. An emotional response to a mental image connects the mind and body, causing a physiologic change. ^[10]

However, there is no study comparing the effectiveness of these two techniques on anxiety and stress in the third trimester of pregnancy. There are studies which suggest, both diaphragmatic breathing exercises as well as guided imagery are effective in mitigation of stress and anxiety in pregnant women. However, there is a paucity of published data comparing the two techniques. This study, is an attempt to find out which of the two techniques is more effective in stress and anxiety management.

2. Review of Literature

- 1) The study conducted by Najmijeh Saadati, Masumeh Mohammadi, for effect of breathing exercise on breathing pattern of 52 pregnant women with gestational age of 28 weeks aged between 18 to 35 years in Imam Khomeini hospital ahvaz Iran between autumn 2013 and spring 2014. The subject were randomly divided into two groups Comparison of PETCO₂ of two groups before performing breathing exercises showed that mean PETCO₂ in the intervention group was 1.08mmHg less than the control group. This difference was not significant (P=0.308). however after performing breathing exercises in intervention group was 2.34mmHg higher than control group, which showed significant difference (P=0.011). these exercise can help modify breathing patterns in pregnant women, and has a significant role in fetal and maternal health. [8]
- 2) Nevinhotunsah in conducted the study to determine the effect of maternal-foetal diaphragmatic breathing exercise on the level of depression, anxiety, stress and maternal fetal attachment in pregnancy. Between June 2015 and June 2016, 60 pregnant women with gestational diabetes were followed up at Istanbul University Medical School's Department of Obstetrics and Gynecology's polyclinic. The intervention and control groups' mean ages were 30.6 ± 3.3 and 31.3 ± 3.1, respectively, while the mean gestational age was 27.2 ± 0.8 and 27.2 ± 1.0. The intervention group's PAI value increased more than the control group's (p =.000). The study found that diaphragmatic breathing exercises appear to improve mood and increase maternal-fetal attachment. [9]
- 3) This study was conducted by George Pchrousos, Christina tragea to assess the effectiveness of applied relaxation in reducing anxiety and stress in second-trimester pregnant women. Sixty Primigravida women in their second trimester were randomly assigned to a 6-week stress management programme (RB-PMR, twice daily) or not (N=29). The proposed relaxation techniques reduced perceived stress (mean change-3.23, 95 percent CI:-4.29 to-0.29) and increased sense of control (mean change 1.99, 95 percent CI: 0.02-3.7). Relaxation appears to reduce perceived stress and increase sense of control in pregnant women. [10]
- 4) An early second trimester guided imagery (GI) intervention for stress reduction in pregnant African American women was evaluated by R. Jeanne Ruiz. This 12-week prospective longitudinal study of 72 pregnant women used a randomised controlled experimental design. The results suggest that GI intervention may reduce stress, anxiety, and fatigue in pregnant African American women. [11]
- 5) This study was conducted by Saeideh Nasiri, Hossein Akbari to determine the effect of progressive muscle relaxation and guided imagery on stress, anxiety, and depression in pregnant women. Results suggest significant differences in mean scores of stress, anxiety, and depression at three different times in the relaxation group (P< 0.05) whereas found no significant differences in the mean of scores of stress, anxiety, and depression in the control group. [12]

3. Methodology

The aim of our study was to compare the effects of diaphragmatic breathing exercise with guided imagery on anxiety and stress in the third trimester of pregnancy. The Objectives were to study the effect of diaphragmatic breathing exercise on anxiety and stress in the third trimester of pregnancy; to study the effect of guided imagery on anxiety and stress in the third trimester of pregnancy; and compare which group is more effective on anxiety and stress in the third trimester of pregnancy. Our alternate hypothesis was that there was a significant difference between diaphragmatic breathing exercise group and the guided imagery group in effective management of anxiety and stress in the third trimester of pregnancy.

The study design chosen was comparative in nature. We included women in the third trimester of pregnancy with a primigravida history. The average age of all patients was above 18 years. Data was collected from a tertiary care centre located in Dahisar, Mumbai. The Sampling type was convenient. The sample size was estimated to be fifty (50), twenty five in the experimental group and twenty five in the control group. The total duration of the study was six months. We included patients who agreed to participate and were able to read, write, and understand the scale. Their capability to express a source of social support was checked as well. We excluded patients had a history of pregnancy related complications. We also excluded participants with known psychiatric illness and those who were single parents.

