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# Impact Of Aerobic Exercise On Physical & Mental Health In Nulliparous Pregnant Women

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**INTRODUCTION:** Pregnancy is the fertilization and development of one or more offspring, known as an embryo or fetus, in a women's uterus. Pregnancy and the transition to motherhood may cause stress for women that negatively affects their psychological health. Maternal stress is associated with early labor onset, poor fetal development, and poor child motor and mental development. Fatigue has been found to be related to stress, with pregnant women often reporting tiredness or fatigue (87.2% to 96.5). Prenatal fatigue is also related to prenatal depression, anxiety and preterm birth and is predictive of cesarean delivery. In other words, maternal stress and fatigue have a similar impact on a woman's health and well-being during pregnancy.
**MATERIAL AND METHOD**: Women who were pregnant (nulliparous) and age between 16 & 30 were randomly selected for the study. Participants were equally divided into 2 groups randomly; Group A (aerobic exercise group), Group B (control group). Baseline data such as name, age, Center for epidemiological studies-depression scale (CES-D), Perceived stress scale (PSS-10) & Chalder fatigue scale (CFS) score was obtained to compare the same with post test data. Participants in group A received aerobic exercise 5 days/week. Participants in group B received antenatal education.
**RESULT:** The significant change was observed in experimental group in CES-D, PSS & CFS score. The significant change was also observed in control group in CES-D, PSS but there was no significant difference found in the mean score reduction in case of CFS score. The p value of unpaired test was <0.0001. The significant change was observed in the experimental group & control group but there was no difference in case of control group for CFS. The p value of Un-paired t test was 0.0985. The P value of paired t test for post CES-D,PSS & CFS score between experimental and control group was <0.0001. So there was statistically significant change was noted in CES-D, PSS & CFS.
**DISCUSSION:** The study shows the significant effect of aerobic exercise on the level of fatigue, depression & stress in nulliparous pregnant women. The therapeutic effects of aerobic exercise on the level of fatigue observed in this study might be connected with the effect of exercise training on neuromusculoskeletal efficiency and improved cardiovascular endurance, on the level of depression is connected with antidepressant effect of exercise & the possible physiology that aerobic exercise reduces the stress level is aerobic will increases the endorphin level as there is high level of cortisol in blood for long time it will blocks the continuous release of CRH and negatively affect the body.
**CONCLUSION:** This study concluded that there was a significant effect of aerobic exercise on the level of fatigue, depression & stress in nulliparous pregnant women.

**Key words:** *Nulliparous pregnant women, Aerobic exercise, CES-D, PSS & CFS Scale*

## INTRODUCTION

The reproductive period of women begins at menarche and ends in menopause. It usually extends from 13 -45 years. While biological variation may occur in different geographical areas , pregnancy is rare below 12 years and beyond 50 years.[(1)]Pregnancy is the fertilization and development of one or more offspring, known as an embryo or fetus, in a women's uterus. Pregnancy is divided into 'trimesters', each equating to approximately three month. During pregnancy there is a progressive anatomical & physiological change occur not only confined to the genital organ but also to all systems of the body.[(2)]

Pregnancy and the transition to motherhood may cause stress for women that negatively affects their psychological health. Maternal stress is associated with early labor onset, poor fetal development, and poor child motor and mental development. Fatigue has been found to be related to stress, with pregnant women often reporting tiredness or fatigue(87.2% to 96.5). However, few studies have focused on prenatal fatigue .Among those few studies, mothers perceived significantly higher level of fatigue in the evening than in the morning as well as more severe fatigue from the seventh to ninth month of pregnancy , although the increase in fatigue may start as early as 11 to 12 weeks of gestation . Prenatal fatigue is also related to prenatal depression, anxiety and preterm birth and is predictive of cesarean delivery. In other words, maternal stress and fatigue have a similar impact on a woman's health and well-being during pregnancy.

According to the literature, pregnancy is considered a unique time for behavior modification and habits adopted during pregnancy may have the potential to affect a woman's health for the rest of her life[1, 2]. The period might offer enhanced health focus as it is a time of bodily changes and also because many women feel a responsibility for the health of the unborn baby .[3]Thus, pregnancy has been proposed to be an optimal time to introduce lifestyle changes through advice about exercise, as well as nutritional and weight gain counseling[4].

**Recommended Classification of Deliveries from 37 Weeks of Gestation**

- Early term: 37 0/7 weeks through 38 6/7 weeks
- Full term: 39 0/7 weeks through 40 6/7 weeks
- Late term: 41 0/7 weeks through 41 6/7 weeks
- Post term: 42 0/7 weeks and beyond

Data from Spong CY. Defining "term" pregnancy: recommendations from the Defining "Term" Pregnancy Workgroup. JAMA 2013; 309:2445–6

**MATERNAL ADAPTATION TO PREGNANCY**

**PHYSIOLOGICAL CHANGES DURING PREGNANCY:**

During pregnancy the female body goes through various anatomic and physiologic changes to create a suitable environment for the fetus, meet the increased maternal and fetal metabolic demands and to prepare the mother for parturition.[5] The most obvious changes are the enlarged abdomen and increased body weight, but there are also important changes in the cardiovascular and respiratory system[5], e.g. affecting cardiac output, resting heart rate, blood volume and minute ventilation .[3]

Some of the maternal adaptations to pregnancy may also impact pregnant women's ability to participate in and perform physical activity and exercise. According to Artal & O'Toole[3]anatomical changes due to weight gain increases the forces around the hip- and knee joint, especially during weight bearing activities. An increased lumbar lordosis and a shift in the center of gravity may affect posture and balance, and potentially increase the risk of falling. Also, increased levels of pregnancy hormones causes increased ligamentous laxity [3, 6], which may result in more unstable joints and thereby increased risk of injuries and discomforts.[6]

