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RESEARCH ARTICLE

THE EFFECTIVENESS OF PHYSICAL ACTIVITY AS A WEIGHT CONTROL MEASURE IN PREGNANCY

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ABSTRACT

Gestational weight gain (GWG) is usually defined as a change in maternal weights measured before pregnancy and prior to delivery, which is crucial to fetal growth and subsequent breastfeeding. Both excessive and inadequate GWG affect maternal and offspring health. Exercise contributes significantly to maternal and fetal wellbeing during pregnancy. This study probed the effectiveness of supervised, planned physical activity (aerobics) on maternal weight in pregnancy. Sixty-Four pregnantwomen who completed the study were simply randomized into experimental (n=38) with age range 25-43years and control (n=26) with age range 19-41years. Their pre-intervention weight measurements were taken and recorded and a 10-week, three times weekly aerobic exercise (40-45 minutes duration each session) training administered on the experimental group only. Post-intervention values were taken from all participants and data summarized using mean and standard deviation. Analysis of covariance was used to test the efficacy at 0.05 alpha level. The result revealed that the pretest experimental group mean value was 73.16±9.67with a mean difference of -4.28. The post intervention mean score was expectedly higher at 76.37±9.95 with a mean difference of -7.78. It follows that the aerobic exercise impacted the weight of the pregnant women. Also, being in the negative, showed that there was a reduction in the body weight of the experimental group as compared to the control group. It was concluded that the aerobic exercise was effective in moderating maternal weight gain in pregnancy and is an effective strategy in maternal weight maintenance.

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INTRODUCTION

The worldwide prevalence of obesity has increased substantially over the past few decades. Economic, technologic, and lifestyle changes have created an abundance of cheap, high-calorie food coupled with decreased required physical activity. (1) Obesity is a significant public health concern and is likely to remain so for the foreseeable future. Maternal obesity increases the risk of a number of pregnancy complications, including preeclampsia, gestational diabetes mellitus (GDM), and cesarean delivery (1). Excessive weight gain during pregnancy and postpartum retention of pregnancy weight gain are significant risk factors for later obesity in women. (2) The global mean prevalence of obesity in women has more than doubled in about four decades increasing from 6.4% in 1975 to 14.9% in 2014 and this has been projected to surpass 21% by 2025 if the trend should continue (3). Globally, obesity is now a pandemic with serious medical, social and economic implications (4). In addition, reports indicate that many women are entering pregnancy either overweight or obese and that the incidence of obesity and excessive weight gain during pregnancy is increasing with associated short and long term consequences on pregnancy and perinatal outcome (4). In the United States of America, more than half of all pregnant women are obese (5) while in Australia, 34% of pregnant women were overweight, obese or morbidly obese (6). A link between maternal obesity in the first trimester and obesity in children has been demonstrated as there is relative risk of childhood obesity associated with maternal obesity in the first trimester of pregnancy (7). Birth weight has also been shown to be directly correlated with body mass index (BMI) later in life (8). One mechanism thought to underlie these relationships is in utero fetal programming by nutritional stimuli. Fetuses have to adapt to the supply of nutrients crossing the placenta whether a deficit or an overabundance, and these adaptations may permanently change their physiology and metabolism (9),Moreover, because of fetal programming, obesity may become a self-perpetuating problem. Daughters of obese women may themselves be vulnerable to becoming obese and more likely to have offspring who share this vulnerability (9). Racial and ethnic factors clearly affect weight gain during pregnancy. According to (10)African American women are more likely to be overweight prior to pregnancy and were most likely to gain weight in excess of the Institute of Medicine (IOM) guidelines, white females were most likely to report target weight gain, Hispanic women were least likely to report target gains, and Asian women were more likely to gain less than the recommended weight.