The materials used for the execution of the study included digital BP apparatus, printed informed consent form, and the following scales: Beck's anxiety inventory and perceived stress scale

4. Procedure

Participants' consent was obtained by having them fill out a consent form prior to the start of the study. Based on study criteria, eligible pregnant women were invited to participate in the study.

Randomization was carried out with a manual randomization technique where the pregnant women chose a piece of paper with Group A or Group B on it.

All 50 participants were separated into two groups (Group A and Group B), with Group A being allocated to diaphragmatic breathing exercises and Group B being allocated to guided imagery.

For all participants, pre-study vitals (blood pressure, heart rate, and respiratory rate), the Beck inventory anxiety scale and perceived stress scale were taken prior to the trial to determine the baseline value.

Group A-Diaphragmatic breathing exercises:

- Position: sitting /semi fowler's position.
- Instruction: One hand on the chest, the other on the belly. Breathing should be done in such a way that when inhaling, the hand on the abdomen should rise, and when exhaling, the hand on the abdomen should fall, ensuring

that the hand placed on the chest moves as little as possible Breathing should be done in a relaxed manner.

- Duration: They were instructed to complete 3 sets of 10 repetitions with a 10 second rest between each set. They were instructed to do the same thing at home unsupervised twice a day. It was repeated for 5 weeks (supervised breathing exercise + unsupervised breathing exercise with a mobile phone). They were asked via mobile phone if they did breathing exercises at home or not for the same weekly activity log maintained for individual participants.

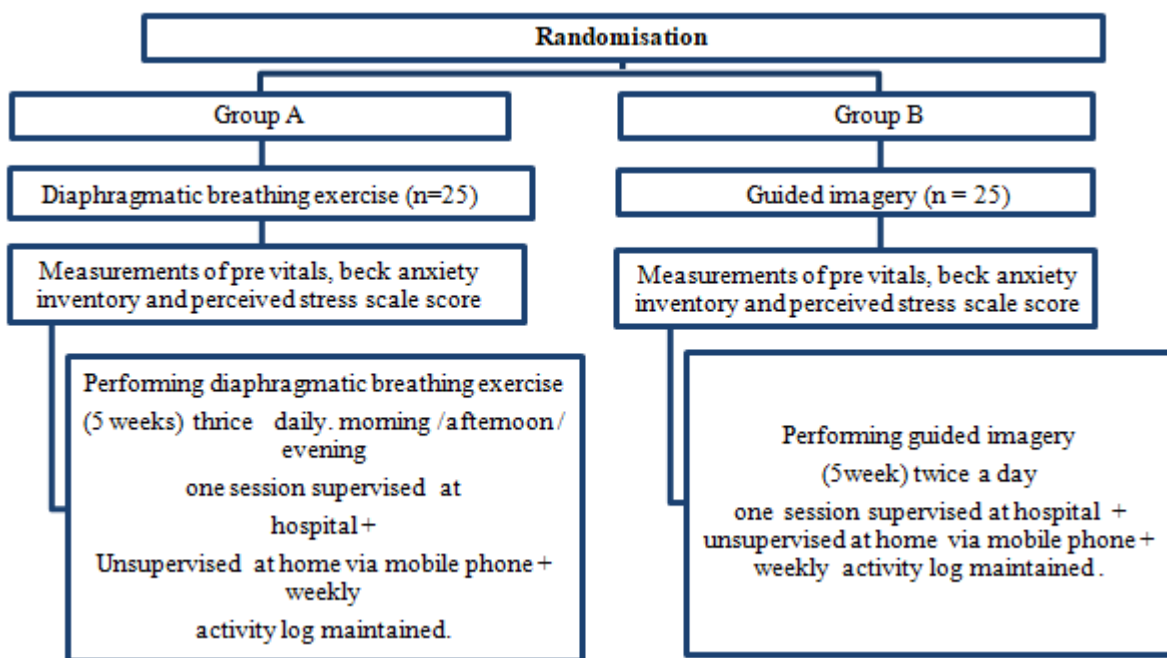
Group B-Guided imagery therapy:

- Position: Sit or lie comfortably in a quiet environment.
- Direction: Eyes closed Take deep breaths. Continue to inhale and exhale deeply as you relax. Imagine a peaceful scene like a verdant forest a, stunning mountain range, or a tranquil tropical beach or imagine a relaxing area in nature.