Moreover, maternal response to exercise is affected by endocrine changes that alter the regulation of the cardiopulmonary and metabolic function. Hemodynamic changes, including increased blood volume, heart rate, stroke volume and cardiac output, as well as reduced blood pressure, appear to establish a circulatory reserve necessary to fulfill maternal and fetal oxygen and nutrition requirements both at rest and during moderate physical activity .[3]A reduced maximum heart rate and increased resting heart rate results in a reduced maximum heart rate reserve . Due to the increased plasma volume, the hemoglobin concentration is reduced, and thus also the capacity for oxygen delivery.[7] Moreover, cardiovascular changes apply some considerations to maternal body positions both during exercise and at rest . Supine positions results in a relative obstruction of the vena cava, thus a reduced venous return, decreased cardiac output and orthostatic hypotension. In addition, motionless standing is associated with a significantly decreased cardiac output .[3]

Basal metabolic rate and heat production are increased during pregnancy compared to non-pregnant levels .[3] Due to the increased resting metabolic rate, less energy is available for muscle contractions .[7] The increased heat production affects body temperature which during physical activity is directly related to exercise intensity, and the extra heat is dissipated through the cardiovascular system and through the evaporative cooling through sweat. For non-pregnant women, moderate intensity aerobic exercise in thermo neutral conditions results in a rise in core temperature of approximately 1.5 degrees, but data on the effects during pregnancy are limited. Moreover, as a result of the increased oxygen requirements during rest and because breathing is more labored due to the enlarged uterus adding pressure on the diaphragm, there is a decrease in oxygen available for aerobic exercise .[3] Also, maternal weight gain due to increased adipose tissue and blood volume, as well as growth of the placenta, fetus and uterus, results in increased cost of energy during weight bearing activities, and a reduced relative oxygen uptake .[7] Hence, subjective work load and maximum exercise performance is decreased.[3] The physiological changes during pregnancy may affect women's psychological health, and pregnancy complaints are also common.

**COMMON PREGNANCY COMPLAINTS:**

Due to the physiological changes of pregnancy, many of them triggered by pregnancy hormones, physical symptoms are common and normal[8]. Table 1 shows a list of pregnancy symptoms that are to be expected, as well as proposed mechanisms.

**Table 1 COMMON PHYSICAL CHANGES WITH PREGNANCY FROM ACOG:**

| Physical symptom | Proposed reason |
|---|---|
| Backache | Strain on back muscles from extra weight<br>Changed posture<br>Stretched and weakened abdominal muscles |
| Constipation and nosebleed | Hormone levels and increased blood volume makes mucus membranes swell, dry out and bleed easily |
| Constipation and gas | Infrequent bowel movements<br>Slowed digestion due to progesterone<br>Extra weight from uterus adding pressure on the rectum |
| Leg cramps | Reasons are not clear |
| Frequent urination | Kidneys work harder to flush waste product out<br>Uterine growth adds pressure to the bladder<br>Fetus moving against the bladder |
| Hemorrhoids | Extra blood in the pelvic area<br>Pressure of the growing uterus on the lower body |
| Headache | Pregnancy hormones, hunger, stress, caffeine withdrawal symptoms |
| Mouth and tooth ache | Pregnancy hormones causes swelling and bleeding<br>Mouth watering<br>Increased risk for cavities |
| Heart burn | Burning feeling in throat and chest due to pregnancy hormones relaxing the muscle valve between the stomach and esophagus |
| Insomnia | Uncomfortable because of growing stomach<br>Pulling of ligaments around the uterus |
| Lower abdominal pain | Pilling of ligaments around the uterus |
| Fatigue | Pregnancy hormones, body works harder to create and support a new life |
| Nausea and vomiting | Increased levels of hormones, other, unknown reasons |
| Numbness and tingling | Uterine growth and swelling adds pressure to nerves Hyperventilation |
| Shortness of breath | Increased progesterone<br>Growing uterus adds pressure to the diaphragm |
| Skin and hair changes | Increased melanin |

Studies measured minor pregnancy symptoms by the Physical Discomfort Checklist containing 29 different symptoms identified through literature searches as well as expert and practitioner's advice. In addition to fatigue, nausea and vomiting, pelvic girdle pain, back pain and urinary incontinence, examples of symptoms include heartburn, constipation, headache, vaginal discharge, leg cramps, varicose veins, hemorrhoids, edemas and insomnia. Later Zib and colleagues identified 38 different symptoms occurring with higher frequency in pregnant women than controls. The authors found that in mean, pregnant women reported 24.2 symptoms, compared to 11.2 in the non-pregnant sample. During pregnancy, the five most frequently reported symptoms were: frequency of micturition, fatigue, pelvic pressure, insomnia and low back pain. Recently, Foxcroft et al. designed a Pregnancy Symptoms Inventory aimed to assess a wide range of pregnancy symptoms, as well as determine their impact on quality of life. The Pregnancy Symptoms Inventory consists of 41 items, with the top four most common complaints being: urinary frequency (52.2%), tiredness (45.5%), poor sleep (27.5%) and back pain (19.5%) (47). Tiredness (76.3%), poor sleep (54.5%), back pain (52%), headache (50.9%) and nausea (30.1%) were the symptoms reported to considerably limit activities of daily life. [9]

**PREGNANCY AND DEPRESSION:**

According to Gaynes et al. perinatal and pregnancy depression is defined as minor and major depressive episodes that occur either during pregnancy or within the first 12 months postpartum. Symptoms of depression include sadness and anxiety, loss of interest in activities, fatigue and decreased energy, insomnia, changes in eating patterns, as well as aches and pains. In the literature, depression or depressive symptoms is often measured by the Center for Epidemiological Studies Depression Scale (CES-D), the Edinburgh Postnatal Depression Scale (EPDS) or the Beck Depression Inventory (BDI). These self-report instruments consist of 20-21 items and assess depressive mood through e.g.; feelings of pessimism, guilt, helplessness and sadness, sense of failure, suicidal thoughts, fatigue, and weight loss. Studies suggest a prevalence of depression of between 7.4% and 12.8% at different times during pregnancy. As for depressive symptoms, Haas et al. reported an increase from 11.7% prior to pregnancy to 25.2% during the first trimester. Moreover, Mckee and

colleagues found that half of the healthy pregnant women in the study sample showed elevated levels of depressive symptoms.