Excess weight gain during pregnancy and persistent weight retention 1 year postpartum are strongpredictors of overweight a decade or more later(2).According to the National Maternal and Infant Health Survey, more than 30% of women retained 14 lb or more when compared with their recall of their prepregnancy weight, with African American women reporting a larger weight gain during pregnancy and less weight loss postpartum (11), A more recent study showed that 12% of women retained at least 11 lb 1 year postpartum (12). Maternal obesity increases the risk of a number of pregnancy complications, Maternal obesity is a risk factor for spontaneous abortion (for both spontaneous conceptions and conceptions achieved through assisted reproductive technology), as well as for unexplained stillbirth (intrauterine fetal demise). A recent meta-analysis of 9 studies revealed that obese pregnant women have an estimated risk of stillbirth that is twice that of normal weight pregnant women(13), Several mechanisms have been proposed for this relationship, including the increased risks of hypertensive disorders and gestational diabetes that are associated with maternal obesity during pregnancy.Obese women are at increased risk of complications at the time of labor and delivery. The rate of successful vaginal delivery decreases progressively as maternal BMI increases (14), obese women are also at increased risk of intraoperative complications, especially including increased infectious morbidity and thromboembolic events. There is also an increased risk of anesthetic complications, such as failed intubation at the time of general endotracheal anesthesia (15). The rate of cervical dilation in nulliparous women in spontaneous labor decreased as maternal BMI increased. In this study, normal weight women (BMI 19.8–26.0 kg/m^2) took a median duration of 5.43 hours to dilate from 4 to 10 cm, whereas obese women (BMI> 29.0 kg/m^2) took 6.98 hours (16).
Excessive Gestational Weight Gain (GWG) is strongly associated with maternal-foetal complications such as gestational diabetes mellitus (GDM), hypertensive pregnancy disorders (HPD), macrosomia, low birth weight, higher risk of caesarean deliveries and a higher incidence of anaesthetic and postoperative complications in these deliveries, low Apgar scores and neural tube defects are more frequent in infants of obese mothers than in infants of normal-weight mothers(17). In Nigeria, data from National Demographic Health Survey shows that the perinatal mortality rate is 41 deaths per 1000 deliveries while the maternal mortality rate is 576 per 100,000 live birth which is the second highest in the world, most of these deaths are nutrition-related either directly or indirectly (18). However, there is limited information on the effect of maternal obesity on pregnancy outcome among Nigerian women.

A focus on obesity prevention in women of reproductive age is consistent with the current paradigm for interventions to address obesity more generally(19), The rapid increases in obesity prevalence in diverse populations around the globe, in both children and adults and across socioeconomic strata, constitute a public health crisis (20). Lifestyle interventions for weight control can be divided into those that are diet-based, physical-activity-based, and a mixture of diet-based and physical-activity-based. Currently, the National Institute for Health and Care Excellence in the UK recommends a healthy diet, and atleast half an hour of daily physical activity to prevent excessive gestational weight gain in pregnancy (21). In this present study, we investigated the effectiveness of physical activity as a weight control measure in pregnancy.

MATERIALS AND METHODS

Materials

Participants: The population for this study consisted of pregnant women who attended antenatal clinic at the Obstetrics and Gynaecology (O & G) Department of the Rivers State University Teaching Hospital, Port Harcourt. The research design adopted for this work was the pre test-post test experimental design.The population for this study consisted of Three Hundred and Eighteen (318) pregnant women (age range 19 – 43years) who were registered at the O&G departments of the hospital (parity 1 – 4) in the months of December 2020 and January, 2021. Seventy-Eight (78) pregnant women willingly volunteered for study following a health promotion talk / sensitization at the Obstetrics and Gynaecology Department but Sixty-Four (64) completed the study. They were randomly assigned to experimental (n=38) and control (n=26) groups using the simple randomization method of tossing a coin.

The sample size for the study was determined using sample size determination for randomized controlled test.

$$n = 16\left[\frac{1}{Effect\ \text{Size}}\right]^2$$

n = Sample Size

Effect Size = 0.53

$$n = 16\left[\frac{1}{0.53}\right]^2$$

=56.96
=57

Instrument: The Omron Karda Scan Body Composition Monitor (HBF–522, OMRON HEALTHCARE Co Ltd. Japan) was used to measure body weight and the percentage body fat of the participants.

Validity and Reliability of the Instrument: The instrument for date collection for this study was a standardized instrument. The validity and reliability coefficient of body composition monitor (body weight and body fat percentage) has been documented. Body weight and percentage body fat monitor has a validity and reliability coefficient of 0.69, percent body fat was 0.85 for females (22).