Visualize your baby safe and secure inside your body, cushioned and protected. You can gradually let go of worries and focus on your inner serenity and stillness. Consider the scene's details. Then imagine the sounds, scents, and feelings of being there.

A path in your scenario. Imagine yourself travelling along the trail, imagining the sights and sounds. Allow yourself to be immersed in your scene for a while. Deepen your breathing. Count to 3 after 15 minutes. Eyes open.

- Duration: They were instructed to do it 15 minutes, twice a day. It was repeated for five weeks (supervised guided imagery + unsupervised guided imagery via mobile phone). They were asked via mobile phone if they did guided imagery at home or not. For the same weekly activity log maintained for individual participants.
- The Post-Vitals, Beck inventory anxiety score and perceived stress score of all participants were obtained after 5 week of intervention.



Picture of participants:



Picture 1: Diaphragmatic Breathing Exercise



Picture 2: Guided Imagery



Picture 3: Example of Guided Imagery Scenes for Participants

5. Statistical Data Analysis and Interpretation

Table 1: Diaphragmatic breathing exercise

Parameters	Test	Mean±SD	Paired t Test	P-Value	Significant at 5% Level
Systolic blood pressure	Pre	120.8±7.2168	2.479*	0.0206	Yes
	Post	118.84±4.968			
Diastolic blood pressure	Pre	69.92±7.4884	1.421	0.1682	Not
	Post	69.24±7.019			
Heart Rate	Pre	73.4±7.1821	2.240*	0.0346	Yes
	Post	71.8±7.5498			
Respiratory Rate	Pre	21.76±1.7625	1.619	0.1185	Not
	Post	21.44±1.5567			

*Statistically Significant at 5% level i.e., P<0.05.

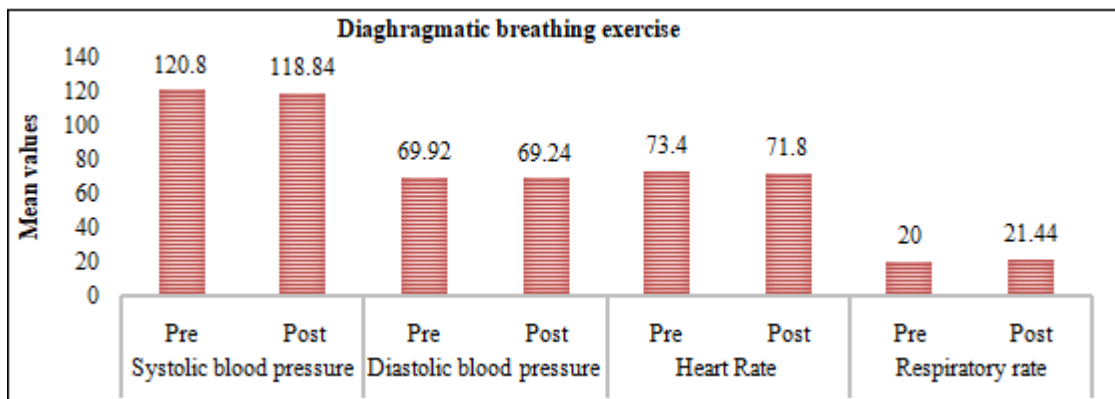


Table 2: Guided imagery

Parameter	Test	Mean±SD	Paired t- Test	P- Value	Significant at 5% Level
Systolic blood pressure	Pre	123.96±7.33	4.955*	0.0001	Yes
	Post	121.4±6.16			
Diastolic blood pressure	Pre	77.28±7.4973	1.438	0.1633	Not
	Post	76.84±7.1686			
Heart Rate	Pre	89.52±8.3022	5.404*	0.0001	Yes
	Post	85.2 ±7.3541			
Respiratory Rate	Pre	20±1.1902	1.000	0.3273	Not
	Post	19.92±1.255			

*Statistically Significant at 5% level. i.e., P<0.05.