The risk factors for perinatal depression include e.g.; family history of depression, previous depressive episodes, social isolation, chronic health conditions and life stress. Pregnancy depression may increase the risk of adverse pregnancy outcomes, e.g. reduced physical functioning including poor sleep, reduced psychosocial functioning, reduced quality of life and increased suicide risk. In addition, a recent study on the Norwegian population found that pregnancy depression increased the risk of alcohol consumption during pregnancy. Moreover, postnatal depression has been found to be a common outcome of pregnancy depression .[9]

**MATERNAL DEPRESSION AND ADVERSE REPRODUCTIVE OUTCOMES:**

1) **Miscarriage:** Depressive symptom can also lead to miscarriage.[11]
2) **Growth effects:** Depressive symptoms in the mother have been linked with an increased risk for delivery of a LBW (low birth weight)infant insome but not all studies.
3) **Preterm delivery:** Preterm deliveries (PTD) are deliveries that occur prior to 37 completed weeks of gestation. Several studies report an association between depressive symptoms or a depressive disorder and shorter gestations, including PTD, although findings are not consistent.
4) **Neonatal effects:** Neonates born to mothers with a depressive disorder have increased risk for irritability, less activity and attentiveness, and fewer facial expressions compared to offspring born to mothers without depression. Neonates born to mothers with a depressive disorder have increased risk for irritability, less activity and attentiveness, and fewer facial expressions compared to offspring born to mothers without depression.[12]

**DIAGNOSING A DEPRESSIVE DISORDER IN PREGNANT WOMEN:**

1) **Routine use of a self-report screening instrument:** Routine use of a self-report screening instrument does not supplant clinical diagnosis but can determine which women require further assessment. Many questionnaires include questions about fatigue, changes in sleep, or alterations in appetite that may be indicative of a depressive disorder but are also common in unaffected pregnant women. Either using a scale that has been validated among pregnant women or clarifying a woman's response to such questions can reduce false-positive rates.

The most commonly used screening questionnaire for depression in pregnancy is EPDS and includes 10 items. A cutoff of at least 12 is often recommended in pregnancy. The nine-item Patient Health Questionnaire is also useful and has been evaluated in an obstetrical–gynecological setting. The 20 item CES-D is also used to determine depression in pregnant women.

2) **Blood sample analysis:** Immune function was measured by serum cytokine. The study on Perinatal Stress, Fatigue, Depressive Symptoms, and Immune Modulation in Late Pregnancy and One Month Postpartum found by C.Y. CHENG in January 2014 that many mothers experienced fatigue and depressive symptoms and that mothers experienced higher levels of stress than women in the general population. Additionally, it was found that maternal stress, fatigue, depressive symptoms, and some aspects of immune modulation as measured by serum cytokines were related.[10]

**TREATMENT OPTIONS OF A PREGNANT WOMAN WHO IS DEPRESSED:**

1) **Behavioral treatments for mood disorders:** Many patients with mild-to-moderate depression can be treated by psychosocial approaches including individual and group psychotherapy in lieu of medication. Patients with residual symptoms, those at high risk of relapse, those with co morbid conditions such as panic disorder and those who prefer to avoid medication may benefit from psychotherapy. This is an especially critical option for women preparing for conception or currently pregnant since a large percentage of women may plan to avoid medication. Cognitive behavioral therapy (CBT) or interpersonal psychotherapy (IPT) has been shown to be effective for depression in pregnant women.
2) **Antidepressant treatment during pregnancy:** Tricyclic antidepressants—(TCA) and Serotonin reuptake inhibitors—(SSRI) are used as antidepressant drug. The majority of studies have not shown an association between TCA use in pregnancy and structural malformations. The majority of linked database and two recent case cohort studies found no increased rate of major or specific cardiac malformations when in utero SSRI exposure was considered in aggregate. While some linked database reports find that compared to unexposed offspring, those exposed to paroxetine during the first trimester are at higher risk of cardiac malformations Other antidepressants include bupropion (Wellbutrin and Zyban), venlafaxine (Effexor), duloxetine (Cymbalta), nefazodone, and mirtazapine (Remeron).
3) **Electroconvulsive therapy:** Electroconvulsive therapy has long been regarded as a safe and effective treatment for severe depression in pregnancy, especially when the depressive disorder is life-threatening or fails to respond to antidepressant drugs. There is little evidence that it is harmful to the woman or fetus when both are carefully monitored.[12]
4) **Physical therapy:** Many studies and guidelines concluded that aerobic exercise at 12-14 RPE or 60-70%HRmax 5 days a week for 30 minutes are beneficial to increase cardiovascular endurance and reduce physical and mental symptoms.[13]

**EXERCISE RECOMMENDATIONS DURING PREGNANCY:** Aerobic exercise defined as planned, structured physical activity that involves large muscle groups in dynamic activities that, if effective, results in improvements in the function of especially the cardiovascular system and the skeletal muscles and leads to an increase in cardiovascular fitness (endurance performance). The exercise dose in aerobic exercise training is usually described by the intensity, duration, and frequency of the training session and in exercise trials, also by the length of the exercise program. Intensity is usually described as a relative intensity, a percentage of the subject's maximal aerobic power (%˙VO2max) or maximal heart rate (HRmax). *Duration* refers to the duration of a single exercise session. *Frequency* refers to the number of weekly exercise sessions. The total volume of training accomplished, expressed as exercise energy expenditure (EEE), also can be used to describe exercise dose.[14]

According to the most recent recommendations by the American College of Obstetricians and Gynecologists (ACOG) [13] as well as the Canadian guidelines [15], exercise prescription for pregnant women should consist of the same elements as for the non-pregnant adult population, including activities to maintain or improve both cardiovascular and musculoskeletal fitness.[15]To date, all pregnant women with no medical or obstetrical complications are advised to participate in 30 minutes or more of moderate intensity exercise on most or all days of the week.[13] Durations exceeding 45 minutes offer two concerns: thermoregulation and energy balance. Therefore, pregnant women should insure to be properly hydrated, maintain appropriate energy intake and exercise in a thermo-neutral environment[3].