Ethical Considerations: We did not anticipate any risks as there are no known risks of moderate Aerobic Exercise Training from literature. However, the volunteers were educated on the procedures of the study and willingly decided to sign the consent form. They were also told that should they have any unfavourable experiences, they were free to discontinue from the training. Moreso, each participant was under the watchful eyes of her consultant obstetrician. Also, there were no cost burdens on the participants throughout the training period.

Methods

Inclusion and Exclusion Criteria: The inclusion criteria for this study was that the age of pregnancy not more than Twenty-Six (26) weeks at the commencement of the study. This was to enable the participants conclude the study while still pregnant and that there was no history of cardiovascular diseases among the participants which could endanger them and their fetus (es). The exclusion criteria for this study were pregnant women with other medical conditions such as cervical incompetence, placenta previa, multiple pregnancies and all pregnant women on bed rest.

Research Design: The design adopted for this research was randomized pre test-post test control group design. The differences in the pre-test and post-test values represented the impact of the ten (10) weeks aerobics training on the experimental group.

Procedure for Data Collection: Ethical approval was granted by the Research Ethics Committee of the Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria (RSUTH/REC/2021048). Informed consent was also obtained from the participants. The participants were volunteers who were randomly assigned into two groups – the experimental (n=38) and control (n=26) groups. All participants went through the rigors for obtaining the baseline data of Name, age, pregnancy age, number of previous pregnancies and occupation. Body weight of each participant was measured using the Omron Karda Scan Body Composition Monitor

(HBF-511). The participants mounted on it bare footed and the indicated body weight was noted.

The training protocol: The exercise protocol (which lasted about 40 – 45 minutes each session) was carried out thrice weekly in the physiotherapy gymnasium of the physiotherapy department. A post-test data was obtained from both the experimental and control groups at the end of the ten (10) weeks of the training program. The training protocol used for this study was researcher-designed but followed the recommendations of the American College of Sports Medicine (ACSM), 2014 (23). The class of pregnant women were instructed to perform the following:

Warm Up

- Move around the gym
- On a spot, Swing arms forwards & backwards x 5
- Side and Upward Swings x 5
- Put hands on waist and rotate slowly x5
- Hold unto the parallel bars, Swing right legs forward and backwards x 5
- Then Swing the Left also x5

Exercise i:Hopping on the spot slowly for 2 minutes

Exercise ii:Alternate leg raises in standing (at least 6" above the floor) x 5 each leg

Exercise iii:Reach out to something far above your height (can use chalk as marker) tip-toe x 5

Exercise iv:With clenched fist and outstretched arms, swing arms beyond your frontal midline x5 each hand.

Exercise v:In sitting on an armless chair with a (1.5 kg wt), swing arms from the back mode to above your heads and return x 10.

Exercise vi – in Sitting

Head/ Neck Movements

- Forward looking, bring your chin to touch your chest and return x 5
- Forward looking, look up to see a bit beyond the centre of your head and return x 5
- Forward looking, turn your head/neck to the right as far as you can go and return x 5
- Forward looking, turn your head/Neck to the left as far as you can go and return x 5

Exercise vii – in Lying

Supine (Face up)

- With both legs together, separate them as far possible as you can go and return x 5.
- Alternate Straight leg raises to about 45^0 above the floor 5 x each (in the last 5wks, increase to 10 x each leg)
- Bicycling in the air (better done with the rhythm of a metronome) for 2 – 3 minutes.

Exercise viii – Side Lying

- Right side lying: raise the left leg from the hip x5
- Left side lying: raise the right leg from the hip x5 (In the last 5wks, increase to 10 x each leg)

Exercise ix – Kegels: Still lying on your left side, try and hold back as if trying to prevent urine/faeces from coming out, hold it to the count of 10; rest for 1 minute, and hold again to the count of 15.

Exercise x – Cool Down

- Gentle Spot hopping, while raising and dropping both upper limbs.
- Deep breathing exercises

Data Analysis: All statistical analyses were done using Statistical Productand Service Solutions (SPSS) for windows version twenty-One (21). Data were summarized using descriptive statistics such as Mean (x) and Standard Deviation (SD). The efficacy was the aerobic exercise training was tested using inferential statistics Analysis of Covariance at 0.05 alpha level. Cohen criterion for interpretation of the partial eta value was used to interpret the effect size of the exercise on the pregnant women with 0.20 – 0.49 as small effect, 0.50 – 0.79 as medium effect and ≥0.80 as large effect (24).