**Statistically highly Significant at 0.1% level. i.e., P<0.001.

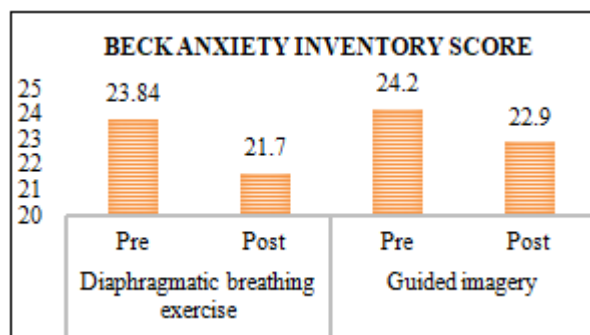


Table 4: Descriptive analysis of pre post perceived stress in diaphragmatic BE and guided imagery. Pre post graph of perceived stress scale for both groups

Parameters	Group	Test	Mean±SD	P- value	Significant at 5% level
Perceived stress	Diaphragmatic breathing exercise	Pre	18.56±5.180	0.001	Yes
		Post	16.2±4.051		
Perceived stress	Guided Imagery	Pre	16.44±4.154	0.002	Yes
		Post	14.7±2.947		

*Wilcoxon signed-rank test

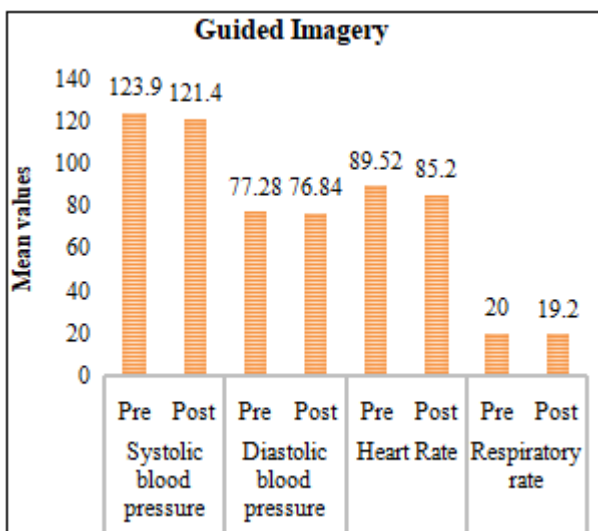
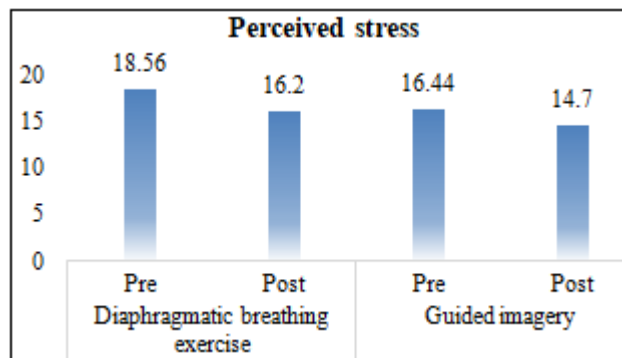


Table 3: Descriptive analysis of pre-post Beck anxiety inventory scales core in Diaphragmatic breathing exercise and guided imagery

Group		Mean ± SD	Median	P- value	Significant at 5% level
Diaphragmatic breathing exercise	Pre	23.84 ± 3.624	2	0.0001	Yes
	Post	21.7 ± 2.296			
Guided imagery	Pre	24.2 ± 4.536	0	0.007	Yes
	Post	22.9 ± 3.310			

*Wilcoxon signed-rank test (Outcome measure Beck anxiety inventory)

Pre-post graph of Beck anxiety inventory score for both the groups:



6. Results

There was a reduction in blood pressure for both groups, but there was no significant difference in systolic blood pressure. However, there was no statistically difference in diastolic blood pressure.

There was reduction in diastolic blood pressure in both groups, but statistically insignificant. The mean heart rate of the diaphragmatic breathing exercise group was lower than that of the guided imagery group.

The results indicated that the difference between the two groups was significant. The mean respiratory rate of the

diaphragmatic breathing exercise group was higher than the guided imagery group. The results indicated that the difference between the two groups was significant.

There is a reduction in anxiety and stress mean scores, but it is statistically not significant for both groups. There is a reduction of Beck's anxiety inventory score in both the groups and it was statistically significant.