Concerning aerobic exercise, ASCM recommends intensities at target heart rate of 60-70% of maximal heart rate for priory sedentary pregnant women, and 60-90% of maximal heart rate for women with a history of pre-pregnancy regular exercise who wish to maintain fitness during pregnancy. However, conventional heart rate target zones for aerobic intensity is less dependable and accurate during pregnancy due to reduced maximum heart rate reserve [6] and the variability in maternal heart rate response to exercise. Measuring perceived exertion is recommended as an efficient alternative, and intensities with a perceived exertion of 12-14 (somewhat hard) on the 6-20 Borg scale is considered to be an optimal level for most pregnant women.[3]

Table no 2 shows an overview of absolute and relative contraindications, and warning signs that exercise should be termination.

**Table 2 OVERVIEW OF ANSOLUTE AND RELATIVE CONTRAINDICATION & WARNINGSIGNS FOR TERMINATION OF EXERCISE:**

| Relative contraindications | Absolute contraindications | Warnings signs to terminate exercise |
|---|---|---|
| • Severe anemia<br>• Unevaluated maternal cardiac arrhythmia<br>• Chronic bronchitis<br>• Poorly controlled type 1 diabetes<br>• Extreme morbid obesity<br>• Extreme underweight (BMI <12)<br>• History of extremely sedentary lifestyle<br>• Intrauterine growth restriction in current pregnancy<br>• Poorly controlled hypertension<br>• Orthopedic limitations<br>• Poorly controlled seizure disorder<br>• Poorlycontrolled Hyperthyroidism<br>• Heavy smoker | • Hemodynamically significant heart disease<br>• Restrictive lung disease<br>• Incompetent cervix/cerclage<br>• Multiple gestation at risk for premature labor<br>• Persistent second- or thirdtrimester bleeding<br>• Placenta previa after 26 weeks of gestation<br>• Premature labor during current pregnancy<br>• Ruptured membranes<br>• Preeclampsia / pregnancy-induced hypertension | • Vaginal bleeding<br>• Dyspnea prior to exertion<br>• Dizziness<br>• Headache<br>• Chest pain<br>• Muscle weakness<br>• Calf pain of swelling<br>• Preterm labor<br>• Decreased fetal movement<br>• Amniotic fluid leakage |

*Contraindications and warning signs related to aerobic exercise during pregnancy. From ACOG.*

The CES-D assess the depressive symptom in pregnant women .It consist of 20 items and had adequate test retest reliability ,internal consistency and concurrent validity.(Wells et al 1987).A score of 16 on the CES-D scale is considered the cut point for depression.(16) The Center for Epidemiological Studies-Depression (CES-D) Scale (Radloff 1977) was used to assess depression during pregnancy at <20 and 24–29 weeks' gestation. The scale measures depressive symptoms, particularly depressed mood in the general population; however, the results of the scale cannot be used to make a diagnosis of depression. The CES-D is a 20-item, structured self-administered questionnaire. Each response was given a score of 0 to 3. A composite score is calculated summing responses and the score ranges from 0 to 60. A variety of cutoff scores have shown associations with a clinical diagnosis of depression, with a score of 16+ suggested as an appropriate positive screen for depression (Gaynes et al. 2005; Radloff 1977; Weissman 1977). In this analysis, a cutoff of 17 was used as CES-D scores for pregnant women may be higher due to overlap between depressive and pregnancy symptoms (Hoffman

and Hatch 2000; Orr and Miller 1995; Klein and Essex 1994/1995). The outcome of interest was depressive symptoms at 24 –29 weeks' gestation. Depressive symptoms at < 20 weeks (median gestational age= 16.7 weeks) was included as a covariate.[17]

The 10-item Perceived Stress Scale (PSS) was used to collect data about stress. The PSS-10 was shortened from the original 14-itemPSS to measure the degree by which situations were appraised as stressful in one's life. ThePSS-10 is a 5-point (scores 0 to 4) response scale. A higher score on the PSS indicates higher levels of stress. The internal reliability and validity of the PSS-10 were supported in the scale-development study. The Cronbach alpha for thePSS-10 at prenatal and postpartum intervals in the current study was .75 and .88, respectively. The 10-item PSS assessed the perceived stress in the pregnant women resulting from their perception of decrease control or the ability to cope with life events (Cohen &Williamson 1988). The PSS is easily understood and response alternatives are easily grasped. The PSS focused on subject feelings and thoughts experienced during the previous week. Items were designed to determine how uncontrolled, unpredictable and overloaded respondents felt their lives were. Participants rated their responses on a five-point Likert scale ranging from 'never' (0) to 'very often' (4).[10]

The chalder fatigue scale assesses the fatigue level. The FQ consists of 11 items measuring fatigue related symptoms and loading onto two dimensions—physical and mental fatigue. Seven items related to physical symptoms of fatigue (e.g., Do you feel weak? Do you need to rest more?). Four items related to mental symptoms of fatigue (e.g., Do you have difficulty concentrating? How is your memory?). Cronbach's alpha for the 11-item scale was 0.89. The alpha forthe physical fatigue subscale was 0.85 and for the mental fatigue subscale was 0.82.[18]

**AIMS AND OBJECTIVES OF THE STUDY**

**AIM OF THE STUDY**

To evaluate the effectiveness of aerobic exercise on fatigue, depression & stress in nulliparous pregnant women.

