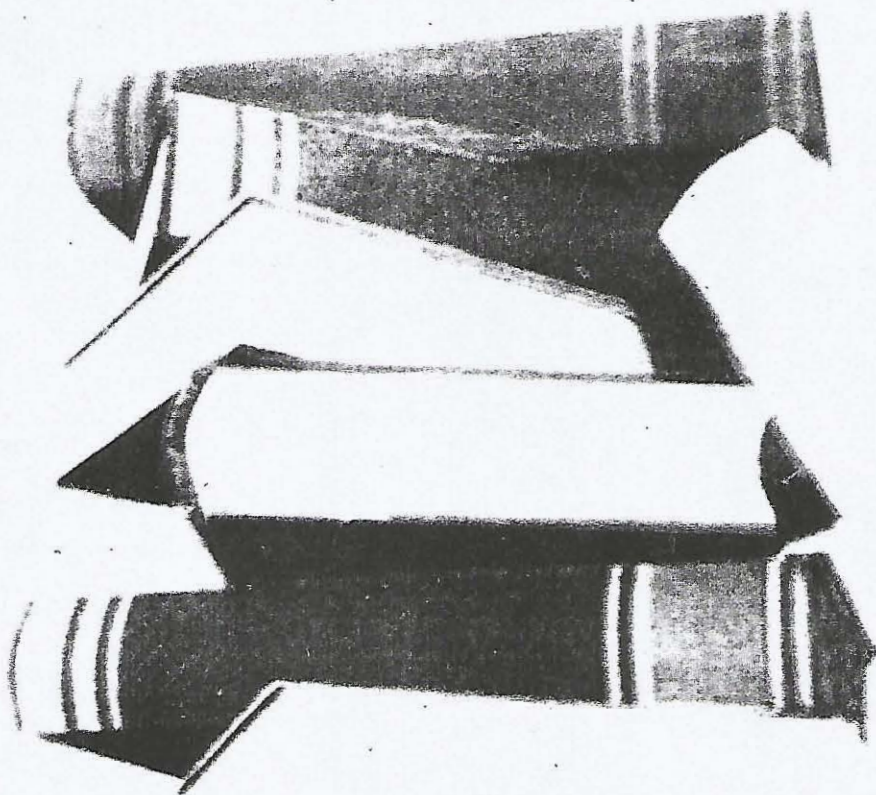


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Physical and Physiological Implications of Exercise during Pregnancy

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Abstract

The paper examines the physical and physiological implications of exercise on the health and well-being of expectant mothers. Modern popular culture has embraced the concept of a fit pregnancy. However, in Nigeria the awareness of the contention that regular exercise during pregnancy incurs little risk is yet to be well accepted. Ideally, it is good for any woman to follow a regular exercise routine throughout her life, likewise women who are considering being pregnant, begin in a good physical condition before becoming pregnant is important. Being fit helps a woman's body meet the increasing physical demands of carrying a baby. The changes that occur to a woman's body during pregnancy are many but this paper selected some physical and physiological changes which exercise can be of benefit. The paper further discussed effect of exercise on these changes. The authors recommended some exercises with necessary guidelines that can be of benefit to the mothers to be.

Introduction

Pregnancy is a time of tremendous musculoskeletal, physical and emotional changes and yet it is a condition of wellness. Pregnancy is divided into three trimesters. In the first trimester (first three months) of pregnancy, one of the pregnancy hormones (relaxin) influences ligaments and supportive soft tissue. It softens the supportive tissues, thereby reducing stability of joints throughout the body. Obstetrically, this is desirable as a little more flexibility within the joints of the pelvic girdle allows more room for manoeuvring when the baby enters the pelvic girdle, engages and settles into the delivery position (Calguneri, Bird, and Wright, 1982).

Myths abound with respect to exercise during pregnancy. Exercise enthusiasts claim that women who are fit have shorter labours and fewer complications during pregnancy and birth. Those who advocate caution warned that exercise may cause distress to the foetus, place the mother at increase risk of injury and lead to lower birth weight in babies.

At the moment there is relatively little scientific evidence about the effects of exercise during pregnancy. Recommendations have changed during the last 10 years and will continue to do so as more evidence accumulates. These guidelines were designed to ensure the safety of the majority of pregnant women but did not take account of athletic women. In 1994, they published revised guidelines that eliminated figure for heart rate and duration of exercise and suggested that women can exercise moderately to maintain cardiorespiratory and muscular fitness throughout pregnancy and the postpartum period.