RESULTS

The result of the study on table 1 revealed that the pretest experimental group mean value was 73.16±9.67with a mean difference of -4.28. the post intervention mean score was expectedly higher at 76.37±9.95 with a mean difference of -7.78. the post intervention mean score was higher than the pre-intervention score. It follows that the aerobic exercise impacted the weight of the pregnant women.

Table 1. Mean and Standard deviation on the impact of aerobic exercise on Weight among pregnant women in Rivers State University Teaching Hospital

Weight	Group	N	MEAN	STD	Mean difference
Pre intervention	Experimental	38	73.16	9.67	-4.28
Pre intervention	Control	26	77.44	5.18	
Post intervention	Experimental	38	76.37	9.95	-7.78
Post intervention	Control	26	84.15	4.91	

Also, being in the negative, showed that there was a reduction in the body weight of the experimental group as compared to the control group. In table 2, a One-way between groups Analysis of CoVariance (ANCOVA) was conducted to compare the impact of aerobic exercise on weight among pregnant women in Rivers State University Teaching hospital. The dependent variable consisted of readings of weight after the intervention. The participants' weight on the pre-intervention was used as the covariate. Preliminary checks were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variance, homogeneity of regression slope and reliable measurement of covariance. After adjusting for pre-intervention weight value reading, aerobic exercise had a significant impact on weight ($F(1,61)=124.21, p=0.00$, partial eta square=.671).

DISCUSSION

The result of this study indicated that aerobic exercise of moderate intensity had a statistically significant effect on maternal weight. Exercise has a positive effect on maternal weight during pregnancy. Exercise reduces maternal weight gain during pregnancy, and if maintained after pregnancy, it also aids in postpartum weight loss. The result of this study was in tandem with the (25), (26), (27) who showed a positive relative between gestational weight gain and exercise during pregnancy. The main finding of this present study was that exercise program reduce total (mean) maternal weight gain as well as cases of excessive weight gain. It seems to be the consensus that physical exercise prevents excessive weight gain (28), (29), (30), (31). There are important points worthy of note. First, supervised exercise programs are more effective than home exercise counseling. Secondly, women with higher BMI prior to pregnancy are resistant to achieving the target weight gain accordingly to the Institute of Medicine (IOM).

Table 2. ANCOVA on the impact of aerobic on weight among pregnant women in Rivers State University Teaching Hospital

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5117.42[a]	2	2558.710	1833.39	.000	.984
Intercept	14.39	1	14.39	10.32	.002	.145
Pre-weight	4184.20	1	4184.20	2998.09	.000	.980
Group	173.35	1	173.35	124.21	.000*	.671
Error	85.13	61	1.40			
Total	410000.71	64				
Corrected Total	5202.55	63				

a. R Squared = .984 (Adjusted R Squared = .983)

P<0.05. *Significant

(32), randomized women with normal weight at 16-20 weeks gestation to 1 of 3 groups: low-intensity exercise, moderate-intensity exercise, or control. Total gestational weight gain was higher in the control group compared with either exercise group. (30) studied pregnant women with normal weight and compared a 12-week supervised exercise program with usual care. Only women who attended 24 exercise sessions demonstrated significantly less weight during pregnancy. On the contrary, in a recent study of (33) concluded that performing exercise during pregnancy is not associated with a reduction in maternal weight gain. They saw no difference in maternal weight at 20, 28, 36 and 38 weeks gestation or in weight gain at 38 weeks between women who followed the exercise program and those who did not. Also, (34) claims that moderate exercise was not found to be associated with gestational weight gain below or above the ranges for rate of gestational weight gain recommended by IOM.

CONCLUSION

Participating in a planned, supervised aerobic exercise program can be of a great benefit to the pregnant woman as this study showed a significant reduction in maternal weight gain during pregnancy when compared with controls. It is therefore safe to conclude that aerobic exercise has a positive influence on maternal weight management and overall maintenance of physical fitness in pregnant women.

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