**OBJECTIVES:**

1. To evaluate therapeutic benefit of aerobic exercise on fatigue, depression & stress in nulliparous women during pregnancy.
2. To compare therapeutic benefit of aerobic exercise on fatigue, depression & stress in nulliparous women during pregnancy.

**PROPOSED HYPOTHESIS:**

**1.** NULL HYPOTHESIS: There will be significant effect of aerobic exercise on the level of fatigue, depression &stress.
**2.** ALTERNATE HYPOTHESIS: There will be no significant effect of aerobic exercise on the level of fatigue, depression & stress.

**METHODOLOGY**

**STUDY DESIGN:** Pretest Posttest Experimental study
**SAMPLE DESIGN:** Simple random sampling
**POPULATION:** Pregnant women of age 16-30 years with 16-20 gestational ages.
**SAMPLE SIZE:** 60 pregnant women
**STUDY SETTING:** Ahmedabad

**MATERIALS:**

1. Stop watch
2. Pen & paper
3. Center for epidemiological studies-depression scale (CES-D)
4. Perceived stress scale-10(PSS-10)
5. Chalder fatigue scale
6. Informed consent form
7. Data collecting sheet

**METHODS OF COLLECTION OF DATA:**

6O nulliparous women was selected who fulfilled inclusion and exclusion criteria. An informed and written consent was obtained from each of the women in which the woman was agreed to participate in the study.

**INCLUSION CRITERIA:**

- 16-20 gestational age
- Age ≤ 30
- Nulliparous women

**EXCLUSION CRITERIA:**

- Participated in a structured exercise program in the past six month
- Had a history of high blood pressure
- Chronic medical illness (cancer, renal, endocrine, psychiatric, neurologic, infectious, or cardiovascular)
- Persistent bleeding after week 12 of gestation
- Poorly controlled thyroid disease
- Placenta praevia
- Incompetent cervix
- Polyhydramnios, Oligohydramnios
- Miscarriage in the past 12 months.

**DURATION OF STUDY:**8 weeks

**OUTCOME MEASURES:**

1. Center for epidemiological studies-depression scale (CES-D).
2. Chalder Fatigue scale.
3. Perceived stress scale (PSS-10)

**PROCEDURE:**

Women who were pregnant (nulliparous)and age between 16 & 30 were randomly selected for the study. They were explained about pregnancy, pregnancy symptoms, and its prevalence, how aerobic exercise can help them improve their quality of life and reduce their problems. An informed consent form was obtained from them. 60 participants were equally divided into 2 groups randomly; Group A ( aerobic exercise group), Group B (control group). Baseline data such as name, age, CES-D, PSS-10 &Chalder fatigue scale score were obtained to compare the same with posttest data. Participants in group A received aerobic exercise 3 days/week & were given antenatal education. Participants in group B was given antenatal education.

**EXPERIMENTAL GROUP INTERVENTION:**

According to inclusion and exclusion criteria 30 pregnant women were taken in experimental group. Participants in this group were made to undergo aerobic exercise programme in addition to education. Participants in the experimental group were invited to participate in three 60-min exercise classes per week, starting between week 16 and 20 of gestation and continuing for 8weeks. Sessions consisted of aerobic exercise (30 min), walking (10 min), stretching (10 min), and relaxation (10 min). Aerobic activities were prescribed at moderate to vigorous intensity, aiming for 55–75% of maximal heart rate or with a perceived exertion of 12-14 (somewhat hard) on the 6-20 Borg scale.

**Table 3 EXPERIMENTAL GROUP INTERVENTION PROTOCOL:**

| Phase | Exercises | Time |
|---|---|---|
| **Warm up** | 3 deep breathing exercise, Light movement of cervical, shoulder, trunk, hip, ankle, stretching of large major muscle groups | 10 min |
| **Conditioning phase** | Shoulder abduction adduction with sidestepping | |
| | Shoulder flexion, internal & external rotation with side stepping | (aerobic dance) |
| | Elbow flexion extension with side stepping | 3 5=15min |
| | Trunk rotation, Hip knee flexion with opposite hand touch, ankle planter and dorsi flexion | |
| | Step up-down | 3 min |
| | Slow walking | 2 min |
| | Walking | 10 min |
| **Cool down** | Stretching exercise (large muscles) | 10 min |
| | Relaxation (mental imaginary technique) | 10 min |

**CONTROL GROUP INTERVENTION:**

Patients in this group were given only antenatal education:
Education will be regarding:

- Hygiene
- Sleep
- Diet
- Clothing
- Breast care
- Precaution during pregnancy

Contents of education program is explained in Annexure.

The post-intervention CES-D, PSS-10 and Chalder fatigue scale scores will be recorded for both the groups.
Patients in A group will be treated three sessions a week for total duration of eight weeks.

**STATISTICAL ANALYSIS**

The data were analyzed using t test. The pre and post data within the groups were analyzed using paired t-test. The post data between both the groups were analyzed using unpaired t-test.