Anatomic and Physiologic Changes during Pregnancy

Pregnancy brings many physiological and structural changes in a mother-to-be. Johnson (2001) reported that many physiological changes occur in the body systems such as the cardiovascular, respiratory, musculoskeletal, endocrine and digestive systems, while the anatomical changes of pregnancy alter posture, balance, flexibility, co-ordination. The centre of gravity shifts forward and weight gain of 10 – 16kg is common. These changes will modify her response to exercise, and she will need to adapt her exercise programme accordingly.

Pregnancy Weight Gain

A pregnancy percent increase in total weight is normal. This is necessary to nourish the foetus. Weight gain is produced by (average figures):

Foetus	3.63 – 3.88kg
Placenta	0.48 – 0.72kg
Amniotic fluid	0.72 – 0.97kg
Uterus and Breasts	2.42 – 2.66kg
Blood and fluid	1.94 – 3.99kg
Muscles and fat	0.48 – 2.91kg

Table 1: Recommended Total – Weight Range for Pregnant Women by Pregnancy Body Mass Index (BMI)

Weight – for – health	Recommended total weight
Low (BMI 19.8)	12.5 – 18
Nor mal (BMI of 19.8 to 26.0)	11.5 – 16
High (BMI 26.0 – 29.0)	7 – 11.5

Source: ACOG (1994)

Mottola (2002) recommended that young adolescents and black women should strive to gain at the upper end of the recommended range while short women (157cm or 62 inches) should strive to gain at the lower end of the range. The recommended target weight gain for obese women (BMI 29.0) is at least 6.8kg (table 1).

Cardiovascular Changes

Artal, et al. (1995) reported that cardiac output increases by 30% to 50% during pregnancy as the heart adapts to the increased demands placed on it by the enlarging uterus and growing fetus. However, when a pregnant woman is supine, cardiac output decreases beyond the non-pregnant baseline, especially after 28 to 32 weeks gestation. They further suggested that some aerobic exercises, such as sit-ups and weight lifting on a bench press machine should be avoided because in this position the pregnant uterus compresses the inferior vena cava and reduces venous return to the heart. The resting heart rate increases by up to 7 beats per minutes in the first trimester and by 15 beats per minutes in

the second and third trimesters. There is an increase in blood volume of 35% to 45% over the pre-pregnant state.

However, performance in endurance athletic activities may actually improve during the first trimester of pregnancy as a result of these cardiovascular changes. Changes in blood flow probably occur within the placenta during exercise, although this has still to be demonstrated clearly. Studies of pregnant women exercising in controlled settings (Artal, 1999; ACOG, 1994) have shown that the foetal heart rate increases during the mother's exercise. Whether this should be interpreted as a sign of foetal distress or simply a response to exercise-induced hormones circulating in the maternal blood stream remains to be determined.

Respiratory Changes

As the uterus enlarges, the diaphragm is displaced upwards by as much as 4 cm. This will reduce the respiratory volumes available during exercise. A slight rise in the rate of breathing at rest is caused by increased progesterone levels. Resting oxygen consumption is increased by up to 20% in later pregnancy (Lokey, et al., 2001)

Digestive Changes

ACOG (2002) reported that the digestive system is affected by the presence of the enlarging uterus and physiologically by increased plasma progesterone, a smooth muscle relaxant. The combined effects of these changes contribute to constipation and a slowing of gastrointestinal motility. The caloric requirement of mother and baby gradually increases during pregnancy, and becomes an additional 300 kcal per day in the third trimester. Exercise during pregnancy further increases calorie use, and the mother's nutrition should reflect these increased needs.

Locomotor Changes

According to Arena and Maffuli (2002) changes in the musculoskeletal system during pregnancy will affect responses to exercise. The enlarging uterus and breasts move the woman's centre of gravity forward and exaggerates the normal forward curvature of her spine in the lumbar region. This increases the likelihood of back pain. The balance skills required for athletic activities such as gymnastics, ice skating, skiing, golf and tennis are affected by changes in the centre of gravity, and these sports may have to be given up during pregnancy and other activities substituted. Hormonal changes 'loosen' the ligaments, reinforcing pelvic joints and this may predispose her to diminished co-ordination and a greater risk of injury or sprains.

Benefits of Exercising before, during and after pregnancy

Exercise plays an important role in promoting health and well-being for pregnant woman. According to Brown (2002), women who exercise during pregnancy have the following:

- (1) Improved cardiovascular function
- (2) Limited weight gain and body fat retention
- (3) Improves digestion
- (4) Reduced constipation
- (5) Reduced back-pain
- (6) Improved attitude and mental state.
- (7) Easier labour or reduction in possible complications during labour
- (8) Reduced odds of caesarean delivery
- (9) Faster recovery
- (10) Better fatness level
- (11) Reduces diastolic blood pressure in pregnant women at risk of hypertension
- (12) The offspring may have a reduced fat cell growth rate without compromising other body cell growth, a high stress tolerance and an advanced neurological developmental rate.