7. Discussion

In the present study, there was a significant decrease in post systolic and diastolic blood pressure in the diaphragmatic breathing exercise group. However, the decrease can be attributed to sympathetic-vagal balance modulation.^[18] Similar findings were found by Aalami et al. in a study done on pregnant women, which showed a significant decrease in blood pressure.^[19]

There was a decrease in respiratory rate in the diaphragmatic breathing exercise group, but it was not statistically significant. The decrease in respiratory rate could be due to cephalic displacement of the diaphragm and changes in chest wall configuration in pregnancy.^[21] This can be supported by a study conducted on pregnant women to know the effects of breathing exercises on breathing patterns, which shows that after performing breathing exercises, respiratory rate decreases.^[18]

In this study, there was a decrease in heart rate and it was statistically significant for the diaphragmatic breathing exercise group. The probable cause of a significant decrease in heart rate could be impaired baro reflex control. A study conducted on pregnant women showed a decrease in heart rate.^[20]

In this study, there was a significant decrease in post systolic blood pressure and heart rate, but an insignificant decrease in diastolic blood pressure and respiratory rate in the guided imagery group. A study was done on the effects of guided imagery on blood pressure in pregnant women with hypertension, which showed a decrease in blood pressure and heart rate in pregnant women.^[22] The possible justification given in a study which show guided imagery is a mind body therapy that involves visualization of various mental images to facilitate relaxation and reduction in blood pressure and heart rate (Moffatt et al. in 2010). The lack of statistical significance in reduction in respiratory rate could be attributed to short time duration.

There was a significant decrease in the Beck's anxiety inventory and perceived stress score in diaphragmatic breathing exercise group. These can be supported by study on effect of diaphragmatic breathing exercise on psychological parameters in gestational diabetes, shows decrease in anxiety and stress in pregnant women (Fiskinet al. in 2018). This anxiety and stress score decrease due to changes in functioning of maternal HPA-Axis. As stress and anxiety increases sympathetic and HPA-Axis is activated. The HPA-axis secretes cortisol, which is activated by the adrenal gland and causes physiological changes. Diaphragmatic breathing exercise stimulates vagal activation of the GABA pathway, turning the brain function towards

parasympathetic activity which in turn decreases cortisol level. This leads to reduced stress and anxiety in pregnant women.^[9]

In present study, guided imagery shows significant decrease in Beck anxiety inventory and perceived stress score. The possible justification given by R. Jeanne Ruiz et al in 2014, guided Imagery for the Management of Stress and Symptoms in Pregnant African American Women. This anxiety and stress score decrease due to maintaining homeostasis by a process referred to as allostasis. Inefficient management of daily stress and anxiety increases in allostatic load and negative health outcomes (Russell et al. in 2019).^[23] Guided imagery includes focused breathing, mental rehearsal of how to deal with anxiety and stress-related symptoms, the selection of images, and affirmations about healthy pregnancy and babies. This reduces day-to-day anxiety and perceived stress. This impacts on allostatic load and maternal health outcomes.^[11] There are some limitations to our study. Study duration was small. Study was single centric. This study used self-reported scale measures which are dependent on the participants accurate reporting. In this study, pregnant women were followed up for 5 weeks. In the future studies can be carried out on a larger sample size. Collaboration with psychiatrists, gynecologists and obstetrics. The current study has immense clinical application in terms of using it to assess the effect of diaphragmatic breathing and guided imagery on anxiety and stress in the third trimester of pregnant women and performing both the techniques when there is an increase in anxiety and stress. This study is also used to cope with and help pregnant women reduce stress and anxiety. It is very important, effective, low cost and easy to use intervention techniques available to pregnant women.

8. Conclusion

This study investigated the effects of diaphragmatic breathing exercise versus guided imagery on anxiety and stress in the third trimester of pregnancy. Our results indicated that both the diaphragmatic breathing exercise and guided imagery applied by pregnant women for five weeks; it had a beneficial effect on physiological indicators such as blood pressure, heart rate, and respiratory rate, dramatically lowering their levels.

In addition there was no significant difference in Beck anxiety inventory and perceived stress in both the groups, whereas guided imagery was more beneficial than diaphragmatic breathing exercise in reducing anxiety and stress in the third trimester of pregnancy.

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