**RESULT**

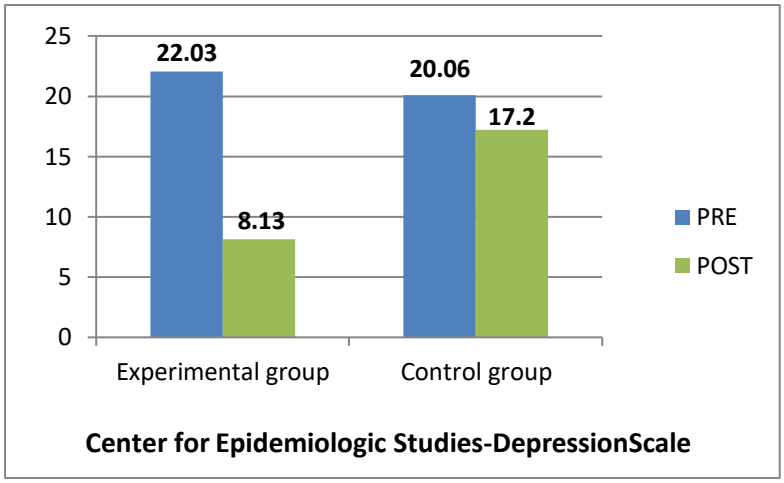
The effect of aerobic exercise was evaluated for fatigue, depression and stress in 60 patients of pregnant women with CES-D, PSS and CFS scale.
The mean age of patient in experimental group was 25.53(SD=1.75) and in control group it was 25.73(SD=2.61) years.
The mean gestation age of patient in experimental group was 17.96(SD=1.27) and in control group it was 18.43(SD=1.35) year.
Table 4 BASELINE DATA:

| **BASELINE DATA** | | |
|---|---|---|
| | **EXPERIMENTAL GROUP** | **CONTROL GROUP** |
| **AGE(YEARS)** | **25.53** | **25.73** |
| **GASTATIONAL AGE(WEEKS)** | **17.96** | **18.43** |

**Table 5 INTRA GROUP COMPARISION OF CES-D:**

| **NO** | **GROUP** | **CES-D** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **PRE** | | **POST** | | **P VALUE** | **Df** |
| | | **MEAN** | **SD** | **MEAN** | **SD** | | |
| **1.** | **EXP** | **22.03** | **4.42** | **8.13** | **2.45** | **<0.0001** | **58** |
| **2.** | **CON** | **20.06** | **4.97** | **17.2** | **4.45** | **0.0222** | **58** |

**GRAPH 1 INTRA GROUP COMPARISION OF CES-D:**

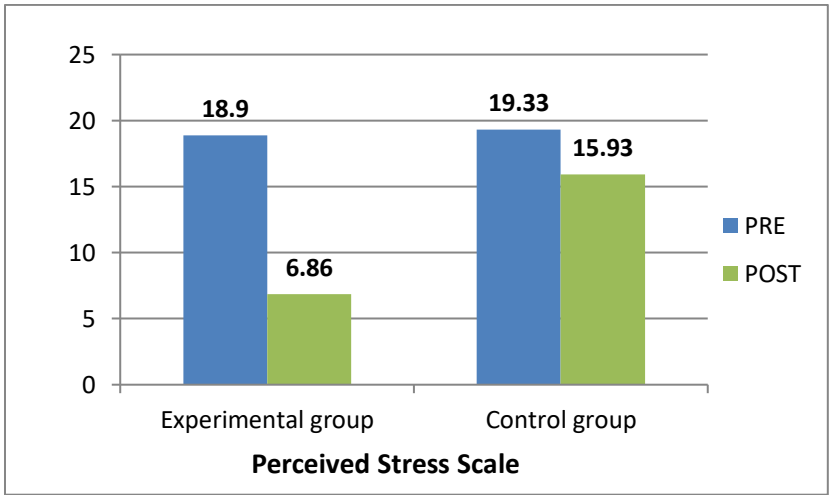



As shown in table.5 the baseline mean of CES-D score for exercises group was 22.03 and the SD was 4.42. After the intervention of 8 weeks the mean CES-D score was reassessed in same group. The post exercises mean CES-D score was reduced from 22.03 to 8.13 and SD was 2.45. The P value of unpaired t-test was <0.0001 with the df of 58.
Whereas the baseline mean of CES-D for control group was 20.06and the SD was4.97 .After 8 weeks the CES-D score was reassessed in same group. The post exercises mean CES-D score was reduced from 20.06 to 17.2 and the SD was 4.45. The p value of unpaired t-test was 0.0222with the degree of freedom of 58.So the significant change was noted within the experimental and control group in CES-D scale.

**Table 6 INTRA GROUP COMPARISION OF PSS:**

| NO | GROUP | PSS | | | | | |
|---|---|---|---|---|---|---|---|
| | | PRE | | POST | | P VALUE | Df |
| | | MEAN | SD | MEAN | SD | | |
| 1. | EXP | 18.0 | 3.62 | 6.86 | 3.29 | <0.0001 | 58 |
| 2. | CON | 19.33 | 5.35 | 15.9 | 5.34 | 0.0168 | 58 |

**RAPH 2 INTRA GROUP COMPARISION OF PSS:**

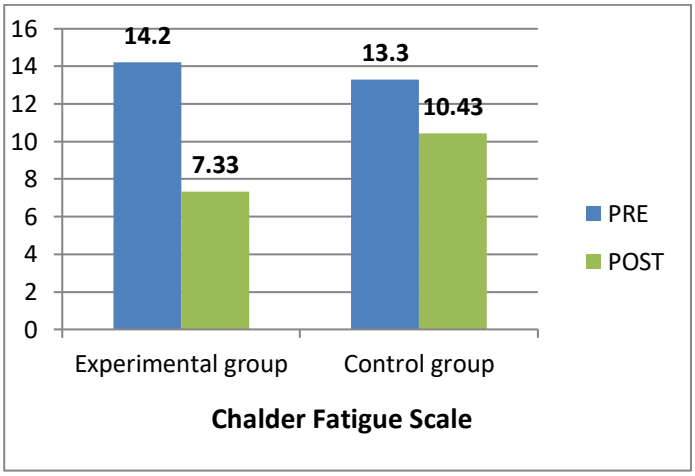



As shown in table.6 the baseline mean PSS score for exercises group was 18.9 and the SD was 3.62. After the intervention of 8 weeks the mean PSS score was reassessed in same group. The post exercises mean PSS score was reduced from 18.9 to 6.86 and SD was 3.29. The P value of unpaired t-test was <0.0001 with the df of 58.
Whereas the baseline mean PSS of control group was 19.33and the SD was 5.35. After 8 weeks the PSS score was reassessed in same group. The post exercises mean PSS score was reduced from 19.33 to 15.9 and the SD was 5.34. The p value of unpaired t-test was 0.0168 with the degree of freedom of 58.
So the significant change was noted within the experimental group and control group in PSS scale.