Conditions Prohibiting Exercise in Pregnancy

The following conditions may contraindicate vigorous physical activity. (ACOG, 2002) guidelines

- (1) High blood pressure
- (2) Anaemia or other blood disorders
- (3) Thyroid disease
- (4) Diabetes
- (5) Cardiac Arrhythmia or palpitations
- (6) History of precipitous labour
- (7) Intrauterine growth retardation
- (8) Bleeding during pregnancy
- (9) Breech presentation during the last 3 months of pregnancy
- (10) Excessive obesity
- (11) Extreme underweight
- (12) Premature labour
- (13) Ruptured membranes
- (14) Incomplete cervix or neck of womb
- (15) Diagnosis of cardiac disease

Guidelines and Precautions for Pregnancy Exercise Programme

ACOG (2002) gave the following guidelines and precautions

- (1) Each participant has a physical examination by a physician prior to engaging in an exercise programme.
- (2) Each person should be individually evaluated prior to participation to screen for pre-existing musculoskeletal problems posture and fitness level.
- (3) Each participant should have sufficient fluid intake before, during and after exercise to prevent dehydration.
- (4) 10 – 15 minutes warming-up and cooling-down periods should be included in each exercise session.
- (5) Suitable clothing should be worn to avoid becoming too hot.
- (6) Lying down exercise must be avoided
- (7) Avoid exercises that require repetitive bouncing and jarring movements.
- (8) Focus on low-impact activities such as stationary bicycling, exercising in water, upper-body aerobic workouts and walking.
- (9) Avoid activities that may result in low-oxygen states e.g. mountain climbing.
- (10) Advice to include a large proportion of complex carbohydrates in diet to minimize the risk of foetal ketosis when exercising.
- (11) Avoid competitive sports where there is a risk off trauma.
- (12) Avoid exercises such as weight lifting that involve holding the breath and significantly increasing pressure within the abdomen.

Warning signs to terminate Exercise

Dempsey (2005) outlined the following warning sign to terminate exercise during pregnancy:

- Excessive shortness of breath
- Chest pain or palpitations
- Presyncope or dizziness
- Painful uterine contractions or preterm labour
- Leakage of amniotic fluid
- Vagina bleeding
- Excessive fatigue
- Abdominal pain, particularly in back or pubic area
- Pelvic girdle pain
- Reduced foetal movement
- Dyspnea before exertion
- Headache
- Muscle weakness
- Calf pain or swelling

Therefore, women should be advised to seek medical advice should any of the above symptoms occur.

Guidelines for exercise during pregnancy

These guidelines were published by the American College of Obstetricians and Gynecologists (2002):

- (1) Always maintain correct posture by tilting your pelvic and straightening your back
- (2) Monitor your breathing and maintain the ability to walk and talk comfortably while exercising
- (3) Stop exercising when tired and do not exercise to exhaustion
- (4) Avoid any type of exercise that may potentially cause even mild abdominal trauma
- (5) Avoid arching your back
- (6) Do not bring your feet over your hips
- (7) Do not do sit up past 45 degrees
- (8) Breathing continually while exercising do not hold your breath
- (9) Drink a lot of fluids before, during and after exercising to prevent dehydration
- (10) Avoid activities that require precise balance and coordination. As your pregnancy progresses, your coordination may be altered by your increasing weight, shift centre of gravity and softening and increased mobility of your joints and ligaments
- (11) Muscles that are used in aerobic activity should be appropriately stretched before and after the exercise.

Recommended Exercises during Pregnancy

Before pregnancy women start exercising, it is important to talk to their health care provider and if they had started exercising before pregnancy, they may be able to keep up with the routine and adapt to it as the pregnancy grows. The heart rate should be under 140 beats per minute and overheating should be avoided especially in the first trimester. The following exercises can be recommended

(1) Kegel Exercises

Pregnant women who perform kegel exercises often find out that they have an easier birth. Strengthening these muscles during pregnancy can help you develop the ability to control your muscles during labour and delivery. Toning all these muscles will also minimize two common problems during pregnancy which are bladder leaks and hemorrhoids. Kegel exercises are also recommended after pregnancy to promote perineal healing, regain bladder control and strengthen pelvic floor muscles. The best thing about kegel exercises is that they can be done anywhere.

(2) **Swimming**

Many health providers and fitness professionals say swimming is the safest exercise for pregnant women. It keeps the body toned without adding weight and stress to the joints. Swimming raises heart rate and it is noted to be a safe cardiovascular exercise that is not likely to cause overheating.

