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# Effect of Breathing Exercise with Incentive Spirometry on the Level of Physical Activities among Pregnant Women in Ondo Town

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## Introduction

Pregnancy is a period during which the female body undergoes functional and anatomical alterations in order to nurture and accommodate the developing foetus [1]. ese changes begin a er conception and a ect every organ and system in the body. ese changes are mechanisms that the body has adapted to meet the increased metabolic demands of the mother and fetus and to ensure adequate uteroplacental circulation for fetal growth and development [2]. ese changes include hormonal, musculoskeletal, circulatory, respiratory and other systems [3].

e respiratory physiology changes during pregnancy occur due to structural changes in the chest wall and abdominal compartments as a consequence of hormonal changes, enlarging uterus and elevated diaphragm these changes include, breathlessness (dyspnea), chest increases in size, increase in the amount of air breathed in and out, decrease in amount of air the lungs can handle and increase in oxygen use. e enlarging uterus results in a maximum of 2.1 cm increase in transverse chest diameter on chest radiography and a maximum elevation of 4 cm in the level of the diaphragm [4]. Progesterone increases ventilation by increasing respiratory centre sensitivity to carbon dioxide as a result, the tidal volume and minute ventilation is increased. It is also a respiratory stimulant [5]. Also, the total pulmonary resistance may be decreased due to relaxation of the smooth muscle in the tracheobronchial tree under hormonal in uence (Wise, et al, 2006). Di using capacity of the lungs for carbon monoxide remains normal or decreases during the second half of pregnancy. As pregnancy progresses, there will be an increase in the respiratory demands of the body. According to a study, an estimated 60–70% of women experience shortness of breath (dyspnea) during pregnancy [6].

e level of oestrogen and progesterone e ects changes that occur in the vascular system, peripheral vasodilatation and resultant decrease in systemic vascular resistance (SVR) begin to occur by 8th week of gestation [2]. Cardiac output (CO) increases in order to maintain the increase in blood pressure [4]. In early pregnancy, this increase in CO is achieved by an increase in heart rate (HR) by 15–25% followed by an increase in stroke volume (SV) by 20–30% [7]. Blood volume increases, beginning from 6 to 8 weeks of gestation to reach a maximum increase of about 20% by mid-third trimester [8]. Cardiac output, pulmonary blood ow, and circulating blood volume are all increased during pregnancy due to increased metabolic demands. Pregnant women are

## Results

### Socio demographic data of participants

From this study, 2(4%) of the participants were less than 20 years of age and 98% of them were between the age range of 21-40. 2(4%) of the participants are students, 39(78%) work in private organizations and 9(18%) are civil servants (Table 1).

### Repeated measure ANOVA of comparison of the level of physical activity in the control group

ere is a signi cant di erence in level of physical activity across the baseline, 3rd week and the 6th week in the control group (p= 0.00) (Table 2).

### Independent t test of comparison of the level of physical activity between control and experimental group

ere was signi cant di erence in the level of physical activity at the baseline and 6th week between the control and experimental group (p= 0.001), but there was no signi cant di erence at the 3rd week (p= 0.151) (Table 3).

### Repeated measure ANOVA of comparison of the level of physical activity in the experimental group

ere is a signi cant di erence in level of physical activity across the baseline, 3rd week and the 6th week in the experimental group (p= 0.00) (Table 4).

### Repeated measure ANOVA of respiratory capacity across baseline, 3rd and 6th week in the experimental group

ere was also signi cant di erence of respiratory capacity across baseline, 3rd week and 6th week in the experimental group (p= 0.000) (Table 5).

**Table 5:** Repeated ANOVA of respiratory capacity of the experimental group.

| RESPIRATORY CAPACITY | Baseline (xÑS.D) | 3rd Week (xÑS.D) | 6rd Week (xÑS.D) | F | p |
|---|---|---|---|---|---|
| | 836.000Ñ382.295 | r948.000Ñ300.513 | 1200.000Ñ0.000 | 11.024 | 0.000* |

Keys * =signiýcance (<0.05)

**Table 6:** Pearson correlation of

| Physical activity | R | P |
|---|---|---|
| | 0.24 | 0.04* |

### Pearson correlation of the relationship between the respiratory capacity and physical activity at the experimental group

ere was also signi cant relationship of the respiratory capacity and the level of physical activity of the pregnant women (p= 0.04) (Table 6).