**Table 7 INTRA GROUP COMPARISION OF CFS:**

| NO | GROUP | CFS | | | | | |
|---|---|---|---|---|---|---|---|
| | | PRE | | POST | | P VALUE | Df |
| | | MEAN | SD | MEAN | SD | | |
| 1. | EXP | 14.2 | 4.55 | 7.33 | 3.86 | <0.0001 | 58 |
| 2. | CON | 13.3 | 6.34 | 10.43 | 6.86 | 0.0985 | 58 |

**GRAPH 3:INTRA GROUP COMPARISION IN CFS**

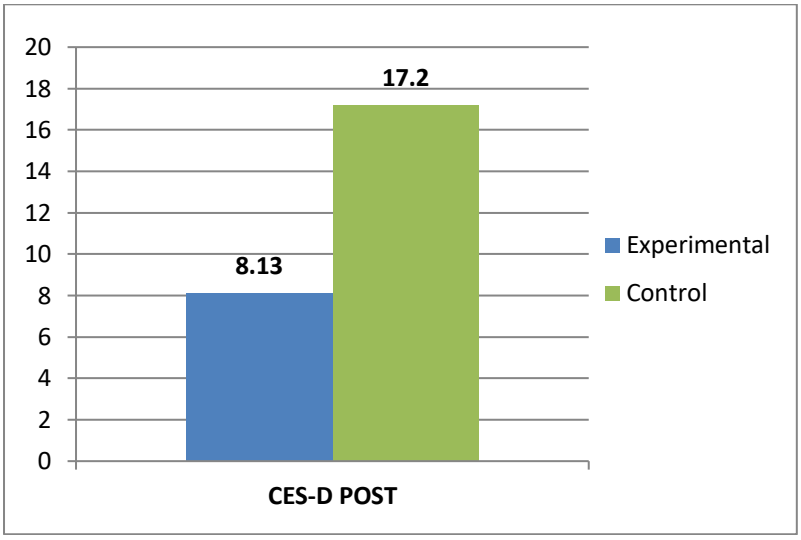



As shown in table.7the baseline mean CFS score for exercises group was 14.2 and the SD was 4.55. After the intervention of 8 weeks the mean CFS score was reassessed in same group. The post exercises mean CFS score was reduced from 14.2 to 7.33 and SD was 3.86. The P value of unpaired t-test was <0.0001 with the df of 58.
Whereas thebaselines mean CFS of control group was 13.3and the SD was 6.34. After 8 weeks the CFS score was reassessed in same group. The post exercises mean CFS score was reduced from 13.3 to 10.43 and the SD was 6.86. The p value of unpaired t-test was 0.0985 with the degree of freedom of 58.
So the significant change was noted within the experimental group in CFS scale but there was no significant change noted in control group.

**Table 8 INTER GROUP COMPARISION OF CES-D, PSS,and CFS:**

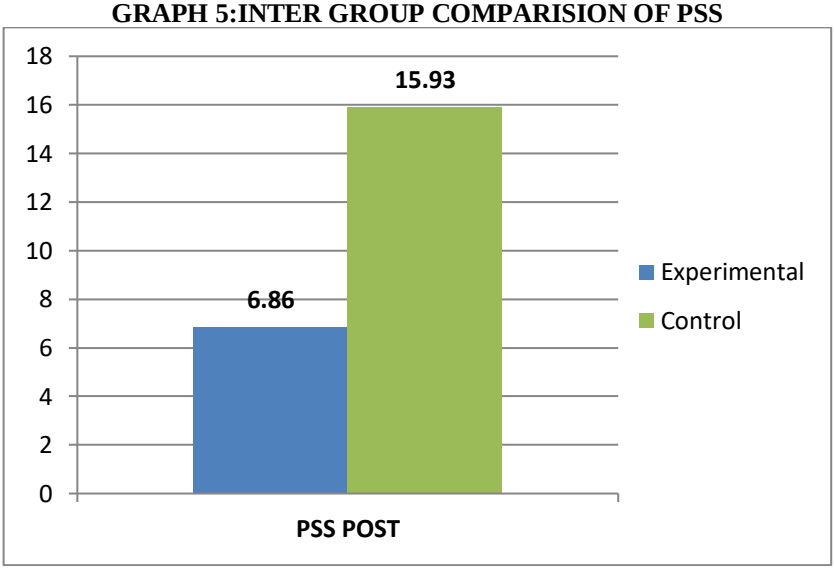
| OUTCOMES | | EXP | | CONTROL | | P-VALUE | Dr |
|---|---|---|---|---|---|---|---|
| | | MEAN | SD | MEAN | SD | | |
| CES-D | POST | 8.13 | 2.45 | 17.2 | 4.45 | <0.0001 | 29 |
| PSS | POST | 6.86 | 3.29 | 15.9 | 5.34 | <0.0001 | 29 |
| CFS | POST | 7.33 | 3.86 | 10.43 | 6.86 | 0.0333 | 29 |