(3) **Brisk Walking**

A good activity to begin during pregnancy is a walking programme three to five days per week. Walking is an inexpensive form of exercise as the only requirements are a suitable pair of shoes and comfortable clothing. Also, it is an activity that can be integrated into daily schedules. However, it may be necessary to use modified forms of walking to gain significant benefits. Walking at increased speed, walking up and down hills and walking while carrying weight can raise the heart rate to levels that will improve aerobic fitness. It is very beneficial because it is safe for the body. Start slowly and be sure you stretch well before you begin also set realistic goals and wear good shoes to decrease the risk of falling or pressure on the feet.

(4) **Bicycling**

The best thing about biking is that the bike supports the weight so there is less stress on the body. A stationary bike is great exercise because there is less chance of falling. The abdomen grows; it can put a lot of stress on the back. Start slowly and do not over exert yourself. Cycling on a stationary bicycle is safer than the mobile bicycle. The bicycle ergometer should be placed in an airy place or if possible air conditioned environment. The seat should be adjusted to provide comfort to the pregnant women. Cycling should not be done to exhaustion but long enough to elicit moderate sweating. It is recommended during pregnancy because it allows for good mobility of the lower limbs with the body weight supported.

(5) **Yoga**

Yoga has a long standing reputation for relieving stress and pressure on the body. Most forms of Yoga will be safe for the mother and the baby as they are not excessively rigorous. Some yoga instructors offer special classes for pregnant women. However, the woman should avoid lying flat on the back for extended periods of time and try not to overstretch.

(6) **Aerobics**

The most comfortable exercises are those that do not require the body to bear extra weight. Aerobic exercise involves rhythmic, repetitive activities that demand increased oxygen to the muscles. Aerobics

include walking, jogging, bicycling and swimming. This type of exercise stimulates the heart, lungs and muscles causing overall body changes. It allows the body to process and utilize oxygen and improves circulation.

The muscle tone and strength increases, which will help relieve backache, constipation and make the mother able to cope with a lengthy labour. An added benefit to aerobic exercise is that it may help control blood sugar, lessen fatigue and promote good sleep. The bottom line is that aerobic exercise will impart a feeling of well-being and coincidence, while heightening the ability to cope with the physical and emotional challenges of childbearing.

Conclusion/Implication

From the discussion in this paper, it can be said that modern popular culture has embraced the concept of a fit pregnancy as demonstrated by researchers. Scientific literatures support the contention that regular exercise during pregnancy incurs little risk and is beneficial in terms of both mental and physical health of mother to be and the baby. However, such exercise programme must be handled by qualified personnel(s) and proper guidelines must be followed to achieve the desired effects. Meanwhile the best type of exercise for a pregnant woman should be the activities enjoyed by the mother which does not pose any risk to her or the foetus and which can be easily modified as the pregnancy progresses.

Recommendations

- (1) There is need to take up a fitness programme before conceiving, this could reduce pregnancy symptoms. Women interested in a programme of 'preconceptional preparation' are often counselled on dietary factors (e.g. recommended to take folate supplements). It may also be appropriate to encourage inactive women to take up moderate aerobic exercise at this stage.
- (2) Exercise programme should be recommended for the first time in pregnancy. Ideally, women should be aiming to maintain a level already achieved. For those wishing to take up exercise, walking or non-weight bearing exercise such as swimming or cycling started very gradually would avoid the extra strain of weight gain during pregnancy. Exercise to exhaustion should be avoided.
- (3) Limber down gradually after vigorous exercise. Hormonal and physiological effects of pregnancy mean that it is more likely that blood will pool in the leg muscles if exercise is stopped suddenly. A warm-down should be included after aerobic exercise.
- (4) Take great care with activities requiring balancing skills. Pregnancy hormones have the effect of loosening ligaments; joints therefore become less stable and more prone to sprain. Of particular importance are the spinal joints, hip joints, knees and ankles.

- (5) Anyone suffering from heart disease, hypertension or anaemia should be discouraged from rigorous exercise. The heart will have an extra load to bear as pregnancy progresses.
- (6) Take care to avoid over-heating. If exercising in hot or humid conditions, shorten the duration or intensity of activity, and ensure plenty of fluid is drunk. Do not take sauna or long hot baths after exercising.
- (7) Measurements commonly used to monitor and prescribe exercise regimes may need to be altered. Heart rate is a less sensitive and reliable method for monitoring exercises intensity during pregnancy. In contrast, perceived exertion has been found to be unaffected by pregnancy – thus some sports scientists recommend using reported perceived exertion in conjunction with heart rate for monitoring and prescribing exercise.

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