## Discussion

In this study, it was observed that 48(98%) of the women were within the age range of 21- 40. is is similar to Gossett [27] who revealed that risky range of maternal age to bear babies is 20-30 years and on the other side, people perceive they should postpone pregnancy [27]. Women's mean age of rst-time pregnancy increased from 21 to 25 years in the 40 years a er 1970, with a decrease of mothers younger than 20 years of age, and a sensible increase of those older than 35 [28]. In UK the average age of mothers in 2013 increased to 30.0 years, compared with 29.8 years in 2012 . e over-35's now have the fastest growing birthrates and women having babies in their 40's have more than doubled in ten years [29]. Teen pregnancies are a risk for both women and o spring and should be discouraged; but they are a minority [30].

ere was signi cant di erence in the level of physical activity at the control group across the baseline, 3rd and 6th week. ere was also a signi cant di erence in the level of physical activity at the experimental group across the baseline, 6th and third week. A study by Artal in 2015 showed that physical inactivity and excessive weight gain have been recognized as independent risk factors for maternal obesity and related pregnancy complications, including gestational diabetes mellitus (GDM) [31]. Concerns that regular physical activity during pregnancy may cause miscarriage, poor fetal growth, musculoskeletal injury, or premature delivery have not been substantiated for women with uncomplicated pregnancies [32]. In the absence of obstetric or medical complications or contraindications, physical activity in pregnancy is safe and desirable, and pregnant women should be encouraged to continue or to initiate safe physical activities. Most of the studies addressing fetal response to maternal exercise have focused on fetal heart rate changes and birth weight. Studies have demonstrated minimum to moderate increases in fetal heart rate by 10–30 beats per minute over the baseline during or a er exercise [33]. ree meta-analyses concluded that the di erences in birth weight were minimal to none in women who exercised during pregnancy compared with

controls [34]. A cohort study that assessed umbilical artery blood flow, fetal heart rates, and biophysical profiles before and after strenuous exercise in the second trimester demonstrated that 30 minutes of strenuous exercise was well tolerated by women and fetuses in active and inactive pregnant women [33]. Observational studies of women who exercise during pregnancy have shown benefits such as decreased GDM (Odds Ratio [OR] 0.103; 95% CI, 0.013–0.803) [35] cesarean birth (Relative Risk 0.69, 95% CI, 0.42, 0.82) and operative vaginal delivery and postpartum recovery time [32]. Physical activity also can be an essential factor in the prevention of depressive disorders of women in the postpartum period [36,37]. A 2017 randomized controlled trial that included 300 overweight or obese women with uncomplicated, singleton gestations at less than 13 weeks of gestation found that cycling exercises initiated in the first trimester and performed at least 30 minutes, 3 times per week until 37 weeks of gestation, significantly reduced the incidence of GDM, significantly reduced gestational weight gain at less than 25 weeks of gestation, and lowered neonatal birth weight. A study of the apparent weight reduction during water immersion in a third-trimester pregnant woman measured a mean of 82.9% of body weight, a reduction that lowers the maternal osteoarticular load due to buoyancy [38]. There may be additional benefits of aquatic exercise as well. A randomized controlled trial of an aquatic physical exercise program during pregnancy consisting of three 60-minute exercises demonstrated a greater rate of intact perineum after childbirth (OR 13.54, 95% CI, 2.75–66.56) [39]. A meta-analysis based on 62 reports assessed the evidence relating preterm delivery, low birth weight, small for gestational age, preeclampsia, and gestational hypertension to five occupational exposures (work hours, shift work, lifting, standing, and physical work load) [40].

In this study, incentive spirometer was used to improve the respiratory capacity of the pregnant women in the experimental group and there was significant increase in their respiratory capacity and level of physical activity. A study carried out in 2017 on the association of physical activity with lung function in lung-healthy German adults: results from the KORA FF4 study showed that there was a significant relationship between the lung health and level of physical activity . Also a study was carried out in 2003 to study the effects of physical activity on exercise tests and respiratory function, the results showed that physical activity had a role in maintaining cardiac and respiratory function. El-Marakby et al. carried out a study on two experimental groups of patients in order to evaluate the effects of aerobic exercise training and incentive spirometry in controlling pulmonary complications following laparoscopic cholecystectomy. The researchers concluded that aerobic exercise and incentive spirometry were beneficial in reducing the postoperative pulmonary complications after laparoscopic cholecystectomy . Kundra et al. carried out a comparative study on the effect of preoperative and postoperative incentive spirometry on the pulmonary function of fifty patients who had undergone laparoscopic cholecystectomy, Result showed that pulmonary function improvement was seen after preoperative incentive Spirometry . Also, a study carried out in 2020 by Magda et al on the effect of incentive spirometer exercise on pulmonary functions in children with spastic cerebral palsy showed significant improvements in FEV1%, FVC %, and maximal mid-expiratory flow .

## Conclusion

It was concluded that the level of physical activity among pregnant women, especially in their third trimester reduced progressively in the control group while there was an improvement in the level of physical

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