**GRAPH 4: INTER GROUP COMPARISION OF CES-D**

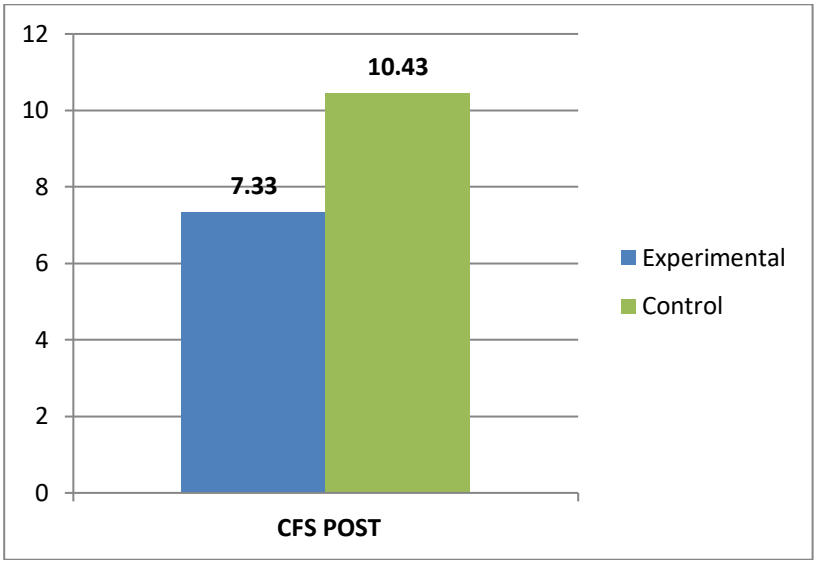



When all outcomes were assessed the P value of paired t test for post CES-D scale between experimental and control group .was <0.0001 with the df of 29. So there was statistically significant change was noted in CES-D scale.
The P value of paired t test for post PSS score between experimental and control group was <0.0001 with the df of 29. So there was statistically significant change was noted in PSS.
The P value of paired t test for CFS score between experimental and control group was 0.0333 with the df of 29. So there was statistically significant change was noted in CFS.

**GRAPH 5:INTER GROUP COMPARISION OF PSS**



**GRAPH 6: INTER GROUPCOMPARISION OF CFS**




**DISCUSSION**

The purpose of this study was to evaluate the effect of aerobic exercise on fatigue, depression and stress in 16 to 20 weeks of gestational age pregnant women. Mood fluctuations are common during pregnancy. During pregnancy, negative mood symptoms such as fatigue, anxiety, and somatic complaints are often reported. There is consistent evidence for improved mood with both acute and chronic physical activity. Improvement include increased vigor, reduced fatigue, reduced stress and anxiety, decreased symptoms of negative mood and depression, and improved self-concept.[38]

Fatigue level reduced within the group for both the groups. In experimental group the mean value of fatigue level in pre and posttest measure shows both clinical and statistical significance. In control group the mean value of fatigue level in pre and posttest measure shows both clinical and statistical significance.

Posttest measures for fatigue level between the group shows statistical significance. In experimental group the mean of fatigue level is reduced more than 3 which is clinically significant also.

This finding agrees with T BA et all who had done study on effect of aerobic exercise on the level of insomnia and fatigue in pregnant women found that aerobic exercise significantly reduces the level of fatigue in pregnant women.[20]This results also supports my study.

The therapeutic effects of aerobic exercise on the level of fatigue observed in this study might be connected with the effect of exercise training on neuromusculoskeletal efficiency and improved cardiovascular endurance, which in turn decreases the level of fatigue and increases the overall physical performance.

Depression level reduced within the group for both the groups' .In experimental group the mean value of depression level in pre and posttest measure shows both clinical and statistical significance. In control group the mean value of depression level in pre and posttest measure shows both clinical and statistical significance.

Posttest measures for depression level between the group shows statistical significance. In experimental group the mean of depression level is reduced more than 9 which is clinically significant also.

The findings agrees with Angelo Fernando Robledo-Colonia in which they had concluded that aerobic exercise reduces depressive symptoms in nulliparous women.[19]. The study done by Ana Victoria Montoya Arizabaletaet all found the same that aerobic exercise improves quality of life in nulliparous pregnant women.

The proposed biological mechanisms by which exercise may influence antidepressant benefits are neurotransmitter enhancement and hippocampal neurogenesis. Although the neurobiological underpinnings of depression are poorly understood, hypotheses of etiology include impaired neurotransmitter activity and hippocampus dysfunction. Antidepressant treatment is largely directed toward facilitating the uptake of the neurotransmitters dopamine, serotonin, and norepinephrine, based upon the assumption that the rate of uptake is impaired in mood and anxiety disorders. Interestingly, exercise has been found to potentiate dopamine, serotonin and noradrenergic activity in the Central Nervous System.[39]

Stress level reduced within the group for both the experimental group not reduced in control group. In experimental group the mean value of fatigue level in pre and posttest measure shows both clinical and statistical significance. In control group the mean value of fatigue level in pre and posttest measure shows no clinical and statistical significance.

Posttest measures for stress level between the group shows statistical significance. In experimental group the mean of fatigue level is reduced more than 7 which is clinically significant also.

Kara Mallory Parker had done study and concluded that aerobic exercise reduced the stress level in pregnancy. This study also supports my study.

The basic mechanism of stress response lies within the hypothalamic pituitary adrenal axis (HPA) and autonomic nervous system (ANS), which response to acute and chronic stress. The HPA regulates the stress response through corticotrophin releasing hormone (CRH) which stimulates the release of b-endorphins and adrenocorticotropinhormone (ACTH) .ACTH release the cortical.ANS regulates the release of catacholamines. In addition to non-pregnant stress response mechanism the placenta also produces CRH beginning in the second trimester. Therefore the pregnant body is naturally at heightened state of potential stress reactivity and thus vulnerable to stress overload. The possible physiology that aerobic exercise reduces the stress level is aerobic will increases the endorphin level as there is high level of cortisol in blood for long time it will blocks the continuous release of CRH and negatively affect the body.[(11)]

**CONCLUSION**

The study concluded significant effect of aerobic exercise on the level of fatigue, depression & stress in nulliparous pregnant women of second trimester.

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